Guide for Evaluating

Historic Resources

in the

I-70 Mountain Corridor

Colorado

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SECTION A: INTRODUCTION

Interstate 70 is among the most important routes in the nation's highway system. The interstate is the only high-speed, multilane road to cross the central Rocky Mountains, linking Denver with numerous Colorado mountain communities and ultimately I-15 in Utah. For much of its length, I-70 is largely as-built with two east-bound and two west-bound lanes separated by a median. A segment known as the Mountain Corridor, from C-470 at the east base of the mountains to Glenwood Springs in Garfield County, became the most heavily traveled portion in recent decades. The Mountain Corridor carries both a high volume of interstate traffic and more Colorado-based business and recreational travel than ever before.

To relieve growing congestion, Colorado Department of Transportation (CDOT) and the Federal High Way Administration (FHWA) jointly began planning additional lanes. But the corridor's environment, both natural and manmade, greatly complicated the project. The corridor not only traverses one of Colorado's most scenic and heavily used regions, but also one of the state's most historically important. In consideration of this, CDOT and FHWA implemented the Context Sensitive Solutions (CSS) planning process, which carefully coordinates design and construction with environmental factors. CDOT and FHWA then developed a Programmatic Agreement among corridor stakeholders, identifying and addressing concerns. CDOT hired engineering firm CH2M HILL to begin the CSS process and develop guidelines.

Potential impacts to corridor's historic character was a primary concern in the CSS process, and preemptively addressed in Section IV of the Programmatic Agreement. The section required a historic context to guide implementation of Section 106 of the National Historic Preservation Act, when construction begins. The context had to structure identification and documentation of historic resources, and evaluation of their significance according to the National Register of Historic Places. Further, the consulting parties also required the context to serve their needs.

CH2M HILL contracted with historian and archaeologist Eric Twitty of Mountain States Historical, Lafayette, Colorado, to produce the context. In consultation with CDOT and corridor stakeholders, Mr. Twitty determined that most of the historic resources expected in the corridor could be categorized under eight broad historic themes: mining, timber industry, agriculture, electric power, railroad transportation, road transportation, tourism and recreation, and architecture. Mr. Twitty completed research and text for most of the themes, and consulted with other cultural resource experts for the others. Historian Caitlin McCusker, at CH2M HILL, researched and wrote the sections on agriculture and road transportation. Architectural historian Carl McWilliams produced the section on architecture. Michelle Slaughter, director of Avalon Archaeological Consultants, researched and contributed text to the section on tourism and recreation. As produced, the context and authors fulfill the requirements defined in Section IV of the Programmatic Agreement for the I-70 Mountain Corridor.

SECTION B: CONTEXT DESCRIPTION

The history of the I-70 Mountain Corridor is lengthy and complex. Between 1859 and 2011, when this context was produced, a significant number of people, businesses, industries, and other entities populated the corridor. Over time, they left a wide variety of historic resources still in existence today. The context is designed to structure identification and recordation of those resources, and established guidelines for evaluating their significance according to the National Register of Historic Places (NRHP). To do so, the context focuses on the dominant historical themes within the corridor and related types of resources that are either common or hold a significant presence. The themes, in order of presentation are: mining, timber industry, agriculture, electric power, railroad transportation, road transportation, tourism and recreation, and architecture.

To serve the needs of Section 106 compliance and corridor stakeholders, the context was modeled after the Multiple Property Documentation Form format developed by the National Park Service. In addition, the context attempts to use language and terminology specific to Multiple Property Documentation Forms. In overview, the document is divided into sections similar to chapters. Sections A through D provide project and environmental background. Section E details corridor history by theme, which is necessary for understanding related resources, identifying important historic trends and patterns, and evaluating resource significant in terms of the NRHP. Section F defines the most common resources in the corridor by theme, and establishes guidelines for assessing their eligibility for listing on the NRHP.

<u>Context Function</u>

Although the context was developed primarily to guide implementation of the Section 106 process, it was produced to meet the needs of consulting parties, as well. The principal functions of the document include, but are not limited to:

- Supporting Section 106 compliance for projects that CDOT may undertake in the corridor.
- Providing information on regional history, common types of historic resources, and historic attributes for use with design and other phases of the CSS process.
- Supporting Section 106 compliance for projects that consulting party Federal agencies, other than CDOT, may pursue in the corridor. Some of those agencies include the Bureau of Land Management and the U.S. Forest Service.
- Establishing guidelines for review agencies to access the accuracy and quality of Section 106 work in the corridor.
- Providing consulting parties with a document to help them understand the results of Section 106 findings for various projects.
- Supporting voluntary projects that consulting parties may undertake with individual historic properties in the corridor but outside of the I-70 right-of-way. Examples include site identification and interpretation, historic preservation, and assessment of potential eligibility.
- Supporting large-scale voluntary projects that involve multiple historic resources, such as surveys and inventories. Such projects could be initiated by environmental watershed studies, pine bark beetle programs, and preservation planning, as examples.
- Offering material for heritage tourism development, primarily by consulting parties local to the corridor.

Section B: Context Description

Format and Content

The variety of consulting parties brings a diverse readership differing in their familiarity with historic resources and the process of evaluating their eligibility to the NRHP. The context features content to meet the above needs, and is formatted and written for those familiar with the nomination process. Following are important points regarding format:

- The context is modeled after the Multiple Property Documentation Form (MPDF), designed by the National Park Service and recognized by other agencies.
- The MPDF format is functional for assessing the potential eligibility of resources in the I-70 Mountain Corridor.
- The context is not, however, an MDPF.

Following are important points regarding content:

- The context includes information for users who are unfamiliar with corridor history and its common types of historic resources.
- The context divides the corridor into the principal historic themes for which historic resources remain.
- The history of each theme is discussed in detail in Section E and covers time, place, important events, and significant people and institutions.
- The common types of resources likely to be encountered in the corridor are described in detail in Section F. Although no formal surveys have been accomplished in the corridor for the context, the resource types are forecasted according to corridor history, informal observations, and cultural resource work completed to date.
- The context establishes guidelines for recommending historic resources eligible for the NRHP. Each resource type is treated independently, within each theme.

Limitations

The context possesses limitations in and restrictions for its use. Key limitations include:

- The context is not the mechanism for officially recognizing historic resources as eligible for the NRHP. It serves as guidance document for *recommending* resources eligible. CDOT, OAHP, the BLM, and the U.S. Forest Service possess the authority for rendering official decisions regarding the eligibility of those resources under their prevue.
- The context is not a binding or enforceable document for determining resources eligible, but provides structure and guidelines for their nomination. Decisions and findings of eligibility rest with the experience, judgment, and protocol of CDOT, OAHP, the BLM, or the U.S. Forest Service.
- The context comes with restrictions in use, although it has been distributed to the consulting parties. In particular, the context must be used with permission by, or in consultation with, CDOT.

SECTION C: RESEARCH METHODOLOGY

Mining Industry

Although Clear Creek County was among Colorado's most important centers of mining, no comprehensive histories of the region have been published. The work that has been done, while sound, focuses on either narrow timeframes or geographic areas. Similarly, little has been published on mining in Ten Mile Canyon and around Dillon. To adequately address both regions, the I-70 context relied on the handful of qualitative secondary sources and considerable primary material.

Six important research facilities in the Denver area offered collections rich with archival materials. The institutions in order of relevance are: Denver Public Library Western History Collection, Colorado School of Mines, Colorado State Archives, University of Colorado at Boulder library system, and the Colorado Historical Society. Events, trends, and institutions important in history were derived from a wide variety of materials. The most useful were period publications, mining periodicals, newspapers, mine inspectors' reports, mine engineers' reports, and popular literature.

Two approaches were useful for identifying significant timeframes. One was consulting the materials identified above, and the other was a statistical analysis of population, ore production figures, and the numbers of mines active between 1860 and 1980. These indicators were tabulated in five year increments where possible, and the mines divided among small, medium, and large scale operations.

Although statistical analysis has inherent weaknesses, it is well equipped to identify important timeframes. For example, sudden rises in both population and the numbers of prospects can be interpreted as a period of discovery, mineral exploration, and boom. Gradual population growth combined with high production figures and an increase in small- and medium-sized mines often reflects the early phase of a productive mining industry. A slight contraction in population, a decrease in small mines, an increase in large operations, and an increase in production figures suggests the maturation of mining. In terms of weaknesses, statistical analysis relies on the accuracy of archival resources. The five year increments between 1885 and 1897 were poorly covered, and some important mines were not mentioned or reported, even though they were active at times. In addition, it seems likely that many prospects were not reported because of their unimportance at the time.

Several Multiple Property Documentation Forms have been produced for mining industries in Colorado. The Author borrowed heavy from these for Section F of the I-70 context. The Author and Jay Fell, Ph.D., co-produced *The Mining Industry in Colorado Multiple Property Listing* statewide mining industry context. The author also produced *Amendment to Tourist Era and Metal Mining Resources in Boulder County Multiple Property Listing* and *Mining Resources of San Juan County Multiple Property Listing*. The author's treatise on mining technology, *Riches to Rust*, was important for the discussion of methods and machinery, and blocks of text were copied into Sections E and F.

Timber Industry

In the corridor, the timber industry was nearly as important as mining and railroads. The timber industry provided the physical materials on which mining, the railroads, other forms of business, and the settlements were based. And yet, the industry received little recognition in both archival sources and popular literature. Given this, the history of the timber industry, its Property Types, and their registration requirements appear to be original work.

Seven important research facilities in the Denver area were examined for relevant materials. The institutions in order of relevance are: Denver Public Library Western History Collection, Colorado School of Mines, Colorado State Archives, University of Colorado at Boulder library system, the Colorado Historical Society, and the U.S. Forest Service. Of these, Denver Public Library, the Colorado School of Mines, and the University of Colorado at Boulder library system offered the most material, meager as it was. Relevant sources were historic publications, business directories, newspapers, and local history publications.

The timber industry history as presented in the I-70 context treated the three principal segments of the corridor separately. Each had its own industry that responded to local demand, specific events, and external markets. Their histories had to be pieced together and interpreted from a combination of industry-specific information, and the regional events and trends that influenced the demand for forest products.

The timber industry in each corridor segment had its own significant timeframes, which were estimated from the interaction of three principal factors. First, the timber industry was primarily a function of mining and railroad construction, and the boom-and-bust cycles of these fields governed most timeframes. Second, fluctuations in the demand among external markets were influential, and third, the exhaustion of forests was an important factor.

There are no timber industry contexts to serve as examples for developing Property Types presented in Section F. Thus, the section is largely original. Structurally, Section F is modeled after the mining industry section of the MPDF because logging and mining were similar industries. The Author based the Property Types and their features on his experience interpreting and evaluating historic logging resources.

High Altitude Agriculture

Agriculture began in Clear Creek drainage when prospectors and miners established homesteads and grew produce for local markets. Homesteading, ranching, and farming then gradually spread westward through the corridor. The I-70 context divided the theme of agriculture into these three categories, none of which were well documented in the past.

A combination of primary and secondary sources provided enough information for a basic history. The sources were found in two key research facilities in the Denver area: Denver Public Library Western History Collection and the Colorado Historical Society. The most important sources were popular literature and period newspapers and publications. Thorough research was unnecessary because influential trends such as settlement, development of local markets, and transportation were already determined for the context's other sections.

The discussion of Property Types in Section F is based on three bodies of information. mostly original and drew some information *Historic Ranching Resources of South Park, Colorado*, a well-written Multiple Property Documentation Form by architectural historians Thomas and Laurie Simmons, provided some Property Types, language, and registration requirements. Because the document emphasizes buildings, the Author added archaeological resources based on his experience and that of others. Architectural historian Carl McWilliams developed additional building types from personal experience and a review of records at the Office of Archaeology and Historic Preservation.

Electric Power Generation

Each section of the corridor had its own power grid built in response to local conditions. The grids began as independent systems with histories specific to their service areas, and they were ultimately unified by the Public Service Company of Colorado. Although electricity played an important role in mining, other industries, and the quality of life in the corridor, its generation received little documentation in the past. Coverage in archival sources is minimal, only a handful of recent publications exist, and no contexts have been produced. Given this, the history of electrical generation in the corridor, the Property Types, and their registration requirements appear to be original work.

The same research facilities mentioned above were examined for relevant materials. Denver Public Library, the Colorado School of Mines, and the University of Colorado at Boulder library system offered the best material. The most important sources were Public Service Company manuscripts, historic newspapers, and mining industry periodicals.

The history of electric power as presented in this context treated the three principal segments of the corridor separately because each had its own localized grid. The histories had to be pieced together and interpreted from a combination of industry-specific information, and the regional events and trends that influenced the development of electrical grids.

The power industry in each corridor segment had its own significant timeframes, which were determined from four principal factors. First, power companies initially built plants to serve mining and dependent settlements. The mining industry was a principal customer base, and its embrace of electricity shaped early power generation. Second, advances in electrical technology influenced periodic developments in the grids. Third, the consolidations of local electric companies were benchmarks for the grids. Last, unification of all the grids into one system, and the associated closure of some powerplants, was a turning point for all systems.

There are no electrical generation contexts to provide examples for defining Property Types in Section F of the I-70 document. Thus, the work is largely original. Structurally, Section F is modeled after the mining industry section of the MPDF because power generation and mining were industries dependent on technology. The Author based the Property Types and their features on his experience interpreting and evaluating power generation resources.

Railroad Transportation

Railroads in Colorado are a beloved institution among historians, who conducted exhaustive research and published dozens of books on the subject during the last 50 years. The railroads in the I-70 Mountain Corridor were not left out, and the historians produced an excellent body of work, most of it accurate and based on primary research. Although the publications are secondary sources, their quality is high enough to support the railroad section in the I-70 context. Thus, little research in primary sources was undertaken in an attempt to avoid repetition.

The historic context and Property Type sections are based on two categories of publications. The body of popular literature was the principal source for railroad histories. Because the individual lines in the corridor were components of larger systems, the histories of these systems had to be considered for a full understanding of the lines. The individual lines also had to be placed in the framework of their surrounding service regions, whose histories are covered in other sections of this context.

Section F of the I-70 context borrowed heavily from Clayton Fraser's *Railroads in Colorado, 1858-1948: Multiple Property Documentation Form*. Fraser, of Fraserdesign in Loveland, produced the statewide railroad context in 1997 for the Foundation for Colorado State Parks with a grant by the State Historical Fund. To avoid contradiction with the precedent Fraser established, the I-70 context adopted his general Property Types, significance statements, and registration requirements. Fraser, however, limited his coverage of resources to large and intact engineered structures and architecture. Missing from the statewide context are small components of rail systems and archaeological resources, which are present in the I-70 Mountain Corridor. Thus, the I-70 context filled in these data gaps.

Road Transportation

Roads figure prominently in the development of the I-70 Mountain Corridor. Their history began with pack trails created by prospectors and miners in 1859 and continues today. Intensive archival research was not carried for the theme, however, because of several reasons. First, trends and historic patterns influential to road development had already been determined through research for the corridor's other topics. Second, a sound body of work regarding roads in Colorado exists. Some primary research was conducted at Denver Public Library and Colorado Department of Transportation, but several contexts currently in publication provided guidance and structure. In 2003, Robert Autobee and Deborah Dobson-Brown published *Colorado State Roads and Highways: National Register of Historic Places Multiple Property Submission* statewide context. Associated Cultural Resource Experts published statewide highway context for Colorado Department of Transportation entitled *Highways to the Sky: A Context and History of Colorado's Highway System*. These documents, other publications listed in the bibliography, and knowledge of the I-70 Mountain Corridor provided information for the development of Property Types in Section F.

Tourism and Recreation

The I-70 Mountain Corridor has a history of tourism and outdoor recreation almost as lengthy as Euro-American occupation. Tourism evolved from a relatively static, resort-based pastime to a diverse array of outdoor activities for which Colorado is currently known. The I-70 context divided the broad topic of tourism and outdoor recreation into three categories represented today in the corridor by historic resources. The categories include the ski industry, resort tourism, and outdoor recreation.

A combination of primary and secondary sources provided enough information for basic tourism and recreation history. The sources were found in three key research facilities in the Denver area: Denver Public Library Western History Collection, University of Colorado at Boulder library system, and the Colorado Historical Society. The most important sources in these institutions were popular literature, period newspapers and publications, and a series of historic reports produced by the U.S. Forest Service.

Section F and its discussion of Property Types was mostly original and drew some information regarding significance from the research sources. The Property Types were based on the Author's experience, and those resources likely to exist in the corridor.

SECTION D: GEOGRAPHIC AREA OF I-70 MOUNTAIN CORRIDOR

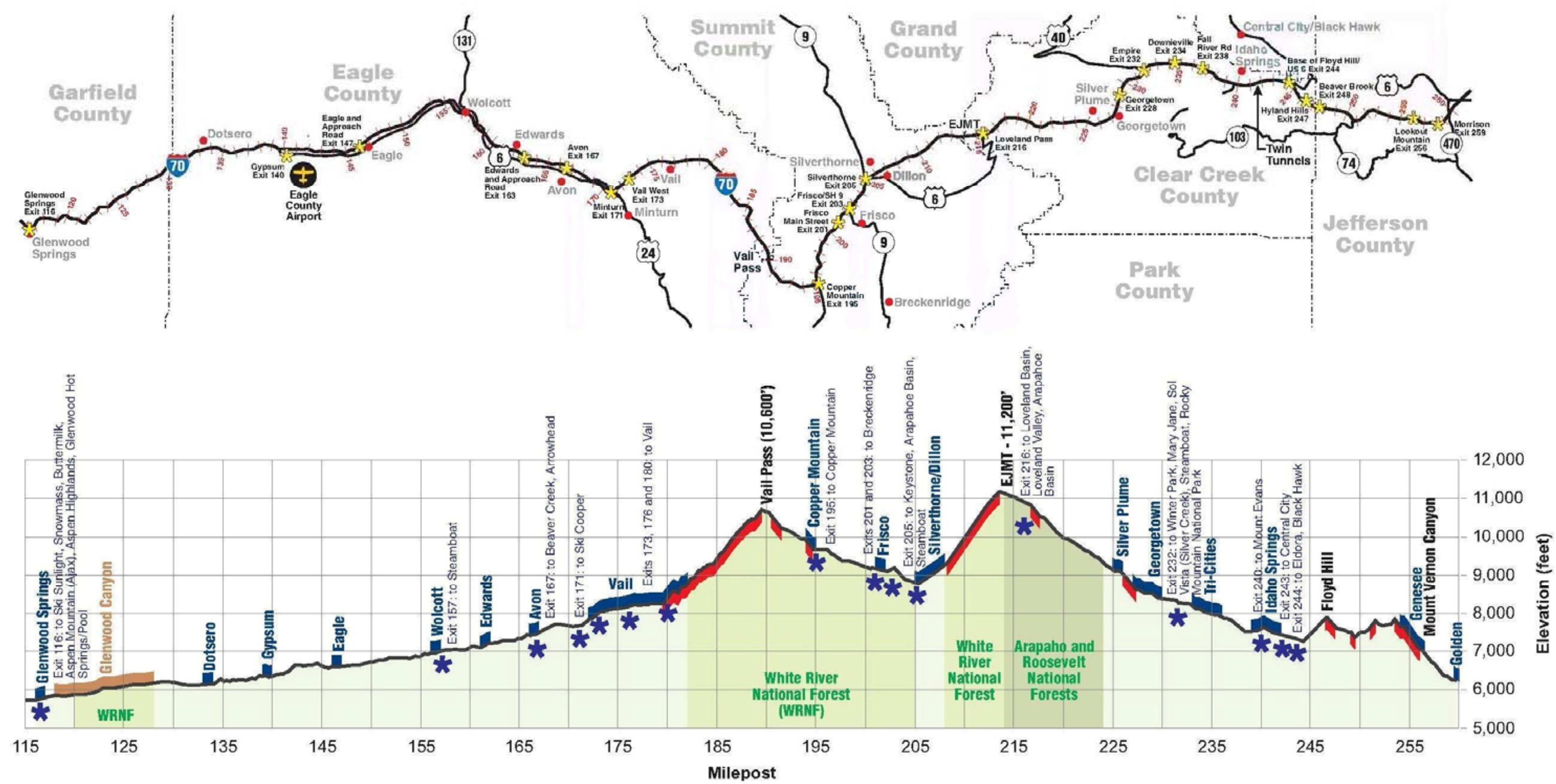
The geographical area of the I-70 Mountain Corridor covered by the context extends from Floyd Hill, east of Idaho Springs, in Clear Creek County, to the edge of Glenwood Springs, Garfield County, Colorado. The corridor is not confined to the I-70 right-of-way, and instead includes the view shed on both sides of the interstate. Because I-70 passes primarily through river and stream valleys, the view shed includes most of the land within the valleys, from ridge to ridge top.

In Clear Creek County, the corridor follows Clear Creek from Idaho Springs to the eastern portal of the Eisenhower Tunnel. In this corridor segment, mining, railroad transportation, electric power, the timber industry, tourism, and road transportation are principal historic themes. The context refers to this corridor segment as Clear Creek drainage. In the segment, the natural environment undergoes transition from Front Range foothills to alpine conditions of the Continental Divide. In between, Clear Creek valley offered gentle gradients for railroads, thick forests for logging, and metamorphic geology conducive to and gold and silver ore formations.

At the western portal of the Eisenhower Tunnel, I-70 emerges into Summit County. The corridor descends Straight Creek to Dillon, crosses the Blue River valley to Frisco, ascends south up Ten Mile Canyon to Copper Mountain, and continues west to Vail Pass. The context refers to the segment as the Dillon and Ten Mile valley area and the Blue River valley. Mining, railroad transportation, electric power, the timber industry, tourism, and highway transportation are principal historic themes. The environment at the both ends is high elevation alpine and the valleys in between are subalpine and riparian. The Blue River flows across the I-70 Mountain Corridor south from Breckenridge and north to Kremling. The entire Blue River valley offered loggers stands of tall lodgepole pines and miners deep gold-bearing placer gravel. Ten Mile canyon, a deep chasm between rugged peaks, featured silver veins in metamorphic geology, and thick forests.

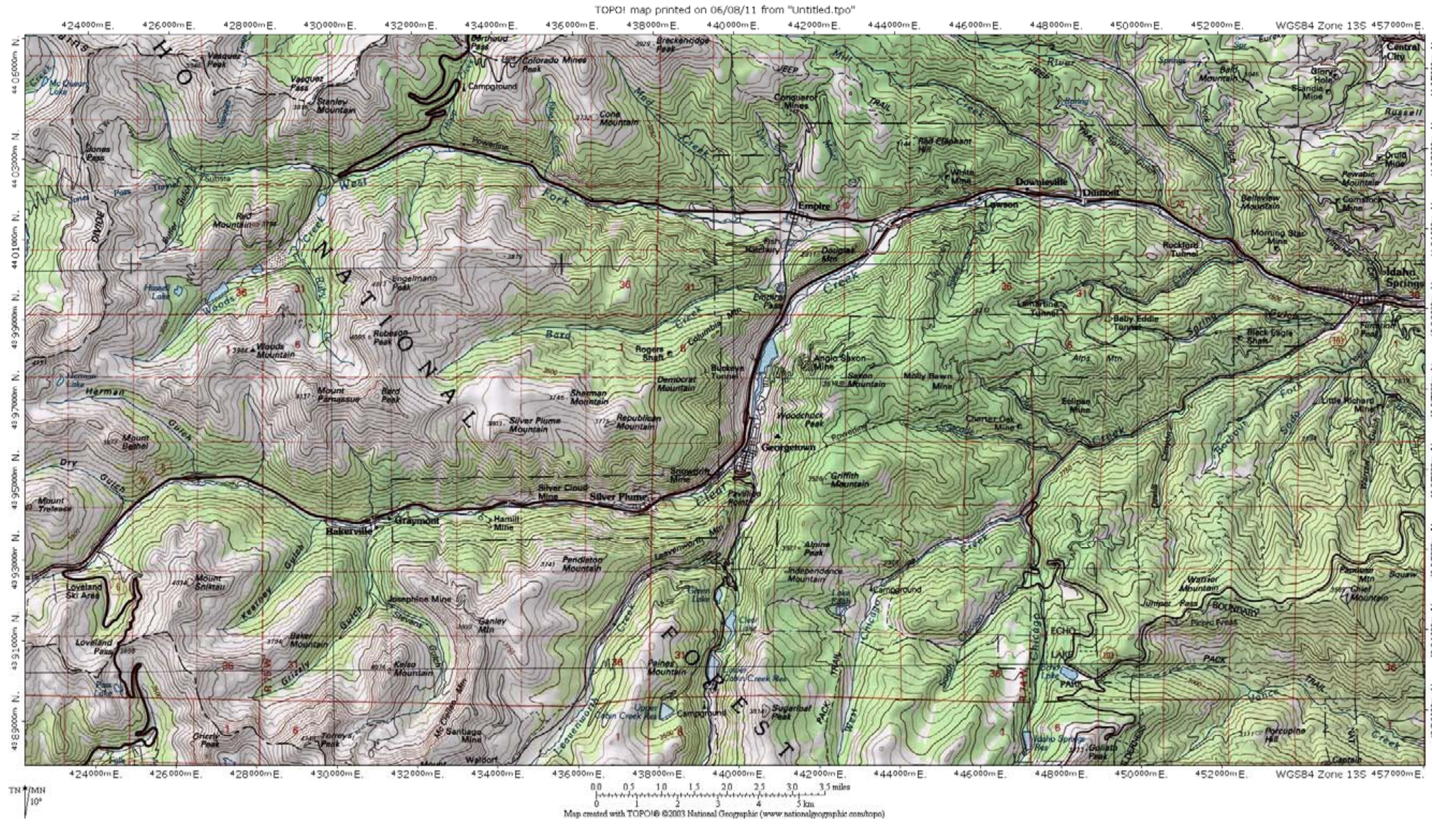
The corridor enters Eagle County west of Vail Pass and descends through Vail to Minturn. At this point, the corridor follows the Eagle River to its confluence with the Colorado River at Dotsero. Although the rivers are distinct and separate, the valley is nearly continuous. The corridor then continues down the Colorado River through Glenwood Canyon to Glenwood Springs. In this segment, railroad transportation, electric power, the timber industry, tourism, ranching, and highway transportation are principal historic themes. The environment is high altitude alpine at the east edge and gradually transitions to high mesa and semi-arid climate in Glenwood Canyon. Sedimentary geology offered little for miners, but thick forests provided resources for loggers. The Eagle and Colorado rivers also were natural corridors for railroad development, and the natural environment was conducive to ranching and limited agriculture.

Section D: Geographic Area of I-70 Mountain Corridor



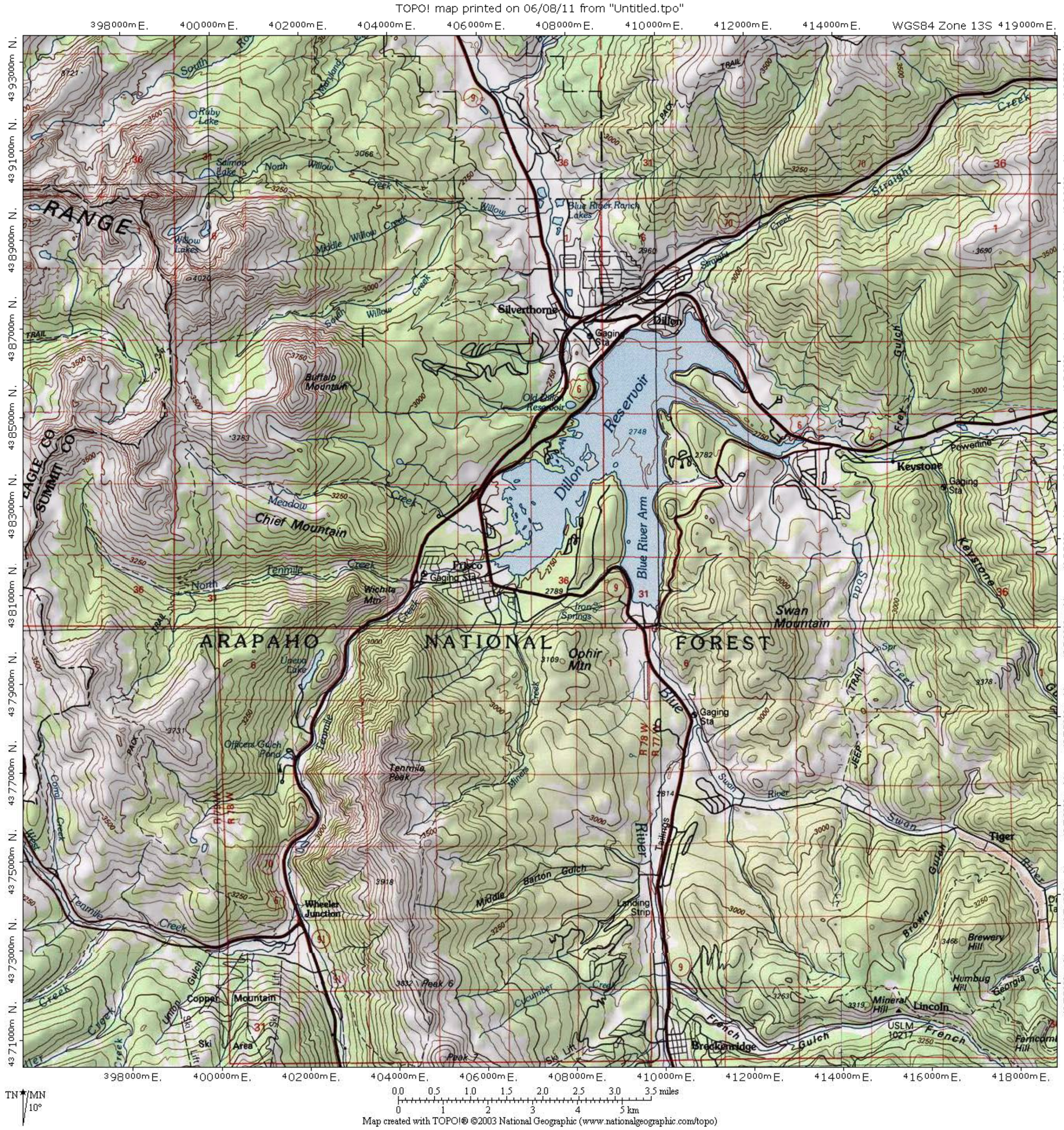
The plan view, top, is an overview map of the I-70 Mountain Corridor and principal geographic features. The profile, bottom, is keyed to the map and illustrates topography and the principal communities and towns.

Section D: Geographic Area of I-70 Mountain Corridor



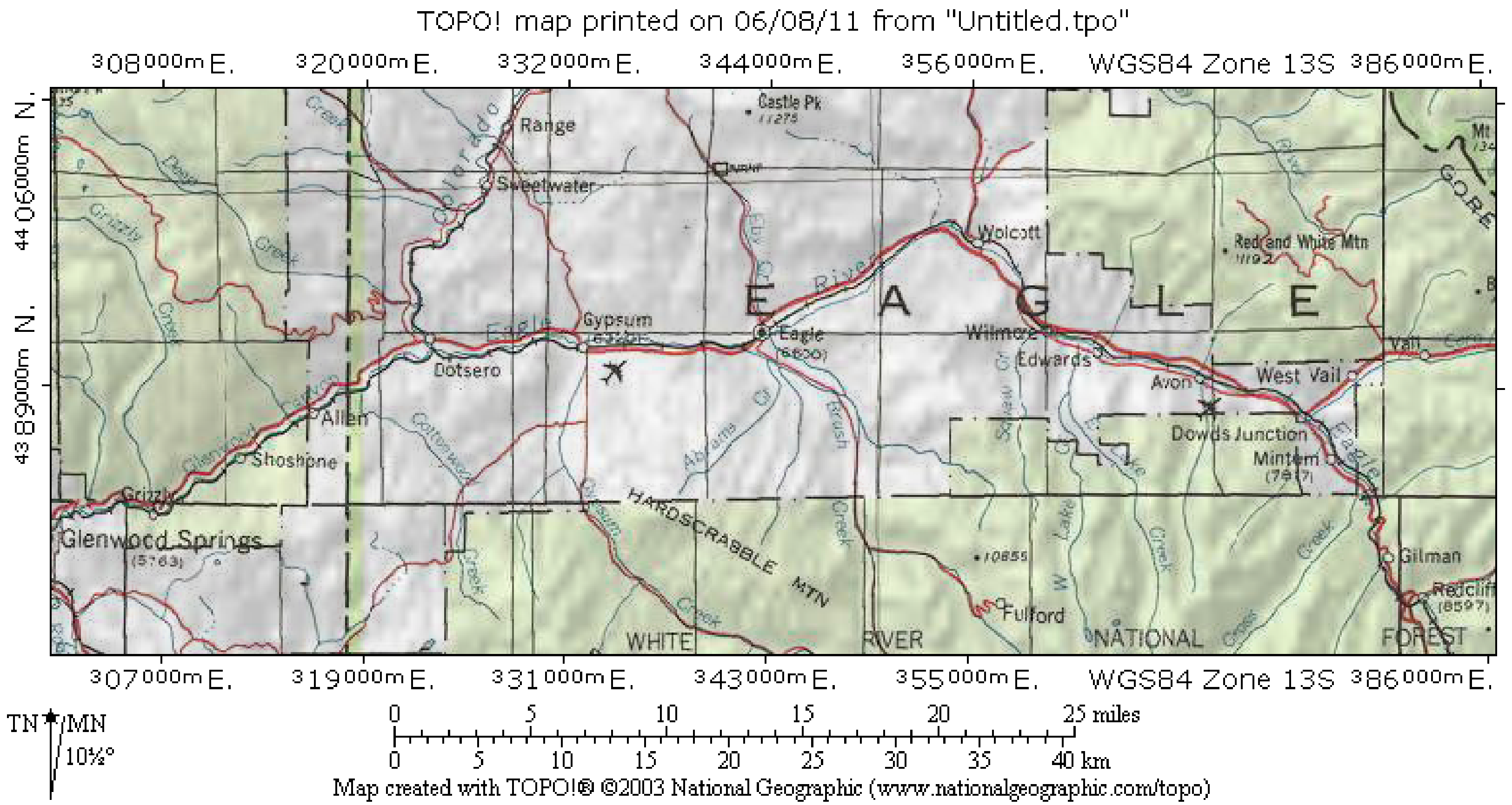
The map provides an overview of the I-70 Mountain Corridor in Clear Creek drainage. Idaho Springs is at the east edge, the Eisenhower Tunnel at the west edge, and Georgetown is center. The dark line is I-70.

Section D: Geographic Area of I-70 Mountain Corridor



The map illustrates the I-70 Mountain Corridor segment passing through Summit County. I-70 descends southwest down Straight Creek from the Eisenhower Tunnel at upper right, and passes by Dillon, Dillon Reservoir, and Frisco. The highway continues south up Ten Mile canyon from Frisco, veers west, and crosses Vail Pass at lower left. The Blue River valley descends north from Breckenridge, bottom, and through the corridor.

Section D: Geographic Area of I-70 Mountain Corridor



The map depicts the western extent of the I-70 Mountain Corridor, from Vail at right to Glenwood Springs at left. I-70 descends through the broad Eagle River valley from Vail to Dotsero, where the Eagle and Colorado River join. At Allen, the valley constricts and becomes narrow, rocky Glenwood Canyon. The I-70 Mountain Corridor ends immediately east of Glenwood Springs.

Section E 1: History of Mining, 1859-1942

Introduction

The first part of Section E provides an overview of the two I-70 Mountain Corridor segments where mining was significant as an industry. The intent is to aid in the identification of related historical resources and provide a context for recommending eligibility for the National Register of Historic Places. Below is a broad overview of mining in Clear Creek drainage in Clear Creek County and around Frisco and Dillon in Summit County.

A lone placer miner pans for gold at the mouth of Chicago Creek where prospector George Jackson first found placer deposits in 1859. Jackson's discovery began the gold rush to Clear Creek drainage, which laid the groundwork for what became one of Colorado's most important mining industries. Settlement, transportation systems, and dependent industries then followed. Although the miner and his camp are typical of prospecting during the 1860s, the photo dates to the 1890s. Courtesy of Denver Public Library, MCC-367.

Period of Significance, 1859-1942

Mining was among the most influential forces in central Rocky Mountain history. The industry played a fundamental role in the I-70 Mountain Corridor during the Period of Significance 1859 through 1942, directly influencing all the other historical themes outlined in Section E. The industry and its people created principal markets for agriculture and forest products. Their need for efficient transportation fostered the development of a road network and drew railroads into the central mountains. Investors arranged some of Colorado's earliest electrical grids to provide the industry with power and the communities with lighting.

Despite its importance as an anchor industry, mining occurred in only two of the corridor's segments. The Clear Creek drainage, in Clear Creek County, was most productive and longest-lived, extending west from Floyd Hill to Loveland Pass. The other segment, in Summit County, extended west from Dillon through Ten Mile Canyon to Copper Mountain.

The mining industry's Period of Significance began in 1859 with the discovery of placer gold at Idaho Springs. Within a short time, placer mining evolved into a hardrock industry that spread throughout the Clear Creek drainage and over to Dillon and Ten Mile Canyon. The Period ended in 1942 when the federal government temporarily outlawed gold mining because it diverted labor and resources needed for World War II. The industry slumped and was no longer a major employer or economic contributor, and it never recovered after repeal of the ban in 1945.

The Period of Significance encompasses mining as a theme in the corridor, but the industry was not uniform in chronology, trends, and significance throughout. The Clear Creek drainage and the Dillon and Frisco area experienced different histories, and narrower periods of development are therefore more relevant for these regions. The periods of development for each region are relayed below. Generally applicable National Register of Historic Places (NRHP) areas of significance include Architecture, Commerce and Economics, Community Planning and Development, Engineering, Exploration/Settlement, Industry, Law, and Politics/Government. Level of significance in Clear Creek drainage ranges from local to national. Level of significance in the Dillon and Frisco area is most likely local.

Mining in Clear Creek Drainage

As a geographic entity, Clear Creek drainage was among the most important centers of gold, silver, and industrial metals mining in Colorado. When the drainage is perceived closely, however, its history is somewhat complex because the gold and other metals occurred separately. The drainage's eastern portion, from Floyd Hill at the east to Empire at the west, was known primarily for gold. Most of the silver and industrial metals were produced in the western portion, from Empire at the east to Loveland Pass at the west. Both segments followed different historical patterns because economic cycles, political events, technological developments, and geological conditions affected gold mining separately from silver and industrial metals. It should be noted that there was some parallel development due to overlapping geology, close proximity, and shared institutions and people. Table E 1.1 charts the timeframes of importance, labeled Periods of Development, as well as relevant areas of significance and general historical trends for the eastern and western drainage.

Table E 1.1: Important Time Periods in Eastern and Western Clear Creek Drainage

Eastern Clear Creek Drainage [Metals: Gold, Some Silver]			Western Clear Creek Drainage [Metals: Silver, Lead, Zinc]		
Period of Development	**Areas of Significance**	**General Trends**	**Period of Development**	**Areas of Significance**	**General Trends**
1859-1864	Commerce Comm Planning Exploration Industry Politics Transportation	Discovery Gold rush Placer mining Initial settlement Hardrock mining Collapse in 1864	1859-1864	Commerce Comm Planning Exploration Industry Politics Transportation	Discovery Exploration Gold rush Placer mining Initial settlement Transition in 1864
1865-1873	None	Industry operates at low level due to troublesome ore and lack of investment	1865-1874	Architecture Commerce Comm Planning Engineering Exploration Industry Transportation	Silver rush Hardrock mining boom First smelters built Industry grows Towns established Transition due to RR
1874-1893	Architecture Commerce Comm Planning Industry Transportation	Industry grows Railroad in 1873 Towns established	1875-1893	Architecture Commerce Comm Planning Engineering Industry Law and Politics Transportation	Peak production Industry boom Railroad in 1877 Towns established Silver policy
1894-1897	Architecture Commerce Comm Planning Engineering Industry	Hardrock mining boom Industry grows	1894-1897	Architecture Commerce Engineering Industry Politics	Silver crash Industry adjusts Region contracts Mining stabilizes
1898-1918	Architecture Commerce Engineering Industry	Peak production Industry boom Mining stabilizes Collapse in 1918	1898-1907	Commerce Engineering Industry	Industry contracts Population leaves Zinc recovery Mining stabilizes Mining declines
			1915-1920	Commerce Industry	Revival due to WWI Collapse in 1920 Industry unimportant
1919-1929	None	Industry at low level and unimportant			
1930-1942	Engineering Industry Commerce	Depression stimulates subsistence mining Jump in production Major revival Gold outlawed 1942			

<u>Mining around Dillon and Frisco</u>

Like Clear Creek drainage, the Dillon and Frisco area was divided between gold and silver mining. Mining companies produced gold around Dillon, but the silver and industrial metals in Ten Mile Canyon were the basis for the industry. The first important time period began in 1878 with a wave of prospecting in Ten Mile Canyon following the discovery of silver.

Mining began shortly afterward, and gave rise to an industry and the communities of Frisco and Wheeler. The period ended in 1885 when miners exhausted the richest ore and the value of silver fell. The area around Dillon and Frisco remained quiet until the federal government passed the Sherman Silver Purchase Act in 1890, increasing the value of silver. The Act ushered in a revival that defines the second timeframe of importance, ending in 1893 with repeal of the Act and a general economic collapse. The region was in a deep depression through much of the 1890s. A number of factors awoke the industry in 1898 and brought it to the next timeframe of importance. Not only did silver and industrial metals mining reach peak production and development in Ten Mile Canyon, but also gold production at Dillon assumed industrial proportions. The industry contracted sharply in 1912 due to exhaustion of profitable ore and abandonment of the Denver & Rio Grande Railroad's Dillon Branch. A high demand for industrial metals and a price increase in silver due to World War I supported the industry's last time period of importance. The period began in 1916 and ended in 1920 when miners removed the last vestiges of ore. The areas of significance relevant to the Dillon and Frisco area include Architecture, Commerce, Community Development, Engineering, Industry, and Politics/Government.

Section E 2: History of Mining in Clear Creek Drainage, 1859-1942

Introduction

January 1859 was a pivotal month in the history of the Rocky Mountains. George Jackson discovered placer gold at today's Idaho Springs, beginning a mining industry that spread throughout Clear Creek drainage. During the first several years, the industry was formative and limited to small parties and individuals who recovered placer gold from Clear Creek and tributaries. Organized companies began to dominate the placer deposits during the early 1860s and by the middle of the decade, hardrock mining gradually increased. Although placer mining was important, its duration was short. The hardrock industry by comparison held a position of great significance for decades.

Because of the industry, the Clear Creek drainage and its sophisticated towns became a center of culture, social development, and commerce in the central mountains. Mining contributed heavily to the material wealth of Colorado, as well as the personal fortunes of investors and property owners. Through its ties to complex economic and financial systems, the industry fostered banking, farming, and manufacturing both within and outside of Colorado. A number of companies in the drainage also forwarded mining and metallurgical engineering.

Gold, silver, lead, and zinc were the mining industry's principal products, and they came from operations scattered between Floyd Hill to the east and Loveland Pass on the Continental Divide to the west. Both of these geographic points also approximate the eastern and western boundaries of Clear Creek County. The sought-after metals were not distributed evenly throughout the drainage and instead were divided between the eastern and western portions. The eastern portion, from Floyd Hill west to Empire, was known principally for gold, although some of the ore also featured silver. In the western portion of the drainage, from Empire west to the Divide, the ore offered combinations of silver, lead, and zinc. In some cases, the ore had some gold content, as well.

Economic cycles, politics, technological developments, and the nature of the ore deposits affected gold and silver production separately. Because of this, mining in the eastern portion of the drainage followed different trends and chronology than in the western portion. Thus, except for the first several years, the two geographic regions are discussed under their own headings.

Discovery and the Placer Boom, 1859-1864

The history of mining in Clear Creek drainage began not on Clear Creek, nor in 1859, but rather ten years earlier during the California Gold Rush. In 1850, a party of Georgians, including a number Cherokees, trekked across the plains and camped on the Front Range's piedmont area while en route to California. The party consisted of prospectors with experience gained in Georgia's goldfields, and they examined the piedmont area for placer gold out of curiosity. Party members struck gold-bearing gravel on Ralston Creek (in north Golden) and took note of the find, but the meager discovery did not detract from the lure of California. Unaware that rich gold deposits ironically lay a short distance west in the mountains, the party broke camp and continued their journey.[1]

[1] Stone, 1918:230.

After moderate success in California, the Cherokees returned to Georgia where William Green Russell learned of their Ralston Creek find. In 1858, Russell organized an expedition with two brothers and other experienced Georgia prospectors and approached the Rocky Mountains along the Arkansas River. John Beck also departed the South with a band of Cherokees possibly related to the original prospectors who made the 1850 strike. Around the same time, John Easter organized a third party that traveled up the Arkansas. The Russell and Beck parties met on their Arkansas path, joined forces, and camped at the confluence of Cherry Creek and the South Platte River. There, they discovered traces of gold, and, after much effort, located a few profitable deposits. Word somehow spread to the Easter party, near Pikes Peak, and they joined the growing prospectors' camp.[2]

The number of prospectors from the three parties exceeded the available placer deposits, and after much exhausting and fruitless effort, many soured and returned east. When the returning prospectors relayed their unsatisfactory experiences, their cautionary stories were distorted into visions of gold waiting for shovels and sacks. The Midwest, mired in an economic depression, became inflamed with gold fever and gave rise to the great Pikes Peak Gold Rush of 1858. Before the year came to an end, rush participants began congregating near the original discovery point at the confluence of Cherry Creek and South Platte, and hopeful individuals continued to arrive. Their small settlement was at first named Auraria, and then Denver.

George Jackson was among those who came in 1858, and he was better prepared than most for the overcrowded conditions and lack of profitable ground at the settlements. Jackson, cousin to Kit Carson, was born in Missouri in 1836 and went to California to mine placer gold when age 16. After hard labor and little gold, he tried farming but returned home in 1857, grew restless, and left for Wyoming. At Fort Laramie, Jackson learned of the gold discoveries in Colorado. He quickly assembled a prospecting party and worked his way south along the Front Range to Auraria, where he surveyed the placer fields on the plains, well east of the mountains. Discouraged, Jackson and several partners moved west to Arapahoe City, near today's Golden, and pitched camp as winter began.[3]

Jackson's California experience served him well. He understood that the gold on the plains came from sources in the mountains, a fact that seemed to elude the other prospectors. While they tarried about the piedmont, Jackson planned to quietly examine the mountain drainages, and unusually warm weather at the beginning of January 1859 granted him the opportunity. Jackson left Arapahoe City on the premise of hunting, ascended west into the hills, and dropped into Clear Creek drainage where the valley opened up, most likely near Floyd Hill. He made camp on the valley floor near today's Idaho Springs, and according to some sources, was curious about the river gravel, panned a sample with a tin cup, and found gold. In actuality, Jackson was prospecting with purpose and had to conduct considerable work to expose gold-bearing gravel layers. With gold pan and shovel, Jackson made the first recorded gold discovery in the mountains west of the piedmont area on January 7, 1859. In comparison, Thomas Aikens and party made the second mountain find in Boulder County on January 15, and B.F. Langley and John Gregory followed within weeks in Boulder and Gilpin counties, respectively.[4]

When Jackson returned to Arapahoe City, he carefully informed only members of his party, who kept the secret and apparently formalized their partnership as the Chicago Mining Company. In April, Jackson led the party undetected back to his discovery point, and they began an organized prospecting campaign. The party established a camp at the mouth of what the members named Chicago Creek and struck a significant gold deposit. The partners had the

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[2] Abbott, et al, 1994:51; Stone, 1918:232, 234.

[3] Brown, 1985:8, 26, 28.

[4] Brown, 1985:26; Fossett, 1876:21; *History of Clear Creek County*, 1986:7; Hall, 1889:189; Hollister, 1867:60; Stone, 1918, V.I:238.

valley to themselves for at least several weeks, until Jackson went east to Auraria to secure provisions. He had no choice but to pay in gold, which drew the attention of idle prospectors who followed Jackson to the location. Word of the discovery then spread quickly.[5]

But by the time Jackson's discovery became knowledge, prospectors were already aware of the placer deposits that Langley, Aikens party, and Gregory found during the winter. These three finds became centers of major rushes when the season opened, leaving Jackson's Diggings, as they came to be known, as fourth in importance at the time. Those prospectors who came gathered around Chicago Creek at first, and then followed Clear Creek for several miles and began working gravel at what they named Payne's and Spanish bars. By May, around 300 miners were busy recovering gold with typical hand methods, primarily rockers and short sluices, which were more efficient than simple pans.[6]

The miners quickly found that mountain placers required extensive labor in cold water to reach the lower gravel layers were the gold was distributed. In general, placer deposits featured gold particles that natural weathering dislodged from a parent vein and washed into the nearest drainage. Over time, erosion and water flow sifted the heavy gold downward, where it accumulated in the lower strata of gravel and along the underlying bedrock. Valley floors, such as Clear Creek, required more digging than tributary drainages, by as much as 20 to 30 feet, but had the potential for richer and higher volume deposits. Thus, miners had to shovel away the upper gravel levels, keep the tailings off their neighbor's workings, and move the auriferous material to their sluices and cradles, all while standing in frigid water. Because of such labor, many miners settled for the lesser deposits along tributaries and valley sides.

Prospectors continued to arrive during the spring, presenting competition for claims and available resources. This threatened what had been a peaceful rush with chaos and confusion leading to friction and even violence, a pattern witnessed during the California gold rush. In response, the existing miners met in May to bring order and establish the Jackson Mining District. Miners typically organized districts as a primitive form of frontier government, electing a governing board, establishing boundaries, and recording bylaws defining claim sizes and rules for staking and holding such. In some districts, laws also created a miner's court and punishment for common crimes. The Jackson district was important because it was among the earliest in both Colorado and the greater Rocky Mountain chain. Here, miners defined claim size as 50 feet along stream channels and 250 feet up the banks, granted discoverers two locations, and everyone else one claim. Because few precedents existed at the time, these sizes differed from the claims in Colorado's other nascent districts and addressed placer deposits exclusively since few prospectors were aware of hardrock gold veins.[7]

Prospectors continued descending into the valley throughout the spring, and when they arrived, they found the best ground between Chicago Creek and Fall River occupied. As a result, the new prospectors moved west up the valley, developing claims almost in series along Clear Creek. Later in summer, the prospectors organized two more mining districts. One was the Downieville district, named after a rich placer center in California, and the other was the Griffith district, pioneered by the Griffith brothers.

George and David Griffith came to Clear Creek from the Gregory Diggings (today's Central City) discouraged by the number of prospectors already there. When they arrived at Jackson's Diggings, however, they found conditions little better and moved up the valley to the confluence of main and South Clear Creek, well past the continuous row of placer workings. Although the Griffiths were interested in placer gold, experience taught them to search for

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[5] Brown, 1985:8, 26, 28; Hall, 1889:190.
[6] Hollister, 1867:70.
[7] Hollister, 1867:70.

hardrock source veins, as well. George and his father Jefferson mined in California for years prior to the Pikes Peak Gold Rush and learned that placer gold came from parent veins known as lodes. In 1857, they returned to their family in Nebraska, and George convinced his brothers to try their luck in Colorado the following year.[8]

Between George's California experience and seeing miners scrape gold from surface outcrops at the Gregory Diggings, the brothers examined the sides of Clear Creek valley for similar vein formations. At the confluence, they found two that they claimed as the Griffith and Turner. Because the veins were exposed, weathering rendered the quartz fill friable and easy to run through sluices. The Griffiths also found a silver vein while prospecting, but because gold commanded their interest, they ignored it as a novelty. Within ten years, however, silver mining would dominate the area.[9]

The Griffiths were not the only prospectors in the region who were aware that placer gold came from parent veins. Experienced Colorado pioneers Henry Allen, William N. Byers, William M. Slaughter, and Richard Sopris examined a number of veins along Clear Creek in May 1858. Discovery of the Albro Lode drew a few seasoned prospectors into the Downieville district, where they found several more veins. Of these, early Colorado historian Orvando Hollister observed: "Lodes were struck in the hills all along Clear Creek, prospects from which were very large, although these were generally taken from narrow crevices."[10] Like the Griffiths, the surface miners gouged out the decayed and loose quartz fill, smashed it with hammers, and shoveled the material into their sluices. Although the quartz operations were unsophisticated, they were significant as a first step in hardrock mining.

When not processing gravel on their claims, the miners retired to their camps and attended to domestic activities. Most of those camps paralleled the placer workings along Clear Creek, and they consisted of little more than tents, dugouts, hovels of branches, and primitive log cabins. Where activity was heaviest, group camps evolved into the valley's first settlements. The camp of Jackson's Diggings grew at Chicago Creek, Spanish Bar materialized one mile west, and Downieville around two more miles west. Prospectors established Bloomington at the confluence of South and Middle Forks of Clear Creek, and named the growing settlement around the Griffith camp George's Town.[11]

Mill City, adjacent to and west of Downieville, was one of the most important camps. It differed from the other settlements in its industrial content and name and heralded the coming transition from placer to hardrock mining. Miners at the Albro and nearby veins passed through the surface zone of loose quartz, and as they incised deeper, the quartz became blocky and difficult to pulverize by hand. Thus, a number of outfits constructed arrastras, which were primitive facilities for crushing the simple quartz ore and recovering the gold. An arrastra consisted of a circular stone floor, low sidewalls, and a capstan at center. A draft animal tethered to a harness beam walked a path around the floor and dragged muller stones that ground the ore. The sidewalls retained the material within the interior, and a miner periodically added water and mercury to amalgamate the gold as it became freed. The assemblage of arrastras west of Downieville was so noteworthy that individuals throughout the drainage referred to the associated camp as Mill City. The camp established a precedent and marked an important step in the transition from placer to hardrock mining. Although miners built arrastras elsewhere along Clear Creek, Mill City was the drainage's first ore treatment center.[12]

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[8] Leyendecker, 2001:2.

[9] Hollister, 1867:71; Jessen, 1996:1; Leyendecker, et al., 2005:3.

[10] Hollister, 1867:71.

[11] Harrison, 1964:20; *History of Clear Creek County*, 1986:1; Jessen, 1996:1.

[12] *History of Clear Creek County*, 1986:41.

During the fall of 1859, most of the miners left Clear Creek drainage. Some were afraid of becoming snowbound while others exhausted their claims and moved to try their luck at the Gregory Diggings. A few stayed, however, worked when they could, and otherwise kept warm. Like the previous year, December and January were unusually tolerable and allowed those miners in the eastern, lower portion of the drainage to continue work uninterrupted.

When the working season of 1860 broke, most of the original miners returned, along with a wave of Pikes Peak rush newcomers. The number of miners was higher than ever, and they turned over more acreage with pick and shovel. Because of their inexperience, the far majority was unfamiliar with the concept of parent lodes and hence paid them little attention. Still, the rush did bring prospectors knowledgeable about hardrock veins. These individuals not only discovered additional ore formations, but also organized companies that pursued the ore underground and erected the earliest mechanized mills. Spanish Bar joined Mill City as a nascent hardrock center when several outfits developed the Hukill and Gum Tree veins. Some sources claim that the Badger State Mining Company then built the drainage's first stamp mill at Spanish Bar, most likely to process ore from one of the two properties. Other sources suggest that a Dr. Seaton built the first mill at Jackson's Diggings to treat ore from his Seaton Mine, on Seaton Mountain. In function, a stamp mill served the same purpose as an arrastra: crushing ore and recovering the gold. A stamp mill, however, relied on a battery of stamps instead of muller stones, and they pounded the ore much like mortars and pestles. The resultant sand and slurry flowed over copper tables coated with mercury, which amalgamated the gold. As can be surmised, a stamp mill was mechanized and required a power source, which was water in frontier Clear Creek.[13]

Regardless of which was earliest, both the Badger State and Seaton were significant for several reasons. First, the mills signified that individuals with capital and some engineering knowledge had arrived in the drainage. Second, the mills were able to process higher volumes of resilient ore than arrastras. Third, these factors inspired confidence among other investors who, with their additional mills, were necessary to bring hardrock mining to fruition.

In 1860, several of the crude prospectors' settlements began assuming a role as the region's commercial and communications centers. Community activists formalized the largest as townsites with grids of lots and blocks, and entrepreneurs then set up needed businesses. Sam Hunter, William L. Campbell, William E. Sisty, and William Spruance organized the Idahoe Town Company and platted a townsite on Idahoe Bar, adjacent to Jackson's Diggings. All received income from the venture and enjoyed varying degrees of success afterward. Campbell surveyed the plat, reinvested his proceeds in a stage company, and became involved in mining during later years. Spruance spent his money prospecting for a while and then opened a store in Georgetown. Sisty worked for several mining companies during the 1860s and helped organize the Denver & Pacific Road Company to complete a toll road over Berthoud Pass. Once Idahoe was platted, Samuel D. Hunter opened the first store in a small log cabin, and F.W. Beebee established the Beebee House hotel and restaurant. This latter business became a lasting institution and received many important guests.[14]

Although Idahoe quickly became the principal settlement in the drainage, miners reinforced the other principal camps and created several new ones. Spanish Bar, Downieville, and Mill City received several businesses, including mercantiles. The new camp of Fall River, named after the tributary, attracted several mercantiles, a hotel, and a post office.

The most important new settlement was Valley City, later Empire, which grew in 1860 during a rush to the West Fork of Clear Creek. Prospectors found rich placer deposits on the

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[13] Frost, 1880:277; Hall, 1895, V.3:313; *History of Clear Creek County*, 1986:1; Hollister, 1867:114, 123; Wickersheim and LeBaron, 2005:109.

[14] Fossett, 1876:91; *History of Clear Creek County*, 1986:1.

West Fork in the spring and organized the Union Mining District to regulate activity. An effort to name the principal landforms around the settlement became a game based on political party affiliation. Several prospectors started by naming the prominent peak to the northwest Lincoln Mountain after President Abraham Lincoln. In response, Democratic prospectors termed a landform to the east Douglas Mountain after Lincoln's electoral opponent. Republican S.F. Johnson countered with Covode Mountain, to the east, after Republican Pennsylvania Congressman John Covode. Not to be outdone, Democrats named the mountain adjacent to and south of Lincoln after their party. Republicans then applied their affiliation to the next adjoining spire. All these mountains later yielded gold and silver ore, which prospectors began recognizing as early as 1860.[15]

Repeating the pattern developing elsewhere in Clear Creek drainage, most prospectors at Valley City sought placer gold, and many found the material on the flanks of Silver and Eureka mountains east of town. A few experienced individuals, however, unearthed narrow gold veins, gouged out the surface quartz, and began pursuing the harder ore underground. Richard and Edward Bard, J.H. Smith, George Webster, and E.R. Williams claimed the first vein in the area as the Iowa and organized the Union Mining Company to develop it. The workings of this and other mines were shallow but yielded enough ore to convince several individuals with mechanical skills to build stamp mills. John Leeper erected the first, J.H. Coombs followed, and George L. Nicholls converted his sawmill into a stamp facility. As activity in the area increased, Nicholls, David J. Ball, and other early prospectors platted the townsite of Empire City to compete with Valley City and ultimately attracted most of the businesses.[16]

A short distance south, at the confluence of main and South Clear Creek, the Griffiths prepared for an anticipated rush. During the winter, David returned to the East for brother John, father Jefferson, their families and needed equipment. The party met George in Central City during the spring and divided into two groups. One puzzled out how to freight their goods over the impassable terrain down to Clear Creek and to their Griffith Lode. The other, joined by William Renshaw, secured land around the confluence and organized the Griffith Mining District. The partners filed several homestead claims and staked the townsite of Georgetown to sell lots near their small hardrock operation. With no clearly passable wagon route from Central City to Clear Creek, the family decided to invest in a road and recover the cost by charging tolls. Probably with hired workers, the family graded a crude avenue up Empire Gulch from Central City, down York Gulch to Fall River, over to Clear Creek, and along the valley to their townsite. In 1861, the Griffiths formalized their venture as the Central City & Georgetown Wagon Road Company, suggesting that they included outside investors to help fund the project.[17]

The Griffiths completed the first wagon road into Clear Creek valley, rough as it was, and that road became a main point of entry. Investors then built another artery that made Idaho (spelling now changed) a transportation hub. They graded the South Clear Creek Wagon Road from Bergen Park down to Idaho and the Idaho & Fall River Wagon Road from Idaho to the Georgetown road at Fall River. Although the primitive system was only a start, it revolutionized both the quality of life and the nascent mining industry because wagons could now deliver a wider variety of goods at lower costs than man or pack animal.[18]

As mining activity increased during 1860, the hardrock discoveries combined with placer mining now outside of stream channels overwhelmed the sparse regulations defined by the various mining districts. In response, prospectors and miners met during the summer to revise

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[15] Hall, 1895, V.3:315; Harrison, 1964:24.
[16] Harrison, 1964:27.
[17] *History of Clear Creek County*, 1986:23; Jessen, 1996:2; Leyendecker, 2001:9, 48; Leyendecker, et al., 2005:6.
[18] *History of Clear Creek County*, 1986:95.

claim codes and add definitions applicable to hardrock mining. Because no precedent existed, the miners adopted bylaws similar to those in Gilpin and Boulder counties. In these areas, Gulch Placer Claims in stream channels were 50 by 100 feet in area. Patch Placer Claims, usually staked over gold-bearing soils known as blanket deposits, were 100 by 100 feet in area. Lode Claims, staked over hardrock veins, were 50 feet wide centered on the vein, and 100 feet long. Tunnel Claims provided rights to drive tunnels into the veins, and they were as wide as the tunnel and the necessary length. If a tunnel inadvertently penetrated a hidden lode, the operators could claim 250-foot segments in both directions. Millsite tracts were 250 by 250 feet in area, and they allowed the owner to cut ditches and races for waterpower through adjoining properties. Water claims allowed measured volumes of water to be diverted from a stream for power and placer mining, and when the flow was insufficient for all users, the first to obtain a right had seniority, no matter their location. When the federal government recognized the Territory of Colorado in 1861, the legislature codified these regulations and enforced them until superseded by the 1872 mining law.[19]

Official designation of Colorado as a territory impacted Clear Creek drainage in other ways. First, the territorial legislature designated 17 counties, including Clear Creek, and chose Idaho as its county seat. County residents now had political representation. Second, the federal government increased its protection of transplains supply routes against angry Native American tribes. Previously, ties with commercial centers in the Midwest had been tenuous, which retarded growth in Colorado. With the routes now more secure, higher volumes of goods and expertise arrived in the territory, and the Postal Service began regular, reliable mail. The institution's importance to the drainage cannot be understated because mail was the principal form of communication between individuals, companies, and their contacts in the East. New post offices in Mill City and Empire City provided these communities with a future in the mining industry. Although Idaho was the county seat, a transportation center, and continued to grow, it was not granted a post office until 1862, a year later than the other two towns.[20]

The improved conditions increased confidence among Eastern investors and drainage residents, who then made a wave of hardrock discoveries and built a few new mills. The western portion of the drainage was a center of activity and energy in 1861, and many prospectors pitched camp in the Griffiths' townsite. Because the area was not rich with placer gold, prospectors turned their attention to hardrock veins instead. They found a significant 75 lodes and staked 2,000 to 3,000 claims, and although most were unprofitable, several yielded ore. To treat the small batches of payrock from the new mines, William Davidson built Georgetown's first mill, which featured only three stamps. Another interest erected a second mill within a short time. The Griffith Mine was among the productive operations, and the Griffiths developed it into one of the drainage's best at the time. They erected a small mill and an aerial tramway to lower ore down from the workings. The system consisted of two buckets suspended from a rawhide rope, acting in tandem. One bucket was at the mine, the other at the mill, and they were linked by a rope passing around a pulley. When the Griffiths lowered a filled bucket from mine to mill, it pulled the light, empty vessel up. They filled the bucket before them, lowered it to the mill, and received the other vessel, now empty, at the mine. The Griffiths repeated the process, back and forth, until they sent all the ore down to the mill. The system, however primitive, appears to have been the first aerial tramway in the Rockies.[21]

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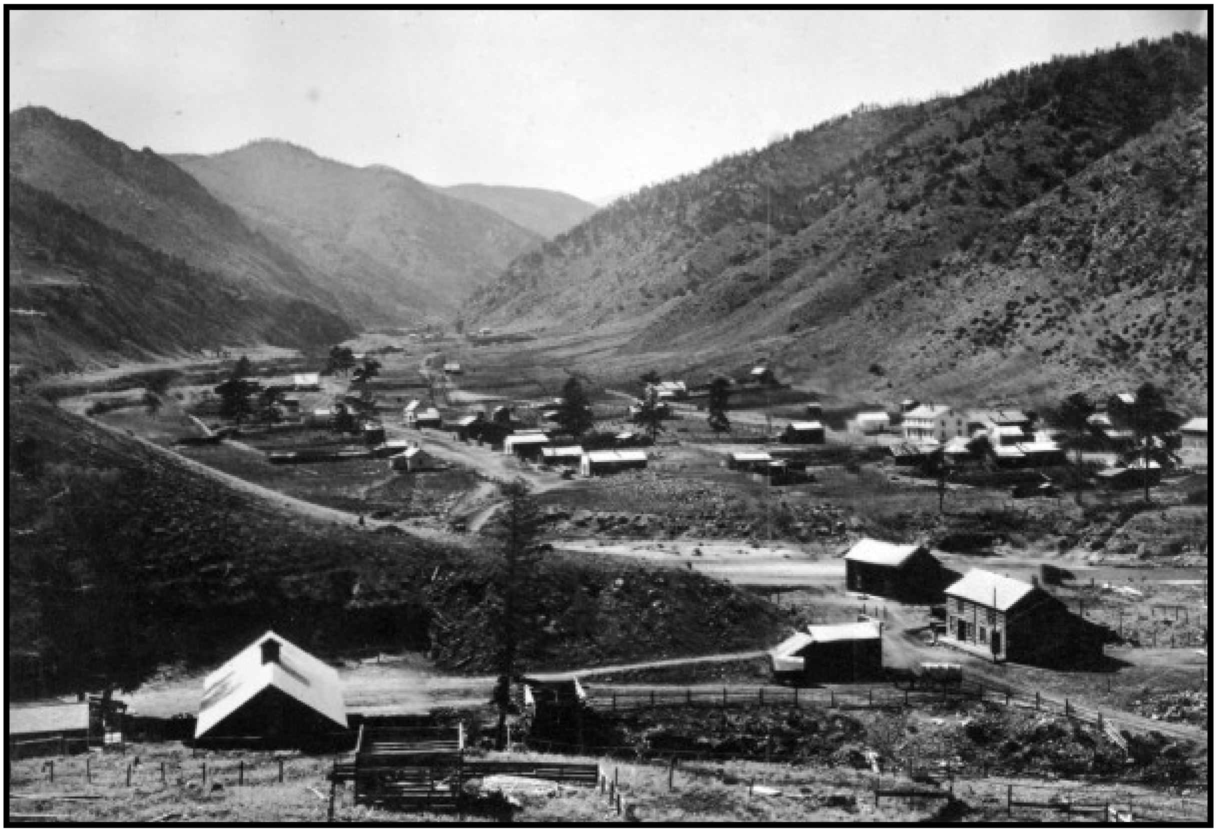
[19] Fossett, 1876:26, 29, 90, Frost, 1880:276; Hall, 1895, V.3:313; Hollister, 1867:358.

[20] Bauer, et al., 1990:51, 98.

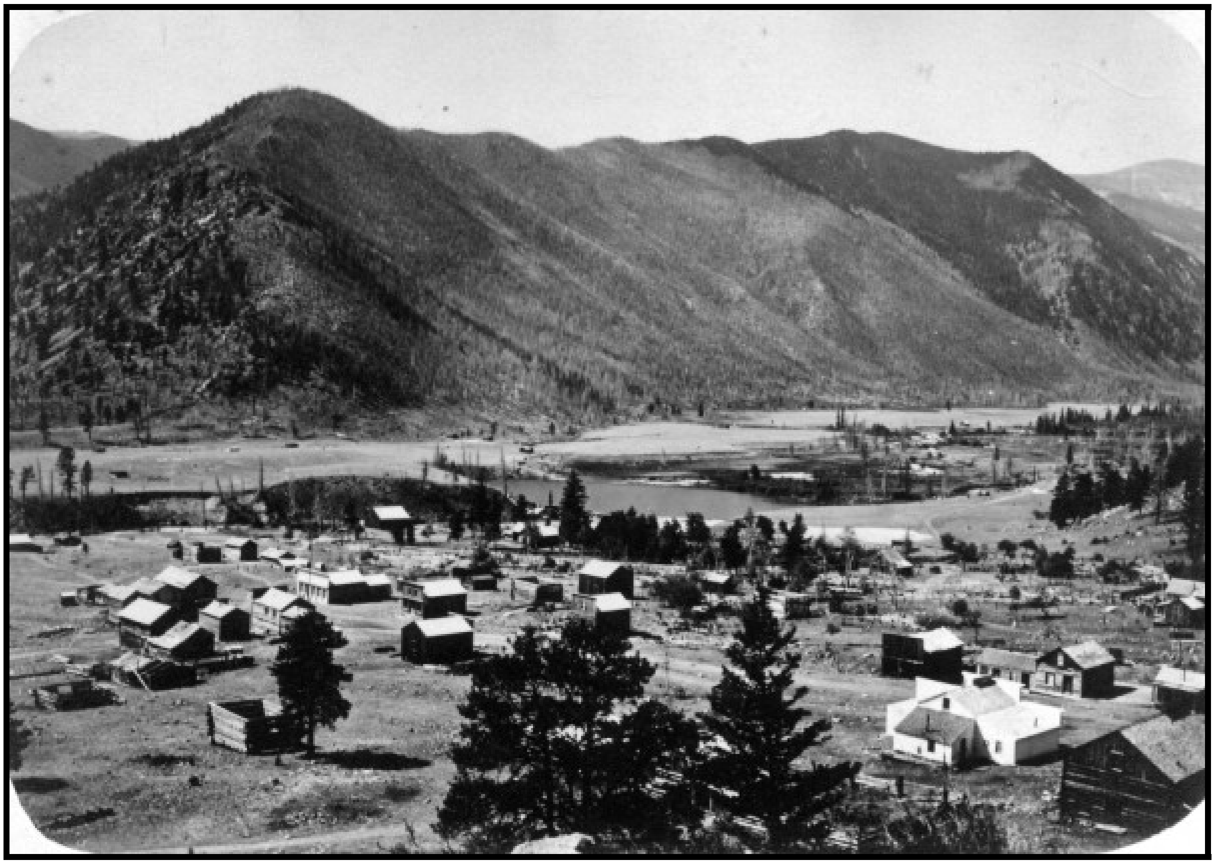
[21] *Georgetown Courier* 3/23/35 p1 c2; Leyendecker, 2001:17; Leyendecker, et al., 2005:10.



Idaho Springs, originally known as Idahoe, became the most important town in eastern Clear Creek drainage during the 1860s. When this west view was captured in mid-decade, the hamlet was in transition from placer to hardrock mining. Because neither industry was ready to support major growth at the time, the town remained small. Courtesy of Denver Public Library, X-2243.

Mining continued largely as before in the drainage during 1862, but several changes began to develop. The most important involved the placer deposits, which were the basis for nearly all the meaningful gold production at the time. The thinnest layers of gravel showed signs of exhaustion, and miners had to dig deeper in the thicker beds. It appeared that the easy gold neared an end in those areas worked since 1859.

The second important change involved the drainage's other source of gold, the hardrock veins. Although they yielded only a small fraction of the hundreds of thousands of dollars produced from placer gravel, the lodes increasingly drew the interest of both prospectors and investors. The Union district, in particular, developed into a center of hardrock claim development, and the discovery of particularly rich veins incited a rush during 1862. In sluicing gold-laden soils off Silver Mountain, James C. Huff and partners exposed the Tenth Legion Lode, and Charles A. Martin and George L. Nuckolls unearthed the Great Equator Lode. Afterward, other seasoned prospectors scratched around and found the Pioneer, Silver Mountain, Livingston County, and Benton. All these veins became important. William H. Russell, among the early investors in the drainage, acquired other profitable claims, built a stamp mill, and produced gold bullion. Russell had a vested interest in the growing industry's success because his Central Overland California & Pikes Peak Express Company hauled a considerable tonnage of freight into the region. Empire City grew in response and approached Idaho in size and importance during 1862. The town had 70 buildings, multiple businesses, and specialty establishments such as a brewery, butcher, and brickyard.[22]



Empire boomed during the mid-1860s and rivaled Idaho Springs as a center of gold production. While placer mining declined and hardrock mining developed slowly elsewhere in the drainage, both were highly productive at Empire into the late 1860s. Courtesy of Denver Public Library, X-8180.

Depletion of the shallow and easily extracted placer gold everywhere else in the drainage hastened the transition from surface to hardrock mining. Miners exhausted more placer claims than ever in 1863, and a large number of the seasoned miners left for better goldfields elsewhere, even as a few late-comers still trickled into the drainage. The population in Mill City fell so low that the Postal Service revoked its station there in 1863. As conditions were at the time, mining was on the brink of collapse.[23]

Meanwhile, investors in the East became seized with hardrock mining in the West, including Colorado, due to several reasons. First, capitalists sought economic stability in gold as the Civil War disrupted the national economy. Second, when the Union Army established a firm presence on the plains, it improved the reliability of overland routes and made the Rocky Mountains more accessible than before. Last, a handful of promoters went East and drew investors' awareness to Colorado, whose gold mines began to command a premium interest. William H. Russell represented Clear Creek drainage, and he personally brought samples of gold from his Empire City properties to show in New York City. The promoters offered glowing

[22] Fossett, 1876:92; Harrison, 1964:93; *History of Clear Creek County*, 1986:95; Leyendecker, et al., 2005:12; Wickersheim and LeBaron, 2005:121, 130, 139.
[23] Bauer, et al., 1990:98.

accounts of their properties, natural resources, sizes of the veins, and assay values of the ore. They failed to mention, however, that their properties had no infrastructure, the veins were undeveloped, and the extent of available ore was completely unknown. Further, promoters and investors alike grossly underestimated the cost of running a mine in the remote Rocky Mountains as well as the length of time between breaking ground and realized income. The result was a short-term gain in capital investment and property development, which temporarily saved Colorado mining from collapse, but created conditions for disappointment in the long-run.

Inexperienced and overly optimistic investors organized mining companies, blindly purchased claims, and dispatched officials and supplies to Colorado. In many cases, the companies lacked funds and merely sold stock to individuals who were eager for gold. Of the trend, early Colorado historian Frank Fossett noted: "Agents were sent out to Colorado to hunt up and purchase mining claims. It is evident they were not very particular as to the value thereof so long as they could show evidence of a record or transaction of some kind."[24] In Clear Creek drainage, Idaho and Empire City featured the most veins and saw the greatest amount of activity. Companies bought many of the veins between Idaho and Fall River and built a few mills near those that already existed. At Empire, the Knickerbocker Gold Mining Company bought the Tenth Legion, and the Bay State Mining Company began the Aorta and Bay State tunnels to develop the Livingston County. Both outfits also built mills.[25]

In developing Colorado properties, few if any company managers and engineers had practical models to emulate because mining in the West was new. They adapted industrial practices and management strategies from the East, which were of limited use in the rugged and remote Rockies. Unaware that many gold veins were shallow and offered little ore, they invested capital in unnecessary tools, buildings, and even large mills. Further, many of those mills were equipped with processes that had not been vetted on Clear Creek ore. Frank Fossett succinctly observed: "The working capital was usually expended in building a mill of some kind, instead of on the claim to see if it had anything that called for a mill."[26] The over promotion of properties, underestimation of costs, inept management, and expensive construction ahead of vein development positioned many operations for failure. This was one of the patterns that plagued the mining industry for decades afterward.

The conditions for failure caught up with the young hardrock mining industry after only one year. The veins in the Clear Creek drainage, the companies that bought them, and external conditions were to blame in varying combinations. In the drainage, most of the veins either lacked ore that was rich enough or pinched out at shallow depths. The few veins of substance offered ore that was easily crushed and gold that readily amalgamated. Between 100 and 200 feet below the surface, however, the ore changed character and included pyrite and sulphur compounds that resisted amalgamation. While assays indicated that such ore was rich, it could not be milled with conventional methods. Thus, some mines possessed ore with high assay values but unprofitable to produce.

Other factors worsened a growing crisis. Native American tribes began an offensive against transplains traffic, which interfered with freighting and communication. In Clear Creek drainage, floods caused by a wet spring damaged towns, roads, and mines. As a result, companies suffered construction delays and increased operating costs, and were unwilling to ship gold back East to satisfy investors. After a year of stock assessments but no gold, the investors balked at further requests for capital and froze their respective companies.[27]

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[24] Fossett, 1879:133.
[25] Harrison, 1964:139, 161.
[26] Fossett, 1879:135.
[27] Fossett, 1879:135; Hollister, 1867:138; King, 1977:18, 19.

Clear Creek drainage entered a deep depression in 1864. The placer boom was over, hardrock mining failed to deliver, and more people left the region. A few companies still operated near Spanish Bar and Empire, but they were unable to carry the region alone. Empire succumbed to the same problems as the rest of the drainage and went bust in 1867.

Silver Boom in the Western Drainage, 1865-1874

Gold, and gold alone, commanded the attention of miners and investors during the first five years of development in Clear Creek drainage. In their inexperience, most wealth-seekers focused on placer deposits because this source was well-known. A small proportion of prospectors, however, were knowledgeable enough to examine the mountainsides for parent veins in bedrock. Although the prospectors sought gold, a few in western Clear Creek drainage inadvertently encountered silver. The Griffiths, in particular, encountered the ore near their camp of George's Town, James Huff did likewise at the Ida Lode near Empire, and others identified more silver in the same area. They noted their discoveries but did little with them because gold was more valuable at $20.70 per ounce and could be recovered with crushing and mercury amalgamation. Silver, on the other hand, fetched around $1.20 per ounce, occurred in harder rock, and required smelting to separate. But in 1865, several events came together that stimulated a silver rush leading to a major mining industry in the western drainage.

The excitement ironically began with the discovery of rich silver ore outside the drainage. James Huff, Robert Steele, and Robert Taylor were prospecting partners at Empire, and they organized an expedition to search for gold in the Snake River drainage, Summit County, in 1864. They planned a route through Georgetown, southwest up Leavenworth Creek, west over what became Argentine Pass on the Continental Divide, and down to the Snake River. Huff, Steele, and probably Taylor were well-qualified to find both placer gold and its hardrock parent veins. Huff arrived at Empire in 1860, developed several gold veins, and spent time exploring high altitude areas. Steele embodied the Rocky Mountain prospector of the 1860s. He was born on an Ohio farm in 1820, left at age 26 to study law in Iowa, and established a practice in 1852. After three years, Steele and wife moved to Omaha, became involved in real estate, and Steele was elected to the Nebraska Territorial Legislature in 1858. The allure of gold proved stronger than politics, and after only one year in the legislature, Steele joined the Pikes Peak rush. Steele tried mining near Central City but found that his skills as a lawyer and politician were more lucrative. He and other early Pikes Peak prospectors started a movement to carve Jefferson Territory out of Kansas and Nebraska. Although Steele was elected provisional governor, the effort failed and he never took office. Steele and partners also organized the Rocky Mountain Company to dig one of the first community ditches at Central City to deliver water to their placer claims and sell the surplus, which was in great demand. The gold excitement at Empire then drew him into the upper Clear Creek drainage in 1862, where he met Huff.[28]

As Huff, Steele, and Taylor approached the Continental Divide in 1864, they made camp at the head of Leavenworth Gulch and began prospecting. Huff, already experienced with silver ore from his Ida claim, found an obvious and rich silver vein on the gulch's west side. The partners staked the vein as the Belmont, organized the Argentine Mining District, and began shallow development work. When Huff began a journey east for capital, other prospectors learned of the discovery as he passed down the Clear Creek drainage. Although some individuals hastened up to Leavenworth Gulch, interest developed slowly because few

[28] Fossett, 1876:31; *History of Clear Creek and Boulder Valleys*, 1880:538.

understood silver, and the working season was nearly over. Lorenzo M. Bowman was among those who responded quickly, and mining lead in Missouri gave him the experience required to recognize silver ore, which had a lustrous and gray appearance. Bowman, who was among the few free African-American prospectors in the region, staked the Square and Compass lodes, which became several of the richest in the Argentine district. Huff, Bowman, and others demonstrated that there were silver veins to be found at treeline southwest of Georgetown.[29]

When the working season of 1865 opened, prospectors stampeded to the new Argentine district. Although they would have preferred gold, the collapse of mining in Clear Creek drainage presented most with the choice between a local search for silver or leaving the drainage altogether. In addition, the demand for silver increased as the Union sought economic stability to offset the cost of the Civil War.

As was typical of rushes, the army of prospectors staked a quiltwork of claims around the known veins and collectively camped on the floor of Leavenworth Gulch. Most of the veins, and hence the activity, were on McClellan Mountain, a ridge of exposed rock on the gulch's west side. Someone then designated the camp as the townsite of Argentine and attempted to obtain formal title. Prospectors continued to arrive during the summer of 1865, and when they found the gulch already claimed, the wealth-seekers wandered farther afield in search of open ground. Such was the case with Richard C. Irwin, Jack Baker, and William Fletcher Kelso, all of whom were experienced frontiersmen. Finding McClellan Mountain overrun, they descended the steep west face into a glaciated gulch that they named after Kelso (renamed Grizzly Gulch). Kelso Gulch descended northerly and joined the main fork of Clear Creek. On Kelso Creek's east side was McClellan Mountain, and on the west side stood a pyramidal peak named after Kelso, as well. The prospectors, possibly the first Euro-Americans to explore the drainage, discovered the Baker Lode on Kelso Mountain, proving that more silver veins lay west of the known concentration on McClellan Mountain. In 1866, the party sold their claims to Pennsylvania investors for a handsome sum. Irwin went on to become one of the most iconic prospectors of Colorado, and Kelso settled in Georgetown and thrived with the mining industry.[30]

Once the Argentine district became filled, prospectors no longer bothered with the ascent up Leavenworth Gulch and instead turned to the mountains around Georgetown. Some reasoned that if silver existed at Argentine, they might find similar veins along Clear Creek just as the Griffiths did. Leavenworth Mountain, gateway to the Argentine district, was a natural place to start, and prospectors quickly claimed the O.K. and Saco lodes. Individuals then demonstrated that yet more silver veins existed in the mountains on the northwest side of Clear Creek. John Cree discovered the Henry Ward Beecher on Democrat Mountain, Anderson Orr found the Elijah Hise on Sherman Mountain, and other prospectors found additional lodes in the area. All began yielding ore within a short time.[31]

Although Georgetown was central to the rush, the town grew slowly at first. Most of the prospectors either passed through on their way to Argentine or camped at their claims in the surrounding mountains. Several mercantiles, the Griffith cabins, and the mills built in earlier years anchored the growth. In 1865, William M. Hale claimed a 160-acre tract adjacent to Georgetown with several purposes in mind. He forecasted that the rush would create opportunities for trade and platted Elizabethtown to compete with Georgetown. Hale also built the What Cheer Mill to treat silver ore for the Alpine Gold Mining Company as well as custom

[29] "Clear Creek County" *Rocky Mountain Mining Review* 6/26/84 p1; Frost, 1880:278; Hollister, 1867:252; *Georgetown Courier* 1/14/28 p1 c6; Leyendecker, et al., 2005:21, 70.

[30] Ellis and Ellis, 1983:54; Fossett, 1876:99.

[31] Fossett, 1876:99; Wickersheim and LeBaron, 2005:128.

batches from other outfits. James O. Stewart also foresaw the need for ore treatment and built the Stewart Reduction Works at the mouth of Leavenworth Gulch.

The Stewart works differed in process from the What Cheer plant, but both facilities were tiny and virtually experimental. The What Cheer was a stamp mill that relied on amalgamation to recover silver, but the Stewart works was a true smelter. Amalgamation was effective for simple silver ores, but the material from the Argentine and Griffith districts proved to be too complex. The ore required smelting, which Stewart apparently understood. Although Stewart had difficulties with the ore as well, his smelter was the first and most successful of the initial silver plants.[32]

The rush to Argentine resumed during the working season of 1866, and the Griffith district around Georgetown began attracting as much attention. Prospectors continued finding silver veins in the district, and a rich strike in the Anglo Saxon, on Saxon Mountain, created a local sensation. But local mining outfits and millmen realized that silver presented technological problems that the gold miners down-valley shared only in degree. One was the geological structure of the silver ore formations. The veins tended to be narrow, inconsistent, hard, and encased in very dense metamorphic rock. Such formations required considerable underground exploration to track and planned development to block out for extraction. The dense rock also slowed drilling and blasting, which miners did by hand to advance their workings.

The other problem, whose solution was elusive, was separating the silver bullion from the vein material, known as gangue. Gold ore merely had to be crushed, screened, and amalgamated with mercury. Silver ore from Clear Creek, by contrast, required roasting, crushing, screening, and then smelting in a furnace. Smelting was not straightforward because no one had yet developed furnaces truly designed for Clear Creek silver. The ore had to possess certain characteristics, proportions of lead and silver, and purity in order to melt. In many cases, workers started the process by hand-sorting the ore first to remove inferior material. When operating a smelter, the metallurgist had to pay explicit attention to the furnaces and adjust them for specific batches of ore.

Formal mine development and successful smelting were beyond the abilities of most small outfits and self-made entrepreneurs. They could only be accomplished with expertise, capital, equipment, and wage labor, which was the domain of organized companies backed by investors. In 1866, the number of such companies reached the critical mass necessary for silver mining to become an industry.

That industry, however, struggled at first. Compared to recovering silver, extracting the ore was the easy part, although the mountain terrain, remote locations of the mines, and especially the climate made even this difficult. Winning silver from the vein material was by far the most troublesome and ruined many investors. The What Cheer Mill and Stewart Reduction Works were the first two silver-specific ore treatment facilities, and they offered would-be metallurgists some guidance. Amalgamation proved to be a failure, but smelting offered potential if a plant could be correctly designed.

In 1866, mining and ore treatment companies built a total of five new smelters and refitted the What Cheer Mill. At Elizabethtown, J.W. Watson built an experimental smelter for the Baker Silver Mining Company to test ore from the Baker Lode. The Georgetown Silver Smelting Company, managed by John T. Herrick, also erected a small smelter. The Argentine Silver Mining & Exploring Company, under Caleb S. Stowell, ran a plant with a hearth furnace and a rotary furnace to treat Argentine ore. At Georgetown, John Cree and the Bohemia Smelting Company had a furnace in operation to treat galena from his H.W. Beecher Mine.

[32] Fossett, 1876:322; *Georgetown Courier* 1/7/28 p1 c6; *Georgetown Courier* 1/21/28 p1 c4; Jessen, 1996:9; Leyendecker, et al., 2005:28.

Lorenzo M. Bowman and other African-Americans organized the Red, White, & Blue Company to develop the Square and Compass and operate a small smelter.[33]

The Stewart Reduction Works revolutionized mining in western Clear Creek drainage as the first successful silver smelter. The plant not only provided necessary ore treatment for local mining companies, but also set a precedent for similar facilities. Smelting, the only means of converting silver ore into a profitable commodity, allowed the western drainage to boom. Courtesy of Denver Public Library, X-5765.

The What Cheer Mill was an exception to the wave of new smelters. Erasmus Garrett, Charles A. Martine, and Dr. G.W. Buchanan established Garrett, Martine & Company, leased the plant, and converted it into a chlorination works. Chlorination was an alternative to mercury amalgamation, and, based on his formal training in chemistry, Martine assumed that the process would work on relatively pure silver ore. Buchanan and Garrett provided the capital to refit the mill. Some of the smelters functioned correctly at first, but most did not. Supposedly, the What Cheer chlorination facility produced the first silver bricks in Colorado, but this is questionable because the Stewart Reduction Works had already been in operation for a year. It appears that Bowman may have enjoyed the greatest success because of his practical experience with smelters in Missouri. Not only was Bowman's Red, White, & Blue smelter effective, but also he apparently saved Caleb Stowell's Argentine Silver smelter.[34]

[33] Fell, 1979:58; Fossett, 1876:100; *Georgetown Courier* 1/14/28 p1 c6; Leyendecker, et al., 2005:70.
[34] Fossett, 1876:100, 328; Frost, 1880:340; "Obituary" *EMJ* 7/7/00 p17.

> "Among the first attempts at smelting ore was that of Caleb Stowell. He brought a Scotch hearth furnace from Galena, Ill., and erected it near the mouth of Leavenworth gulch. Stowell was a novice in the business and his first attempt was a failure. Frank Dibben, who was something of a metallurgist, made Stowell a bet of $500 that he could run out a pot of lead in 24 hours. The bet was accepted. Dibbin went to the furnace, locked the door and commenced work. He, too, found that he was a novice in practical work. He labored all day but the lead would not flow. Dibben was on the point of giving up the attempt, when Bowman came along and peeked through a crack to see what was going on. In the broadest dialect he informed the operator that he could never melt the ore with that color of flame. 'What in ____ do you know about smelting lead?' asked Dibben. Bowman replied that he had worked in the lead smelters of Missouri for twenty years. Dibben offered him ten dollars if he would smelt the ore. Bowman went to work, cleaned out the furnace, put in a new charge, and within two hours had a stream of lead flowing. The bet was compromised, but from that time until his death, which occurred on Dec. 24, 1870, Bowman was always addressed as 'Professor.'"[35]

Ultimately, the smelters failed one by one for several reasons. First, most were based on designs used to treat lead ores in Missouri, Iowa, and Wisconsin. Lead was soft and melted much more easily than the complex ores of the Argentine and Griffith districts. Second, some of the smelters were marginally successful, but only because the silver ore came from shallow workings and was oxidized. As with hardrock gold in the eastern valley, the silver ore increased in complexity and became resilient at depths between 100 and 200 feet. Until metallurgists overcame problems presented by refractory ore, mining outfits had to restrict their production to the upper reaches of their veins.[36]

In 1866, the fathers of Georgetown and Elizabethtown decided that cooperation was in their best interest instead of competition; the towns merged. The Postal Service opened a post office under the name of Georgetown, and Charles C. Churchill began regular stage service to Idaho Springs. William Barton erected the Barton House hotel, which offered accommodations capable of satisfying visiting investors. Other residents built around 60 houses and cabins during the year. Overall, the combined settlement grew in importance and replaced Empire as the commercial, communications, and ore treatment center for western Clear Creek drainage.[37]

Between 1867 and 1869, the boom in the Griffith district evolved from a rush of prospectors into a rush of investors, industrial experts, and other entrepreneurs. During this timeframe, the district possessed the characteristics that were typical of the mining frontier and the movement of industry into the wilderness.

Prospectors still arrived in substantial numbers. They examined the mountains around Argentine and Georgetown and claimed mineral formations that merely hinted of silver. They climbed Saxon, Griffith, and Independence mountains, which lined the east side of Clear Creek valley. On the north side, the prospectors sought silver on Douglas, Columbia, and Democrat mountains. Individual investors and mining companies then followed. Like the outfits in the eastern valley several years earlier, most of the companies and investors were legitimate but ill-advised. They bought claims merely when near some of the important discoveries, and speculated on unproven mineral formations. Some of the companies were frauds, and a few struck it rich. As was typical of early stage booms, prospectors worked side by side with organized companies trying to prove the existence of ore, and all of the operations were small and primitive.

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35 *Georgetown Courier* 10/28/33 p1 c5.
36 Fell, 1979:58.
37 Bauer, et al., 1990:60; *History of Clear Creek County*, 1986:95; Hollister, 1867:258; Leyendecker, et al., 2005:32.

Both prospectors and organized companies did especially well on the main fork of Clear Creek, west of Georgetown. Prospectors who were crowded out of the Georgetown area shifted to the north side and found silver on Republican, Sherman, and Brown (renamed Silver Plume) mountains. As at Georgetown, some prospectors conducted their own development work, and others sold to mining companies that invested capital. Most of the prospectors and mining company employees, often one and same but at different times, lived on the valley floor in several concentrations that approximated mining camps. The largest collection of tents and cabins grew at the mouth of Brown Gulch, and residents referred to the camp as Brownville. In 1869, Ambrose H. Bartlett and Charles A. Kimberlin formalized the second concentration a short distance east as Silver Plume. They platted a townsite claim and constructed several buildings including a school to attract a stabile working-class population. Families were few in the area at the time, but the community organizers understood that the coming mining industry would depend on them once established.[38]

A mining industry was starting to materialize not just around Silver Plume, but also throughout the greater Griffith district. Mining companies backed by distant investors began to apply their capital to operations that were formally engineered and capable of generating ore in meaningful tonnages. Frank J. Marshall forwarded what became a common template for claim consolidation and development. Marshall was born in Virginia in 1816, moved to frontier Missouri at age 26, and when went farther west into the Kansas Territory during the early 1850s. He platted the townsite of Marysville, after his wife Mary, in what became Marshall County. Marshall then served in the territorial legislature during the violent antislavery Free State period, served as general over the state militia, and was elected governor of what was officially recognized as the free state of Kansas in 1856. Marshall then joined the Pikes Peak rush, ran a freighting outfit and mercantile in Denver, moved to Central City in 1864, and invested in several profitable mines. He saw opportunity in the Georgetown boom, relocated, and began buying proven claims on Leavenworth Mountain. In 1868, he and D. Ernest Foster organized the Marshall Silver Mining Company, consolidated the claims, and began driving the Marshall Tunnel to undercut a rich vein system at depth. Through deep development, miners could block out the veins, work them from the bottom up, use gravity to draw the blasted ore down into bins, and haul the material out the tunnel. Known as a haulageway, the tunnel was an enormous engineering and financial success when finished and functioned for years.[39]

Charles Burleigh had a similar intention in mind when he began the Burleigh Tunnel at Brownville. He also acquired several rich claims, and not only planned on using the tunnel to extract his own ore, but also to offer rights-of-way to the owners of adjoining claims for subscription fees. Burleigh found that the extremely hard granite country rock impeded progress and experimented with steam drills to bore blast-holes instead of traditional hand methods. Such drills had only recently been developed, and Burleigh was among the earliest to adapt them to mining. Further, he may have been the first in Colorado. Because the drills were ungainly and undependable, Burleigh personally developed his own model, known as the Burleigh, and created a design that the mining industry later adopted. Burleigh's operation was a major capital investment and an important step in the industrialization of upper Clear Creek.[40]

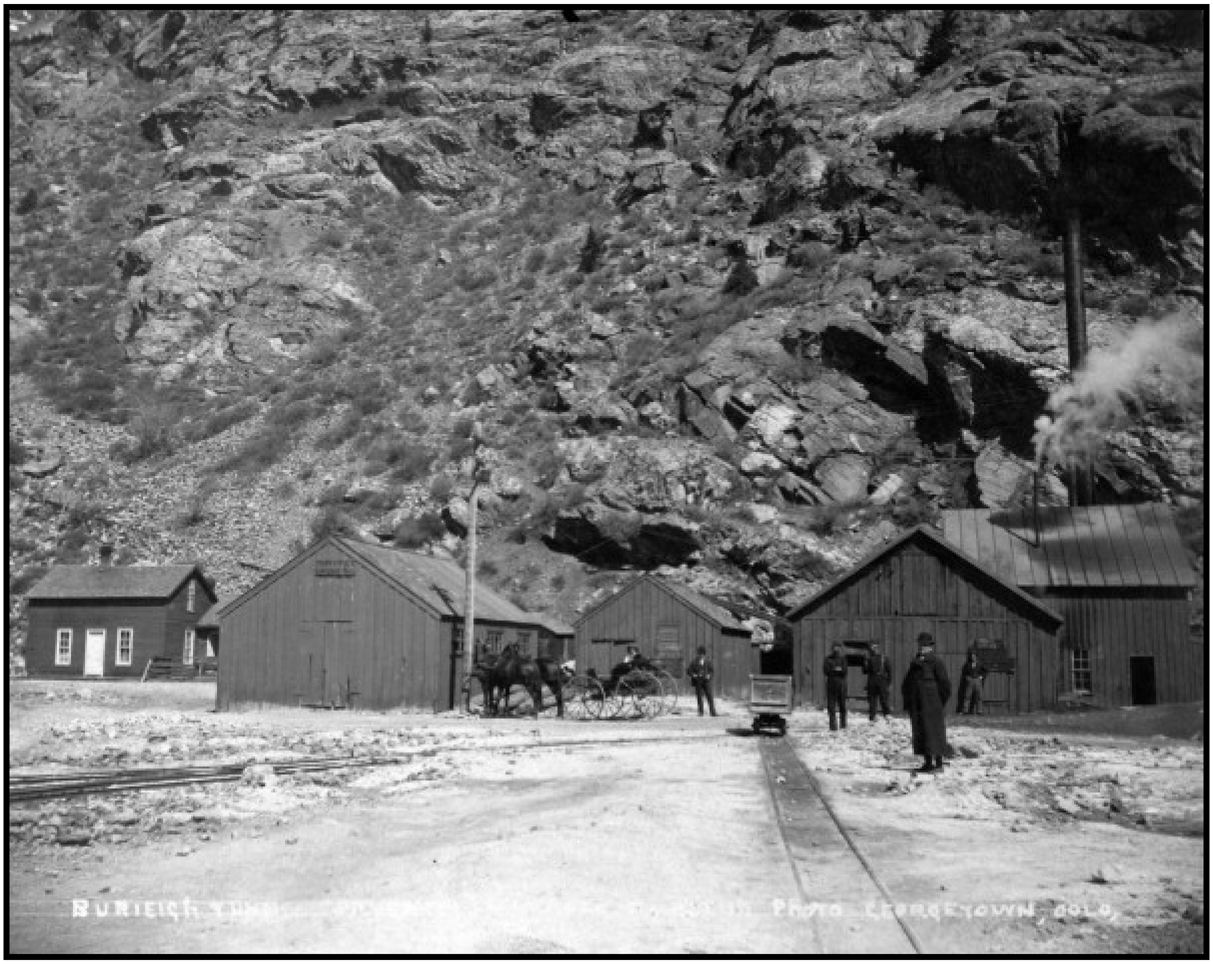
Joseph W. Watson established the Brown Silver Mining Company to develop the U.S. Coin and John Brown claims above the Burleigh Tunnel. After developing its section of the vein, the company built two tram systems to lower ore down to the valley floor, which

[38] Leyendecker, et al., 2005:87, 171.

[39] Fossett, 1876:359; Frost, 1880:320; Hall, 1889:256; *History of Clear Creek and Boulder Valleys*, 1880:519; Wickersheim and LeBaron, 2005:123.

[40] Fossett, 1879:396; Leyendecker, et al., 2005:128.

eliminated costly and slow mule trains. The company erected an inclined rail tram, which consisted of a car on a rail line, and also an aerial tramway. Colorado had few of either during the late 1860s.[41]



The Burleigh Tunnel was among the most important operations in western Clear Creek drainage during the late 1860s and early 1870s. Not only was the tunnel a major capital investment, but also proved that the ore veins around Silver Plume held value at depth, which many investors began to question at the time. Further, Charles Burleigh pioneered the use of rockdrills for drilling blast-holes underground, which revolutionized the greater mining industry in later decades. Courtesy of Denver Public Library, X-61687.

Metallurgists and smelting companies invested capital and applied engineering to treat the ore bought down from the growing number of mines. Several companies built new smelters, and although most joined the ranks of the failures, a few were successful. Watson commissioned two of the new plants in 1867 for companies he represented. He built one at Brownville for the Brown Silver company, and that smelter was apparently patterned after the ineffective Missouri designs. The costly tramway delivered crude ore to the smelter, workers sorted and reduced the cobbles, and loaded them into the smelter furnace. Much to Watson's disappointment, the ore did not feature enough lead to melt properly. Instead of scrapping the affair, Watson imported lead from Chicago at great cost in hopes that it would serve as a flux and encourage the silver to melt. Watson tried over the course of three years and bankrupted the company in the process.[42]

[41] Leyendecker, et al., 2005:126.
[42] Fell, 1979:60; Fossett, 1876:338, 348; Leyendecker, et al., 2005:72.

Watson's second smelter was as much a failure, but it anchored growing activity in the upper reaches of the main fork of Clear Creek. After testing ore for the Baker Silver Mining Company at the experimental furnace in Georgetown, Watson convinced the investors to fund a full-scale plant closer to the mine. Watson erected the smelter at the point where Kelso Gulch (now Grizzly Gulch) emptied into upper Clear Creek. The facility became the seed for a camp of several company buildings and a station where wagons brought ore down from the Baker Mine. Known as Bakerville, the settlement quickly drew a mercantile and Edward Kennedy's sawmill. After the Baker Silver Mining Company spent a considerable amount of money, the entire operation failed in 1870. At first, the company was unable to produce enough ore, and Watson then attempted to keep the smelter running by soliciting custom business from independent producers, but it was too far from Silver Plume to justify their trouble. When the company did begin production of substance, the smelter proved to be too inefficient and closed. Bakerville then evolved into one of Clear Creek's principal sawmill centers.[43]

James Herrick and the Georgetown Silver Smelting Company had similar problems with their plant. After Herrick realized that the smelter was ineffective, he leased it to metallurgist and inventor Charles Bruckner, who used the facility to test a revolutionary rotary furnace of his own design. The furnace featured an inclined steel cylinder lined with fire brick, and it rotated while a jet of superheated gases generated in a stationary hearth traveled through. The gases were supposed to melt ore that workers loaded into the top, and molten metals and slag should have trickled out the bottom. Although the concept worked with soft ore, Bruckner found that it was not suited for the resilient material in the Griffith district. He abandoned further efforts only after installing another rotary furnace at Bakerville for Watson with equally poor results. These and other smelter failures clouded the Griffith district's reputation, ruined a few investors, and bankrupted companies, but were important in identifying truly effective ore treatment methods.

The development of a primitive infrastructure was a defining characteristic of the Griffith district boom, just as it was for the eastern valley years earlier. On the raw frontier where roads had not yet been graded, people often moved about on foot or horse and carried freight on trains of mules or donkeys. In successful mining areas, by contrast, wagons hauled freight by the ton instead of by parcel or crate, and stages and omnibuses shuttled multiple people at once. These vehicles required roads, while railroad service was the ultimate link with the outside world.

In frontier Griffith district, various interests combined the above transportation methods in a circulation system of roads and packtrails. A basic network of roads allowed wagons to move between points of industry and commerce, and packtrails fanned out to mines and prospects in the mountains. The Griffith family already established a toll road east to Fall River, and it served as a principal avenue into Georgetown. In 1866, the Georgetown & Argentine Wagon Road Company extended the road from Georgetown up to Argentine. At the same time, Joseph Watson and the Baker Silver Mining Company graded another road from Georgetown through Silver Plume and up to the Baker Mine. In 1867, Watson organized the Georgetown & Breckenridge Wagon Road Company to improve the road with an option to continue over the Divide and into Summit County. The following year, Stephen Decatur formed the Georgetown, Argentine & Snake River road and completed the route. These roads not only opened western Clear Creek for prospecting and development, but also connected Georgetown with important mining districts over the range to the west. Miners and prospectors then began using Georgetown as a jumping-off point for exploration, contributing to the town's importance.[44]

Mine owners graded additional feeder packtrails up to their operations, allowing mule skinners to lead long strings of draft animals into remote areas. A group of operators built the

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[43] Ellis and Ellis, 1983:60, 208; Fossett, 1876:101.

[44] *Colorado Miner* 11/7/67 p4 c2; *Colorado Miner* 10/21/69 p4 c3; Ellis and Ellis, 1983:59; Hollister, 1867:257.

Magnet Trail up Griffith and Saxon mountains in 1867, and graded the Comet Trail to the same area two years later. Miners also beat trails to their properties on Democrat, Republican, and Brown mountains.[45]

No community benefitted more from the widespread development than Georgetown. In three years, the town equaled or surpassed Idaho Springs in size, importance, and sophistication. Georgetown was center to commerce, banking, communications, and culture. Between 1867 and 1869, George Clark & Company established a bank, Lemuel F. Yates opened a law practice, entrepreneurs built saloons and the Georgetown Brewery, and merchants opened several stores. An educated population expressed confidence in the future by bringing cultural institutions. A.W. Bernard and J.E. Wharton began printing the *Miner* newspaper, and a firm wired a telegraph down the valley. The Methodists, Episcopalians, and Congregationists built churches, and the community funded a school. Community activists formed a municipal government, formally chartered the town, organized police and fire departments, and secured the county seat. A forest fire in 1869 spurred fire regulations such as spark arresters, double-wall construction on buildings, and space between buildings, which were progressive practices in boomtowns.[46]

Between 1870 and 1873, the rush to the Griffith district evolved from prospecting and speculative ventures into a sound mining industry. Further, the industry was so successful that mining experts elsewhere began recognizing Clear Creek drainage as a place of significance. The trends of capital investment, organized companies, expertise, and engineering fully took hold. Despite disorder, ill-conceived projects, and failed companies, the progress made during the last several years brought major results. The production of silver soared, and although silver was the principal metal of interest, mining outfits began recovering lead in substantial volumes, as well. This was noteworthy because lead fetched a price of less than $.05 per pound, and at such rates, miners had to extract an enormous tonnage of ore for a measurable output.

Apart from the frenetic activity in the district, production figures of the time clearly reflect the rise of industrial mining. In 1868, mining companies generated approximately $142,000 worth of silver, despite the smelting difficulties. The total more than tripled to $480,000 in 1870, with an additional $12,000 in lead. These amounts tripled again in only two years to $1.5 million in silver and $64,000 in lead.[47]

Several factors on national and local levels contributed to the rise of the mining industry. On a national level, the economy recovered from the Civil War, and investors were willing to risk their money. They also paid greater attention to silver mining for several reasons. The riches and millionaires produced by the Comstock mines in Nevada created a silver sensation. The Caribou excitement in Boulder County drew the attention of some silver investors to Colorado, and when they surveyed the territory for possible ventures, the investors felt that the Griffith district held great promise. The Comstock, Caribou, and the Griffith districts also reinforced the general mystique and intrigue of Western mining among Eastern investors.

The important factors within Clear Creek drainage were embedded in the development of the mining industry. Ore treatment remained fundamental because most grades of ore were unprofitable without local facilities. The early 1870s saw four significant and lasting advances in this arena, based in part on the failures of the last several years.

The Clear Creek drainage was not alone in troublesome ore. Mining outfits in Gilpin County ran into the same problem with their ore as at Idaho Springs and in the Griffith district.

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[45] *Colorado Miner* 6/27/67 p2 c1; *Colorado Miner* 9/9/69, p4 c1.

[46] Hall, 1895, V.3:320; Harrison, 1964:187; *History of Clear Creek County*, 1986:24; Horner, 1950:64; Jessen, 1996:9; Leyendecker, et al., 200533, 69, :83, 86.

[47] Henderson, 1926:109.

The complexity increased with depth, and conventional milling and smelting were marginally effective, at best. Nathaniel P. Hill, trained in metallurgy and chemistry, solved the problem with a combination roasting and smelting process and built a commercial plant at Black Hawk in 1868. At first, the Black Hawk Smelter accepted ore only from Gilpin County, but Hill increased the capacity to take advantage of the unsatisfied region wide market. By 1870, the Black Hawk Smelter began accepting ore from mining companies across the Front Range. The companies in the Griffith district finally had a reliable outlet for their payrock.

The metallurgists in the Clear Creek drainage were not, however, acquiescent and continued to find their own solutions to the smelting problem. They understood that they could compete with Hill because the cost of shipping ore by wagon to Black Hawk was exorbitant. In 1870, James Stewart, who built the first successful if not small smelter at Georgetown, revised his plant under the Stewart Silver Reducing Company. The facility oxidized the ore by roasting, crushed the material to a specific grit, and used amalgamation to remove the silver. Stewart hired David Brunton as consultant and patented several pieces of specialty equipment for the process. Based in part on this experience, Brunton went on to become a renowned metallurgist, mining engineer, and inventor of the Brunton pocket transit. The Stewart Mill was heralded as the region's first fully effective silver facility and set a precedent that revolutionized mining.[48]

Other metallurgists followed Stewart's example but made their own modifications. In 1870, Jerome Chaffee, John T. Herrick, Eben Smith, and John Stryker built the Georgetown Silver Works, which used smelting and amalgamation. In 1873, Garrett, Martine & Company sold the idle What Cheer Mill at Georgetown to the Pelican Mining Company, which attempted a similar process. The company crushed the ore, relied on Bruckner cylinder furnaces for roasting instead of smelting, and treated the ore with amalgamation. The process was partially effective; the company refitted the mill in 1874 and had some success.[49]

After Charles Martine sold the What Cheer, he secured financing from mine owner George Hall and built a niche facility known as an ore sampler. In general, smelting companies preferred to contract with highly productive mining outfits because they delivered large batches of ore consistent in quality. Small mining outfits, in contrast, offered limited lots that varied widely in content and purity and required testing and constant adjustments to the smelting process. Smelting companies found the small batches not worth their while and often declined such business entirely. Samplers on the other hand, relied on the small mining outfits as a principal customer base and provided several services. The sampling companies assayed ore for miners, tested their lots of ore to advise the best smelting methods, and bought the batches for custom treatment. The companies stored the lots by type, and when they accumulated enough of a type, the companies adjusted their processes and smelted the ore in a custom run.

Martine and G.W. Hall & Company built the first sampler in the Clear Creek drainage at Georgetown in 1870. A year later, H. Augustus and Frank M. Taylor organized the Clear Creek Reduction Company and erected a second sampler. They secured Brunton as metallurgist, who ensured that the plant functioned correctly. This was the first step in a small sampling empire later known as Taylor & Brunton. The Judd & Crosby Silver Reduction & Mining Company erected a smelter, and when it failed in 1874, converted the facility into a sampler. J.B. Church built the Church Sampler also in 1874. These and later samplers fostered the growth of the small producers, which were collectively an important segment of the mining industry.[50]

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[48] Leyendecker, et al., 2005:138.

[49] Fossett, 1876:100, 328; Frost, 1880:340; Leyendecker, et al., 2005:169; "Obituary" *EMJ* 7/7/00 p17.

[50] Fossett, 1879:141, 366; Frost, 1880:342; *Georgetown Courier* 3/24/28 p1 c6; "Obituary" *EMJ* 7/7/00 p17; Wickersheim and LeBaron, 2005:117.

George Teal and Edward Eddy made the fourth major contribution to ore treatment, and they pioneered a process that was adopted across the Rocky Mountains. Around 1871, the Terrible Lode Mining Company built the Terrible Mill at Silver Plume and hired the British expert George Teal to run it. Teal and Eddy then fitted the facility in 1872 not to produce silver metal, but merely to separate the metalliferous material from waste in a process known as concentration. The ore was crushed, screened, ground, and the slurry proceeded to mechanical appliances that used water currents and vibration to achieve the separation. The waste was flumed into the nearest drainage. The metalliferous material passed through another set of appliances and then was dried. Workers sacked the resultant concentrates for shipment to a smelter and final treatment. Mechanical concentration was a relatively new process as of 1872, and few if any metallurgists adapted it to complex silver ore. Teal and Eddy were among the earliest to try and made the Terrible Mill mostly effective. Their success, however, was a qualified one, and although they established a precedent for the greater mining industry, their exact methods did not translate well to other types of ore. In general, concentration was a delicate science that remained in an experimental state for years and confounded metallurgists and their backers. The reason is that no single milling flow-path, sequence of mill appliances, or adjustments to the machinery were universally applicable. Ore from each mine differed slightly, even when on the same vein, and when machinery and settings achieved separation for one property, they often failed for other operations. When effective, however, concentration was of enormous benefit. Mining companies were able to produce grades of ore that were not otherwise rich enough to ship directly to a smelter.[51]

Although ore treatment was important to the rise in Clear Creek's production, the mines themselves were equally fundamental. The formal development and engineering projects started several years earlier began paying off, literally. In the Burleigh Tunnel, for example, miners struck a vein threaded with pure silver 935 feet in during 1871. They cut a large mass of ore from the vein, loaded it onto a wagon, and brought it to Georgetown with enthusiastic promoter Commodore Stephen Decatur seated on top. Initially, some experts claimed that the veins around Silver Plume pinched out or lost value at depth, dooming the tunnel to failure. Burleigh was convinced otherwise and continued to push the tunnel project anyway. The rich strike vindicated him, and the public held a meeting and passed resolutions congratulating Burleigh for disproving the erroneous assumptions. The event was important because it inspired confidence among other investors in similar projects. New York City interests organized the Lebanon Mining Company in 1870 and pushed the Lebanon Tunnel northward into the base of Republican Mountain. When miners reached a length of 1,200 feet, they struck ore. Frank Marshall had a similar experience with the Marshall Tunnel, which he drove southwest into Leavenworth Mountain and undercut the Colorado Central Vein.[52]

The large mining companies were not the only contributors to the silver boom. Prospectors and small mining outfits found and developed yet more veins. Georgetown and Silver Plume were centers to their own localized mining industries; Silver Plume, in particular, was considered sensational. Most of the discoveries and development there were on the north side of the valley, and early Colorado historian Frank Fossett noted in 1876: "Sherman Mountain is east of Brown, and between that and Republican. It is one of the grandest natural depositories of wealth that the world can boast of."[53] There, prospectors located the Cold Stream, Pay Rock, and Mendota, which became several of the area's principal producers. Georgetown investor Robert Old then bought the Mendota and developed it through the Victoria Tunnel. Someone

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[51] Fossett, 1876:102.
[52] *Colorado Mining Directory,* 1883:148; Frost, 1880:320; *Georgetown Courier* 3/2/35 p1 c2; Wickersheim and LeBaron, 2005:120.
[53] Fossett, 1876:348.

found the Matilda Fletcher on Democrat Mountain in 1870, drawing more prospectors who discovered additional veins. Mining outfits enjoyed one rich strike after another on Republican Mountain, as well, and found most of its principal vein systems. Charles H. Morris began developing the Dunkirk in 1870, and he and John Dix then organized the Herman Silver Mining Company to provide capital.[54]

The excitement, confusion of claims, lack of precedent regarding mineral rights, and greed fostered a subsidiary industry perhaps more lucrative than mining. In particular, heated disputes between mine owners supported an entire wing of the legal profession dedicated to mining litigation. Colorado mining promoter John Canfield summarized the business:

> "In the early years it became the seat of mining litigation; principally over contested rights as to territory of mineral grounds. An imperfect survey, an erroneous or faulty description, and a variety of then minor matters, having no material significance when the mine had no great value, become of supreme importance when the property is proved to be rich, and it is then that an otherwise slight error or discrepancy will put in jeopardy the entire property. A single foot of ground in dispute may involve the right of title to a whole claim, and, as is generally the case, it results in the destruction and ruin of all the parties interested."[55]

The Pelican-Dives case, fought over several rich claims at Silver Plume, was a benchmark in litigation and exemplified the extent to which mine owners did battle. In 1868, Elias S. Streeter and Thomas and John McCuniff discovered the Pelican Lode, staked a claim, but did little with the vein until 1870. In need of capital for development, the partners sold interests in the property in 1872 to Edward Y. Naylor and Jacob Snider, who hired a large crew and began production as the Pelican Mining Company.[56]

In 1869, Thomas Burr took advantage of the Pelican discovery and staked his own claim, the Dives, on the same vein. Burr purposefully abutted his Dives against the Pelican, end to end, because he knew that the vein continued beyond the Pelican boundaries. This was a common tactic that prospectors used to secure productive ground. It remains unknown whether Burr was aware, but he staked the Dives over the end of the Pelican, and the two claims now overlapped slightly. Following a typical series of transactions that complicated a mine's ownership, Burr sold half to speculator William Hamill for development capital. Hamill then sold his half to Georgetown lawyer John McMurdy in 1870 at a profit. McMurdy wanted full possession and bought Burr's half, as well. For capital, McMurdy went to New York City, established the Perdue Gold & Silver Mining & Ore Reduction Company, and transferred half to the company. Hamill secured a position as manager and kept shares in the company.[57]

Under McMurdy, the Perdue Company developed the vein and began heavy production from the overlapping end. Around 1872, the Pelican Company suspected that Perdue miners were removing ore from the end of the Pelican claim and double-checked the boundaries. How the Pelican Company realized the infraction is uncertain. It may be that Perdue miners accidentally broke into Pelican workings, or that Pelican miners heard the blasts of the Perdue crew. In either case, the Pelican party sued Perdue for trespass in 1873, and tried to quash the Perdue Company and legally attach the ore mined from the overlap. This was difficult to enforce because the Perdue Company was secretive about which portion of the mine was in production. The high profits from the illicit ore overpowered McMurdy's senses, and he was unwilling to

[54] Fossett, 1879:392, 395; Wickersheim and LeBaron, 2005:123, 128.
[55] Canfield, 1893:105.
[56] Fossett, 1876:345; Leyendecker, et al., 2005:134; Spurr and Garrey, 1908:185.
[57] Leyendecker, et al., 2005:134.

concede to the attachment. Thus, the Perdue miners shipped the ore to Georgetown on Sundays to avoid detection.

Both companies secured their own panels of legal experts, who trained themselves in the new field of mining litigation and carried the case upward to the Colorado Supreme Court. In 1874 and 1875, the lawyers secured a series of compromise decisions that at first penalized the Perdue Company with a shutdown. The Perdue experts appealed on grounds that the company should be able to continue extracting ore from the rest of the Dives claim. The court then allowed both companies to continue operations, but not within the contested ground.

Impatience with the legal process led to open hostility. The Pelican miners retaliated either out of vengeance or because the Perdue miners resumed work in the overlap. Armed Pelican miners invaded the Dives workings through underground passages on grounds that Perdue miners were on Pelican property. The armed men not only seized the overlap, but also portions of the Dives not in question. Both sides then hired armed guards to watch over the surface facilities and the movement of men and freight. The Dives owners appealed to Judge Amherst Stone in Central City to evict the Pelican miners, and he ordered the sheriff to do so by force. When the sheriff approached the Pelican Mine, workers sent him away at gunpoint. His deputies then blockaded the mine in an attempt to starve out the Pelican miners, who somehow received enough supplies to stay. The dispute reached a peak when Jack Bishop, former member of Quantrill's raiders, grew impatient because he was unable to work his lease in the overlap. Furious, Bishop lashed out at the first mine owner he came across, which was Jacob Snider. He shot Snider and escaped, and the Pelican gang assumed that the Perdue interests backed Bishop. The entire region was shocked, and tensions ran high until financial matters brought both parties together in 1876. After spending an astounding $500,000 on legal fees, the two sides divided the contested ground and returned to mining. In the interim, the lawyers and judges learned a great deal about how to sue, countersue, interpret law, and argue their positions.[58]

As the Pelican-Dives war was being waged, mining continued elsewhere in the Griffith district during the early 1870s, and Georgetown and Silver Plume cemented their community roles. Silver Plume was a working-class mining town with a population of 400 to 500, many families, and a distinct business district that included hotels, mercantiles, and saloons. The town began to absorb its western neighbor Brownville, which received the area's post office in 1871. Four years later, the communities unified, and the post office was transferred to Silver Plume.[59]

Georgetown was the center of milling, commerce, and culture, and also a bedroom community for the upper strata. The rise of banking represented Georgetown's role as the area's financial hub. William Cushman bought George T. Clark's financial institution in 1872 and reorganized it as the First National Bank of Georgetown. Two years later, Charles R. Fish, A.R. Forbes, and James Stewart funded the Miner's National Bank. Stewart contributed his smelting proceeds, and Fish supplied capital realized from gold mining at Empire. These and other activists established the Georgetown Water Works and built a plumbing system both for general consumption and fighting fires. Georgetown was more proactive about fire than similar communities and not only erected brick business buildings, but also organized several hose companies and stations.[60]

Georgetown also had a diverse population typical of the Rocky Mountain mining frontier. Although most residents were American, British and Northern European ethnicities held a strong presence as well. Georgetown was also home to substantial African-American and Jewish populations, which mingled with the rest of the community and suffered little overt racism.

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58 Fossett, 1876:346; Leyendecker, et al., 2005:134.

59 Abbott, et al., 2007:383; Bauer, et al., 1990:24, 132; Leyendecker, et al., 2005:87.

60 Frost, 1880:291; *Georgetown Courier* 4/14/28 p4 c2; Jessen, 1996:43; Leyendecker, et al., 2005:92.

African-Americans owned property, and they and the Jewish participated in popular cultural institutions such as fraternal orders, lectures, and baseball. Chinese and Native Americans, however, were not openly accepted, but tacitly tolerated. Georgetown also had a red light district of five bawdy houses on Brownell Street, west of Clear Creek. Prostitution was technically illegal but quietly overlooked by most of society as long as the ladies kept to themselves.[61]

The expansion of mining during the early 1870s fostered the growth of several other communities besides Georgetown and Silver Plume. The Equator, Colorado Central, and Saco mines were too far from Georgetown for a daily commute by foot, so the workers lived in a collection of residences on Leavenworth Mountain. The haphazard community of 75 residences was termed Silver Dale and lacked businesses and a post office, which was typical for industrial mining camps. Many of the other mines in the Griffith district were too far from Silver Plume and Georgetown for a daily commute, especially during the cold winters. As was common, miners lived near their points of work in cabins and boardinghouses. Historian Frank Fossett noted the conditions in the western reaches of the Clear Creek drainage:

> "The miners live in houses that are fastened down into the cliffs, not coming down except when going to Georgetown, ten miles away. In winter, when snows are constant, and the storm king, whose home is in these solitary peaks, holds high carnival around the mountain's brow, days pass when it is impossible to see across the gulch. Communication is then shut off from the rest of the world; and in fact the miners lay in their winter's supplies in the autumn months."

Silver Mining in the Western Drainage, 1875–1893

The period spanning 1875 to 1893 saw two important trends in Clear Creek drainage. In the western extent, silver mining reached full swing and exhibited characteristics of maturing. The general nature of prospecting changed from an individual to an industrial endeavor. Although surface prospecting continued, it declined because most of the mountains had already been examined and the principal veins found. Instead, mining companies pursued underground exploration campaigns to quantify known veins and hopefully blunder into concealed formations. Ore production and mine development began to change, as well. Although there were plenty of small outfits, large companies backed by powerful investors held the greatest presence. The Griffith and Argentine mining districts became a curious mix of heavy industry, social stratification, and a rugged culture adapted to a high-altitude environment, which was typical of Rocky Mountain mining.

The other trend was the awakening of gold mining in the eastern drainage, after a long dormancy. Mining in the east quickly went through some of the same stages toward industry as the west. By the end of the time period, the east featured some of the deepest and most advanced mines, as well as an array of efficient mills, but the region never approached the west in terms of production. For comparison, the west generated 75 percent more income than the east. Regardless, gold mining was a significant and yet separate industry in the drainage.

The railroad was one of the most important factors that affected the entire drainage during the time period. When William A.H. Loveland and Henry Teller organized the Colorado Central Railroad, they planned a line from Golden through Idaho Springs to Georgetown. Financial setbacks stalled the project several times, and when the Colorado Central finally began pushing up narrow Clear Creek canyon, the Panic of 1873 stopped progress at the base of Floyd Hill. In so doing, the Colorado Central established a temporary railhead at the far eastern end of

61 Horner, 1950:107, 137; Jessen, 1996:59; Leyendecker, et al., 2005:88.

the valley. Although the railhead was still far from Idaho Springs, its geographic and topographic location immediately lowered transportation costs. Previously, wagons imported freight into the valley from Denver by crossing over Floyd Hill, or from Central City via the northern mountains. Wagons also carried ore to smelters in Black Hawk and Central City. When the Colorado Central established its railhead, the wagons merely had to carry their freight as far as the eastern end of the valley. The net result was an enormous reduction in transportation rates, which translated into lower operating costs for the mining companies. The lower costs then allowed the companies to pursue grades of ore that were previously unprofitable and thus increase overall production. When the Colorado Central finally finished the line to Georgetown in 1877, and the Georgetown, Breckenridge & Leadville Railroad ascended to Silver Plume in 1884, they furthered the above trends as well as improving the quality of life for residents. These railroads are discussed in detail in the section on railroad transportation.

The Floyd Hill railhead had an immediate and tangible impact in the western portion of the drainage. Companies developed more mines than before, and they increased production by around 25 percent from approximately $1.5 million in 1872 to $2.1 million in 1874. The companies not only continued to ship their ore to the Black Hawk Smelter for treatment, but now found it affordable to send specialty batches of complex material by rail to facilities as far away as Michigan, Missouri, and even Pennsylvania. Overall, the development of mining, local ore treatment, and community growth were similar during the mid-1870s as in the past several years. But the railroad sped the transition from formative to mature stages.[62]

The long-awaited success of local ore treatment worked in synergy with the railroad to propel the mining industry. Because the Black Hawk Smelter was too efficient to compete against, metallurgists continued to build niche facilities. Most of those metallurgists had been involved with the Griffith district's early smelters and learned from their failures.

James Stewart rebuilt his precedent-setting roasting and amalgamation plant in 1875 after it burned. At the same time, Chicago investor J.V. Farwell bought the failed Judd & Crosby Smelter and refitted it with a modification of Stewart's process. Now known as the Farwell Mill, the facility relied on Bruckner cylindrical furnaces to roast the ore and rotating amalgamation pans to extract the silver.[63]

Investors backed local metallurgists in the construction of four new ore samplers during the mid-1870s. W.W. Rose funded the Silver Queen Reduction Works. William Bennett, who ran the Wilson & Cass Smelter in 1869, organized the Pennsylvania Lead Company. Jonathan W. Cree and Patrick McCann established the firm of Cree & McCann. Cree previously managed the Bohemia Smelting Company, and McCann managed the International Smelter at Argentine from 1868 to 1872, followed by the Judd & Crosby plant before it failed. In 1876, James F. Mathews and Charles H. Morris partnered as Mathews, Morris & Company and built the Rocky Mountain Mill. Morris, son of a mining investor, brought both experience and capital. He bought a mill at Dumont in 1869, struggled for a year with the area's troublesome ore, and sold the plant as a failure. The Spanish Bar Mining Company then hired Morris as superintendent of its mill, and he apparently mismanaged the facility and resigned in disgrace. Afterward, Morris followed his father's example and turned to mining investment, where he was highly successful. He purchased shares of the Pay Rock Mine and organized the Herman Silver Mining Company to develop the Dunkirk, both above Silver Plume, and applied some of the profits to build the Rocky Mountain Mill. By the late 1870s, the sampler was known as the Rocky Mountain

[62] Fossett, 1879:360; Henderson, 1926:109.
[63] Fossett, 1876:322; Frost, 1880:342.

Crushing & Sampling Works. G.W. Hall & Company was still in business, and Taylor and Brunton expanded their sampler as the Clear Creek Ore Dressing & Reducing Company.[64]

Curiously, nearly all the new samplers and mills went up at Georgetown even though most of the ore came from Silver Plume. Not until the mid-1870s did several metallurgists build mills at the source. After their success with the Terrible Mill in Georgetown, Teal & Eddy established their own concentration mill and sampler in Silver Plume in 1875. Franklin Ballou then followed with the Silver Plume Mill.[65]

Silver Plume was the most productive community in the western drainage, and its mining industry began to mature earlier than elsewhere. Consolidation among separate mining outfits was a typical characteristic of maturation, and a movement started during the mid-1870s. Some of the mining outfits found cooperation to be in their best interest instead of legal wrangling and merged together. In 1875, William A. Clark, Georgetown banker William H. Cushman, and others organized the East Roe Silver Mining Company to work a claim by the same name on Brown Mountain. They came into heated conflict with the owners of the Hercules property and Heneage M. Griffin, who operated the adjoining Seven-Thirty Mine. Instead of warring, the three parties consolidated their operations as the Hercules & Seven-Thirty Consolidated Silver Mining Company. The Pay Rock owners and their neighbors formed the Pay Rock Consolidated Mining Company and developed their vein through the singular Pay Rock Tunnel. In 1876, William Hamill and Jerome Chaffee consolidated their mines and operated them jointly through the Union and Silver Ore tunnels. The operation was among the earliest in the drainage to use steam drills in underground development. These three mines ultimately joined the ranks of Silver Plume's most profitable producers.[66]

Through consolidation, mining outfits increased their capital reserves, saved operating costs by combining operations, and improved overall efficiency. Complexity of infrastructure and stratification of the workforce were byproducts of combining operations. When the companies merged, they added machinery and surface facilities, and divided labor into specialty positions. Miners employed by small outfits conducted a wide variety of tasks such as drilling, blasting, timbering, tramming ore, and minor engineering. The large companies, in contrast, employed workers who spent their shifts on relatively narrow sets of tasks, much like factory labor. Further, the companies organized their workforces into hierarchies of unskilled and skilled positions, foremen, superintendents, and managers and engineers. Such stratification allowed workers to become experts in their fields but provided little room for upward mobility.

Georgetown enjoyed a small wave of discoveries and development on the mountains that flanked the valley. In 1874, miners blasted open an outstanding ore body in the Fred Rogers Mine on Democrat Mountain, which intensified interest in the slopes north of town. Democrat still offered opportunity for surface prospecting, and individuals quickly found the Silver Cloud and Silver Glance lodes. On neighboring Columbia Mountain, the Hukill Gold & Silver Mining Company, which also ran the Hukill Mine in the eastern drainage, encountered high-grade ore in the Nuckolls Mine in 1876, reinforcing the growing curiosity in the area. Leavenworth Mountain featured the earliest and most productive mines, including the Marshall, Bruce, Thompson, and Robinson tunnels, which developed separate sections of the Colorado Central Vein. At the end of 1876, lessees on another property blundered into a vein they named the S.J. Tilden and found it to be one of the richest yet discovered. This created considerable excitement, which spurred underground exploration from within other mines on the mountain. Several outfits demonstrated that Griffith Mountain held potential. In 1876, Ohio investors established

[64] Fossett, 1876:330; Fossett, 1879:366; Leyendecker, et al., 2005:138; Wickersheim and LeBaron, 2005:90, 148, 149.

[65] Fossett, 1876:329, 366; Frost, 1880:343.

[66] *Colorado Mining Directory*, 1883:160; Fossett, 1876:339, 349; Frost, 1880:310, 312; Wickersheim and LeBaron, 2005:90, 97, 111, 129.

the Ohio Comet Silver Mining Company and began the Comet Tunnel to develop a vein. The Magnet and Jerome Chaffee's Anglo Saxon Mine resumed production.[67]

The late 1870s and early 1880s were a peak in western Clear Creek drainage. A larger number of substantial operations generated more money, and on a sustained basis, than any time before or after. Small outfits developed dozens of shallow mines as well, and they were significant on a collective basis. Ore production remained a relatively constant $2 million per year primarily in silver and secondarily in lead and copper. And yet, the boom would have been greater were it not for Leadville, which siphoned off some interest among investors and miners.

Two synergistic factors contributed to the unrivaled period of prosperity. One had to do with the value of silver. In 1878, the federal Government passed the Bland-Allison Act, which was, in essence, a massive subsidy for the silver mining industry. Initially, the government declared that the treasury would recognize a gold standard to the exclusion of silver. Concerned over the impact to silver mining, Western senators and representatives drafted the Bland-Allison Act, which reinstituted the partial monetization of silver and required the government to buy the white metal at an average of $1.20 per ounce. Previously, silver fetched $1.15 per ounce, but the gold standard and slight fluctuations in price destabilized the market. The increase in value coupled with the stability imparted by the Act instilled confidence among investors, mine owners, and ore buyers.[68]

The other factor chuffed into Georgetown in 1877. The Colorado Central Railroad finished its Clear Creek line and not only reduced freight rates, but also provided a direct and all-season link with smelters and commercial centers. The reduced freight rates lowered operating costs for mining companies and allowed them to haul in more machinery and erect larger structures. As a result, the companies found that previously uneconomical grades of ore were now profitable to mine. The railroad also directly affected the quality of life in the western drainage. Residents enjoyed a greater variety of goods and food at lower costs than before. Luxury items were more affordable, and they made visiting dignitaries, also brought by the railroad, comfortable. Happy dignitaries, the residents hoped, were likely to invest in the area's mining industry.

Georgetown was ready to receive any and all potential investors. They could find quality lodging in the American, Ennis, and Yates houses, or in the Centennial and Star hotels. Several restaurants provided sophisticated menus, and the business district featured fine saloons. Most of the wealthy visitors stayed at the Barton House and attempted to secure a seat in Charles Dupuy's French restaurant, which evolved into the famed Hotel de Paris. Tourist and industry promoters offered glowing accounts of Georgetown, such as Frank Fossett:

> "Its appearance and surroundings are superior to those of any other mountain town. Around it are lofty mountains, ribbed with silver veins, which rise abruptly to heights of from twelve hundred to twenty-five hundred feet above the almost level valley in which the town is built. Here are silver reduction works, ore concentrating mills, and sampling and ore buying establishments, all of which do a large business. The mining operations of the district are very extensive, resulting in an annual export of silver bullion and ore to the value of over two millions per annum."[69]

Mining around Georgetown finally began to pass through some of the same stages of maturity as Silver Plume. Leavenworth, a celebrated mountain of silver, was subject to deep

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[67] *Colorado Mining Directory*, 1883:159; Fossett, 1876:359-366, 402; Frost, 1880:318; Wickersheim and LeBaron, 2005:138.
[68] King, 1977:92; *Report of the Director of the Mint*, 1894:20; Saxon, 1959:7, 8, 14, 16.
[69] Fossett, 1879:95.

development, advanced engineering projects, consolidation, and litigation. Jeremiah Kirtley and E.S. Weaver held claims on the Kirtley Lode but apparently lacked the capital for development at depth. Charles Martine, involved with the Hall Sampler, saw an opportunity to acquire an interest in the operation in exchange for funding. In 1877, the partners organized the Kirtley Tunnel Mining Company, began driving the Kirtley Tunnel, and used rockdrills to hasten progress. The company was among the earliest at Georgetown to use the drills, and with them, miners struck the Kirtley Lode by 1878. The vein proved to be a bonanza, and over the course of several years, the company demonstrated that it was the trunk of a system within Leavenworth Mountain. Various claim owners originally thought that the Argentine, Gates, O.K., Stranger, and Tilden veins were distinct formations, but instead they were branches of the master Kirtley Lode. Needless to say, the Kirtley Tunnel became one of Georgetown's best producers.[70]

Chicago investors had a similar experience with the Equator Lode. They purchased the poorly developed property on Leavenworth in 1878, organized the Equator Mining & Smelting Company, and prepared for heavy production. The company installed a system for rockdrills, pushed the Equator Tunnel 1,100 feet, and when miners reached the vein, made connections with a shaft sunk from above. Miners sent ore to the Equator Mill in Georgetown for concentration, and the company realized around $1.2 million by 1883.[71]

Frank Marshall worked the Colorado Central Lode since 1868, and William P. Lynn found an extension of the vein four years later and claimed it as the Ocean Wave. Only by tracing the formation across the mountain did Lynn come to realize that his Ocean Wave was an upper extension of the greater vein system. He felt that legal criteria gave him mineral rights to the rest of the Colorado Central Lode and brought suit against Marshall for trespass. Although Marshall predated Lynn, he was uncertain about his rights and negotiated with Lynn. Instead of pouring their money into the pockets of lawyers, the two parties consolidated their holdings as the Colorado Central Consolidated Mining Company in 1879 and linked the underground workings. The mine then became one of the largest near Georgetown with 4,000 feet of development drifts along the vein.[72]

The wave of prospecting and shallow development on Democrat Mountain began paying off during the late 1870s. Reflecting a movement toward maturation, local entrepreneurs acquired the lesser mines while distant investors bought the best properties. Georgetown doctor William Burr and Duncan McArthur organized the Lincoln Mining Company and worked the Fred Rogers. The mine was a shallow but sound producer. Cincinnati investors operated the W.B. Astor Mine, and New York interests organized the Polar Star Silver Mining Company for the Polar Star. Both operations ranked among the heaviest producers on Democrat. Prospectors found the Little Emma in 1877 and sold to James F. Mathews of Denver, and he secured Cincinnati investors. They established the Good Luck Mining & Milling Company in 1880 and realized $125,000 in only three years. Experienced mining engineer Ernest Le Neve Foster was responsible for developing several prospects into sound producers. The Fletcher Gold & Silver Mining Company secured Foster as superintendent for the Matilda Fletcher in 1878, and he also operated the Magnet Mine on Saxon Mountain for the Magnet Mining Company.[73]

Mining at Silver Plume was farther along, and the industry possessed characteristics of an advanced state. During the first years in the area, miners extracted ore from the upper sections of the veins because it was rich, easy to treat, and accessible. But by the late 1870s, the miners

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[70] *Colorado Mining Directory*, 1883:147; Fossett, 1879:362; Frost, 1880:321; Spurr and Garrey, 1908:265; Wickersheim and LeBaron, 2005:117.

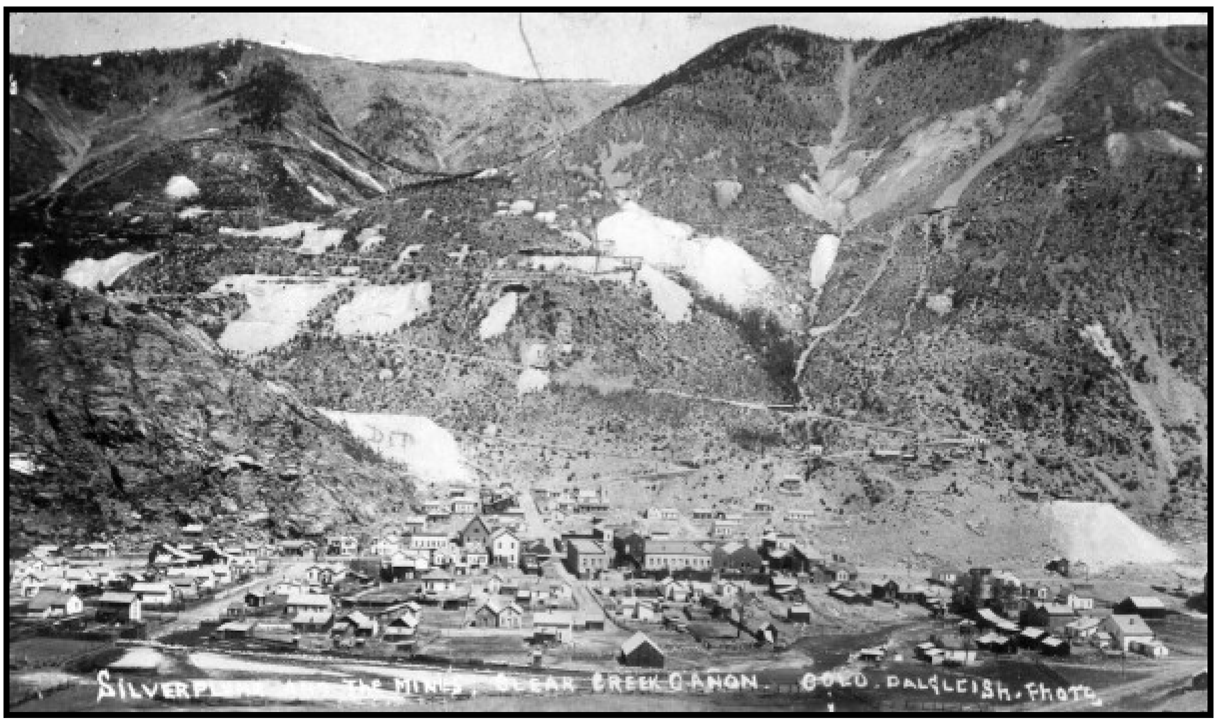
[71] *Colorado Mining Directory*, 1883:133, 148; Frost, 1880:321; Wickersheim and LeBaron, 2005:101.

[72] Fossett, 1876:358; Frost, 1880:320; Spurr and Garrey, 1908:245.

[73] *Colorado Mining Directory*, 1883:146, 162, 173, 177; Fossett, 1879:388; Wickersheim and LeBaron, 2005:121, 123, 131, 134, 145.

exhausted the shallow ore and pursued the deeper reaches of the veins. To do so, the miners drove longer tunnels and deeper shafts, requiring more engineering, machinery, and larger workforces than before. The associated need for capital exacerbated the existing trend toward consolidation and large-scale operations. As at Georgetown, local interests owned the small mines, and distant investors backed the large companies. Sherman, Brown, and Republican mountains all possessed more than enough ore to sustain even the largest of operations.

Mining outfits perforated Republican Mountain with dozens of tunnels, and six substantial companies sent down tons of ore daily. Georgetown banker Charles Fish established Charles R. Fish & Company during the early 1870s and acquired the Corry City on Sherman Mountain. By the end of the decade, a group of investors bought the Corry City, as well as mines on Republican Mountain, and planned to undercut the lot with one of Silver Plume's most ambitious tunnels. They formed the Colorado Diamond Tunnel Silver Mining Company, hired John Fish as superintendent, and pushed the Diamond Tunnel 2,100 feet through Republican and into Sherman. The Lebanon Mining Company followed a similar strategy and advanced from the base of Republican 1,200 feet to the Elija Hise vein. Promoters of such projects hooked investors with visions of hidden veins awaiting discovery. Although most tunnels failed to find hidden veins, the Lebanon was an exception and breached eight. The company then felt confident enough to build its own concentration mill.[74]



Silver Plume, an industrial mining town, reached a peak in production during the late 1870s and early 1880s. The town was wedged onto the valley floor at the toe of several mountains dotted with mines, which employed hundreds of workers. The view is north. Courtesy of Denver Public Library, X-2172.

Local experts backed by distant investors ran four more heavy producers on Republican Mountain. In 1877, concentration pioneer George Teal and mining engineer Ernest Le Neve

[74] *Colorado Mining Directory*, 1883:131; Frost, 1880:312-314; *Report of the Director of the Mint*, 1883:428; Wickersheim and LeBaron, 2005:94, 120, 149.

Foster joined as the consulting firm of Teal, Foster & Company. Their relationship transgressed business in 1875 when Foster married Teal's daughter, Charlotte. Because the partners were from England and had outstanding reputations, British investors naturally selected the firm to oversee their companies in the Griffith district. Teal and Foster did not disappoint, and they made the Silver Plume Mining Company and the Snow Drift Silver Mining & Reduction Company highly profitable. Charles Morris' Herman Mining Company continued to operate the Dunkirk, and his Pay Rock Consolidated worked the Pay Rock. The latter mine, second only to the Pelican-Dives, yielded $450,000 and purchased the Silver Plume Mill to treat its ore.[75]

The Seven-Thirty Mine was typical of Silver Plume's numerous silver producers. The mine was a tunnel operation with massive waste rock dump piled on a steep mountainside. Several times, these dumps gave way and cascaded onto buildings in town below. Source: Spurr, 1908.

Brown Mountain was not quite as rich as Republican, but it was home to several major producers. Like some of the mines on Republican, local interests ran the operations with funding from distant investors. William Clark's Hercules & Seven-Thirty Consolidated Silver Mining Company continued to produce ore through the Hercules Tunnel. The Baltimore Tunnel Mining Company pushed the Baltimore Tunnel 750 feet into the mountain and apparently ran out of money. The Colorado Territory National Silver Mining Company took over and hired Jacob Fillius as superintendent. Fillius came to Georgetown as a school teacher and seemingly became involved with mining through a few fortunate investments. The Baltimore may have been one of Fillius' first charges, and he did well with the property. It provided Fillius with an economic foundation to become an important local mine owner and even railroad builder.[76]

[75] Fossett, 1879:392; Wickersheim and LeBaron, 2005:97, 129, 139.

[76] *Colorado Mining Directory*, 1883:122; Fossett, 1879:396; Frost, 1880:310; Wickersheim and LeBaron, 2005:82, 137.

The Terrible Mine was one of Silver Plume's crown jewels, and it was subject to legal negotiations and extortions typical of the boom. British investors bought the claim in 1869 and organized the Terrible Lode Mining Company to develop it. Miners quickly demonstrated that the vein was rich, which drew the attention of opportunistic speculator William Hamill. He then purchased the adjacent Gun Boat, Silver Ore, and Tycoon claims, either on the assumption that their value would rise because of the close proximity to the Terrible or as the basis for a mineral rights lawsuit against the British company. Hamill chose the latter course during the early 1870s. Hamill's group of claims predated the Terrible, and he asserted that because of this, he held the mineral rights to the entire vein. Hamill then threatened to level a suit if the Terrible Company did not cease or pay him a handsome price. The company, however, had leverage. Its lawyers realized that Hamill could not prove his claims were on the vein because their workings were too shallow. Hamill lacked the funds for necessary development and watched the Terrible Mine disgorge tons of silver ore that he insisted was his. When Hamill was appointed manager of the Dives in 1874, his salary allowed him to finally sink workings on the claims. After a year, Hamill had positive proof that his claims and the Terrible were on the same formation, and reinstated his lawsuit. The Terrible Company underestimated Hamill's position. Because Hamill's claims predated the Terrible, the court awarded him rights to the vein, and the case set a legal precedent for similar conflicts elsewhere.[77]

The net results were wealth for Hamill and another large consolidation in 1877. Hamill's price was one-third interest in the company and the position of manager. He was tough on labor, difficult to work with, and reported to the company only as he pleased. But the company tolerated Hamill because he made the Terrible one of Silver Plume's best producers. The investors reorganized the assets as the Colorado United Mining Company to include Hamill and his claims. Afterward, the Terrible Mill went by the name of the Colorado United.[78]

Two more large consolidations came out of heated lawsuits. In 1877, the feuding owners of the Pelican and Dives mines, discussed in the pages above, merged their extensive operations as the United Pelican & Dives Mining Company. Some of Colorado's mining elite such as Bela M. Hughes and Eli S. Streeter came with the Pelican side and fattened their portfolios. Jacob Fillius and Charles Fish ran the profitable Cold Stream on Sherman Mountain, and they sued the owners of the adjacent Phoenix over mineral rights. Instead of spending money on lawyers, the parties merged as the Cold Stream Consolidated Mining Company in 1878. Their reward was $500,000 in silver by 1883.[79]

The Argentine Mining District underwent the same process of maturity as Georgetown and Silver Plume. But because the district was smaller, more remote, not as rich, and discovered earlier, much of the district was already in decline. The prospectors had moved on, miners exhausted the shallow ore formations, and most of the operations failed. The proven mines continued to attract investors, however, and like Silver Plume and Georgetown, local interests worked the small properties and large companies acquired the substantial operations. The Baker and Stevens mines were two of the most important operations in the district, and they also were in the northern reaches near Clear Creek. The Stevens Mining Company worked the Stevens beginning in 1874 and invested in extensive surface facilities including a long, inclined tramway from the main tunnel down to a loading station. The mine was very difficult to work because of the alpine environment, and the investors grew weary of the financial drain and decided to sell. Heneage Griffin, heavily involved with the Hercules at Silver Plume, learned of this and contacted fellow British investors who were interested in the area. They organized the

[77] Fossett, 1876:337; "Latest Mining News" *Rocky Mountain Mining Review* 4/2/85 p1.
[78] *Colorado Mining Directory*, 1883:127; Wickersheim and LeBaron, 2005:91.
[79] *Colorado Mining Directory*, 1883:126; Frost, 1880:310, 312; Horner, 1950:261; Wickersheim and LeBaron, 2005:90, 143.

Northwest Stevens Mining Company in 1878, bought the Stevens, and appointed Griffin as agent. Through careful management and expertise, Griffin systematically developed the mine for long-term production, which kept him busy for 20 years.[80]

R.B. Weiser leased the Baker Mine in 1879, installed new machinery, and did well for several years. His improvements and record of production attracted another group of British investors who bought the property under the British Queen Mining Company in 1882. They continued production and increased the mine's yield beyond $500,000. The hamlet of Bakerville and the mill there came with the deal. The company may have been as interested in Bakerville as it was in the mine because the thriving settlement held great promise. Bakerville was the western-most outpost on the main fork of Clear Creek and also one of the most important lumber centers in the entire drainage. But perhaps more important, the townsite was on the route projected by the Georgetown, Breckenridge & Leadville Railroad. In 1882, Union Pacific officials chartered the railroad to finish a link they planned between Georgetown and Dillon, in Summit County (discussed in the section on railroads). In particular, the route began at the Colorado Central railhead in Georgetown, wound up the main fork to Silver Plume, continued through Bakerville toward Loveland Pass, and went under the Continental Divide through a tunnel. From there, the route descended the Snake River to Dillon. The British Queen company stood to benefit because not only would Bakerville serve as a construction camp at first, but also it would become an important coal and lumber station once the line was in operation. Property values were then likely to rise.[81]

Workers began grading the line almost at once, but the narrow canyon and steep ascent between Georgetown and Silver Plume slowed progress to a crawl. By 1883, track gangs finished the bed, installed most of the rails to Silver Plume, and pushed onward to Bakerville. Although most of the track was ready, errors in building the High Bridge over Devil's Gate caused further delays in opening the line to traffic. In the interim, railroad officials came to the same conclusion as the British Queen company about the value of a station on the main fork. Thus, they surveyed Graymont in 1882 as home for the station. Because the officials wanted the business of the sawmills and mining companies, they platted their townsite adjacent to Bakerville. Several residents then built cabins, someone opened the Fox and Hounds tavern, J.D. Jennings ran the Jennings Hotel, and Heneage Griffin erected ore bins for the Stevens Mine. The railroad parked a box car and used it as a station, and secured a post office. Bakerville still featured sawmills but failed to grow as hoped. Adding insult to injury to the British Queen company, the Union Pacific cancelled its plans to finish the route over the Divide, and Graymont became the end of the line. In 1884, steelworkers rectified the problems with the High Bridge, and the railroad began traffic to Silver Plume and Graymont.[82]

The Georgetown, Breckenridge & Leadville Railroad was a grand and cleverly engineered extension of the Colorado Central, and it impacted Silver Plume. Direct rail service eliminated the need to transport freight by wagon up from and ore down to the Colorado Central railhead at Georgetown. This reduced operating costs for the mining companies, which allowed them to pursue lower grades of ore. The net effect was, however, not the significant increase in production usually attributable to railroads. During the mid-1880s, the entire drainage maintained a net of $1.5 million per year, and this decreased to $1.3 million by 1887. Two compounded factors offset the benefits that the railroad delivered, and they were the beginning of a long-term pattern that dogged the western drainage for decades.

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[80] *Colorado Mining Directory*, 1883:158; Ellis and Ellis, 1983:98.
[81] *Colorado Mining Directory*, 1883:121; Ellis and Ellis, 1983:67.
[82] Ellis and Ellis, 1983:192, 215, 218.

One was the downside of 15 years of continuous production. Miners not only exhausted the richest ore in the upper reaches of the principal veins, but now the lower grades of material as well. The mountains still contained great reserves of ore, but the material was deep, complex in grade, and not yet fully developed for extraction. Work at depth required greater infrastructure, and the railroad reduced the costs of freighting the necessary materials to Silver Plume.

The other factor was a synergy of forces that not only caused the value of silver to slip, but also made investors wary of its mining. In particular, opponents of the silver standard shifted treasury policy in favor of paper currency and loudly opposed the free coinage of silver. In 1885, the value of silver decreased from $1.12 per ounce to $1.06 and continued a downward trend until it bottomed out at $.94 by 1888. The watershed year, however, was 1886, when President Grover Cleveland's antisilver stance became well-known and silver reached $1.00 per ounce, which seemed to be the threshold for mining investors. The prices for industrial metals fell in parallel, and lead decreased by a penny from $.05 per pound.[83]

The mining industry contracted slightly, and while Silver Plume remained stabile due to the railroad, Georgetown felt the effects more acutely. Real estate values declined, less capital flowed into town, and some mining experts left for other areas. The business district remained vibrant, but with fewer investors visiting, the luxury hotels and restaurants were not as busy as before. Charles Dupuy's Hotel de Paris was an exception, and it may have reached a peak in popularity during the late 1880s. Originally Adolphe Francois Gerard, Dupuy was a cultured Frenchman who joined the army in 1868 and was stationed in Cheyenne. He considered himself above the chain of command and his fellow soldiers, promptly deserted, and changed his name to Dupuy. He at first went to Denver and then Georgetown around 1870 to hide. In need of income, he worked in the Kennedy Mine until 1873, when he was severely injured by a delayed dynamite charge. Finished with mining, he found a job in the Delmonico Bakery, bought the business, and eventually expanded it into a restaurant and boardinghouse. In 1882, Dupuy expanded the business again as the Hotel de Paris, which received a number of dignitaries. Dupuy became cantankerous but was well known for his outstanding French cuisine and cellar of imported wines. He often refused service to common people he thought inferior, and closed on busy holidays because the pressure to prepare proper meals was too great. Despite such practices, the Hotel de Paris thrived through the 1880s.[84]

The ore samplers and concentration mills continued their din in Georgetown during the late 1880s, but they treated less ore. Most of the small mines around Georgetown were idle because their high-grade ore was gone, and the days when investors freely speculated on such properties were over. The large companies, however, had the resources to develop their deep ore reserves and therefore generated enough payrock to keep the mills busy.

The Colorado Central Consolidated Mining Company was one such operation, and it spent a small fortune preparing the lower extent of the Colorado Central Vein for production. Manager George Hall, who owned an interest since 1868, commissioned the Hall Tunnel in 1887 as the deepest haulageway yet driven to the vein. Miners started the tunnel into the base of Leavenworth Mountain, well below the Marshall and Ocean Wave tunnels, and planned to work the vein from the bottom up once they reached it. The project was a considerable undertaking because the miners had to penetrate 4,500 feet of hard rock. As hoped, the tunnel intersected several profitable veins after only 1,500 feet, which offset some of the cost. Years passed before the tunnel was finished.[85]

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83 Brown, 1984:191; "Mining News" *EMJ* 8/14/86 p119; *Report of the Director of the Mint*, 1894:20; Saxon, 1959:7-9, 14-17; Smith, 1994:184.

84 Colorado Historical Society, 1954:4; Jessen, 1996:53; Leyendecker, et al., 2005:88, 186.

85 "General Mining News" *Mining Industry* 8/17/88 p75; "General Mining News" *Mining Industry* 8/2/89 p55; "General Mining News" *Mining Industry* 8/23/89 p83.

In contrast to working-class Silver Plume, Georgetown was a center of culture, sophistication, and mining elite. Luis Dupuy's Hotel de Paris was celebrated for its luxurious accommodations, dining, and cellar of imported European wines. Courtesy of Denver Public Library, X4557.

Even though Georgetown was static in some ways during the late 1880s, it was still a highly progressive and sophisticated community. Georgetown was a center for technological development since its beginning, when the Griffiths built what was most likely Colorado's first aerial tramway. The town continued this tradition when it received one of the earliest electrical systems in the Rocky Mountains. In 1886, M.T. Morrell built a small hydropower generation plant and began limited service for electric lighting. Charles Fish owned the local gas company and held tight the contract for municipal lighting, which locked up Morrell's most important customer base. Morrell struggled and then quit in 1888, but he pioneered an important model that other electric entrepreneurs followed in only several years.[86]

At Silver Plume, many of the small mines closed like those around Georgetown, but the large operations offset their absence. The companies employed an army of miners who supported a substantial business district and several important cultural institutions. A total of three grocers, several butchers, and two slaughterhouses provided food. Miners could drink in Silver Plume's nine saloons or buy beer directly from a brewery. They bought fresh garments from two clothing stores and three shoe stores, and sent dirty items to three laundries. A drug store, several barbers, and a doctor provided health and hygiene, and residents had watches

[86] Leyendecker, et al., 2005:250.

repaired in a jewelry shop. Five hotels received guests, and they found entertainment in the opera house. The town also featured a water system, a school, and several newspapers.[87]

Although most of the mining companies maintained regular production, the poor silver climate caused anxiety for investors and directors. They reacted in several ways and instituted policies that were typical of a mining industry under stress and en route toward decline.

Mine owners and investors decided to cash out of their holdings and leave the industry, which created opportunities for several large buyouts and consolidations. The Colorado United Mining Company felt that the Terrible had little left to offer after yielding enormous profits and sold the mine to Colorado Silver Mines, Ltd., in 1885. John W. Brown brokered a major deal in which eastern investors purchased the Lebanon Mining Company, the Clear Creek Mining & Improvement Company, and a spread of claims on Republican Mountain. Brown was adept at such negotiations and had experience with a similar venture near Idaho Springs, as well as several companies on Republican. British investor J.H. Platt backed the most sensational consolidation of the time. In 1888, he organized the Florence Mining & Milling Company and bought the Pay Rock Consolidated and Silver Plume Mining companies as the foundation for an advanced ore production and milling operation. Both were among Silver Plume's most celebrated producers and cost a fortune. Platt invested yet more money on the Ashby Tunnel, also known as the Florence, to undercut the vein system at levels deeper than the existing Pay Rock Tunnel. The Ashby Tunnel, 1,200 feet long, then served as the working platform for ore production, and such a function required a well-equipped surface plant. The company inherited the Silver Plume Mill from the Pay Rock Company, renamed it the Florence, and refitted the facility not only to treat its own ore, but also custom material from other mines. In so doing, the company provided a needed service while recovering some of its construction costs. Now saddled with a massive debt load, the company had no choice but to hire a large crew and maximize production.[88]

A few companies examined the massive waste rock dumps that fanned out from the mouths of every tunnel and shaft. In some cases, these dumps contained low-grade ore that miners of the past threw out as unprofitable at the time. By the late 1880s, concentration methods rendered such material profitable, and all a company need do was dispatch a crew to sort through the dump and recover the payrock. In the Griffith district, the practice apparently began during the late 1880s and became an important secondary source of ore in later decades.

Some owners leased all or portions of their mines as another response to an uncertain business climate. A lease was an arrangement where a party of miners paid the owner a fee for the right, by legal contract, to work a property. The fee varied and ranged from a percentage of the gross income, to a flat rate, to a combination of the two. A fee of 20 percent was common, although it varied from as low as 10 to as high as 60 percent, based on the quantity and quality of ore. By leasing out a mine, the owner realized income while investing little effort and shifting the financial risks and operating costs over to the lessee. Lessees stood to benefit because they had the potential to make more money than company wages at least, and strike bonanza ore at best. Leasing, however, had its pitfalls. The potential for dishonesty among all parties fostered a sense of insecurity. Some lessees tried to hide their production, and on more than one occasion, the owner attempted to cancel a lease after the lessees made a rich strike. Because the lessees had to pay their own operating costs, they had a tendency to ignore the infrastructure necessary for a mine's long-term well-being as well as the safety of the workers. In their haste, some

[87] Griswold, et al., 1988:145; *History of Clear Creek County*, 1986:35.

[88] "General Mining News" *Mining Industry* 5/4/88 p12; "General Mining News" *Mining Industry* 6/8/88 p13; "General Mining News" *Mining Industry* 6/29/88 p8; "General Mining News" *Mining Industry* 7/19/89 p35; "Latest Mining News" *RMMR* 1/15/85 p10; "Prominent Mines of Clear Creek County" *Mining Industry* 1/20/88 p9.

lessees even damaged the underground workings through poor practices and left them in a state that required costly improvements. In some cases, the mine owner or company maintained the mine and operated the surface plant while leasing blocks of ground or sections of the workings to individual miners, who tried to extract ore as fast as they could.[89]

In general, widespread adoption of the system was a signal of an industry in distress as well as a lack of confidence in the future of the individual mines. Silver Plume saw a wave of leases during the late 1880s, around ten years before the practice became common elsewhere. Jacob Fillius leased a section of the Pay Rock prior to selling the mine to Platt in 1888, and Platt issued more agreements afterward. Gabriel Bartolomea leased the Farwell Mill at Georgetown and refitted it to treat ore from a block of ground that he also leased in the Burleigh Tunnel. More Italians leased the Seven-Thirty and Silver Cloud mines, and produced heavily.[90]

Unlike Georgetown and Silver Plume, the Argentine district fell into a deep slump due to the poor climate of the late 1880s. Most of the mines closed, leaving only a handful of operations on the deepest veins. The Stevens was among these, and like the outfit before, the Northwest Stevens Mining Company found the mine not as profitable as the British had hoped. Heneage Griffin, however, retained full confidence in his ability to sustain long-term production and bought the property in 1885. He continued his wise strategy, so often ignored by inexperienced mine owners, of reinvesting some of the income in deep development and infrastructure. During the late 1880s, Griffin began the Level 14 Tunnel from Stevens Creek to undercut the vein and work it from the bottom up. Miners then increased production to 100 tons of payrock per month, and Griffin erected new ore bins at Graymont to store the material. The Stevens was more attractive than ever, and he had an easy time selling it to yet another party of British investors, who organized the Mount McClellan Mining Company in 1890. Stevens came with the deal as manager.[91]

Despite wariness among the owners and investors, the mining industry passed from the late 1880s into the early 1890s in a stabile and productive condition. In 1890, around 1,925 people lived in Georgetown, 1,250 inhabited Silver Plume, and more were scattered at the mines on the surrounding mountains. A total of 2,000 were employed in 45 principal mines and 6 mills. Such statistics suggest that approximately one-half of the population consisted of able-bodied workers, many of whom were unmarried miners. The prominence of Italians in the leasing system reflected the changing demography among the workforce. Americans still dominated, and Northern Europeans and British held a high percentage, but Italian immigrants began to arrive in large numbers from the East. As immigrants, most were single, and over time, they replaced the legendary Cornish as the region's expert miners.[92]

During the year, the federal government instituted its first new policy regarding silver since 1878, and this perpetuated mining in the western drainage. During the late 1880s, western legislators clamored for a return to a prosilver policy to bolster sagging mining industries in their states, as well as their own personal silver stock portfolios. Well-organized, they succeeded in 1890 with the Sherman Silver Purchase Act, which required the federal government to buy 54 million ounces silver per year at $1.05 per ounce. These figures fostered a demand and price capable of resuscitating silver mining, which created jobs, revitalized regional economies, and, of course, improved the popularity of the legislators among their constituents.[93]

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[89] Brown, 1979:101, 114; "Editorial Correspondence" *EMJ* 4/20/12 p807.

[90] "General Mining News" *Mining Industry* 6/7/89 p252; "General Mining News" *Mining Industry* 6/21/89 p275; "General Mining News" *Mining Industry* 7/20/89 p124; "Latest Mining News" *RMMR* 2/12/85 p9.

[91] Ellis and Ellis, 1983:106; "General Mining News" *Mining Industry* 10/9/88 p197; "General Mining News" *Mining Industry* 7/12/89 p26.

[92] Canfield, 1893:106; Hall, 1895, V.3:322; Schulz, 1976:1890-3.

[93] Brown, 1984:193; Reyher, 2000:179; Smith, 1982:92; Voynick, 1992:62.

In most silver mining districts, the price increase stimulated a wave of activity. Prospectors returned to mountainsides in search of new veins, speculation supported small ventures, and large companies increased their production. The Griffith district seems to have been left out of the statewide trend. In 1889, the industry generated $1.7 million in silver and $209,000 worth of lead, which increased only slightly to $1.9 million for silver and $541,000 in lead the following year. By 1891, when the Sherman Act was in full force, the figures even began to regress.[94]

Why did the Griffith district fail to respond to the positive silver climate? The district simply lacked the ore reserves to support a large increase in output. By 1890, after 25 years of prospecting, underground development, and ore production, the district offered little opportunity for significant discoveries. The principal veins had been located, probed, quantified, and even bought and sold several times over. Thus, the mining outfits produced a little more ore in 1890, but the jump in income during the year was primarily a factor of the higher value of silver, which made the same tonnage of ore worth more. When that value began to slip in 1891, the annual income regressed in parallel.

The value of silver began declining because the climate and market destabilized almost immediately after the Sherman Silver Purchase Act was signed into law. Economic reformers rebelled against their perceptions of a massive government subsidy for mining and profiteering among powerful capitalists, and they demanded repeal. At the same time, a looming economic crisis created political uncertainty in both the federal government and Great Britain, one of the main consumers of American silver. Repeating the cycle of the mid-1880s, an increasingly dour climate contaminated silver investment and industries that depended on it. The price of silver eroded from a high of $1.09 in 1891 to $.78 by mid-1893, an all-time low. As with the 1886 cycle, some of the small mines in the Griffith district closed, but many companies were in sound condition because they were more efficient than before.[95]

Still, the companies assessed their operations and identified ways of maintaining profitability despite the decline in silver. Managers cut wasteful spending, cancelled costly projects, and streamlined operations. They also followed a common strategy practiced throughout the western mining industry and looked to labor for additional savings. In 1892, the largest companies cut wages from $3.00 per shift, the standard in Colorado mining districts, to $2.50. Until the cut, the Griffith district enjoyed a relatively cooperative atmosphere, and the miners and management tolerated each other well. The wage reduction soured the relationship and created deep divisions that precipitated the first region wide unionization movement. The miners joined the Silver Creek Miner's Union for representation in strength of numbers, and the organization had a voice and membership throughout the Clear Creek drainage. But before mine management tested the union's will to strike, political changes at the end of 1893 rearranged the economic landscape of the drainage.[96]

Gold Mining in the Eastern Drainage, 1875-1893

During the latter half of the 1860s, the residents in the eastern drainage, between Empire and Idaho Springs, watched the boom around Georgetown and Silver Plume with envy. The rush for silver fostered considerable growth in the western drainage, and in their haste to the silver mines, investors took little notice of the vacant gold fields along Clear Creek.

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94 Henderson, 1926:109.
95 Henderson, 1926:216; *Report of the Director of the Mint*, 1894:20; Saxon, 1959:7, 8, 14, 16.
96 Canfield, 1893:107; "General Mining News" *MIT* 4/15/92 p191.

During the early 1860s, however, it was the east that boomed, and miners and outfits produced placer gold from every creek of significance. As the placer gold began giving out, prospectors successfully traced it to its source veins, which held the potential to offset the diminishing returns from the exhausted stream deposits. Despite this, the region failed to make the transition from placer to hardrock mining. The region saw a wave of claims acquisitions and mine development that appeared to be the start of an industry. A number of outfits extracted shallow ore and found it easy to treat with conventional amalgamation techniques, but they unknowingly worked within a limited zone of oxidation. Between 100 and 200 feet, the ore in most veins gave way to highly mineralized and refractory material that resisted amalgamation. Nearly all the mining outfits were unable to win gold from the troublesome ore, and because of this and external factors, they failed almost simultaneously during 1864. Most investors gave up, distant rushes drew the miners away, hardrock gold mining collapsed in the development stages, and Clear Creek received a poor reputation.

Thus, when the Griffith district boomed, the eastern drainage languished. The ore was still in the ground, however, awaiting experienced metallurgists to figure out how to extract the gold. John Collom was one of the few who achieved anything that approached success, and although he pioneered a solution to the refractory ore, no one else seems to have imitated him. Collom was a trained Cornish mining engineer who gained practical experience in the Michigan copper mines. When the Boston Silver Mining Association began developing the Comstock Mine near Montezuma, Summit County, in 1865, it hired Collom as manager. He understood that a smelter was required to reduce the silver ore there and built one of Colorado's earliest smelting furnaces. The Bay State Gold Mining Company drew Collom back over the Divide to Empire and convinced him to apply his metallurgical knowledge to the refractory gold ore. Although Collom managed both operations simultaneously, he paid special attention to the Bay State operation. He built an experimental mill in Lyons Gulch and incorporated several innovations. First, he realized that roasting the ore drove off excess sulphur, oxidized the material, and made it more receptive to amalgamation. James E. Lyon proved that the process worked in Central City, where the ore was similar, and Collom adapted the method to Empire payrock. Second, Collom designed an apparatus that relied on mechanical action to separate out the heavy metal content from the lighter waste, purifying the ore for even better amalgamation. When tested, however, he found that his Collom Separator had merit but required more work. As a result, Collom limited his process at the Bay State Mill to roasting and then amalgamation, which provided returns sufficient for the Bay State Company. Although roasting later proved to be an important solution for the ore problem, only the nearby Leibig Gold Mining & Mill Company imitated Collom's furnace. Other firms continued to struggle with traditional ore treatment methods.[97]

Collom thought he had an answer to the milling crisis that halted gold mining throughout the drainage. He decided to build a carefully designed commercial plant at Junction City, formerly Empire Junction and changed the settlement name again to Swansea after the smelting center in England. For unknown reasons, Collom erected a smelter instead of another ore roasting plant, and when he opened for business in 1870, he found that smelting was not the solution. Instead of converting the plant for roasting, Collom sold to Richard Pierce in 1871 and retreated to Golden to develop his separator. Collom returned to Clear Creek several years later and ran several successful mills that incorporated a roasting stage. Pierce had no better luck at Swansea than Collom, and Nathaniel P. Hill hired him in 1873 to manage part of the Black Hawk Smelter.[98]

[97] Fell, 1979:56; Harrison, 1964:161; Hollister, 1867:247.
[98] Harrison, 1964:245.

Although Hill designed the Black Hawk Smelter specifically to reduce refractory gold ore, the facility did little business with Clear Creek mines at first. The smelter operated at capacity on Gilpin County ore and had little room for additional material. More important, investors mistrusted the Clear Creek gold mines due to the previous failures, and most of the mines lay dormant as a result. Those investors interested in the drainage looked to the west instead and poured their money into the silver mines. Clear Creek possessed plenty of gold ore and was almost within sight of the Black Hawk Smelter, but the financial will to connect the two was simply not there.

In 1874, several factors finally provided investors with the confidence they needed to seriously consider Clear Creek gold mining. One was an improvement in the national economy, which recovered from a panic in 1872 and 1873. Investors were again willing to risk money on uncertain mining ventures. Another factor was that Nathanial Hill increased the capacity of the Black Hawk Smelter, which now accepted Clear Creek ore. The last was the arrival of the Colorado Central Railroad at the base of Floyd Hill. As described above with the Griffith district, the railroad lowered the rates for importing goods and sending ore to the Black Hawk Smelter. The costs of production fell for mining companies, and they now had an inexpensive outlet for their ore. The eastern drainage then began to undergo the same process of discovery, development, and industrialization as the west.

That process was relatively slow to start. Small outfits reopened some of the principal mines and produced limited tonnages, and several companies operating prior to the railroad also increased their output. John Dumont, who pioneered placer mining in 1859 at Mill City, bought the Hukill at Spanish Bar in 1871. He developed the Hukill into one of the few important operations of the time. Park Disbrow reopened the Conqueror and made it one of the largest mines at Empire. Henry Dewitt Clinton Cowles worked the Golden Era and Grand View, and David J. Ball operated the Pioneer and Pittsburgh. Ball and Cowles were among the first hardrock prospectors at Empire in 1860 and helped found both the town and the Union Mining District. Ball ran an assay shop until the 1868 collapse and used the poor economic climate to his advantage. Forecasting a future revival, he bought several idle gold producers when discouraged owners offered them at low prices. Included were the Ball Placer at Lyon Gulch and the Pioneer and Pittsburgh mines.[99]

John Collom also forecasted better times for gold mining in the drainage, and he revived his idea of opening a commercial mill. Collom was ready with improved separation appliances and an effective process, and he secured a plant site in Idaho Springs in 1873. The following year, Collom interested Denver capitalists and his brother Charles, and they organized the Collom Idaho Ore Dressing Company and built the first ore sampler in the eastern drainage (sampler described with the Griffith district above). The sampler featured a small smelter, roasting furnace, and what was probably the first successful concentration process for Clear Creek's complex gold ore. In building the sampler, Collom directly contributed to mining in the eastern drainage because he provided the preponderance of small mining outfits with a needed local market. Collectively, these companies made up the bulk of Clear Creek's mining industry. Collom contributed again to the viability of Clear Creek's mining industry in 1876 through an equally important venture. He helped build a larger sampler and smelter in Golden for the Colorado Dressing & Smelting Company and installed a concentration process not only suited to the rebellious ores of Clear Creek, but also to complex material from elsewhere on the Front

[99] Fossett, 1876:370, 373; Frost, 1880:275, 335; Harrison, 1964:186, 253.

Range. The plant began to compete with the Black Hawk Smelter, drove smelting rates down, and provided Clear Creek's mining companies with another market for their payrock.[100]

The Golden smelter was not the only significant event that furthered mining in the eastern drainage during the mid-1870s. In 1876, New York capitalists bought the Hukill and Whale from Dumont for a high price and consolidated them under the Hukill Gold & Silver Mining Company. Both mines were poorly developed and included the marginally effective Whale Mill. The company spent a large sum on improvements, and the transaction and investment contributed to investor confidence in the area around Idaho Springs.[101]

At the same time, David E. Dulaney was prospecting Red Elephant Hill a short distance northwest of Mill City and discovered a vein that he claimed as the Free America. Dulaney was born in Virginia in 1828, moved with family to Illinois, clerked in a St. Louis real estate office as a boy, and began buying and selling at age 18. In 1862, he married Sophie Nilson of Sweden, and they joined the end of the Pikes Peak rush the following year. Between 1863 and 1866, the couple moved from mining camp to camp in Gilpin and Clear Creek counties as the boom went bust, and Dulaney prospected between jobs. The Free America was Dulaney's first discovery of significance, and he proved rich ore with only minor development.[102]

Other prospectors examined Red Elephant Hill before Dulaney, and someone staked the Comstock as early as 1872. But Dulaney's discovery of gold and silver stirred a local excitement in 1876, and prospectors rushed to the hill to locate their own veins. Before the working season ended, Dulaney sold the Free America to James I. Gilbert, Diamond Joe Reynolds, and William H. Moore rather than develop it himself. Reynolds was a Chicago capitalist who operated railroads and a steamer line on the Mississippi River, and he was known as Diamond Joe for the diamond logo on his ships. The time when Reynolds began investing in Clear Creek County is uncertain, but he funneled money into both gold and silver mines by around 1875. Moore was a prospector and mine owner local to Empire, and his interest in the Free America was a voice of confidence in Red Elephant. Gilbert was born in Kentucky in 1823, grew up on the frontier, and established a business trading with Illinois tribes at age 21. When relations between Whites and the Indians deteriorated, Gilbert moved to Iowa in 1848 and went into the lumber business. The potential profits offered by mining drew him to Georgetown in 1876, and he invested some of his lumber money in the Queen of the West, which was a costly failure. Gilbert formed an investment partnership with Reynolds and lost more money on his second venture, the Diamond Joe, but wisely maintained his optimism in Reynolds. They brought the Free America into production, and unlike the Diamond Joe, the mine seemed promising.[103]

John Coburn, another visionary of Clear Creek's future, forecasted a significant rush to Red Elephant Hill for the season of 1877. Coburn was born in Ireland in 1822, began work as a shoemaker's apprentice, and, seeing a very limited future for himself, migrated with siblings to the United States at age 17. He got by as a shoemaker in Pennsylvania until 1861, when he began dealing cattle. Coburn made the acquaintance of investors who organized the Sterling Mining Company, and they offered him the position of superintendent in 1869, providing he relocate to Idaho Springs. The mine failed within a short time, and Coburn secured a tract of land west of Mill City in 1870 and established the Downieville Ranch hotel and livery. Red Elephant was at his doorstep, and he laid out the townsite of Free America in 1876 in

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[100] Fossett, 1876:410; Frost, 1880:343; Wickersheim and LeBaron, 2005:90, 148.

[101] *Colorado Mining Directory*, 1883:144; Frost, 1880:335; Wickersheim and LeBaron, 2005:113.

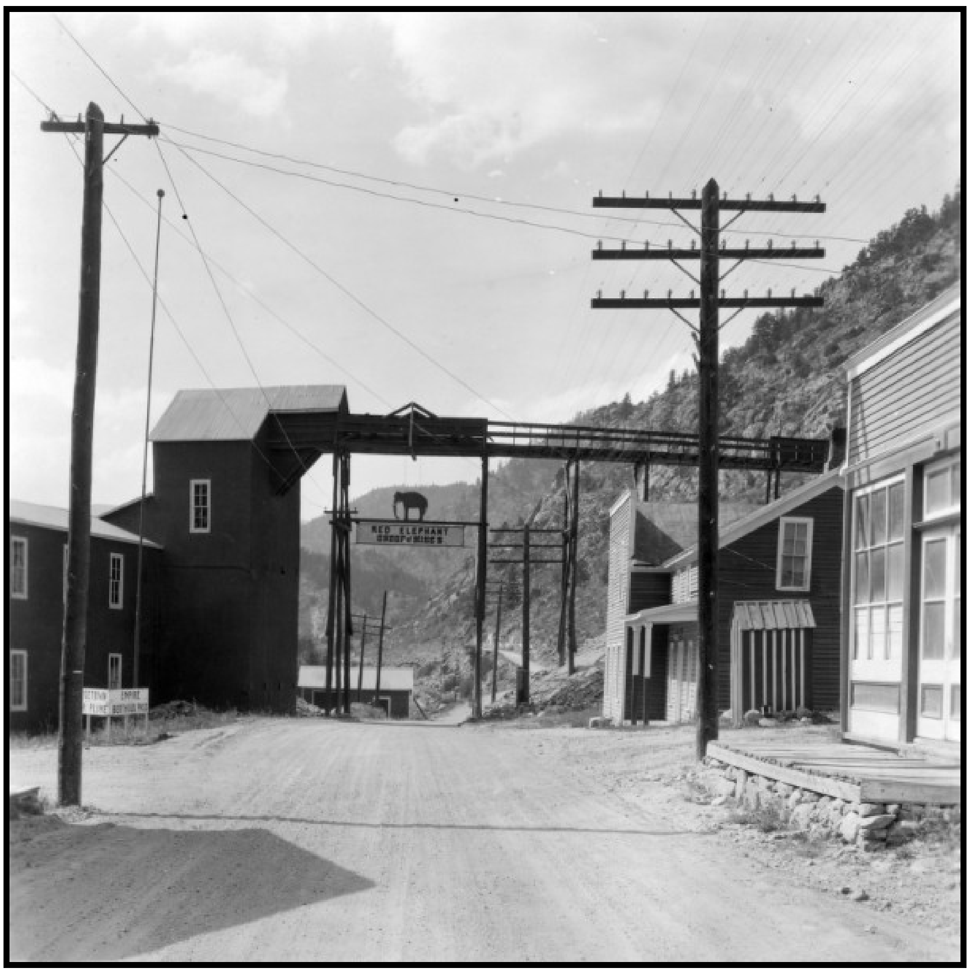
[102] Frost, 1880:285, 326; Hall, 1895, V.3:315; *History of Clear Creek and Boulder Valleys*, 1880:505.

[103] *History of Clear Creek and Boulder Valleys*, 1880:511; King, 1977:77.

anticipation of the rush. Coburn's son-in-law Alexander Lawson followed suit and erected the Six Mile House hotel and tavern a short distance to the west.[104]

Empire mine owner Anson P. Stevens also prepared for the rush to Red Elephant. Expecting high volumes of ore to come of the event, he erected the Stevens Mill in 1876 on speculation. Stevens hoped that building the area's first and largest mill would provide a competitive advantage, and he was correct. The mill also fueled the growing interest in Red Elephant and contributed legitimacy to the townsite.[105]

When the working season of 1877 opened, the rush to Red Elephant began as expected. The Colorado Central Railroad contributed to the excitement when it resumed grading the Georgetown Extension. The railroad built a track through Idaho Springs and past Lawson's Six Mile House on its way to Georgetown. The Colorado Central established the station of Lawson at Free America, and the Postal Service opened a post office under the same name. Lawson and the new Red Elephant mines now had direct connections with important commercial and milling centers.



Discovery and development of the Red Elephant mines gave rise to Lawson, whose main street featured a combination of businesses and industrial structures. Although the photo dates to the 1910s, the mill at left was one of two erected by around 1880. Courtesy of Denver Public Library, X-61585.

[104] Frost, 1880:296; *History of Clear Creek County*, 1986:2, 43, 502.
[105] Harrison, 1964:340.

Those individuals who planned for the rush did well. Gilbert and Diamond Joe consolidated their Free America with the neighboring Boulder Nest, also purchased the Comstock and profited heavily. Silver Plume mine owner Enos Baxter developed the Young America, and Georgetown interests did likewise with the White. Wagons of ore started descending through Coburn's townsite to the Stevens Mill, which ran near capacity. Coburn and son-in-law Lawson then saw their townsite boom into a formal settlement. The railroad, the production of rich ore, the Stevens Mill, and an interest among wealthy investors legitimized Red Elephant as one of Clear Creek's important mining centers. By 1879, Lawson had a population of 400 that supported several mercantiles, saloons, and the two existing hotels. As many miners and prospectors lived on Red Elephant Hill as in Lawson, and they were unwilling to commute by foot from town. A group of individuals established the hamlet of Red Elephant on the north side in 1878 and secured a post office. The settlement may have featured several businesses, but it remained primitive because the north side lacked large mines.[106]

In 1879, Gilbert and Diamond Joe successfully sold their property to Eastern investors, who organized the Red Elephant Mining Company. Gilbert and Moore turned around and reinvested some of the proceeds in the Free America Extension Mine, another rich producer. Patrick McCann, one of Georgetown's pioneer metallurgists, was so impressed with the output from Red Elephant mines that he erected a second mill at Lawson.[107]

Like most rushes, prospectors thoroughly examined Red Elephant Hill and defined the principal veins over the course of only several years. Most of the productive mines fell into the hands of investors, and the prospectors left. The hamlet of Red Elephant dematerialized as a result, the Postal Service changed the name simply to Elephant in 1881, and then cancelled the post office later in the year. Mining contracted around the Free America and White veins near Lawson and continued for several more years.[108]

When the Colorado Central pushed through Idaho Springs and finished the Georgetown Extension, it fostered a boom that swept the entire eastern drainage. Seaton and Bellevue mountains above Idaho Springs assumed an air of industry and saw a wave of development and consolidation. Clinton Reed and Willard Teller, brother to Colorado senator Henry Teller, produced from the Seaton, which was one of several shafts on a much larger vein system. In 1880, a group of Colorado and Chicago investors organized the Consolidated Seaton Mountain Mining Company and bought the entire mountainside to work the vein. The company then began pushing the Idaho Tunnel from a low elevation to undercut the claims and intersect hidden veins. In 1881, Theodore H. Lowe and Colorado Springs capitalists assembled the Foxhall Tunnel & Mining Company and purchased the Foxhall Tunnel, which they drove to intersect another section of the vein system. Lowe was intimate with the Seaton Mountain, and his operation was destined to become profitable. His Lowe Mining Association, for example, owned the Seaton Mine during the 1860s and built one of the earliest stamp mills in Idaho Springs. When not at the Foxhall Tunnel, Lowe could be found managing the profitable Virginia Mine for the Olathe Gold & Silver Mining Company. James Gilbert and Diamond Joe did not limit their attention to Red Elephant and bought the profitable Tropic Mine around 1880.[109]

In Virginia Canyon, between Seaton and Bellevue, Ohio investors established the Springfield Gold & Silver Mining Company, acquired a large tract of claims, and began development. Central City mine owners brought the Crown Point & Virginius Mine into

[106] Bauer, et al., 1990:88, 120; Fossett, 1879:98; Frost, 1880:296; *History of Clear Creek County*, 1986:2, 43.
[107] Fossett, 1879:384; Frost, 1880:326.
[108] Bauer, et al., 1990:50.
[109] *Colorado Mining Directory*, 1883:128, 136, 172; Fossett, 1879:366; Frost, 1880:3376; *Report of the Director of the Mint*, 1883:433; Wickersheim and LeBaron, 2005:136.

production, and New York investors established the Emerson Gold & Silver Mining Company to work the Emerson.[110]

On Bellevue Mountain, prospectors found several important veins such as the Specie Payment. The Sunshine Mining Company bought that claim during the late 1870s, brought it into production, and erected the Sunshine Mill at Idaho Springs. Edward W. Williams located the Champion in 1877 and sold it to the Kohinoor & Donaldson Consolidated Mining Company. Around the same time, the company bought the Donaldson at Trail Run, on the valley's south side, and the Kohinoor on Red Elephant Hill. Manager Alfred Rickard, brother to famed mining engineer Thomas A. Rickard, was highly progressive and incorporated the mines into one of the most advanced operations in the eastern drainage. He purchased a well-designed mill at Spanish Bar, between the Champion and Donaldson, and built continuously operating aerial tramways to lower the ore from the lofty mines down to the mill. These were almost certainly of the Hallidie pattern and may have been the first endless loop tramways in the drainage. Although the Kohinoor Mine freighted its ore to the mill by wagon, Rickard set another precedent at that mine. In particular, he installed the drainage's first electrical system in 1883 to provide power for lighting, and possibly to sell surplus electricity to subscribers in Lawson.[111]

Placer mining around Idaho Springs followed a trend similar to the hardrock sector. After the 1864 collapse, a few companies continued to glean gold from the gravel of Clear Creek and principal tributaries. Many of the experienced miners understood that the bedrock floor of Clear Creek was laden with gold, but they lacked the capital to divert the creek and penetrate the thick gravel. Other companies were aware of fine gold disseminated in dry gavel banks on the valley sides and hoped to mine them someday with hydraulic methods like David Ball did at Empire.

The railroad lowered the cost of the materials that the companies needed, and the boom attracted investors who had the capital. Thus, the late 1870s saw a movement of large-scale placer mining primarily around Idaho Springs and Mill City. John W. Edwards operated the Edwards Placer on Chicago Creek. Edwards arrived in the mountains with the Pikes Peak rush, found little gold on his own, and ended up working as a miner near Idaho Springs. He survived the 1864 collapse, managed several hardrock operations, and bought the Edwards Placer and the Robinson Mine with savings. A.S. Bennett had a similar experience, and he and John M. Osborn backed the Fall River Placer Mining Company, which operated at the mouth of Fall River. The Munn & Loomis and Munn & Miller Placers also produced in the same area. Those companies working in the stream channels cleverly adapted hardrock methods to the thick gravel beds. They used steam hoists to sink shafts to bedrock and extracted the lower layers of material through lateral passages. Water was always a problem, and only large pumps were able to keep up with the inundation that seeped through the plank lagging. The conditions were extremely dangerous for the miners because the loose gravel was saturated, difficult to retain with timbering, and prone to sudden collapse. But the gold lining the bedrock floor of Clear Creek was worth the trouble and cost.[112]

Fall River and Chicago Creek were included in the late 1870s hardrock boom. On Chicago Creek, J.V.W. Vanderburg developed the Little Mattie and Warren & Company worked the Kitty Clyde, both of which yielded rich ore. Most of the former producers at Spanish Bar were reopened. The Hukill Gold & Silver Mining Company enlarged its already profitable Hukill and Whale mines and refitted the stately but ineffective Whale Mill. Due primarily to the

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[110] *Colorado Mining Directory*, 1883:133, 168; Wickersheim and LeBaron, 2005:94.

[111] *Colorado Mining Directory*, 1883:147; Fossett, 1879:362; *Report of the Director of the Mint*, 1883:434; Wickersheim and LeBaron, 2005:89, 140, 150.

[112] Fossett, 1879:381; Wickersheim and LeBaron, 2005:99, 102, 125.

Hukill Company, the population of Spanish Bar rose to around 150, which was large enough to justify the post office of Hukill in 1879. Although the post office closed the following year, the mines only increased their output during the early 1880s.[113]

As the focal point of the boom, Idaho Springs assumed the same role in the eastern drainage that Georgetown did in the west, although Idaho Springs was smaller. The town was a center of transportation, communication, commerce, and banking, and because of this, experienced unprecedented growth. Around 400 people lived in and around town during the early 1870s, and the population nearly doubled to 730 by 1880. The business district offered the array of stores and services expected of a thriving mining town, and many were built of brick. The residents looked to the future and planted aspen and cottonwood trees along the streets for a feeling of permanence. E.A. Benedict began publishing the *Iris*, which was the first regular newspaper in the town. The Beebee House was the finest hotel and continued to receive dignitaries, although F.W. Beebee certainly improved it from the log cabin built in 1860. Community activist Thomas B. Bryan was a figurehead for the intimate relationship that Idaho Springs had with its mining industry. He was not only mayor during the late 1870s, but also directly participated in several important mining ventures when not in city hall. He managed the Idaho Tunnel on Seaton Mountain and developed the Great Republican Mine on Chicago Creek into a sound producer. He and eastern investors organized the Hoosac Mining & Milling Company in 1881 and made the Hoosac one of the area's most advanced operations.[114]

Also like Georgetown, Idaho Springs became a milling center, which John Collom predicted several years earlier. In 1877, Miles & Company built the Miles Concentration & Sampling Works, and S.H. White opened White's Concentration Mill. In 1882, San Francisco investors organized the Pacific Mining & Reducing Company and built a smelter. Although these accepted custom ore from throughout the drainage and competed with Collom, their success remains uncertain. At the same time, the Colorado Central continued to haul a considerable tonnage of payrock to the smelters at Black Hawk and Golden.[115]

Some of that payrock came from the mines around Mill City, which received special attention because of their proximity to nearby Lawson. In 1877, prospectors who were probably crowded off Red Elephant Hill crossed Clear Creek valley and examined Columbian Mountain on the south side. They found several rich gold and silver veins and developed them as the Dictator, Live Yankee, Tom Moore, Wall Street, and others. Diamond Joe, James Gilbert, and James M. Daily quickly purchased the most promising group of claims, relocated them as the Diamond Joe, and developed them through the Daily Tunnel. William Moore, loosely associated with Diamond Joe, organized the Moore Mining & Smelting Company in 1880 and did well with the Murray. In a pattern similar to Red Elephant Hill, the principal mines were within walking distance from Dumont, but some of the prospectors and miners established their own camp farther away. In particular, they lived in a cluster of cabins on upper Silver Creek and applied that name to their camp.[116]

The local rush and the railroad restored Mill City to its status prior to the 1864 collapse. The population nearly tripled from 75 to 200 almost overnight, and community activists asked the Postal Service to reinstate the post office. Because another Mill City existed elsewhere, the Postal Service required a different name, and the residents chose Dumont after pioneer and community founder John Dumont. The Postal Service then awarded the branch office in 1880 most likely to one of the enterprises in the small business district. At that time, the population

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[113] Bauer, et al., 1990:76; Fossett, 1879:370.

[114] *Colorado Mining Directory*, 1883:128, 140, 143; Frost, 1880:293, 337; Leyendecker, et al., 2005:86; Schulz, 1976:1880-5.

[115] *Colorado Mining Directory*, 1883:160; Fossett, 1879:366; Wickersheim and LeBaron, 2005:148, 151.

[116] *Colorado Mining Directory*, 1883:145, 156; Fossett, 1879:385; Frost, 1880:325.

bought basic provisions in a mercantile, and miners relied on a cobbler to mend their worn boots. Visiting guests had their lodging choice of either the Mill City House run by a Mrs. Green, or the Unadilla House named after one of the local mining companies. Residents drank in two local saloons and dined at either of the hotels. Dumont also featured the offices for around 15 mining companies, although many of these were probably in the residential cabins of their mine superintendents. Several of the companies purchased and refitted the old mills at Dumont.[117]

When the Colorado Central graded up Clear Creek valley to Georgetown in 1877, it bypassed Empire because the town was several miles west of the planned route. The railroad did, however, establish a depot at Swansea and renamed the tiny community Empire Station. The railroad amplified the activity that was already happening around Empire. The town was similar in scale to Lawson and Dumont, and the population rose from around 150 residents during the early 1870s to more than 200 at the decade's end. The principal differences were that the mining industry was much older and more productive, and the small population enjoyed its own brewery and placed bets at a local racetrack. The business district was sparse with only several mercantiles and the Peck House Hotel, which included a saloon and restaurant.[118]

The Peck family ran the hotel, and the members were cornerstones of the community. When James and son Frank came to Empire in 1862, they already were versed in milling, which they applied to the small industry on the West Fork. James, born in 1802, was already advanced in age but was prepared for the primitive conditions because he spent 30 years on the frontier. During the early 1840s, Peck moved his family to Chicago, became part owner and agent of a shipping company, and greeted the birth of his son Frank. The financial panic of 1857 ruined Peck's business, and he struggled until the family received word of the Pikes Peak gold discovery in 1859. James reverted to his frontier upbringing and crossed the plains with Frank in hopes of securing something better. Like most rush participants, the Pecks realized that gold was not as easy to find as supposed, but James had the advantage of business experience, which he used to secure a position as manager at a Nevadaville mill. There, he learned the basics of gold ore. In 1861, father and son moved on to the Van Deren Mill at Trail Run, but they soured when the community became a hotbed of Confederate sympathizers lathered into a froth by the Civil War. The Pecks quickly abandoned Trail Run in favor of Empire in 1862, and father and son bought the Atlantic Mine on Silver Mountain. James sold his shipping business for operating capital, obtained more money from Chicago associates, and organized the Peck Gold Mining Company. The easiest part of the project for the Pecks was building and running a small mill at Empire because of previous experience. They did well until the local mining crash in 1867, and Frank moved to Georgetown, married, and ran a mercantile. He returned when Empire began showing signs of life again in 1872, and the entire family converted one of their houses into the hotel and also operated several mines.[119]

Empire's mining industry was staged for a major revival by the late 1870s. Most of the principal veins had already been identified, traced, and partially developed. Some of the mining companies that were established during the 1860s rush still possessed their claims and mills, but suspended when they ran out of easily treated ore. They awoke and resumed activity when the climate improved during the late 1870s. The Knickerbocker Mining Company initially developed the Tenth Legion on Silver Mountain in 1863, closed the mine in 1867, and reopened it in 1877. David Ball did likewise with the Pittsburg and the Pioneer, which he acquired in 1866, and then built a mill at Empire in 1877 for the operation. The Bay State Mining Company was one of Empire's most important producers during the mid-1860s, and it resumed driving the

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[117] Bauer, et al., 1990:47; Frost, 1880:296; *Colorado Business Directory*, 1883:177; *History of Clear Creek County*, 1986:41.

[118] Leyendecker, et al., 2005:86.

[119] Harrison, 1964:108-113; *History of Clear Creek and Boulder Valleys*, 1880:527.

Aorta Tunnel to undercut the Tenth Legion Vein. The company also worked the Livingston County Mine and treated ore in the Candee Mill, which the company built in 1866. Park Disbrow reopened the Conqueror Mine again, and William Moore brought the Empire City back into production.[120]

Several important deals helped whip the Empire revival into a boom. The Pecks operated the Equator Mine and mill on Silver Mountain (not to be confused with the Equator in Georgetown), originally developed in 1862 as the Aldebarren. In 1881, eastern investors backed the Great Equator Consolidated Mining Company, purchased the historic producer from the Pecks, and made it the centerpiece of a large and profitable operation. John Dumont poured money from his sale of the Hukill and Freeland mines into the Benton, Neath, and Pioneer. Empire took great stock in Dumont because of his experience. A.D. Breed initiated one of the highest profile buyouts in 1881. He and New York City investors established the Great Republic Gold & Silver Mining Company and purchased the Silver Mountain Mine, already with $100,000 in silver and gold to its credit. Breed was a dealer in patent medicine and funerary supplies in the Midwest, and he had a reputation for reaping a fortune from the silver mines at Caribou, Boulder County. Altogether, the above sales and consolidations inspired confidence among other investors in Empire's mines.[121]

By the early 1880s, the boom began to have a dramatic impact on Empire. More people moved to town, and the number of businesses doubled, creating so much competition for prime real estate that some individuals jumped town lots. The Pecks enlarged their hotel and the Colorado Central added to its depot at Empire Station. Empire proper even received a telephone system in 1881, undoubtedly to improve communications for investment and banking.[122]

The mid-1880s was an important time for eastern Clear Creek drainage as the investment and improvements made a few years earlier finally began yielding returns. The region continued growing and passed out of the discovery and development phase and into a time of significant production. The mining industry gradually increased its annual gold output from $134,000 in 1878 to $600,000 by 1884. These figures were among characteristics that reflected a mining industry in the beginning stages of maturity. Other aspects included a strong interest among knowledgeable investors, consolidation between companies, increased mechanization and formal engineering, and stratification of the workforce. According to the example of silver mining in the western drainage, the transition toward maturity in the eastern drainage was far from complete and would take years.

The eastern drainage certainly saw the rise of large companies in its movement toward industrialization, but the trend was not as pronounced as in the west. Because silver fetched less than $1.20 per ounce, the value of crude ore there was too low for small outfits unless the payrock was particularly rich. As a result, prospectors and the small outfits in the western drainage readily sold to the principal companies, which then dominated the silver industry.

The gold veins in the eastern drainage, in contrast, presented a different set of conditions that simultaneously favored both small outfits and large companies. The well-known veins were wide, deep, and consisted of complex ore that ranged widely in grade. They required capital to develop and yielded limited returns per ton when extracted in economies of scale. The large veins therefore tended to be the domain of large companies. The eastern drainage also offered numerous veins that were too thin to interest the large companies, but rich enough to sustain small outfits. Thus, the small outfits continued to thrive in this niche.

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[120] Fossett, 1879:386; Frost, 1880:328; Wickersheim and LeBaron, 2005:93, 121, 141.

[121] Harrison, 1964:335, 343; "Latest Mining News" *RMMR* 6/19/84 p10; Wickersheim and LeBaron, 2005:139.

[122] Harrison, 1964:318.

The economic forces that affected silver mining in the western drainage during the latter half of the 1880s impacted the eastern drainage, as well. The decline in silver values and an unstable climate gave some companies reason for pause, which caused hiccups in the industry. Gold production dropped by almost half from $600,000 in 1886 to $317,000 the following year because much of the ore in the eastern drainage included some silver. When mining companies suspended because of the decline in silver, they produced less gold as well. The decrease was, however, very short-lived as mining investors turned from silver to gold because of its constant value of $20.70 per ounce. The industry rebounded by 1888, produced $522,000 in gold, and resumed its ascent in profitability.[123]

This trend was prevalent among the mines around Idaho Springs because most of the veins there had high proportions of gold. Many companies finished their initial development campaigns by the late 1880s and began regular production. Wagons hauled ore down from around twenty large mines on Seaton Mountain, including the Crystal, Freighter's Friend, Garden, Tropic, and Victor. The Gem Mine became one of the best producers and employed 40 workers, which was a relatively large crew. The Foxhall Company drove its tunnel toward the Seaton vein system, but progress was fitful because the investors were wary in the uncertain climate. They were rewarded in 1890 when the Foxhall Tunnel undercut the system, and the company promptly secured Alfred Rickard to direct heavy production. Rickard may still have directed the Kohinoor & Donaldson Consolidated Mining Company, which made great progress with the Champion. That company sank the shaft to the impressive depth of 800 feet by 1889 and kept an army of 70 miners busy extracting as many tons of ore per day. The operation was one of the deepest and most advanced for its time in the entire Clear Creek drainage.[124]

At Spanish Bar, the existing operations continued production, and activity spread up the south side of the valley. The Stanley was one of the most important mines in Spring Gulch and received a new surface plant in 1888. Trail Creek was especially productive, and F.F. Obiston erected a smelter there in 1885.[125]

Backed by a sound industry, Idaho Springs grew during the late 1880s. The population nearly doubled again from around 720 early in the decade to almost 1,400. The business district expanded in parallel and not only featured the basic set of mercantiles, saloons, and hotels, but also included specialty shops. The demography was similar to Georgetown and apparently fairly egalitarian in terms of race. The Washington Mine, one of the profitable operations on Seaton Mountain, was owned and staffed by African Americans. Of this, a Colorado mining industry journal noted: “There are quite a lot of colored men at work in the Washington Mine, and we are glad to say that our dusky brethren are doing well.”[126]

The other communities in the eastern drainage were not as vibrant as Idaho Springs during the late 1880s. The nearby veins were subject to the same problems as the ore bodies in the western drainage because they featured higher proportions of silver. Dumont became relatively quiet when most of the mines on Columbian Mountain closed, and miners abandoned the camp of Silver Creek. Dumont then relied heavily on a handful of small operations and the Albro Mine, a historic gold producer on the valley’s north side. The rush to Lawson dissipated, and activity there contracted to the principal mines on the south and north sides of Red Elephant Hill. On the north side, employees of several companies occupied the hamlet of Red Elephant. On the south side, the Red Elephant (formerly Free America), Joe Reynolds, and White produced

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[123] Henderson, 1926:109.

[124] "General Mining News" *Mining Industry* 8/10/88 p67; "General Mining News" *Mining Industry* 4/26/89 p190; "General Mining News" *Mining Industry* 3/6/90 p119; "Latest Mining News" *RMMR* 6/5/84 p10; "Latest Mining News" *RMMR* 7/17/84 p10.

[125] "General Mining News" *Mining Industry* 5/18/88 p13; "General Mining News" *Mining Industry* 5/25/88 p11; "Latest Mining News" *RMMR* 6/4/85 p9.

[126] "General Mining News" *Mining Industry* 4/13/88 p13.

ore, but most of the other properties were depleted. Owners of the principal mines, however, were confident that their properties offered ore at depth and pursued deep development in hopes of sustaining production. They organized the Red Elephant Tunnel Company in 1888, drove a tunnel into the base of the hill, and produced enough ore to feed the Stevens Mill. In total, Lawson remained stabile because of its mines and role as a transportation node on the Colorado Central Railroad. The town retained its population of around 500, and the residents supported a mercantile, saloon, cobbler, and at least one hotel.[127]

The town of Empire followed a trend paralleling Lawson. Approximately the same number of people lived in Empire, and they patronized a like panel of businesses. But because Empire had a longer history of mining, it featured a few more industry services such as blacksmiths, carpenters, and contractors. Empire also was a transportation stop on the heavily used Berthoud Pass route into North Park.[128]

Most of Empire's mills were idle, however, because of their age. During the early 1860s, mining companies equipped the original generation of mills with mercury amalgamation because most of the gold ore was relatively simple. But when the simple ore later gave way to complex material, few of the companies refitted their mills for concentration as elsewhere in the drainage. Although highly inefficient, amalgamation continued to recover just enough gold to keep the operators content. During the mid-1880s, John Dumont leased the Bay State Mill and David Ball ran the Pioneer Mill, largely unchanged, for their operations. The Barrret & Fletcher Mill (formerly Knickerbocker) accepted custom ore from Dumont's Benton Mine, the Bay State Company's Livingston County Mine, and Ball's Pittsburg Mine because it recovered just enough gold. As the companies went deeper underground during the 1880s, the character of the ore changed more and rendered nearly all the mills in Empire obsolete. And yet, the mill owners still resisted the necessary improvements, forcing the mining outfits to ship ore by wagon to Empire Station, and then by rail to smelters at Denver, Golden, and Boulder.[129]

The lack of milling capacity was one of several factors that began suppressing mining around Empire during the late 1880s. A general decline in underground ore reserves was another contributing factor. After nearly 25 years of production, miners exhausted the numerous small veins and placer deposits, leaving a fewer number of deep ore bodies. Because of this, mining contracted around the most developed properties, including the Conqueror, Pittsburg, Bay State's Tenth Legion, David Ball's Pioneer, and Dumont's Benton and Neath.

The Kohinoor & Donaldson Company may have been the only new venture of significance in Empire during the late 1880s, and it plucked the mining industry out of its decline. In 1887, the British company purchased several mines above Empire, consolidated them, and sought capital for several more acquisitions. Around this time, George G. Vivian joined the company as its American representative, and Vivian learned of Empire's milling crisis from John Dumont. The two were associates and cooperated on several mines around Freeland years earlier. Vivian came to the conclusion that if he built a concentration mill at Empire, the facility would be profitable in several ways. First, the mill would primarily allow the company to operate its Empire properties, and second, it would be the custom plant that the community so badly needed. By charging for the custom work, the company would likely recover the construction costs. In 1888, Vivian proceeded with his plans and erected what may have been the first new concentration mill at Empire in ten years. The mill bolstered the sagging industry

[127] *Colorado Business Directory*, 1889:392; "General Mining News" *Mining Industry* 7/6/88 p17; "General Mining News" *Mining Industry* 8/31/88 p99; "Latest Mining News" *RMMR* 7/17/84 p9; "Latest Mining News" *RMMR* 11/27/84 p8.

[128] *Colorado Business Directory*, 1889:325.

[129] Harrison, 1964:347; "Latest Mining News" *RMMR* 7/31/84 p11.

through local ore treatment but was unable to solve Empire's second major problem of declining ore reserves.[130]

The early 1890s was a time of irregularity and inconsistency for mining in the eastern drainage. The instability of the silver market continued to influence the industry, sometimes in an inverse relationship between silver and gold. In 1889, for example, the eastern drainage enjoyed a spike of gold production because the value of silver remained low and mining investors turned to gold mines for security. When the federal government passed the Sherman Silver Purchase Act in 1890 (discussed in detail above with the western drainage), the elevated price of silver encouraged a shift from gold back toward silver mining. As a result, gold production declined slightly in 1890 and 1891. But when antisilver reformers in the government threatened to repeal the Sherman act, the silver market destabilized enough to impact gold mining, as well. Companies that produced ore primarily with silver and secondarily gold either cut back on operations or suspended altogether. Gold production began to suffer as a result. The eastern drainage generated $522,000 in gold in 1889, and this fell to around $440,000 for 1890 and 1891. The following year, production plummeted to $314,000.[131]

Idaho Springs was least affected because the veins there had a high gold content, which countered the silver problems. The principal operations on Seaton and Bellevue mountains on the north, and around Spring Gulch and Chicago Creek on the south, continued to produce heavily. Idaho Springs was home to a record number of twelve mills, some of which were custom samplers, others independent concentration facilities, with the majority dedicated to specific mining companies.

The impacts of the silver problem became more noticeable and severe in a westward progression from Idaho Springs, paralleling a higher proportion of silver in the ore. At Spanish Bar, many mines were idle while their operators monitored the silver market. Only the richest properties maintained production, and they were consolidated together. Charles A. Gehrmann, formerly manager of the Foxhall Tunnel, kept ore flowing out of the Salisbury Mine on the valley's north side. The Hukill Gold & Silver Mining Company operated the Hukill and Whale on the south side. The Stanley Mining Company ran the Stanley also on the south side. In 1892, the Consolidated Stanley Mining Company bought these mines along with a broad spread of claims. The company then worked the entire property as a single, massive operation and built a new smelter in supplement of the existing Whale Mill. Now known as the Stanley, the operation became one of the most important and reliable in the eastern drainage.[132]

Lawson weathered the silver fluctuations better than most other communities dependent on combined gold and silver ore. Several substantial mines on the north and south sides of the valley bracketed the town, and they gave an impression of vibrancy. The Red Elephant, American Sisters, Donaldson, Joe Reynolds, and new Bellevue-Hudson kept Lawson's population stabile at 500 and supported basic businesses. Dumont did not fair nearly as well, relying primarily on the Albro, Syndicate, Senator, and West Albro. Empire was largely quiet as its residents waited for conditions to change. They did not wait long, however, because conditions did change dramatically in 1893. At the end of the year, Colorado entered one of its most trying periods of time, which affected the gold and silver communities differently.[133]

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130 "General Mining News" *Mining Industry* 3/23/88 p8; "General Mining News" *Mining Industry* 6/15/88 p12.
131 Henderson, 1926:109.
132 Canfield, 1893:110; "General Mining News" *MIT* 3/31/92 p152; "General Mining News" *MIT* 6/9/92 p255.
133 *Colorado Business Directory*, 1892:409; "General Mining News" *Mining Industry* 4/2/91 p168; Hall, 1895, V.3:323.

The Silver Crash, 1894-1897

At the end of 1893, a synergy of political decisions and economic trends at first undercut mining across the American West and then precipitated one of the nation's worst depressions. The economy was on the brink of collapse immediately prior to the catastrophe, and the crisis inflamed tensions in the federal government regarding the silver policy. Hoping to avert a collapse and mollify the antisilver faction, President Grover Cleveland called a special session of Congress and repealed the Sherman Silver Purchase Act, which took effect in November of 1893. At the same time, Britain adopted a gold standard, abolished its silver standard, and extended this policy to its empire in the Far East. Britain was one of the largest consumers of American silver and shipped much of that metal to India for coinage. The American economy began to disintegrate because of these and other factors, and the market for silver promptly evaporated. The metal's value plummeted from $.78 to an abysmal $.64 per ounce by March 1894. Only four years earlier, the metal fetched more than $1.00 per ounce, and many mining companies predicated their finances on this figure. The mining industry collapsed, investors were bankrupted, and those that survived were certainly not about to squander their meager savings on silver. Mining companies across the West suspended their operations and discharged thousands of workers, who suddenly found themselves jobless. A financial panic then swept the West and rippled out to the rest of the nation, ushering in a depression that lasted through much of the 1890s.[134]

Colorado was hit particularly hard because it depended on silver, and nearly all its mining districts suffered deeply. In total, 45,000 workers lost their jobs, 435 mines closed, and 377 businesses failed. The Clear Creek drainage was one of a few exceptions to the trend, and it defied the bust that swept most of the West. The reasons were different for the eastern and western portions of the drainage, however, and the industries in each portion responded to the crisis in their own ways.[135]

The Silver Crash struck an immediate blow to the western portion of the drainage, where silver was the principal metal of interest. Most of the mining companies suspended operations during 1894, temporarily so the directors hoped, and laid off around 870 workers. This had a compounded impact from which the region never fully recovered. The workforce was an underpinning of the local economy and now circulated less money through the community, which caused retail and supply businesses to close. The service sector was in trouble as well, because the mining companies and their dependents provided less business to consultants than before. The western drainage then saw an exodus of talented miners and entrepreneurs, who left to find income elsewhere. Some went as far as the eastern drainage and stopped, but many left altogether, and their absence was a loss to the industry when mining resumed.

Those individuals who stayed in the western drainage were rewarded for their perseverance because the shutdown lasted a relatively brief time. The largest companies tepidly reopened their mines in the early spring of 1894 while management assessed the general economic conditions. Other companies followed, and the industry returned to a regular production schedule by summer. The industry was, however, far below its previous state of prosperity. Production toppled from $1.7 million in silver and $300,000 worth of lead in 1893, the year of the crash, down to $1 million in silver and $200,000 in lead by 1895. The figures reflect a loss of nearly half the precrash income but not a parallel decrease in the amount of

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[134] Brown, 1984:194; *Report of the Director of the Mint*, 1894:26, 30; Saxon, 1959:7, 8, 14, 16; Stone, 1918, V.1:437.

[135] Leyendecker, et al., 2005:279.

work. The mining companies produced almost the same tonnage of ore as before, but the low value of silver reduced its worth.[136]

The changed financial conditions impacted the mining industry in several ways. Many large companies continued production as before the crash but resigned themselves to lower profits. Some also reduced elective operating costs and cancelled improvement and underground exploration projects. A few took the opposite approach and invested in new facilities that increased production and efficiency to offset silver's low value. At the Mendota, one of Silver Plume's best, owner Robert Old financed a new set of machinery in 1895. Both large and small companies under heavy debt did not fair as well, and many went bankrupt. The Colorado Central Consolidated Mining Company, one of Georgetown's flagship operations, failed in 1895 and was sold at a sheriff's auction. Melvin Edwards purchased the Equator Mill and refitted it as a custom concentration plant when the owners disposed of that property. Many other companies remained solvent but suspended operations until the value of silver rose again. It did, but 20 years later. Most companies were unwilling to wait this long and either resumed production or left the business.[137]

Although the Silver Crash dragged down the western drainage, the event ironically pushed the eastern drainage into its greatest period of production. The reason was mining investors turned away from silver and redirected their remaining capital toward gold because of its economic stability. While the value of silver and industrial metals fell, gold fetched a constant $20.70 per ounce due to federal policy. The eastern drainage featured dozens of mines with proven gold reserves, as well as other properties that held great potential. Investors began taking interest as early as 1894, although they restrained their spending due to the poor economy. The investors bought into the principal companies at first, and as gold emerged from the region, began speculating on nascent operations as well. As a result, the mining industry gathered momentum after the Silver Crash and reached a peak during the late 1890s. Production figures reflect the trend. Gold more than doubled from $314,000 in 1892 to $663,000 by 1894 and continued to climb until 1897, when it declined slightly. Because of this trend and the continuation of silver mining in the western drainage, Clear Creek County's mining industry was Colorado's third largest employer in 1895 and approached the same status in terms of output.[138]

The boom swept Idaho Springs and its gold mines in advance of other portions of the eastern drainage. The area was ready for investors by 1895 because the mines were well developed, the town was fairly sophisticated with electric lighting and a water system, and the valley floor featured a dozen mills. The Dewey Brothers and Chamberlain samplers ran at capacity, and the Humphrey, Mattie, Mixsell, and other mills contracted with individual mining companies. The Donaldson Mill at Spanish Bar accepted custom ore when not treating payrock from the other Donaldson & Kohinoor properties. The Champion on Bellevue Mountain was one of its properties, and approximately 30 leasing parties sent as many tons of ore per day down the tramway to the mill. The Consolidated Stanley Mining Company, also at Spanish Bar, developed the Hukill and Whale and encountered several rich gold veins. On Seaton Mountain, W.E. Renshaw reopened the Gem Mine and developed it into one of the most important operations near Idaho Springs.[139]

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136 Henderson, 1926:109.

137 "General Mining News" *MIT* 12/12/95 p263; "General Mining News" *MIT* 9/19/95 p106.

138 "General Mining News" *MIT* 11/14/95 p211; Henderson, 1926:109.

139 "General Mining News" *MIT* 9/26/95 p121; "General Mining News" *MIT* 10/10/95 p145; "General Mining News" *MIT* 10/17/95 p159; "General Mining News" *MIT* 11/21/95 p224.

A boom in gold mining allowed Idaho Springs to grow into an urban center during the mid-1890s, when most of Colorado was in depression. Courtesy of Denver Public Library, X-2265.

The Crown Point & Virginia Gold Mining Company at the head of Virginia Canyon was a vehicle for important developments in milling during the mid-1890s. S.A. Josephi was an investor who valued gold for its stability and bought the Crown Point & Virginia immediately after the Silver Crash. He was born in New York City in 1856, studied science in a university, and migrated to Leavenworth, Kansas, at age 20. There, Josephi found a job as cashier at a manufacturing firm and became a partner in the business. He moved to Texas in 1882 and founded a bank, coming to Colorado four years later to take advantage of the state's industrial potential. Within a short time, Josephi became aware of oil discoveries near Florence and invested his capital in the Colorado Oil Company, which also bought him the position of manager. The firm did well, and Josephi sold for a large sum and moved to Denver where he reinvested in other lucrative ventures, including several silver mines. When the Silver Crash threatened these ventures, Josephi scrambled for gold.[140]

The Crown Point & Virginia had a long history as a profitable producer, but the easily treated ore was gone when Josephi bought the property. Instead, the mine featured material that was low in grade and difficult to treat in the company mill. As a result, the company shipped the ore to the Newton and Silver Age mills in Idaho Springs, which charged treatment fees. Perceiving the fees as lost profits, Josephi and another metallurgist devised a concentration process for the complex gold ore and refitted the Crown Point & Virginia Mill accordingly. The process proved to be effective and became an example for other mining companies with similar ore. The companies then imitated the process, which rendered large reserves of low-grade ore profitable to produce.

The Silver Crash gave life to one of the most ambitious tunnel projects of its time in Colorado, with Idaho Springs as its seat. As early as the 1860s, Colorado mining promoters

[140] Hall, 1895, V.4:485.

pushed the idea of undercutting mountains with long tunnels. Exemplified by the Burleigh Tunnel at Silver Plume, the promoters claimed that the long passages offered numerous benefits to investors. On one hand, the tunnels allowed mine owners to efficiently work their veins from the bottom up, using gravity to draw blasted ore down. On the other hand, a tunnel could serve as a transportation artery for adjacent properties, as well, with the owners leasing rights-of-way from the tunnel company. Most intriguing of all, however, was the potential to intersect and claim ownership over hidden veins, which inexperienced investors assumed were likely.

In 1893, Samuel Newhouse, Charles C. Parsons, and others organized the Argo Mining, Drainage, Transportation & Tunnel Company not only to fulfill the above intentions, but also something grander. They proposed driving a tunnel from Idaho Springs north for seven miles to undercut the Central City mines, build a massive mill at the portal, and haul and treat ore from the depths of that district. Newhouse also sold the tunnel as a massive drain eliminating the need for costly pumping. By planning the tunnel at Idaho Springs, the company would start with Seaton Mountain, followed by the gold-bearing area to the north, and realize immediate business. The proceeds could then be applied to the Central City extension.[141]

Newhouse and Parsons solicited beneficiary mining companies for capital. Most to the north of Seaton Mountain refused because they thought the project unrealistic. Time proved them wrong. Newhouse and Parsons gathered enough money from outside investors and a few companies on Seaton Mountain to begin the tunnel, recognized by the mining industry as both the Argo and Newhouse. The tunnel was well designed for its function. It was 10 by 12 feet in-the-clear, had a double track for ore trains, and a water channel down the center. Initially, mules pulled the trains, but the company planned electric locomotives once production began.[142]

As the tunnel neared Seaton Mountain in 1895, an unforeseen issue stymied progress. Newhouse and Parsons underestimated the logistics of obtaining easements through the myriad claims on the mountain, and the company fitfully pushed the tunnel as lawyers secured agreements. By 1897, miners finally undercut Seaton Mountain, made connections with several mines, and began hauling out ore. Although the easement issue stopped progress again, Idaho Springs celebrated the Seaton Mountain achievement, the company was validated, and more subscriptions were sold.[143]

Peak Production in the Eastern Drainage, 1898-1918

As the decade of the 1890s progressed, a number of factors came together and brought gold mining in the eastern drainage into its greatest period of activity. First, the nation's economy began recovering from the post-Silver Crash depression. The rebound started in the East and reached the West by the late 1890s, and as the economic climate stabilized, investors felt secure enough to risk capital. Mining companies were then able to finance their development projects. Second, transportation improved, railroad traffic increased, and goods and services were readily available again. Third, mine and mill owners were more than willing to extend themselves and improve their properties or sell or lease them to investors who could. Fourth, the general demand for industrial metals such as copper, lead, and zinc greatly increased due to the economic revival of industry and consumerism.

[141] *Mining Reporter* 1/9/02 p117; Warwick, 1902.
[142] Warwick, 1902.
[143] Callbreath, 1899; "General Mining News" *MIT* 8/15/95 p45; "General Mining News" *MIR* 7/97 p25; *Report of the Director of the Mint,* 1899:78.

The last and fifth factor was the production and concentration of low-grade ores in economies of scale through massive investment and mechanization. Several mining companies in San Juan County pioneered this practice during the mid-1890s, and when capital and credit became available again at the decade's end, other large mining companies imitated them and profited from the abundance of low-grade ore. The companies employed advances in mining technology and milling methods, which rendered the low-grade material economical to produce. While the movement gave rise to companies larger than in previous years, even small outfits were able to profit when they supplanted labor with machinery and ensured the production of high volumes of ore per shift.

Improved technology, available capital, and the extraction of large tonnages of ore translated into tangible metals. Although gold production tapered from a peak of $793,000 in 1896 down to $465,000 in 1900, the figure was still relatively high. The figure would have been greater were it not for a general labor strike that shut down a number of mines and mills in 1899. At that time, the State of Colorado mandated an eight-hour shift law for millworkers, and some milling outfits complied while others did not. Many of those companies that did comply reduced wages on grounds that the millworkers were on the job for fewer hours. The millworkers demanded eight hours and no reduction in pay, and when the ore treatment companies balked, the Mill and Smelterworkers' Union called a general strike. The Western Federation of Miners, the largest union of mine workers, then struck in sympathy. Miners and millworkers across the state, including in Clear Creek County, walked off the job and paralyzed the mining industry for more than one month.[144]

Although the strike interrupted gold production in Clear Creek drainage, the effect was short-lived. Gold mining in the eastern drainage peaked in all aspects during the early 1900s. Workers generated $930,000 in gold in 1902, and, although the yield tapered again afterward, the amount varied between $500,000 and $700,000 in subsequent years. The number of active mines increased in parallel with production. A total of 250 mines were scattered throughout the county in 1897, and by the next year, the eastern drainage alone was home to 200. The population increased, as well, mirroring greater activity at the mines. In 1900, 2,592 people lived in Idaho Springs, double the population of 1890. In the rest of Clear Creek County, the number of residents increased from 7,184 in 1890 to 8,794 by 1900. Given that the Griffith district still suffered from the exodus that followed the Silver Crash, most of the new residents lived among the county's gold mines.[145]

The increase in mines, workers, and ore tonnage stimulated a wave of mill activity. Each town in the eastern drainage had several concentration mills dedicated to a localized industry, and Idaho Springs featured a record 20 such facilities, as well as 3 more ore sampling plants. Many of the existing mills traded hands, and mining companies erected at least six new plants. Some of the mills failed even though metallurgists had a better grasp of how to treat the complex gold ore than in previous decades. The Newton Mill, built by the Newton Gold Mining & Milling Company in 1897, was among the most important. The Newton Mine was on Chicago Mountain south of Idaho Springs, but the company erected the mill at the Newhouse Tunnel in hopes of capturing some of the ore hauled out the tunnel. Metallurgists built new smelters as far away as Golden. The Golden Pyretic Smelter, for example, was built in 1901 specifically for Clear Creek ore, and the operator doubled its capacity in 1903.[146]

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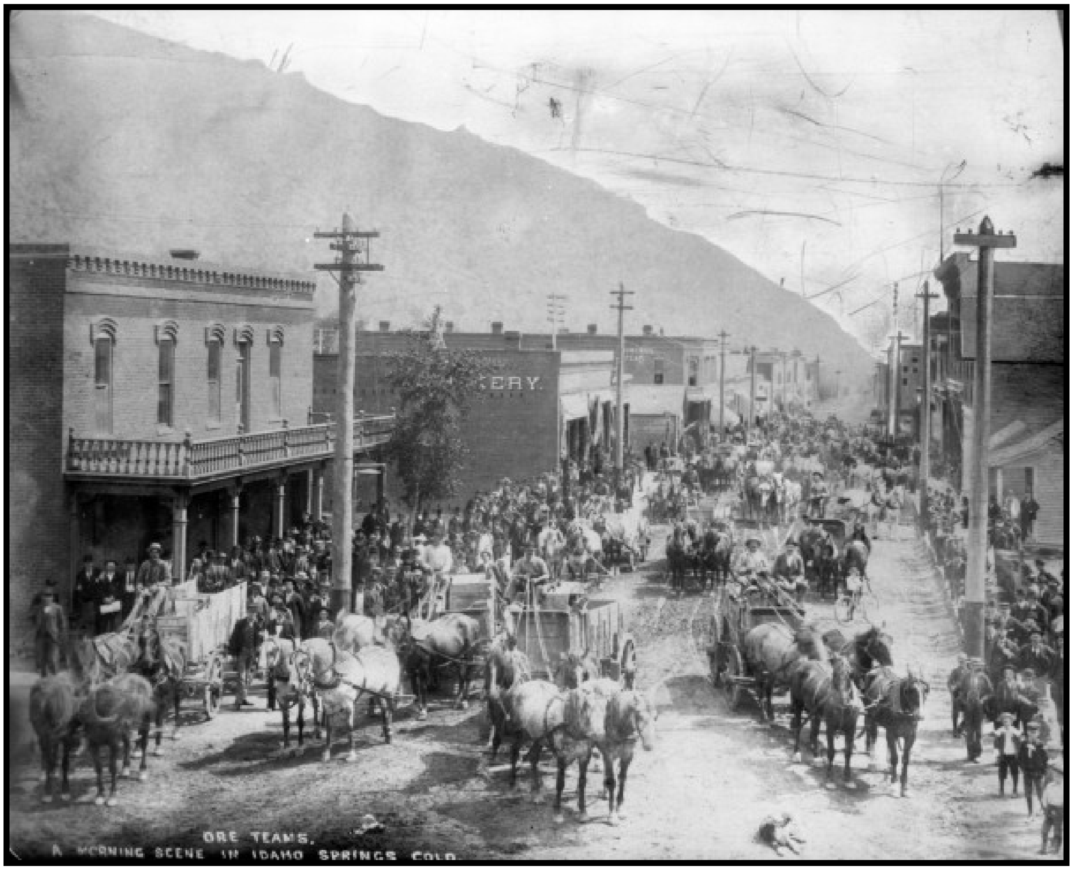
[144] Henderson, 1926:109; "Mining News" *Mining Reporter* 7/20/99 p54.

[145] Henderson, 1926:109; "Mining News" *Mining Reporter* 9/15/98 p17; *Report of the Director of the Mint*, 1898:117; Schulz, 1976:1890-3; Schulz, 1976:1900-4.

[146] *Colorado Mining Directory*, 1898:142; "Mining News" *Mining Reporter* 10/3/01 p258; "Mining News" *Mining Reporter* 12/4/02 p470; *Report of the Director of the Mint*, 1902:111.



Eastern Clear Creek drainage reached a peak in production during the late 1890s and early 1900s. Ore flowed down into Idaho Springs from all directions in wagons, which clogged already busy streets. Idaho Springs featured a record number of ore treatment mills. Courtesy of Denver Public Library, X-2269.

The Allen Mill was among the most reliable of the local facilities, and it also exemplified how the gold boom provided opportunity for women experienced in the mining industry. Maria A. Allen inherited the mill in 1894 when her husband James Allen died of pneumonia. James erected the facility during the early 1890s, married Maria in 1892, and the couple apparently ran it together. James attended to the mechanical aspects, and Maria the business matters. Unwilling to give up the business after James died, Maria hired a metallurgist and leased the Decatur and General Thomas mines to feed the mill. In 1898, Maria leased the plant to the Butler Mining & Milling Company but stipulated rights to continue treating ore from her own operations. The Allen Mill was not the only woman-owned mining business. During the late 1890s, Vermont stenographers Mary H. Husted and Ella H. Chisholm vacationed in Georgetown, visited Empire, and became seized with gold fever. They used their savings to organize the Atlantic Gold Mining & Milling Company and bought the venerable Atlantic Mine from Frank Peck. They hired Mrs. E.C. Atwood as manager, and she personally supervised the operation. Atwood lived in Empire and was a self-made mining woman, which was difficult in a male industry. After losing money on several ventures, she vowed to make a profession of mining and learned the industry. Atwood then began her professional career in Clear Creek County and expanded her horizons to Cripple Creek, Boulder County, and California. During the early

1900s, Julia W. Anderson was owner and active manager of the Harrison Mine, which produced gold near Idaho Springs.[147]

The principal reason why Idaho Springs was home to more than 20 mills was the huge tonnages of ore flowing down from the surrounding mines. Some of those mines were recent, others were old properties renamed by new owners, and many were historic producers operated by well-established companies. To increase production, the companies mechanized their mines to a greater degree and employed larger workforces than in previous years. Professionally engineered compressed air systems, steam hoists, ventilation blowers, and multiple buildings became common. A few companies invested extravagant sums on both their underground workings and surface facilities, creating some of the most advanced and deepest operations in the entire drainage. Such mines and the large-scale property acquisitions on which they were predicated were characteristic of a maturing industry.

Seaton Mountain was a center of advanced operations, and they produced heavily. The Seaton Mining & Milling Company and the Foxhall Tunnel & Mining Company cooperated on a complex maze of underground workings. The Seaton Company sank the Seaton Shaft to great depths and installed a costly surface plant. Instead of hoisting ore to the surface, however, the company sent approximately 40 tons of ore per day out the tunnel, saving energy costs. The Foxhall Tunnel Company not only provided access to the Seaton's deep workings, but also those of adjoining properties. The Foxhall Company then charged the outfits a fee to extract their ore through the tunnel, increasing its income.[148]

The Freighter's Friend, Franklin, and Silver Age were a group of neighboring mines on Seaton Mountain. They became the subject of the large consolidations typical of the vibrant mining industry. The Silver Age Mining & Milling Company worked the Silver Age at a profit, and William E. Renshaw operated the other two since the mid-1890s. Eastern investors targeted the three mines for acquisition and planned extensive development. Because all three were proven producers, their owners sold only at high prices. The investors readily organized the Consolidated Franklin Mining Company in 1902, bought the three mines, and immediately began major improvements. The company also acquired the Wilkie Mill in Idaho Springs to treat the ore. The Consolidated Franklin then began yielding heavily and joined the ranks of the important operations in the region.[149]

Renshaw, wealthy from the sale of the Freighter's Friend and Franklin, made even more money from other Seaton Mountain consolidations. He leased the Gem Mine from William Benellack & Company and worked the Gem with adjoining claims that he owned. Investors from the Midwest targeted the group for buyout and organized the Consolidated Gem Mining Company in 1900 to allocate necessary capital. When the company was finalized, the investors paid Benellack and Renshaw handsomely for the properties, and because Renshaw had extensive experience on the mountain, the company also retained him as manager. Renshaw then spent their capital on advanced surface facilities, including one of the earliest sets of electrified machinery, for work at great depth. Under Renshaw, the Gem produced heavily for decades.[150]

The Sun & Moon Mining & Milling Company operated what may have been the largest and most heavily equipped mine in the eastern drainage. J.W. Britton and G.G. Lowden organized the company in 1897 or 1898 to work the neighboring Sun & Moon and Minott shafts on northern Seaton Mountain. The company then poured money into surface facilities such as

[147] *Colorado Mining Directory*, 1898:136, 138, 139; *Colorado Mining Directory*, 1901:34, 42; *History of Clear Creek County*, 1986:171; Harrison, 1964:389; Myres, 1999:264; Zanjani, 1997:104.

[148] *Colorado Mining Directory*, 1898:139; "Mining News" *Mining Reporter* 1/1/03 p15; *Report of the Director of the Mint*, 1902:126.

[149] *Colorado Mining Directory*, 1898:144; "Mining News" *Mining Reporter* 11/13/02 p405; "Mining News" *Mining Reporter* 4/24/02 p412.

[150] *Colorado Mining Directory*, 1898:139; *Colorado Mining Directory*, 1901:41; "Mining News" *Mining Reporter* 9/17/03 p265.

large hoists, boilers, and air compressors to sink the shafts deeper and block out extensive segments of a gold vein. By 1901, the company connected both shafts with lateral drifts and extracted ore from depths of 400 feet. When manager H.N. Sims found that the ore continued downward, he installed yet larger hoists and compressors. All the while, the company generated enough ore not only to pay for the improvements, but also to provide high profits.[151]

A movement to bore long and costly tunnels underneath nearly every mountain known for ore was another characteristic of the eastern drainage's sophisticated mining industry. A number of companies looked to the Newhouse and Foxhall tunnels as models to emulate. The Newhouse and Foxhall exemplified engineering, service when completed, and the resolution of logistical issues such as easements. Like the Newhouse, companies planned their tunnels to be haulageways and drains for specific groups of mines but hoped to charge rights-of-way to neighboring property owners. Between 1898 and 1903, various companies commissioned at least 20 tunnels, many of which were finished and in service within several years of start.

Because Seaton Mountain already featured the Newhouse and Foxhall tunnels, it had space for only a few new tunnel projects. The Edgar Consolidated Gold Mining Company invested heavily in a tunnel from Idaho Springs underneath Virginia Canyon to Seaton. Within a short time, the Edgar Tunnel became one of the area's important operations. The Big Revenue Gold Bullion Mining Company imitated the Edgar operation and started another tunnel in the same area.[152]

Although Bellevue Mountain had fewer veins of substance than Seaton, it drew five major tunnel projects. One was the appropriately named Bellevue Tunnel. Another was the Centurion Tunnel, driven by Colorado Springs investors to undercut the Champion Vein. The Champion originally was one of three deep shaft mines owned by the Kohinoor & Donaldson Consolidated Mining Company, and when the outfit went bankrupt in 1901, the Colorado Springs men bought the assets. They assumed that the vein held value as far down as the base of Bellevue Mountain and pushed the tunnel accordingly in 1902. S.A. Josephi backed the third important tunnel project on Bellevue Mountain. He and associates organized the Knickerbocker Gold Mining, Milling, Tunnel & Transportation Company in 1897, spent two years boring the Knickerbocker Tunnel, and began production by around 1900.[153]

The Big Five Tunnel was among the most important projects of its time in the Idaho Springs area. William P. Daniels and partners owned groups of claims on Bellevue Mountain, at Ward in Boulder County, and near Howardsville in San Juan County. They decided to not to develop the groups from the surface, but instead simultaneously through deep tunnels. The three separate projects required an enormous amount of capital, and should one of the tunnels fail, the other two would offset the loss. Daniels and partners then merged the assets under the Big Five Tunnel, Reduction & Transportation Company in 1900. The company commissioned the tunnels and named each the Big Five, including the one in Bellevue. The Ward and Bellevue projects proved successful by 1903 while the one in San Juan County was a costly failure.[154]

R.C. Vidler pursued a strategy similar to the Big Five Company, but his three tunnels were all within Clear Creek County. In 1901, he convinced a panel of capitalists to simultaneously fund the Vidler Tunnel in the Argentine district, the East Red Elephant Tunnel at

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[151] *Colorado Mining Directory*, 1898:144; *Colorado Mining Directory*, 1901:49; "Mining News" *Mining Reporter* 8/8/01 p105; "Mining News" *Mining Reporter* 10/3/01 p258; "Mining News" *Mining Reporter* 10/9/02 p296; *Report of the Director of the Mint*, 1903:126.

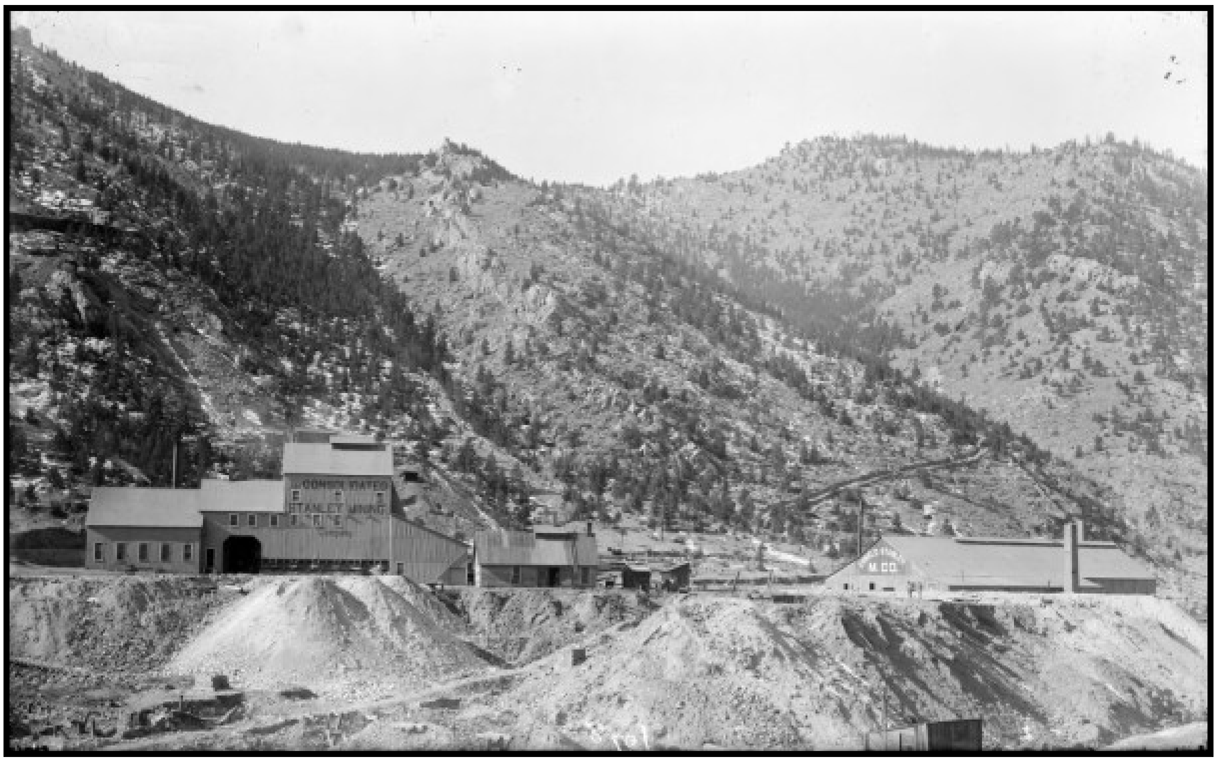
[152] *Colorado Mining Directory*, 1898:138; *Colorado Mining Directory*, 1901:39; "Mining News" *Mining Reporter* 6/9/04 p590.

[153] Callbreath, 1899; *Colorado Mining Directory*, 1898:140; "Mining News" *Mining Reporter* 2/23/99 p16; "Mining News" *Mining Reporter* 7/23/03 p79.

[154] *Colorado Mining Directory*, 1901:34; "Mining News" *Mining Reporter* 9/13/1900 p152; *Report of the Director of the Mint*, 1903:126.

Lawson, and the Luciana Tunnel on Bellevue. Vidler planned to drive the Luciana easterly through Bellevue and underneath Seaton, but ran out of funds.[155]

Spanish Bar was center to substantial mines and tunnel projects. The Consolidated Stanley Mining Company ran one of the most advanced operations in the entire drainage. The company extracted 30 tons of ore per day from the Hukill and Whale veins during the late 1890s. The Hukill Tunnel followed the vein on the north side of the canyon and the Whale Tunnel on the south side. A complex of compressors, buildings, powerplant, and the Whale and Plutus mills was located between. Manager Charles A. Gehrmann realized that the veins connected deep underneath the valley floor, which the previous operators left undeveloped because of groundwater. He then commissioned the Gehrmann Shaft on the segment and was rewarded with heavy production. The Stanley Company had so much milling and power capacity that it accepted custom ore from local mines and provided electricity to Spanish Bar and the immediate area. And yet, Gehrmann was unsatisfied with the operation, added more machinery in 1902, and increased production.[156]



The Stanley Mine was a result of the mid-1890s gold boom in eastern Clear Creek drainage. The operation, a consolidation of properties on both sides of the valley, was developed into one of the most advanced mines in the region. The building at left is an icon visible from I-70 today. Courtesy of Denver Public Library, CHS-B1486.

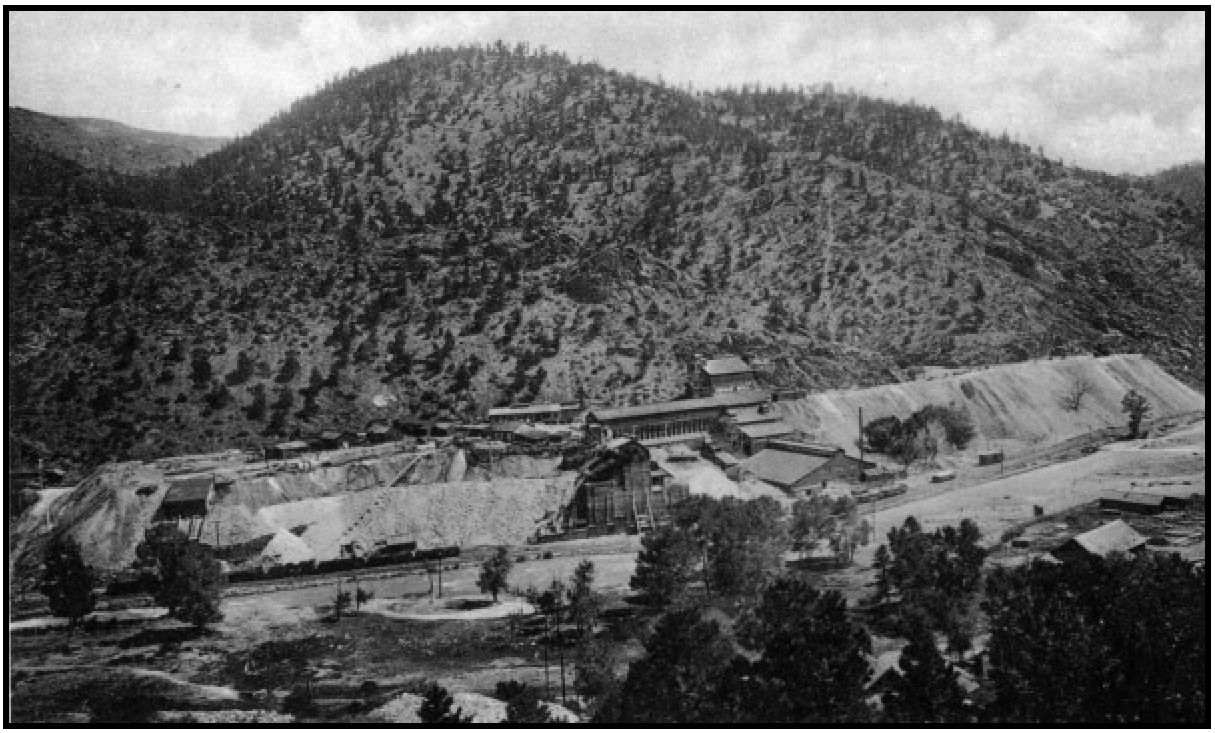
J.H. Shepherd presided over the Shafter Mine, the other major operation at Spanish Bar, and the fourth to drive a deep tunnel there. The Shafter Mining & Milling Company was among the most profitable in the area, extracting ore from extensive workings and processing the

155 "Mining News" *Mining Reporter* 8/22/01 p145; "Mining News" *Mining Reporter* 11/5/03 p442.

156 *Colorado Mining Directory*, 1901:37, 48; "Mining News" *Mining Reporter* 9/21/98 p17; "Mining News" *Mining Reporter* 7/4/01 p10.

material in its own mill. In 1901, Shepherd commissioned the Big Four Tunnel to undercut the workings at depth, and within three years, pushed it to a length of 4,400 feet and success.[157]

The Mayflower Tunnel was the fifth such project at Spanish Bar. The Lord Byron Mining Company owned a collection of productive properties in Spring Gulch, including the Lord Byron, Lord Wellington, and Mayflower. The directors thought that the veins could be worked more efficiently through a haulage tunnel than from the existing shafts, and started the tunnel south from the Stanley property in 1900. The principal complication that ultimately interfered with the tunnel's completion was the three miles of solid rock that miners had to penetrate. The project got off to a good start, but the cost became too great for the investors, who lost interest after a few years.[158]



The Newhouse Tunnel, also known as the Argo, extended north from Idaho Springs to Central City. The tunnel was designed as a deep drain and haulageway for mining companies in the mountains in between. They paid royalties to work their properties from the inside out and shuttle ore to the Newton and Newton Annex mills at the tunnel portal. Through its function, success, and distance of approximately seven miles, the tunnel was an engineering marvel that set a precedent in the greater mining industry. Courtesy of Denver Public Library, X-61683.

The Newhouse Tunnel was the most costly if not successful haulageways and drains, and was well on its way to the goal of Central City. The Argo Mining, Drainage, Transportation & Tunnel Company stopped work in 1897 when the tunnel reached 7,800 feet in length due to easement issues. At this distance, the tunnel was already through Seaton Mountain, and the company increased its customer base by raising connections with the Gem, Sun & Moon, and other heavy producers. Electric trains hauled a constant flow of ore out the tunnel, much of which was concentrated in the Newton Mill. By 1899, company lawyers secured more

[157] *Colorado Mining Directory*, 1898:144; *Colorado Mining Directory*, 1901:48; "Mining News" *Mining Reporter* 8/8/01 p104; "Mining News" *Mining Reporter* 11/17/04 p533.
[158] "Mining News" *Mining Reporter* 11/29/1900 p345; "Mining News" *Mining Reporter* 2/21/01 p118.

easements, allowing miners to resume progress. They lengthened the tunnel to 13,000 feet over the course of three years, and although this was more than most other tunnels in Colorado, the miners were only half way to Central City. After several more interruptions, the company finally undercut Quartz Hill near Central City in 1910 and declared victory.[159]

Dumont was one of the few pockets in the eastern drainage that was relatively quiet during the time of peak production. The town remained small with several businesses, the Mill City House hotel, and a population of approximately 100. Long-term resident miners kept several of the venerable producers in operation during the late 1890s. Simon Dingle leased the Albro Mine, James Ninan worked the Pioneer and ran its mill, and others extracted ore from the Alkire.[160]

The Pioneer and Senator mines became the subject of acquisitions and improvements, but they went bust. Investors bought the Senator in 1900, built a mill at Dumont, and worked the mine for a year. The mill proved to be ineffective, and instead of shipping the ore by rail to a smelter, the owners suspended operations. The Senator then remained idle for years. The Kokomo Pioneer Mining Company bought the Pioneer from Ninan in 1901. Ninan probably sold because the mill was only marginally effective and he did not want to risk capital figuring out the problems. The Kokomo Pioneer company was willing, however, and refitted the mill. Validating Ninan, the improvements proved to be a waste of capital, and the company then sold the Pioneer to another firm whose experience was equally poor.[161]

Lawson was nearly as quiet as Dumont, but the substantial veins on Columbian Mountain and Red Elephant Hill attracted a greater number of ventures and tunnel projects. Charles Lawson and Chicago investors owned the Joe Reynolds Mine on Columbian Mountain and came to the conclusion that a haulage tunnel was a logical step to efficiently extract its deep ore. Because the project would be costly, they interested Robert Old and John Kemp, who owned adjoining mines. Old was an experienced investor in Georgetown and held the Nil Desperandum, and Kemp possessed the Murray, as well as mines in Central City. In 1897, the parties commenced the Princess of India Tunnel at the base of Columbian Mountain to undercut the three mines. Kemp was the first to benefit when the tunnel struck the Murray Vein in 1898, followed by the Joe Reynolds and Nil Desperandum two years later. The tunnel proved to be a wise investment both for the mine owners and Lawson because it yielded significant tonnages of ore for years afterward.[162]

On the north side of the valley, other companies were trying to develop the depths of Red Elephant Hill. R.C. Vidler and associates purchased a group of claims on the hill, organized the East Red Elephant Mining & Milling Company in 1902, and began the Red Elephant Tunnel, Vidler's third such project in the county. Meanwhile, Albert E. Reynolds (no relationship to Diamond Joe Reynolds) was at work on the Red Elephant Group. Reynolds was a Colorado pioneer, Indian trader, and mining expert who made a fortune investing in dozens of mines across the state. He did particularly well in the Creede district and organized the Commodore Mining Company during the late 1890s to acquire a mine there by the same name. The company became an umbrella organization for other mines elsewhere in the state, including the Red Elephant Group. Previously, Chicago interests consolidated the Boulder Nest and adjoining claims into the group and started a tunnel to undercut them. But the investors mismanaged the

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[159] "General Mining News" *MIR* 7/97 p25; "Mining News" *Mining Reporter* 1/25/1900 p52; "Newhouse Tunnel Complete"; *Report of the Director of the Mint*, 1903:126; Warwick, 1902.

[160] *Colorado Business Directory*, 1898:415; *Colorado Mining Directory*, 1898:124; "Mining News" *Mining Reporter* 9/8/98 p17; "Mining News" *Mining Reporter* 9/8/98 p17.

[161] *Colorado Mining Directory*, 1898:125; "Mining News" *Mining Reporter* 4/12/1900 p220; "Mining News" *Mining Reporter* 2/21/01 p118; "Mining News" *Mining Reporter* 7/21/04 p68.

[162] *Colorado Mining Directory*, 1898:146; "Mining News" *Mining Reporter* 11/17/98 p17; "Mining News" *Mining Reporter* 1/18/1900 p39.

company and sold to Reynolds in 1902. Following his usual pattern, Reynolds dispatched a trained engineer to systematically develop the workings. Once the mine was in production, the engineer resumed work on what was now the Commodore Tunnel and finished it during 1904.[163]

The above operations and a few small outfits were vital to the town of Lawson, which was home to around 200 people, a saloon, hotel, and several mercantiles. As activity on Columbian and Red Elephant contracted around the principal mines during the early 1900s, the population shrank to only 100, and Lawson assumed a status similar to Dumont.[164]

Empire was second only to Idaho Springs in the intensity and quality of its mining operations. The town enjoyed one of its most important periods of growth during the late 1890s and early 1900s. Because of improved milling methods, interest among capitalists, and the application of local expertise, production increased 100 percent between 1897 and 1899. Although prospectors returned to the mountainsides and outfits started a number of small mines, the historic properties received the most attention. They were the subject of buyouts, consolidation, and significant improvements.

The Peck family was responsible for some of the most important transactions. After the late 1860s bust, the Pecks purchased Empire's principal mines as they came up for sale, gradually assembling a substantial roster. They worked the Atlantic, Dunderburg, Equator, Gold Dirt, and Silver Mountain intermittently through the 1880s. Frank Peck gradually lost interest in the business and leased the properties out during the 1890s. By the decade's end, Lafayette Hanchett, who managed the Lamartine Mine at Lamartine, leased the Gold Dirt. He was also involved with the Corncracker Mining Company, which leased the Dunderberg. The company also owned and operated the Tenth Legion Mine, another of Empire's important producers. The Silver Mountain Gold Mining Company leased the Silver Mountain mine and Clear Creek Mill, which may have been in John Collom's old smelter building at Empire Station.[165]

In 1900, Frank Peck decided to retire and dispose of the family mines, beginning a series of transactions and consolidations that were important to Empire. He sold the Atlantic to the Vermont stenographers noted above, and they did well with the property. Peck sold the Dunderburg, Equator, Gold Dirt, and Peck Placer as a group to the Hartford Mining Company. These properties figured prominently in a tunnel project that company directors A.H. Woodbridge and John A. Amendt began during the late 1890s. At that time, they organized the Empress Mining & Tunnel Company and purchased the idle Aorta Tunnel near Empire. The Bay State Mining Company began the tunnel during the 1860s to undercut a section of the rich Tenth Legion Vein and produced ore intermittently through the 1880s. Woodbridge and Amendt bought the tunnel, renamed it the Empress, resumed work on the Tenth Legion, and began extending the tunnel to the Gold Dirt and the other principal veins on Silver Mountain. Following the strategy of other tunnel projects, the directors planned to lease out rights-of-way to the Pecks and other claim owners who extracted ore through the tunnel. Instead of leasing a right-of-way and using the tunnel, the Pecks offered the Gold Dirt and the other mines to Woodbridge and Amendt. They reorganized the Empress Company as the Hartford Mining Company in 1901 for capital to complete the deal and now had even greater incentive to push the tunnel. The Hartford Company apparently cancelled the leases other parties held on the Gold Dirt, Dunderburg, and Equator, and worked these mines itself. In 1902, the company connected the Empress Tunnel with the Gold Dirt workings and began production.[166]

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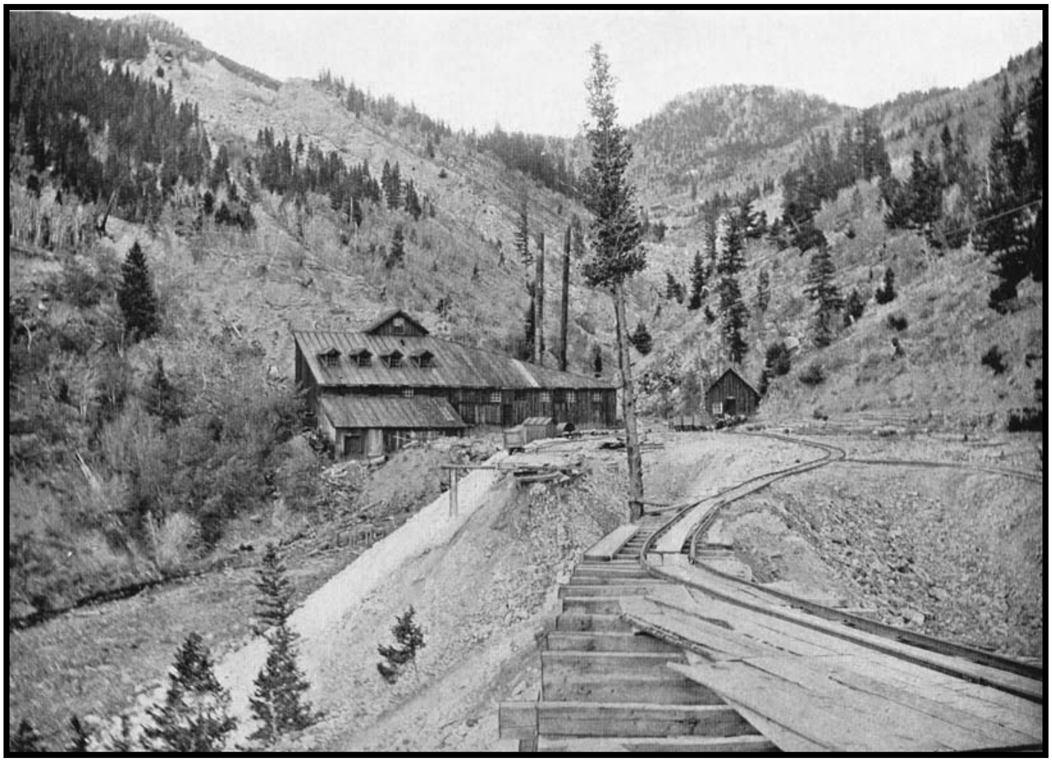
[163] *Colorado Mining Directory*, 1901:47; "Mining News" *Mining Reporter* 1/18/1900 p39; "Mining News" *Mining Reporter* 12/11/02 p492; "Mining News" *Mining Reporter* 1/1/03 p16; "Mining News" *Mining Reporter* 3/10/04 p251.

[164] *Colorado Business Directory*, 1898:524; *Colorado Business Directory*, 1901:597; *Colorado Mining Directory*, 1898:145.

[165] Harrison, 1964:386; *Colorado Mining Directory*, 1898:126, 128.

[166] *Colorado Mining Directory*, 1901:40; Dillenbach, ca. 1898:8; Harrison, 1964:387; "Mining News" *Mining Reporter* 5/9/01 p308.



The Aorta Tunnel was among Empire's earliest profitable mines but went idle during the 1880s. During the late 1890s, the Empress Mining & Tunnel Company lengthened the tunnel as a deep haulageway for other mines. The operation became one of Empire's most important. The mill, a good example of an amalgamation stamp mill, may have been built by the Bay State Mining Company during the 1860s. Source: Spurr, 1908.

Meanwhile, the Empire Tunnel Company was boring the Empire Tunnel into the base of Covode Mountain, a short distance south of the town. Frank A. Maxwell, Frederick P. Dewey, and J.M. Copeland organized the company in 1900 to develop the Paymaster and other veins that they owned. Maxwell was a Silver Plume mining engineer who helped build the Georgetown Loop on the Georgetown, Breckenridge & Leadville Railroad. Dewey was an investor in Georgetown, owned several mines, and organized the United Light & Power Company in 1893. The firm drove the Empire Tunnel to a length of 3,000 feet by 1903 but stalled. The Hartford Company became overextended and sold its property to the Empire Tunnel Company, which now owned the prized Gold Dirt and Empress Tunnel. The company continued work on the Empire Tunnel as well, struck another section of the Gold Dirt Vein, and extracted yet more ore. But this was insufficient to pay the heavy debt load, and like its Hartford predecessor, the company entered financial difficulties and collapsed.[167]

The Silver Mountain Mine was one of the Peck properties that remained reliable and under constant ownership. When the Pecks sold their properties in 1900, they offered the Silver Mountain and the Clear Creek Mill to lessee Silver Mountain Gold Mining Company. Manager M.B. Stewart kept the mine in heavy production and solicited custom business at the mill to increase income. When the Hartford Company pushed the Empress Tunnel toward Silver Mountain ground, Stewart subscribed to the project as a wise investment. He even began a shaft to intersect the tunnel. But when the tunnel became tangled in the chain of failed companies, the effort dissolved. Stewart was careful not to overextend his operation and maintained production

[167] Harrison, 1964:382, 402; "Mining News" *Mining Reporter* 2/14/01 p102; "Mining News" *Mining Reporter* 2/5/03 p132.

for years. For added income, he ran the mill as a custom facility, providing other outfits in the area with an outlet for their ore.[168]

Despite the company failures, the revival of mining had a direct impact on the town of Empire. The population grew nearly 50 percent from 500 in 1898 to 700 by 1901. The number of businesses increased in parallel. The Denton Brothers and Lenninger & Barth sold groceries, hardware, and miners' supplies. Anderson & Swanson kept a dry goods and clothing store and a liquor outlet. William Blamey had a second liquor outlet, and George Van Antwerp maintained a combination post office and stationary store. Guests stayed in the Peck House or the Cottage Hotel, and drank in the Christenson or Cook saloons. W.R. Collins provided healthcare, J.W. Cline ran the drugstore, and Charles Carpenter attended to general hygiene. The mining trade was well represented with carpenters, contractors, blacksmiths, and an electrician.[169]

Residents and businesses erected a small number of new buildings, and community activists instituted modern services. Frank Peck introduced electricity in 1900, and it was gradually adopted. His powerplant was no more than several dynamos turned by a gasoline engine and waterwheel originally used for an early mill. In 1901, the Empire Power & Light Company took over the service and increased the capacity, and the town fathers allocated money to improve the water system by replacing the old redwood pipes. In 1901, the *Empire True Fissure*, Empire's first newspaper, went into print under editor Dean Burgess. He was an undependable alcoholic, however, and abandoned the project after a short time. Empire also received its first jail, reflecting the increase in crime brought by the industrial workforce.[170]

After the 1902 peak, mining in the eastern drainage contracted and then stabilized. Between around 1905 and 1910, gold output varied slightly between $502,000 in 1905 and $656,000 in 1908. A sudden burst of production from both small and large outfits accounted for the 1902 surge, and when the small outfits exhausted their limited ore deposits, the output settled at the lower figure. The contraction was a symptom of maturation where substantial companies and their well-developed mines dominated the industry. The large outfits had the capital, infrastructure, and technology required to profit from the complex, low-grade ore that remained.

On Seaton Mountain and at Spanish Bar, the principal mines remained largely the same, although the owners leased some out. As discussed above with the Griffith district, mining companies leased their properties when the richest ore was gone and a mine's best days appeared to be over. The Producer Mining Company leased the Franklin and Silver Age mines on Seaton Mountain beginning in 1906, and local mine owner R.C. Bonney organized the Sol Luna Mining Company to assume the Sun & Moon two years later. These mines maintained a place among the area's top ten, despite the lack of confidence among their parent companies. The Consolidated Gem Mining Company was another principal operation, and W.E. Renshaw continued deep development underground and claim acquisition on the surface. As designed, the Newhouse Tunnel served as a haulageway and platform for deep development among the Seaton Mountain mines. All the principal operations sent their ore out the tunnel instead of hoisting the material up to the surface through long shafts. The practice greatly reduced operating costs, allowing the companies to extract lower grades of ore than before. Mining companies such as Consolidated Gem sank extremely deep workings from the tunnel and developed more sections of their veins, increasing ore reserves for long-term production. In response to the need for

[168] *Colorado Mining Directory*, 1901:48; Harrison, 1964:380; *Report of the Director of the Mint*, 1903:127.
[169] *Colorado Business Directory*, 1898:433; *Colorado Business Directory*, 1901:505; Dillenbach, ca. 1898:6.
[170] *Colorado Business Directory*, 1901:506; Harrison, 1964:361, 368, 376, 391.

services underground, the tunnel company installed additional machinery at great cost, such as a massive air compressor and electrical circuitry.[171]

The strong interest in deep tunnel projects calmed between 1905 and 1910, which was another symptom of a maturing mining industry. Investors abandoned the ill-conceived and speculative ventures, which remained unfinished. Most of the realistic and practical tunnels either reached their destinations and began yielding ore or were still being driven. In 1906 alone, miners added 20 miles of deep tunnels to the 100 miles already existing in the drainage. The Big Five Company's tunnel at Seaton Mountain was in production and ultimately penetrated the target Bellman Vein in 1910. The Shafter Mining Company finished its Big Four Tunnel at Spanish Bar in 1906 and increased production, and R.C. Vidler's Luciana Tunnel finally struck several veins underneath Bellevue Mountain in 1909.[172]

The contraction in mining and decrease in ore production throughout the eastern drainage between 1905 and 1910 forced approximately 40 percent of the mills in Idaho Springs to close. The number decreased from more than 20 mills in 1902 down to approximately 12 by 1906. Although such a figure seems significant, most of the mills that closed were small, old, and inefficient. Their ancient equipment was not suited to the grades and types of ore, and lost considerable percentages of the gold content. In addition, the mill capacities were too limited to treat the ore in economic volumes.

The well-established and proven mills, in contrast, remained in business. Nearly half, including the Allen, Bertha, and Jackson, relied exclusively on custom business from independent mining outfits. The Newton Annex Mill, originally built in 1904 to treat tailings from the Newton Mill, may have been the largest and most advanced of the custom plants. The rest of the mills were either owned or leased by mining companies that treated their own ore and accepted some custom business when convenient. Following this pattern, the Shafter Mining Company leased the Hudson Mill, the Consolidated Gem company the Newton Mill at the Newhouse Tunnel, and the Tawassa Gold Mining & Milling Company the Idaho Mill. Several milling companies refitted their facilities when it became obvious that the old processes and equipment were ineffective. George S. Wilkie, for example, installed a cyanide process in the Wilkie Mill in 1906 to treat midgrade ore. He was among the earliest metallurgists to employ the process with success in the drainage, gaining a competitive advantage. Metallurgists then tried cyanidation in the Newton and Black Eagle mills but met with failure.[173]

Mining around Lawson followed the trend toward maturation in effect elsewhere in the drainage during the late 1900s. The principal mines were the foundation of the local industry, and the small operations were few. Companies worked groups of claims through deep tunnels, produced large tonnages of ore, and ran their mills on a combination of in-house and custom ore. Most of the operations were leases, but several were still worked by their owners. Charles Lawson and associates had the Joe Reynolds Mine in production through the Princess of India Tunnel, which they finished in 1900. The outfit treated a considerable amount of ore in its mill during the next decade. Roscoe B. Morton leased the Red Elephant Group from A.E. Reynolds in 1906 and focused his activity at the Commodore Tunnel. Based on experience as superintendent in the Tropic and other mines, he employed a strategy of reinvesting profits in development for long-term production. Miners lengthened the tunnel as money became available, granting access to more veins. The Red Elephant Mining Company pursued a similar course with the Red Elephant Tunnel, finished in 1910. The John A. Holmburg Mining &

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[171] *Mineral Resources*, 1907:250; "Mining News" *Mining Reporter* 9/20/06 p294; "Mining News" *Mining Reporter* 2/6/08 p153.

[172] "Current News" *Mining Science* 4/29/09 p336; "Current News" *Mining Science* 11/17/10 p479; *Mineral Resources*, 1906:211; "Mining News" *Mining Reporter* 1/4/06 p15.

[173] "Custom Milling Plants".

Milling Company bought the Bellevue-Hudson in 1907, reopened the main workings, and erected a new mill capable of treating the complex ore. The company did well for several years afterward, and then sold the mine.[174]

Empire and Dumont passed through maturation stages and went directly into decline between 1905 and 1910. Most of the veins in the surrounding hills were exhausted after 40 years of production, leaving little ore for small and large operations alike. Only two mines of substance, the reliable Albro and Pioneer, supported Dumont during the time. The small mines around Empire closed, followed by many substantial properties. The Conqueror, Gold Bug, Gold Dirt, Mint, and Neath became the principal producers, and they yielded ore only intermittently. Empire's population contracted with the industry, decreasing from 700 people in 1902 to 150 by 1908. Many businesses then left, and electrical service was cancelled.[175]

Despite the decline, Empire saw several new ventures of significance that supported the sagging community. In 1909, a firm began driving the Marshall-Russell Tunnel northward from Empire Junction as a deep haulageway and drain for the principal mines in the Union district. The tunnel was probably the Empress Tunnel renamed. Miners lengthened it to 3,300 feet, struck the Neath Vein, and began extracting ore. The New System Mining Company, organized in 1910, backed Empire's other significant venture. The company purchased the Mint Mine on Covode Mountain, erected a new mill, and joined the roster of Empire's principal mines.[176]

The period of maturity and stability continued in the eastern drainage during the first half of the 1910s. Gold production varied slightly from a low $446,000 in 1912 to a high of $527,000 in 1915. Although the figures seemed fairly consistent, they were a little less than previous years. But mining outfits worked harder for the gold. They extracted greater tonnages of increasingly complex ore and further improved milling for the same yield. These factors indicated that the eastern drainage had little rich ore left and was even running out of low-grade material. The large-scale operations, mechanization, and efficiency only accelerated the trend.[177]

Despite subtle signs, mining between 1910 and 1915 was similar to the previous five years. The Idaho Springs area had the same principal operations. The Newhouse Tunnel finally realized its full potential as a haulageway and deep development platform in 1910. A workforce of 150 to 200 miners used the tunnel to access approximately 12 veins underneath Seaton Mountain. In addition, Central City's mining companies sent ore out the five-mile bore to the Newton and Newton Annex mills. The Gem Mine was still one of the most important mines on Seaton Mountain, although W.E. Renshaw lost confidence in the property. He sold operation to the Idaho Mining, Reduction & Transportation Company in 1911 and moved on to the Crown Point & Virginia Mine.[178]

The industry local to Spanish Bar underwent several adjustments, where decline of some mines balanced increased activity at others. William P. Daniels and his Big Five Tunnel, Reduction & Transportation Company produced heavily from two of the important tunnels. Daniels leased the Big Four Tunnel from the Shafter Mining Company in 1911 and still operated the Big Five Tunnel. R.C. Vidler continued pushing the Luciana Tunnel into Bellevue Mountain and reached another set of veins in 1911, adding to that project's economic worth. Countering

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[174] "Current News" *Mining Science* 10/29/08 p356; "Current News" *Mining Science* 3/3/10 p211; *Mineral Resources*, 1906:211; "Mining News" *Mining Reporter* 9/27/06 p319; "Mining News" *Mining Reporter* 1/24/07 p100.

[175] *Colorado Business Directory*, 1908:654.

[176] "Current News" *Mining Science* 9/16/09 p258; "Current News" *Mining Science* 5/12/10 p450; *Mineral Resources*, 1910:406.

[177] Henderson, 1926:109.

[178] "Current News" *Mining Science* 8/17/11 p164; "Current News" *Mining Science* 2/9/11 p168; "The Lower Clear Creek Mining District" *Mining Science* 5/11/11 p495.

these operations, the Stanley slowed and assumed a minor role in the area, and the Quito Mining Company went bankrupt and lost its property at auction.[179]

The mining industry around Lawson remained fairly stabile. The handful of principal companies supported a population of 200 in the town as well as a hotel, mercantile, and saloon. Neighboring Dumont enjoyed the first increase in activity in more than five years. Investors reopened the Lee Mine on Albro Hill and built the McKelvie Mill in 1911. These and other mines maintained a population of 100 that patronized a basic set of businesses in town.[180]

Like Dumont, Empire saw a minor revival due to several new ventures. In 1910, G.D. Parks & Associates reopened the idle Atlantic Mine and leased the Clear Creek Mill at Empire Station to treat new ore. The following year, the Golden Empire Mining Company drove the Arvada Tunnel to undercut the Denver City, Golden, Brighton lodes on Covode Mountain. The Duluth & Empire Mining Company pushed the Duluth Tunnel at the same time. Both companies began production within a few years. Empire also participated in one of the last gold excitements in Clear Creek drainage. While working an abandoned placer claim on Bard Creek west of town in 1910, James Beshear unearthed a substantial gold vein. Prospectors then rushed to the area in search of more deposits, and although they found little of worth, the event publicized Empire and created a sense of optimism among investors.[181]

The principal companies around Empire still generated ore, contributing to the community's stability. The Conqueror Mining & Milling Company erected a new mill at North Empire in 1911, and the New System Gold Mining Company finished its mill and operated the Mint Mine. Miners bored the Marshall-Russell Tunnel to a length of 5,000 feet by 1911 and brought several veins into production.[182]

The optimism at Empire, as well as elsewhere in the eastern drainage, was short-lived. The mining industry and associated communities had grown comfortable with their relatively constant output, but a combination of factors brought this to an end in 1916. Gold production quickly decreased from $429,000 in 1916 down to $231,000 in 1918. World War I, which began in 1914, was a burden on the economy and increased the costs of needed materials. By 1916, the United States began mobilizing in support of the Allies and dedicated industrial capacity, labor, and ultimately armed forces to the conflict. Operating costs rose, labor became scarce, and many industrial materials were no longer available. At the same time, Clear Creek mining companies almost simultaneously ran out of profitable grades of ore. Conditions grew worse as the war progressed, forcing most companies to shutter their mines. Those companies that remained in business into 1918 hoped that Armistice would deliver relief. While Armistice did bring relief to Europe, it had a minimal affect on the problems that plagued Clear Creek's gold mines. More companies went out of business, and by 1920, the industry yielded a meager $49,000 and was no longer viable. The eastern drainage then entered a dark depression lasting more than ten years.

Gradual Decline in the Western Drainage, 1898-1907

Between 1898 and 1907, Colorado entered one of its most important periods of mining. The economy recovered from the post-Silver Crash depression, and investors were willing to risk

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[179] "Current News" *Mining Science* 2/2/11 p143; "Current News" *Mining Science* 9/28/11 p307; *Mineral Resources*, 1911:537.

[180] *Colorado Business Directory*, 1910:901; *Colorado Business Directory*, 1912:582; "Current News" *Mining Science* 3/2/11 p247; "Current News" *Mining Science* 9/7/11 p235.

[181] "Current News" *Mining Science* 5/4/11 p480; Harrison, 1964:407, 411, 413.

[182] "Current News" *Mining Science* 3/9/11 p273; "Current News" *Mining Science* 9/28/11 p307; Harrison, 1964:41.

capital on mining. Technology and improved mining methods reduced operating costs, and better milling practices rendered previously uneconomical grades of ore profitable to produce. Although the value of silver remained low at around $.60 per ounce, these conditions fostered a major mining revival across Colorado. Many districts based on silver returned to life after five years of abandonment and entered a time of peak production. As discussed above, eastern Clear Creek drainage participated in the revival and enjoyed unprecedented growth and prosperity.

But the western drainage was unaffected by the revival. The production of silver and industrial metals rose briefly and almost imperceptibly during the late 1890s and then continued its gradual decline, instead of increasing like other silver districts. Mining companies generated $870,000 in silver and $189,000 worth of lead in 1897, which peaked at $926,000 in silver and $222,000 worth of lead the following year. By 1901, the figures slipped to $763,000 in silver and $167,000 in lead, and continued to ebb.[183]

The western drainage still suffered from the effects of the Silver Crash. When the mining industry temporarily stopped in 1894, hundreds of experienced miners and professionals left, businesses closed, and investors chilled toward Clear Creek silver mines. Although the industry returned to work by 1895, it faced another problem with no solution. The high-grade ore was gone and exploration projects found few new ore formations in replacement. This left mining companies with the known and proven veins, and although these had not yet been fully developed, much of the ore was low in grade. Profiting from such payrock required efficiency and production in high tonnages to offset silver's low value.

The conditions discouraged small mining outfits and instead favored large companies. Because the small outfits were unable to subsist on available low-grade ore, they were relatively few and contributed little to the industry. Large companies, in contrast, had the capital to mechanize, consolidate ore-bearing ground, and produce payrock in economies of scale. Headed by a combination of local and distant investors, these companies were the foundation of the mining industry during and after the late 1890s.

In some cases, old mines that saw little systematic development in the past provided a new opportunity for local investors. They organized a tier of midlevel companies that either purchased or leased the old mines, employed some mechanization, and systematically developed the veins at depth. Although such mines had been stripped of their high-grade ore long ago, the remaining payrock was pure enough to support limited operations.

The large and well-capitalized companies were responsible for most of the activity during the late 1890s. A few of the organizations were decades old and continued extracting ore from the proven properties. On Democrat Mountain, the Good Luck Mining & Milling Company, organized by Denver investors in 1880, produced from the Little Emma. Earnest Le Neve Foster still ran the Matilda Fletcher after 20 years of intermittent work. Feuding parties who owned sections of the various veins on Leavenworth Mountain sorted out their differences and reopened what had been one of Georgetown's most important mines. Previously, the Colorado Central Consolidated Mining Company owned most of the Colorado Central Vein, but the Silver Crash forced the company into bankruptcy. Powerful New York City investor Solomon Turck bought the complex property at foreclosure in 1895 but made little progress because litigation froze operations. Rather than allow their properties to remain idle, the owners came together as the Aliunda Consolidated Mining Company in 1898, resumed production, and developed the Colorado Central Vein through the Marshall Tunnel.[184]

The large and well-funded companies continued pulling low-grade ore out of the principal mines at Silver Plume. Like at Georgetown, some of the companies were decades old.

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183 Henderson, 1926:109.

184 Callbreath, 1899; *Colorado Mining Directory,* 1898:131; "Mining News" *Mining Reporter* 9/21/98 p18.

On Republican, the Hermann Mining Company still worked the Dunkirk, Jacob Fillius kept the Baltimore Tunnel in production, and the Pay Rock Consolidated Mining Company ran the Pay Rock Mine. All three outfits predated 1885. Similar were the Cashier Silver Mining Company, Robert Old's Mendota Mine, and his Captain Wells, the most important operations on Sherman Mountain. The Pelican-Dives, Dunderberg, and Terrible mines were three of Silver Plume's best producers, and they were troubled by the Silver Crash. For example, British-based Colorado Silver Mines, Ltd, originally owned the Terrible Mine and Mill at Brownville. When that company teetered on the brink of failure, investors reorganized it as the New Colorado Mining Company to save the mine. The New Dunderberg Mining Company came from similar origins, and it employed a large crew of 75 miners in the Dunderberg on Sherman Mountain. The Pelican-Dives Mining Company was the largest operation with 150 to 200 miners busy in the Pelican, Dives, and Seven-Thirty.[185]

These and other large companies were responsible for the minor rise of metals production in the Griffith district during the late 1890s. The increase had a positive effect on the region and reinvigorated investors, who dumped more money into the district during the early 1900s than the industry had seen in years. Both local and distant investors funded surface work, installed machinery, pushed underground exploration and development, and erected several new mills. The various projects were designed to squeeze greater tonnages of ore from the ground, improve efficiency, lower operating costs, and recover higher percentages of metals in local mills. Of the movement, a Denver-based mining journal observed:

> "The most encouraging feature of the present conditions is the large amount of new capital that has taken an interest in the district and started work on various propositions that will be of great benefit to the future of the camp. There is undoubtedly more systematic development in progress now than there has been for several years, and it is projected on a scale which should double the production of the camp as soon as the objective points are reached."[186]

Frederick Dewey and other community figures invested new capital in their United Light & Power Company, and one of the most important projects in the western drainage. Since inception in 1893, the company generated Direct Current (DC) at its Georgetown power plant, like most early electric providers. Because DC current could not be transmitted far, service was restricted to Georgetown and immediate mines. Alternating Current (AC) could be transmitted much farther than DC, but the early AC motors were unable to meet the needs of mining. Thus, although electricity had great potential to lower operating costs for mining companies, most of the Griffith district continued to rely on steam and waterpower. Electrical engineers solved the problems of AC motors and circuits by the late 1890s, and the technology was ready for mining. In 1899, United Light & Power began wiring an extensive AC grid to simultaneously earn profits for the company and improve conditions for the mining industry. The company extended three-phase AC lines west to Silver Plume and east to Lamartine and built a new AC hydropower plant at Georgetown.

In the positive climate, many mining companies found capital to improve their operations and develop known veins at depth, which yielded results. The owners of the Centennial Mine on Leavenworth Mountain deepened their shaft to 600 feet, installed a costly air compressor, and then enjoyed heavy production through 1901. Around the same time, local mine owners William B. Hood and Frank Maxwell organized the Lynn Consolidated Mining Company, which became

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[185] *Colorado Mining Directory*, 1898:131, 134.
[186] "Clear Creek County" *Mining Reporter* 1/9/02 p42.

one of Georgetown's important operations. They purchased the Mineral Chief Mine in 1902, bored the Moline Tunnel into its lower workings, and sent the ore to their Georgetown mill.[187]

Democrat Mountain was among the few silver-bearing landforms in the district not yet developed at depth with long tunnels. Although investors recognized this fact, few were willing to bear the enormous cost of a major tunnel project. In 1900, B.F. Kelly perceived this opening as an opportunity and began work on the new Kelly Tunnel through the Georgetown Deep Mining & Tunnel Company. Kelly had a checkered history promoting similar schemes elsewhere in Colorado, some successful but most not. In 1893, he, Charles Nelson, and others bored the Nelson Tunnel along the famed Amethyst Vein in the Creede Mining District, linking its principal mines and improving production. Kelly began Oro Tunnel four years later, and it was to be a four-mile passage underneath the Las Animas Mining District near Silverton. Kelly ran the company into debt without much progress, left it in the hands of bewildered investors, and became known in Silverton as "Tunnel Kelly" for the fraud. He also promoted the Creede & Gunnison Short Line Railroad to grade a line from Creede to Gunnison, obtained some financing, but allowed the scheme to collapse with nothing to show.

Shortly after organizing the Georgetown Deep company, Kelly promoted the new tunnel concept in the local press, and a Denver-based mining journal noted in 1901:

> "The Georgetown Deep Mining, Tunnel & Transportation Company has now underway one of the largest enterprises of Georgetown. The tunnel is more familiarly known as the 'Kelley Tunnel.' The tunnel runs from the foot of Republican mountain in a northerly direction, and is projected to run 9,900 feet. In its course, it will cut forty-two known veins, and of these, the company owns thirty-three, and with working privileges on the others. In addition to these known veins it is believed the tunnel will cut a large number of blind veins."[188]

Kelly almost certainly intended for the heavily financed Democrat Mountain project to serve several needs. At the very least, the operation could support his lavish lifestyle like Silverton's Oro Tunnel. At best, it might actually prove to be an economic success as the Nelson Tunnel. Ultimately, the Kelly Tunnel fulfilled both goals. Within two years, miners drove the tunnel approximately 1,300 feet and penetrated the Great Western and Jessie M. veins at depth, and both yielded rich ore. Miners struck yet more veins within a short time, but not the 42 suggested by the press. In a pattern common among mining scheme promoters, Kelly failed to keep the company solvent, and the Democrat Mountain Mining, Milling & Transportation Company took over the tunnel in 1904.[189]

While Kelly's company may have failed due to fraud, others collapsed because of poor planning. In 1901, the Red Oak Mining & Milling Company bought the Astor Mine, one of the oldest producers on Democrat Mountain. Excited, the investors funded at great cost a new mill on the valley floor and an aerial tramway to carry ore down from the mine. They made the fatal error, however, of building without first confirming sufficient ore reserves. When the operation approached insolvency within the year, its investors sued each other instead of directing their legal fees toward underground development. Before the company could sort out its problems, the mill burned in a mysterious fire, ending matters.[190]

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[187] "Mining News" *Mining Reporter* 2/28/01 p135; "Mining News" *Mining Reporter* 3/20/02 p298; "Mining News" *Mining Reporter* 7/11/01 p27.

[188] "Mining News" *Mining Reporter* 12/12/01 p478.

[189] "Mining News" *Mining Reporter* 2/14/01 p102; "Mining News" *Mining Reporter* 11/21/01 p410; "Mining News" *Mining Reporter* 10/16/02 p316; "Mining News" *Mining Reporter* 12/25/02 p534; "Mining News" *Mining Reporter* 6/9/04 p690.

[190] "Mining News" *Mining Reporter* 3/28/01 p236; "Mining News" *Mining Reporter* 7/25/01 p64; "Mining News" *Mining Reporter* 1/30/02 p144.

Despite the above failures, most companies were legitimate and generated enough ore to support the local milling sector. As in the eastern drainage, old mills were either refitted or replaced with new plants, and metallurgists did well with sampling facilities. The Chamberlain & Dillingham Ore Company, organized in 1902 by W.J. Chamberlain and Frank Dillingham, became the most important sampler outfit. Both millmen began their careers in Georgetown during the mid-1870s. Dillingham worked in the Mathews, Morris & Company mill in 1876 and married Kate, daughter of W.G. Chamberlain. They moved to Silver Cliff where Dillingham opened his own sampler in 1878, formed a partnership with W.J. Chamberlain during the 1880s, and built samplers in Denver and Boulder. The partners then expanded into Georgetown, Black Hawk, Breckenridge, and Idaho Springs in 1902.[191]

At the same time, Chauncy E. Dewey built the Dewey & Wheeler sampler. Dewey had a background similar to Dillingham, but arrived in Georgetown during the early 1880s. He opened the Dewey Sampler in 1885, moved to Hinsdale County for several years and erected the Hidden Treasure Mill, and returned in 1891. Dewey bought the idle Clear Creek Mill at Georgetown, ran it as a custom plant, and probably converted the facility into the Dewey & Wheeler sampler.[192]

In 1905, the Anglo-Saxon Mining & Development Company erected another mill both to treat its own ore and also custom payrock. The company installed what may have been the first cyanidation process in the western drainage, suggesting that the mill specialized in ore with a high gold content.[193]

Heavy ore production continued at Silver Plume during the early 1900s. The mining companies there, however, engaged in fewer improvement projects than at Georgetown because they already invested heavily on efficiency during the post-Silver Crash depression. An advanced and high-capacity mill at the Mendota Mine was among the important developments. Owner Robert Old decided to retire during the late 1890s and began disposing of his numerous mines, including the Mendota. But before he sold, Old hired engineer Frank A. Maxwell to erect the new mill. Maxwell dismantled the Rocky Mountain Mill at Georgetown and the Terrible Mill at Silver Plume and combined some of the structural elements and machinery into the Mendota facility, known as the Maxwell Mill. The plant began treating low-grade ore in 1899, providing a service important to the well-being of the local mining industry. Old then sold the Mendota and the associated Victoria Mill in 1900, and the new owners began a major development campaign.[194]

The Pelican-Dives Mining Company was among the most aggressive firms in seeking out new ore formations. The company remained Silver Plume's largest employer and producer and resumed driving the Burleigh Tunnel in 1902 to penetrate the lower reaches of several veins not yet developed at depth. The entire property changed hands for a huge sum in 1904, and the new Dives-Pelican & Seven-Thirty Mining Company increased the development work. The campaign successfully found enough ore to justify a new mill in 1905.[195]

The Argentine Mining District was one of the few areas of the western drainage that fit the statewide pattern of revival and boom during the turn of the century. Except for the Stevens and Baker mines, Argentine went largely quiet in the mid-1880s. Mining companies stopped work at this time and left their reserves of low-grade ore in place because of high operation costs and declining silver values. Some properties even still had pockets of rich payrock. A rare

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191 "Mining News" *Mining Reporter* 4/10/02 p367; Smiley, 1913:393.
192 "Mining News" *Mining Reporter* 4/3/02 p343.
193 "Mining News" *Mining Reporter* 8/31/05 p218.
194 *Georgetown Courier* 4/12/30 p1 c6; *Report of the Director of the Mint*, 1900:116.
195 "Current News" *Mining Science* 3/14/12 p260; "Mining News" *Mining Reporter* 5/21/03 p475.

discovery drew attention to the district, and a few investors grew curious about the ore left in the now-vacant properties.

Charles Carlson, who had a long history with the district, was prospecting McClellan Mountain in 1898 and found a vein that he named the Santiago. He already possessed a number of claims requiring attention, and therefore offered the unproven formation to fellow prospector William Rogers. With relatively little work, Rogers found the vein to be a bonanza somehow missed during the past decades. Rogers quit his position as superintendent of the Wilcox Tunnel near Idaho Springs to devote his attention to the mine. Reinvesting some of the profit, Rogers quickly developed the Santiago into a noteworthy producer, which caught the attention of regional capitalists.[196]

Jacob Fillius, B.B. Lawrence, Henry Seifried, and C.K. Wolfe were among the first experienced operators to take a serious interest in the Argentine district following the discovery. They bought the Stevens Mine from the British-based Mount McClellan Mining Company, Ltd, when the firm lost confidence in the property in 1899. Fillius and partners understood how to profit from low-grade ore and organized the Stevens Mining & Milling Company. When Henneage Griffin departed along with the British firm, Fillius hired Jacob H. Robeson as manager, and he had experience as superintendent of the Pelican-Dives. Under Robeson, a small workforce extracted enough low-grade ore to pay for operating costs.[197]

Edward J. Wilcox and R.C. Vidler, two wealthy mine operators in the eastern drainage, were the next individuals of means to take an interest in the Argentine district. Edward J. Wilcox was president and manager of the Miami Mining & Tunneling Company, which employed Rogers as superintendent of the Wilcox Tunnel. When Rogers quit, he told Wilcox about the Santiago, and Wilcox may have passed word on to Vidler. The Santiago and the sale of the Stevens Mine convinced Vidler and Wilcox of the potential offered by the Argentine district, and they began buying claims.

Wilcox was the first to formalize a strategy for the Argentine district. Convinced that ore still lay underneath McClellan Mountain, he organized the Waldorf Mining & Milling Company in 1901 and purchased the Huckleberry, Independence, Wheeling, and undeveloped property on the eastern side. Wilcox then purchased the Stevens Mine at a high price from Fillius and partners to secure the mountain's western side. Wilcox then commissioned the Wilcox Tunnel, also known as the Argentine, and drove it from the old townsite northwest toward the Santiago. Miners struck the Paymaster Vein in 1902, confirming Wilcox's suspicions that economic grades of ore still existed at depth. Wilcox also kept the Stevens in production for immediate income and erected a new mill there in 1903.[198]

While Wilcox's miners were at work, Vidler began the Vidler Tunnel, his third such venture in the county. Because Vidler's project was not well-founded on known ore reserves, he had difficulty securing investors. To appeal to a broad audience, Vidler billed the project as a combination railroad and development tunnel through the Continental Divide. He claimed that a railroad tunnel would be profitable in itself, and his specific location had the added benefit of penetrating ore formations. By 1902, he organized the Transcontinental Transportation & Mining Company and began work. The site was near Wilcox's operation, and the tunnel was supposed to pass directly underneath Argentine Pass and open into Peru Creek, Summit County.[199]

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[196] *Georgetown Courier* 2/26/27 p1 c6.

[197] Ellis and Ellis, 1983:112.

[198] "Mining News" *Mining Reporter* 5/16/01 p325; "Mining News" *Mining Reporter* 11/7/01 p368; "Mining News" *Mining Reporter* 6/19/02 p582; "Mining News" *Mining Reporter* 11/5/03 p442.

[199] "Mining News" *Mining Reporter* 6/19/02 p582; "Mining News" *Mining Reporter* 9/17/03 p265.

Despite the Argentine revival and widespread investment and improvement projects, metals production declined significantly in the western drainage after the late 1890s surge. The annual yield fell from $842,000 in silver and $220,000 worth of lead in 1900 to $422,000 in silver and $154,000 in lead by 1905. Within the span of five years, the western drainage saw its income halved. The reduction would have been even greater were it not for the improvement projects and recovery of greater amounts of zinc. Up to 1902, mining companies gave little thought to zinc as a profitable metal. Its market was limited; many companies considered zinc a nuisance that interfered with ore treatment and had trouble separating the metal out. But by 1901, a strong market materialized as manufacturers found zinc useful in a variety of applications. At the same time, metallurgists figured out how to recover zinc from simple ores and began developing machinery to do likewise with complex payrock. In the Griffith district, much of the zinc was simple and easy to recover, and because of this, mining companies began producing small amounts as byproducts of lead production. Encouraged by the new market, supported with better technology, and pushed by waning ore reserves, the mining industry began a concerted effort in 1902. The following year saw the region's first significant output of $35,000, which nearly doubled by 1905. After 1905, zinc became a highly important addition to the portfolio of economic metals in the western drainage.[200]

The mining companies in the western drainage responded in two ways to dwindling silver and lead reserves and zinc as a partial alternative. On one hand, many companies leased out their properties or cut costs such as maintenance, improvements, and development. The physical well-being of the mines suffered as a result, and underground workings decayed to the point of no longer being viable. Well-financed companies, on the other hand, either improved their existing mills or built facilities anew to recover zinc, as well as silver and lead more efficiently.

In 1906, the Aliunda Consolidated Mining Company and the Griffith Mines Company erected new mills at Georgetown, and the Lynn Consolidated Mining Company and Anglo-Saxon Mining & Development Company improved their mills. Although B.F. Kelly was long gone, his tunnel was a surprising success and penetrated enough ore veins to support another new mill, erected by the Democrat Mountain Mining & Milling Company. William Rogers built the fourth new mill at Georgetown for his Santiago Mine in 1905. In Silver Plume, the Scotia Mines Company built the Scotia Mill and treated ore from the Antelope Tunnel, and the Jewel Mining, Milling & Leasing Company began its new mill on payrock from the Frostburg and other Sherman Mountain mines. The owners of the Ward Mill refitted their Silver Plume plant with the second cyanidation process in the western drainage.[201]

The Argentine district continued to defy the decline in the rest of the western drainage. The district was home to four significant operations, as well as a number of small ventures. The East Argentine Tunnel Company imitated Wilcox, purchased several formerly productive mines on McClellan Mountain in 1905, and started a tunnel to undercut them at depth. Miners struck a substantial vein in the Vidler Tunnel and erected a mill in 1906.[202]

William Roger's Santiago Consolidated Mining, Milling & Tunnel Company and Edward Wilcox's Waldorf Mining & Milling Company were by far the most productive in the district, and they anchored several of the largest development projects in the western drainage in years. Shortly after Wilcox organized the Waldorf Company, he and Rogers coordinated their operations. Wilcox hired Rogers as superintendent, and Rogers continued pushing the Wilcox Tunnel and amassing property in the central portion of the district on behalf of the company.

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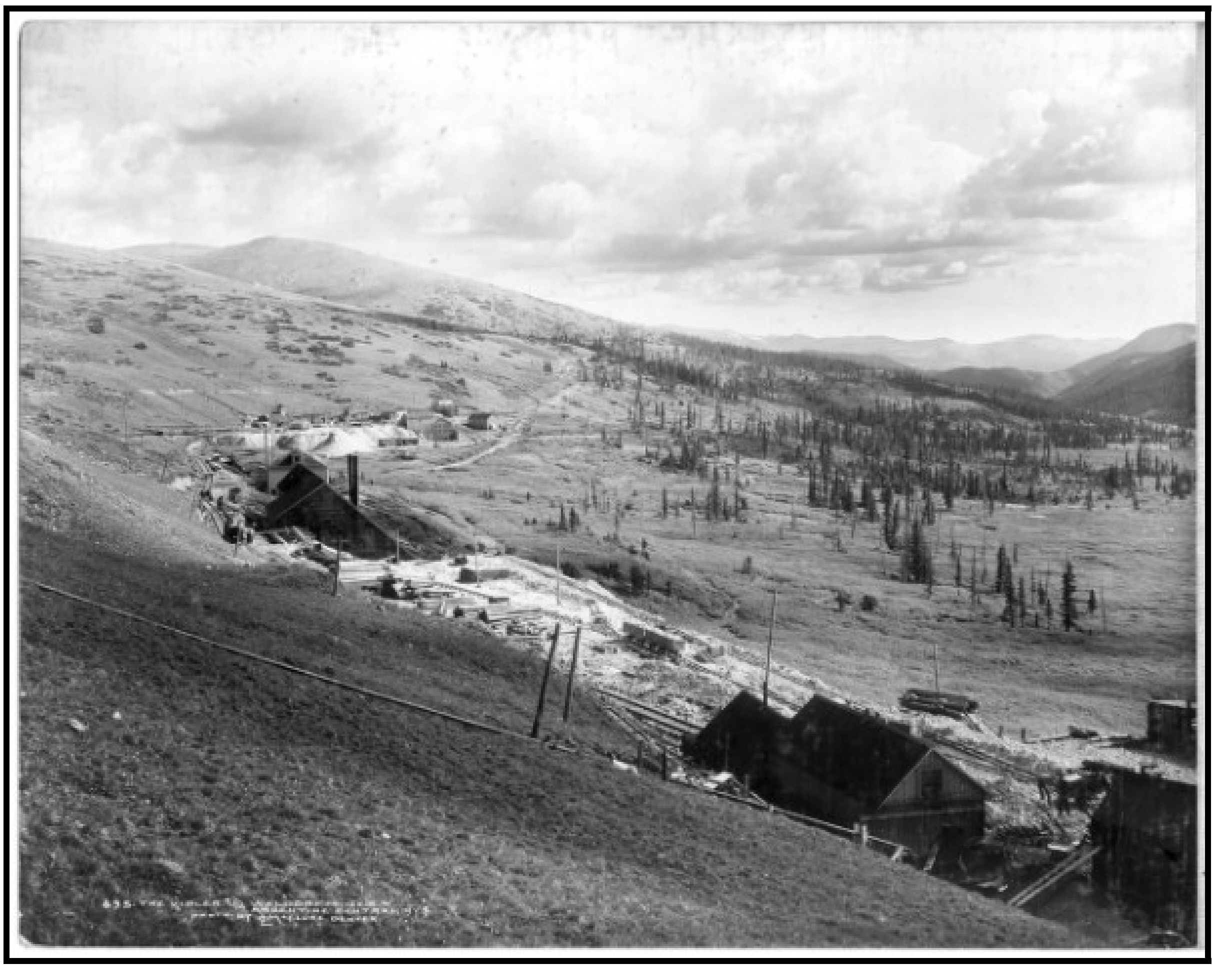
[200] Henderson, 1926:109.

[201] *Georgetown Courier* 1/13/06; *Georgetown Courier* 4/4/31 p1 c6; *Mineral Resources*, 1906:211; "Mining News" *Mining Reporter* 9/28/05 p320; "Mining News" *Mining Reporter* 7/26/06 p93; "Mining News" *Mining Reporter* 11/22/06 p525; "Mining News" *Mining Reporter* 12/6/06 p577; "Mining News" *Mining Reporter* 3/21/07 p276.

[202] *Mineral Resources*, 1905:197; "Mining News" *Mining Reporter* 11/15/06 p501.

Wilcox designed the tunnel to undercut the Santiago at depth, which Rogers otherwise may not have been able to afford.

The relationship culminated in 1905 when Wilcox began grading the Argentine Central Railroad into the district from Silver Plume. Wilcox built the railroad to fulfill two purposes. The most important was lowering the Waldorf Company's operating costs by hauling in freight and exporting ore at rates far below wagon drayage. The other purpose was to provide a like service for the rest of the district, charge shipping fees, and recover some of the construction costs. Rogers also saw the railroad benefitting the Santiago, so he supported Wilcox and probably fronted some of the money. Wilcox aggressively pushed construction through the freezing winter of 1905 and completed the line in 1906. The Argentine Central was the first railroad built in Clear Creek County in more than 20 years and also one of the highest in the nation (see Section E on railroads for a full history).



In the northeast overview, the Vidler Tunnel complex is in the foreground and Wilcox Tunnel and settlement of Waldorf is in the left background. Both were important operations in the Argentine Mining District, which enjoyed its first significant revival since the 1880s. Waldorf was center of Edward Wilcox's mining empire, including the Wilcox Tunnel and mill, Argentine Central Railroad terminus, and a tourist hotel. The abandoned townsite of Argentine was on the valley floor at far right, and Georgetown lay over the ridge beyond. Courtesy of Denver Public Library, MCC-695.

The railroad was one of several projects that Wilcox and Rogers undertook together. Another was a new concentration mill that Wilcox erected at the tunnel in 1905. As with the railroad, Wilcox intended for the mill to serve the Waldorf Company first, but he relied heavily on ore from the Santiago as well. To provide a constant flow, Rogers erected an aerial tramway between the Santiago and the mill. The camp at the tunnel grew due to the railroad, mill, and a heavy tourist trade. Wilcox actively solicited tourists to ride the Argentine Central and built a hotel and restaurant at the camp. Wilcox named the camp after himself, and in 1906, the Postal Service granted a post office under the alternative name of Waldorf.[203]

Although production in the western drainage declined significantly during the first years of the 1900s, the region seemed to enter a period of a low-level stability. In 1907, however, general economic cycles and the result of four decades of ore extraction fouled the climate for mining. A national recession struck toward the end of 1907, pushing the western drainage into its first sustained depression. Production for the year slipped to $342,000 in silver and $148,000 for lead. The industry, however, recovered a record $164,000 in zinc, partially offsetting the decline. As the recession manifested fully in 1908, metals prices ebbed until silver averaged a lowly $.56 per ounce, the worst value since the 1893 Silver Crash. At the same time, many mining companies exhausted their profitable grades of ore and closed, and the rest had to extract payrock from greater depths, which was more expensive than before. As a result, production fell in 1908 to $267,000 in silver, $85,000 for lead, and $39,000 worth of zinc, and hovered near these levels for years. The industry contracted around the large companies that had both sufficient ore reserves, and the infrastructure necessary to produce in economies of scale.[204]

The recession exacerbated the affect that the declining mining industry was already exerting on the communities. The pattern was similar to that of the Silver Crash. As companies closed their mines or scaled back operations, the demand for labor, supplies, and services shrank. Discharged workers and insolvent businesses then had to leave for opportunities elsewhere. Approximately 30 percent of the population left the western drainage between 1900 and 1910, and mostly after 1907. A total of 1,413 people lived in and around Georgetown and 775 about Silver Plume in 1900. By 1910, 950 people stayed in Georgetown and 460 in Silver Plume. The hamlet of Silver Dale, a bedroom community for the Leavenworth Mountain mines, was nearly abandoned by 1907, and only ten families remained afterward. The western drainage slipped into its first deep and prolonged depression, which lasted for years. Although the mining industry was dear to those residents who remained in the western drainage after 1907, it lost its greater importance.[205]

The general recession of 1907 changed the economic equation on which the Argentine revival was based. Vidler suspended his tunnel, and Wilcox's small empire collapsed under the weight of debt. The Wilcox mill was unable to treat the complex Santiago ore, requiring Rogers to ship the payrock by rail to a mill that he leased in Georgetown. The loss of revenue from Rogers only pushed Wilcox further into debt. Wilcox retained some of the small mines and the railroad because of its heavy tourism patronage, but he sold the Waldorf Company to British investors, who organized the Waldorf Metal Company. Only several years earlier, a separate group of British offered Wilcox $3.5 million for the company and railroad, and Wilcox thought the price too low and refused. Even without the Waldorf Company, the railroad alone kept him

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[203] Bauer, et al., 1990:148; *Mineral Resources*, 1905:197; "Mining News" *Mining Reporter* 1/25/06 p92; "Mining News" *Mining Reporter* 11/15/06 p501.
[204] Saxon, 1959:7, 8, 14, 16; Henderson, 1926:216.
[205] *History of Clear Creek County*, 1986:46; Schulz, 1976:1910-10.

heavily in debt, so Wilcox sold that as well in 1909. The British firm failed in 1908, and the Waldorf property reverted to Wilcox, but it sat idle because he had no operating capital.[206]

By 1905, when the Centennial Mill was photographed at Georgetown, western Clear Creek drainage already experienced approximately 40 years of continuous production. The rich silver ore was nearly exhausted, and mining companies built new, efficient mills in an attempt to render the remaining low-grade material profitable. Reflecting changing conditions and gradual decline of the industry, the Centennial plant was built over the ruins of an earlier mill. Courtesy of Denver Public Library, X-61590.

<u>The World War I Revival in the Western Drainage, 1915-1920</u>

The western drainage was in a depressed state from 1908 through 1914. Depending the year, the industry consisted of between 11 and 16 principal mines, and they generated no more than $300,000 per year. Georgetown had only a single, consistent mine to rely on. The Capital Mining Company reopened the Colorado Central in 1910 after it was idle for several years and maintained a steady but limited output. Otherwise, groups of lessees worked various properties around Georgetown, opening some and closing others, and extracting ore as they encountered it. Silver Plume was in a similar state. Groups of lessees continued to glean low-grade ore from the

206 Abbott, 1977:73; *Mineral Resources*, 1907:249.

depths of the old, reliable properties on a regular basis, but their production was minor. Reflecting how bad off Silver Plume was, the Dives-Pelican & Seven-Thirty Mining Company, the only organization of substance, went bankrupt in 1912.

Those individuals remaining in the western drainage during the early 1910s may have entertained optimism that political unrest in Europe might revive the moribund mining industry. When World War I began in 1914, manufacturing industries mobilized at first in Europe and then in the United States to meet a heavy wartime demand. As the war progressed and devastated Europe's economy, governments there sought financial stability in silver. On a statewide level, the greater mining industry saw the value of industrial metals and silver slowly rise during the first years of the war and then shoot upward as the war dragged on. Silver ascended from an abysmal \$.54 per ounce to \$.73 and continued upward to \$.84 in 1916, a price not seen since the Silver Crash of 1893. Lead and zinc, which never fetched high values, almost doubled. Around 1910, zinc was valued at \$.05 per pound and leaped to \$.08 by 1917, while lead doubled from \$.04 to \$.08 per pound. Ores that were profitable by 1910 standards became almost the stuff of bonanza, and impoverished ore, still in plentitude underground, was at last profitable.[207]

The improved conditions ushered in a sudden surge of activity across Colorado. Silver mining districts, many in states of depression similar to western Clear Creek, revived and returned to prosperity. But the movement had a limited effect in the western drainage due to the well-worn problem of waning ore reserves. The few mining outfits still in business did the best they could with several sources of ore rendered profitable by the World War I price rise. A few properties still featured disbursed stringers of midgrade payrock. These were limited in size, difficult to work, and extracted in minor lots by pairs of lessees. Many formerly productive mines had larger bodies of inferior ore left by past operators, and these were suited for company operations. Past operators also poured previously unprofitable grades of ore into underground stopes as fill or as waste rock on the surface. Known as mixed waste, the material became an important form of ore because it was plentiful and already fragmented into cobbles.

Mining companies and lessees produced all the above types of ore, contributing to a significant rise in annual output. In 1914, 15 principal mines generated \$191,000 in silver, \$95,000 for lead, and \$54,000 worth of zinc. In 1917, the figures climbed to a peak of 22 principal mines, \$434,000 in silver, \$416,000 for lead, and \$322,000 worth of zinc.[208]

Activity was divided almost evenly between Georgetown and Silver Plume. The Onondago Mining Company was Georgetown's largest operation. Its workers extracted ore from the Capital Tunnel and sorted through the waste rock dump at the Colorado Central Mine for low-grade ore. The company produced so much ore that it treated some in Georgetown and shipped overflow to another mill at Idaho Springs. The Capital Mining Company worked nearby and ran its concentration mill part-time. The Colorado Mining Company also relied on Leavenworth Mountain waste rock dumps for low-grade ore. Workers dug through dumps at the Equator, Marshall, and Ocean Wave tunnels and recovered so much material that the company erected a new mill nearby. The metallurgist installed flotation process equipment, which was state of the art for separating silver and industrial metals from inferior ore.[209]

The Wasatch-Colorado Mining Company was Silver Plume's largest operation and accounted for a significant proportion of the region's production. Distant investors organized the firm in 1916 to consolidate the central portion of the Silver Plume area, and started with the Mendota and Frostberg mines. The company also acquired the Graham Mill because it not only

[207] Henderson, 1926:216; King, 1977:183; Saxon, 1959:7-17.
[208] Henderson, 1926:109; *Mineral Resources*, 1915:442; *Mineral Resources*, 1917:816.
[209] *Mineral Resources*, 1916:351; *Mineral Resources*, 1917:816.

concentrated silver and lead, but also included a separate process for recovering zinc. In 1917, the directors achieved their goal by either leasing or buying the Diamond Tunnel, Pelican-Dives, Mammoth, Phoenix, and Seven-Thirty properties. In so doing, the Wasatch-Colorado company assumed the role of Silver Plume's economic cornerstone.[210]

Leasing companies reopened the principal mines in the Argentine district, contributing heavily to the western drainage's World War I output. Louise M. Rogers, wife of William Rogers, ran the most important operation. She leased the Santiago from its owners in 1915 under the old firm of Santiago Consolidated Mining & Tunnel Company. William Rogers may have died or been incapacitated, and Louise personally managed the operation. At first, she shipped the ore by rail to a mill in Silver Plume. By 1917, another party leased the Wilcox Tunnel, refitted the mill at Waldorf with flotation, and accepted ore from Louise. The Argentine mines yielded $112,000 in 1916 and nearly as much the following year.[211]

The World War I revival was short-lived in the western drainage, and even though high metals prices provided an incentive, production declined one last time. By the end of 1917, one mining outfit after another exhausted the last of its low-grade ore and suspended operations. In 1918, only ten principal mines remained open, and they produced $371,000 in silver, $275,000 of lead, and $165,000 worth of zinc. Armistice at the end of 1918 only worsened economic conditions for the industry, and, although the value of silver remained high, the demand for industrial metals fell as arms manufacturing slowed. In response, the western drainage yielded $400,000 in silver, but only $80,000 in lead, and $44,000 worth of zinc during 1919. And then, a postwar economic depression pushed the mining industry into ruin in 1920, and production collapsed to a fraction of the 1919 figures.[212]

Mining in the western drainage never recovered, but as long as the underground workings offered ore even if in minor pockets, some activity continued. Although mining was important to those people who stayed in the region after 1920, the industry was no longer a viable entity of greater significance. Between 1873 and 1893, the industry regularly produced more than $1.5 million in silver, lead, and zinc per year. The output then gradually fell, and from 1921 until the late 1960s when nearly all activity ended, production rarely exceeded $200,000. Despite the dissipation of one of Colorado's most important mining industries, the culture and tradition remained intact for much of this time. Elements of the industry, its people, and time and place are still clearly evident in the western drainage today.

Great Depression Revival in the Eastern Drainage, 1930-1942

Eastern Clear Creek drainage passed through the decade of the 1920s in a condition similar to the western drainage. In 1918, the mining industry collapsed and became unable to employ a substantial workforce or support the area's communities. From 1920 through 1929, only a handful of mines produced less than $120,000 per year. The eastern drainage was in a deep depression that forced many people to leave, and those who stayed endured poverty and sought income from sources outside of mining. The economy depended on tourism, the Colorado & Southern Railroad, and automobile traffic over Berthoud and Loveland passes, as much as mining.

In 1929, the nation joined Clear Creek drainage in its state of depression. The national economy at first destabilized, and financial experts thought that market sectors were merely

[210] *Mineral Resources*, 1916:351; *Mineral Resources*, 1917:816.
[211] *Mineral Resources*, 1916:350; *Mineral Resources*, 1917:815.
[212] Henderson, 1926:109.

undergoing short-term adjustments. But as bank security and stock values continued to slide downward, the experts revised their opinions and forecasted a recession similar in scale to the one of 1907. Between September and November, however, a financial panic pushed the nation into the Great Depression. All aspects of business and commerce imploded, tens of thousands were thrown out of work, capital necessary for industry evaporated, and many goods and services were curtailed or became unavailable.

Under President Herbert Hoover, the nation's economic climate worsened, bringing mining and other forms of industry to a standstill. The prices for silver and industrial metals dropped to their lowest values in decades. After the post-World War I troubles, silver slid to around $.60 per ounce, which was a particularly low price. When the Great Depression struck, however, demand for the metal nearly disappeared, and silver fetched a mere $.29 as a result. At the same time, copper fell from more than $.13 to $.11 per pound, and lead decreased from at least $.06 to $.05 per pound.[213]

The Great Depression was unlike any economic bust that the Clear Creek drainage experienced. Although the drainage was in depression during the 1920s, the rest of the nation was not, and Clear Creek residents could hope for some sort of economic input or stimulus from the outside. The Great Depression destroyed hopes that silver and industrial metals mining would recover, and even undermined the non-mining sources of income. Tourism nearly stopped and demand for freight or passenger service dropped to an all-time low. The Colorado & Southern drastically reduced its schedule and ran trains between Denver and Idaho Springs on Tuesdays and Fridays, and irregularly to Silver Plume.

The eastern drainage still possessed one resource that seemed little affected by the climate of the Depression. Because the federal treasury based the U.S. dollar on a gold standard, the precious metal still fetched $20.70 per ounce, despite the economic collapse. Aware of this, unemployed people, primarily miners and their families, returned to the idle gold producers to eke out a subsistence-level income, forming a cottage industry of sorts. A return to the nearly forgotten labor-intensive practices was a hallmark of the cottage industry movement because most individuals and partnerships were unable to afford machinery. These miners expected only to get by, their needs were very simple, and most individuals were satisfied with several dollars' worth of ore per day. In addition to working underground, subsistence miners favored two other sources of gold that required no investment beyond hand tools. One was old placer mines thought to be exhausted in the past. The Depression-era subsistence miners found that the original placer outfits were sloppy and left just enough gold dust to provide an income. The other favored source of gold was low-grade ore that past operators cast off as waste rock at shafts and tunnels.

Cottage industry mining became a movement in the eastern drainage beginning in 1930. Although the subsistence operations were primitive, they were a vital source of income in the climate of the Depression. Individuals, partnerships, and families generated $112,000 in gold cumulatively, more than most years since 1922. The gold also interested investors. One group reopened the West Gold Mine and refitted the associated mill with cyanidation to treat low-grade ore. Another party was aware of the leftover placer gold and planned a large operation to work Clear Creek in economies of scale. They leased several miles of streambed from William Renshaw in 1932 and apparently recovered gold. But because relatively few investors had capital to spare, most mining was subsistence from 1930 through 1932.

When Franklin Delano Roosevelt was elected president in 1932, he instituted policy changes that made mining more attractive to investors than before. Roosevelt and advisors developed a plan to simultaneously devalue the dollar while stimulating metals mining on a

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213 *Minerals Yearbook*, 1937:115; Saxon, 1959:7-9, 14-17.

broad scale. The Federal Reserve took the dollar off the gold standard in 1933 and then bought gold at inflated prices. The plan worked well. The value of the dollar fell and gold mining began to revive as expected, proven by an increase in the volume of gold that flowed into the treasury. Satisfied with the test, Roosevelt signed into law the 1934 Gold Reserve and Silver Purchase acts. The Gold Reserve Act raised the minimum price of gold from around $20.67 to $35 per ounce, and the Silver Purchase Act raised the value of silver from around $.40 to $.70 per ounce.[214]

Roosevelt's plan combined with widespread destitution, lack of employment, and a raft of government programs stimulated a Depression-era revival of mining across the West. In eastern Clear Creek County, experienced miners returned to properties that they thought may still possess low-grade ore, and unemployed laborers formed a workforce necessary for their mining operations. Adding to the growing interest in mining, improvements in ore treatment rendered previously uneconomical ores profitable to produce.

Overall, the revival in the eastern drainage was minor compared to activity of past decades, but the region witnessed a return to the old mines on a scale not seen since the mid-1910s. Investors began directing their financial resources into the region as early as 1933. They reopened many of the former producers, rehabilitated the underground workings, and completed surface improvements. In some cases, experienced managers and engineers oversaw the work to professional standards. Mostly, though, mining outfits did the best they could within severe financial constraints. They reused materials and machinery, erected poorly built structures, and conserved capital and supplies. Regardless, the results were tangible and immediate. In 1934, annual gold production returned to levels high enough to directly support local communities, and even contribute to the state's economy. At least 100 hardrock operations and 80 placer mines generated $416,000 in 1934 and $573,000 the following year. Some of the hardrock operations were well-funded and formally engineered, although none were as grand as the Sun & Moon and similar mines of the early 1900s.[215]

Gold, and the jobs created by the mining companies, drew the first wave of immigrants that Clear Creek County saw in decades. The immigrants were mostly unemployed from the Denver area, the plains Dust Bowl, and impoverished mountain towns with no economic bases. A few of the immigrants were investors or speculators willing to risk capital on gold ventures. The population for the county increased approximately 80 percent from 2,155 people at the end of the 1920s to 3,784 by the late 1930s.[216]

The eastern drainage featured approximately twenty substantial mines mostly concentrated around Idaho Springs and Empire. Clyde M. Lyon, among the immigrant capitalists, organized one of the flagship companies. Lyon was born in Iowa in 1882, attended a business school in Des Moines when a young man, and went to work for a newspaper when he graduated. In 1905, Lyon married Janette Evans, and they homesteaded a claim in South Dakota. Probably because pioneering was a difficult and uncertain life, the family returned to Iowa and opened a mercantile. Still interested in the west, Lyon brought the family to Montana and raised cattle, did well, and moved to Fort Collins in 1923. He became involved in the local oil industry, invested in Texas oil as well, and expanded into mining.[217]

In 1933, Lyon and Denver investor A. Downs organized the Alma Lincoln Mining Company and purchased the Elliott & Barber, Josephine, and Lincoln Mine and Mill. The well-developed but idle properties were a ready-made operation on the south side of Clear Creek

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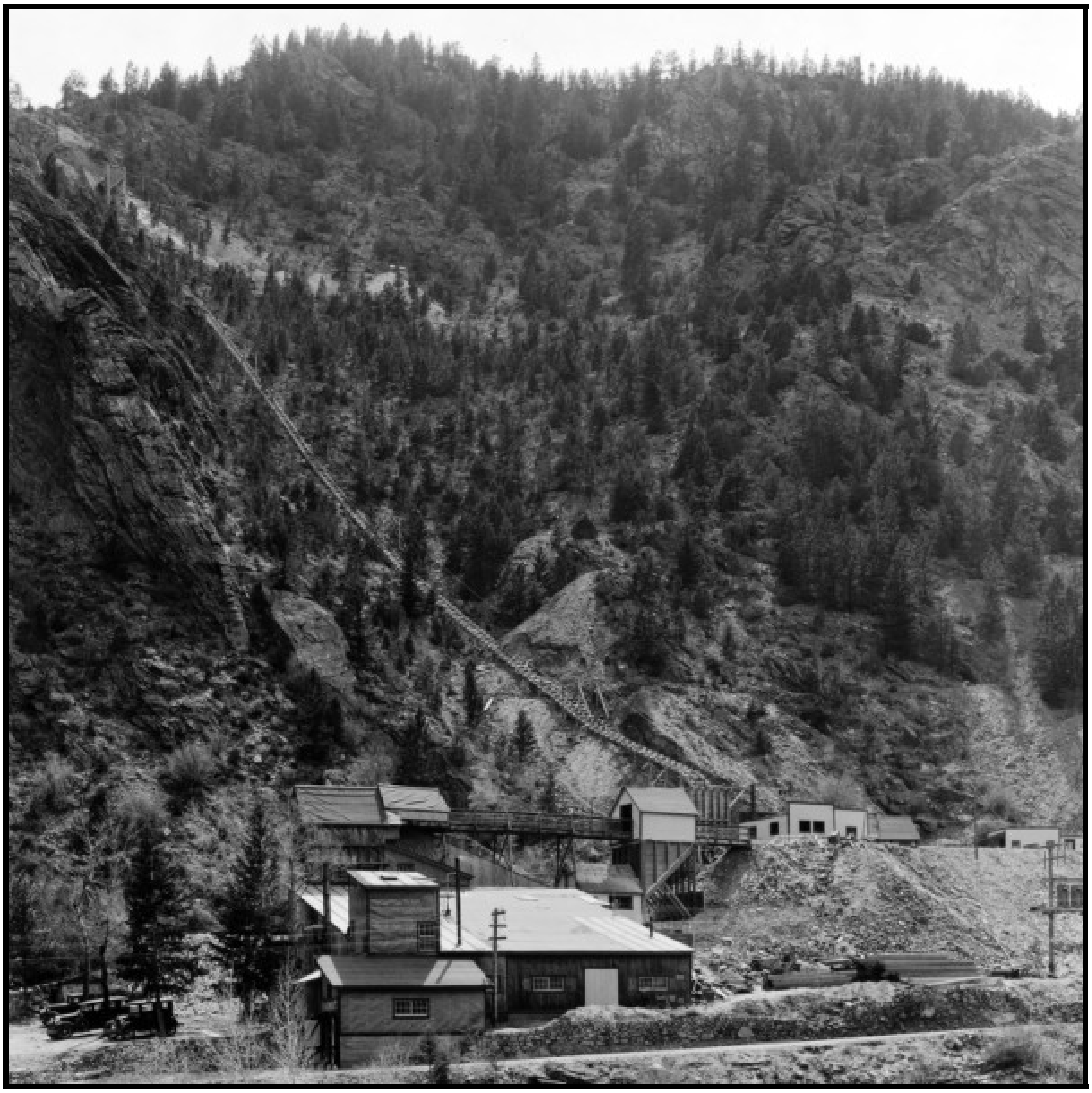
[214] McElvaine, 1993:164; Saxon, 1959:7, 8, 12, 14, 16.
[215] *Minerals Yearbook*, 1935:200; *Minerals Yearbook*, 1936:247.
[216] Schulz, 1976:1940-10.
[217] *History of Clear Creek County*, 1986:338.

between Idaho Springs and Spanish Bar. Within the year, Lyon and Downs refitted the mill, hired a considerable workforce, and began mining 50 tons of ore per day. The daily tonnage, as much as any large company during the era of peak production, defined the Alma Lincoln Company as most important producer in the eastern drainage. Lyon moved from Fort Collins to Idaho Springs to personally manage operations, and the company maintained its status for much of the 1930s.[218]



The Alma Lincoln Mine, visible today on the south side of I-70 west of Idaho Springs, was a cornerstone of the Great Depression-era revival in eastern Clear Creek drainage. The mine and others like it provided employment, economic contributions, and a sense of wellbeing for the region during an important time of need. Most of the buildings in the photo, including mill at center, still stand intact. Courtesy of Denver Public Library, X-61670.

[218] Colorado Mine Inspectors' Reports, Clear Creek: Alma; *Minerals Yearbook*, 1934:174.

The Mattie Mine was another principal producer and employer near Idaho Springs. During the era of peak production, the Mattie was a well-developed and notable mine on Chicago Creek. R.R. Mitchell and his father R.L. bought the property at a bargain price in 1922 after mining collapsed and worked it several times on a minor scale during the 1920s. In 1933, they reorganized the firm as Mattie Consolidated Mines, Inc., for additional capital; modernized the Mattie Mill; and produced heavily until 1935. Afterward, the Mitchells leased the property out to other parties and accepted custom business in the mill.[219]

The owners of the Big Five Tunnel reopened their costly bore in 1933 to lessees interested in the gold veins underneath Bellevue Mountain. William Daniels' Big Five Company drove the tunnel during the early 1900s, produced heavily for several years, stalled, and then went bankrupt in 1924. The remaining directors reorganized the outfit as the North American Mining Company but did little with the Big Five Tunnel, now known as the North American, because only low-grade ore was left underground. The Engineers Mining Company found the ore economical to extract in the positive climate of 1933, signed a lease, and profited through most of the decade.[220]

Roosevelt's Gold Reserve Act of 1934 created sound conditions that gave rise to several particularly important mining ventures. Joseph P. Ruth was the principal behind the Denver-based Ruth Company, a construction firm he organized during the 1910s to build surface plants and mills for mines. Ruth also invented some of his own milling apparatuses, including the Ruth Rod Mill for fine ore crushing. He acquired the Golden Edge Mine on north Seaton Mountain possibly through a lien during the 1910s and worked it primarily from the bottom up through the Newhouse Tunnel for several years. The ore declined in grade, the operation became too costly within a few years, and Ruth suspended work. But when the ore became profitable in 1934, Ruth reopened the mine in a new production and treatment operation. He rehabilitated the underground workings through the Newhouse Tunnel, by now known as the Argo, and began building the efficient Ruth Mill with appliances of his own design. Although the mine produced heavily and provided jobs through much of the 1930s, the mill may have been more important. Finished in 1935, it was the first erected in Idaho Springs in years and increased the area's overall ore treatment capacity. Through this role, the mill helped foster the independent outfits making up the bulk of the mining industry.[221]

The Argo Mill, at the mouth of the Argo Tunnel, served a similar function, but on a much larger scale. The mill was originally the Newton but heavily modified by the 1930s. Horace W. Bennett leased the mill through his King Kong Mines Company, organized in 1934 as one of the largest operations in the entire county. Initially, Bennett and several Denver investors leased the Black Eagle, P.T., and Specie Payment mines, and bought the Bismarck Mine through their Bismarck Mines, Inc. In need of a mill to concentrate high volumes of ore, they leased the Argo, which was idle, and consolidated their interests under King Kong. Within the year, the group decided to use the Argo Mill as a foundation for a greater ore treatment business. Bennett and partners obtained a lease for the Newhouse Tunnel, already used by independent outfits such as the Ruth Company to access the bottom of Seaton Mountain. King Kong Mines then charged royalties for use of the tunnel and easily convinced the outfits to send their ore to the Argo Mill for an additional fee. The Argo Mill then became another custom plant, which local mining outfits desperately needed as demonstrated by the Ruth Company's business. Bennett did not limit the royalty and milling strategy to the outfits within Seaton Mountain. He and partners invested heavily in rehabilitating the tunnel for its intended purpose as a haulageway for the

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219 Colorado Mine Inspectors' Reports, Clear Creek: Mattie; *Minerals Yearbook*, 1934:174.
220 *Minerals Yearbook*, 1934:174.
221 Colorado Mine Inspectors' Reports, Clear Creek: Golden Edge; *Georgetown Courier* 8/4/34 p1 c2; *Minerals Yearbook*, 1936:254.

mines west of Central City. Bennett convinced the Central City operators to resume production from the depths of that district, and they began sending trains of ore through the tunnel to the Argo Mill. The tunnel and mill were a focal point of activity and contributed heavily to the economic and emotional well-being of Idaho Springs during the decade.[222]

Bennett, in advanced age, typified the strata of Denver-based investors who were financially equipped to support large operations during the Depression. Bennett was born in Michigan in 1862, became involved in a Detroit mercantile at age 18, and lived frugally. After several years, Bennett moved to Milford and acquired an interest in a store there. He sold in 1884 and came to Denver, where he used some of his capital to speculate on real estate. Successful, Bennett reinvested in more real estate until he attained the status of baron and developer. The gold boom at Cripple Creek drew Bennett into mining speculation, and he organized the Bennett & Meyers Investment Company and the Bi-Metallic Investment Company. Both firms netted a small fortune, which Bennett leveraged into greater ventures such as the Denver Tramway Company, South Broadway National Bank, and Home Public Market Company. Although the Great Depression reduced his net worth, Bennett retained sufficient capital to lease several significant but idle mines in Park and Clear Creek counties. Large mines required capital to reopen, and once refurbished, they offered the potential to repay the initial cost and provide profits.[223]

The Depression-era revival around Idaho Springs reached a peak during the latter half of the 1930s. Interest in gold remained high, and the success of Lyon, Ruth, Bennett, and other operators convinced investors to try their fortune. Several vital service organizations contributed support to the revival, aware that a sound mining industry would provide them with more business. In 1935, William Freeman, district manager for the Public Service Company, announced a 25 percent reduction in power rates to foster mining. The Colorado & Southern Railroad increased traffic to Idaho Springs and hauled greater tonnages of mill concentrates to smelters in Denver and Colorado Springs.[224]

Although the railroad benefitted the mining industry, it also gave the operators reason for insecurity. In 1936, the railroad petitioned the Interstate Commerce Commission (ICC) to abandon its entire mountain system on grounds that the financial losses were too great. The Clear Creek mine operators understood that their industry depended on rail service, even if on a reduced schedule. They joined compatriots in Gilpin County and rose up with a loud and unanimous voice of protest. They argued that the industry was undergoing a measureable revival and needed the railroad for viability. Convinced, the commissioners postponed further hearings and required the Colorado & Southern to maintain service and find cost savings elsewhere.

Despite this insecurity, new ventures leased old mines and erected a few more mills. The Consolidated Smelting & Metals Company leased the Black Eagle and Bismarck mines from Bennett, erected a new flotation mill on Chicago Creek, and linked the plant and mines with an aerial tramway. The company then produced heavily beginning in 1936. Gold Mines Consolidated, Inc. rehabilitated the Dona Juanita Mine and Gustafson Mill, and did well. In 1940, S.S. Huntington leased the Specie Payment, Diamond Joe, Freighter's Friend, and Brighton mines, and trucked the ore to the Black Eagle Mill. Lyon organized the Silver Spruce Gold Mining Company in 1939, erected another mill, and leased the Niagara Mine as a source of ore. Because of the above operations and many small outfits, Idaho Springs maintained title as the most important town in Clear Creek County during the 1930s.[225]

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[222] Colorado Mine Inspectors' Reports, Clear Creek: Argo, Bismark; *Minerals Yearbook*, 1936:254.

[223] Baker, 1927:82; Norman, 1932:28; *Who's Who*, 1938:215.

[224] *Georgetown Courier* 3/9/35 p1 c2.

[225] *History of Clear Creek County*, 1986:338; *Minerals Yearbook*, 1937:320; *Minerals Yearbook*, 1940:295; *Minerals Yearbook*, 1941:301.

Empire followed a similar course of revival as Idaho Springs. Local interests reopened several of the principal mines in 1933, and their success inspired confidence among organized ventures during the following years. As was common during the Depression, subsistence-level outfits proliferated and were important to the local economy on a cumulative basis. Empire had a population that was large enough to support a full business district and a new school in 1939. Entrepreneurs opened several additional businesses to meet the demands of the mining industry. Robert Yonker ran a sawmill, someone else established a building supply yard, and Tulley Trucking hauled ore from the mines to the various mills in the eastern drainage. Empire also had several gas stations and hotels both for the mining industry and traffic over Berthoud Pass.[226]

At first, lessees reopened four of Empire's principal mines. Small parties worked the Mint and Gold Dirt, and local interests brought the Golden Eagle into production and treated the ore in a mill in town. The Conqueror, however, was the most important. In 1933, the Viking Gold Mines Company leased both the mine and mill and hired Albert Hanson as manager. He was superintendent of the Bellevue-Hudson at Dumont in previous years and used his experience to restore the Conqueror back into full production. Viking then drew the Tenth Legion into the lease and produced consistently through 1939.[227]

The Gold Dirt Mining & Ore Reduction Company was another regular gold producer and also provided custom treatment for independent outfits. Frank Kistler organized the company in 1934, and he was a distant investor who made a fortune in the Texas oil fields. Kistler started with the Gold Dirt Mine, and when this proved successful, added the Tenth Legion and Dunderberg in 1937.[228]

Empire was home to the Minnesota Mine, one of Clear Creek County's greatest Depression-era gold producers. The operation began in 1934 when the D.A. Odell Mines Company leased the Atlantic, Comet, and Crown Prince mines on Silver Mountain as a group. The company also leased the Gold Dirt Mill near Empire to treat the ore. At the same time, the company reopened the long-idle Minnesota Mine and found a rich gold vein that past operators missed. Miners then traced the vein and found that it traversed several other properties that the company leased. The discovery caused a sensation among local interests, who also searched adjoining properties for extensions of the vein. Odell now not only possessed the low-grade ore reserves originally identified in its mines, but also the new vein. The company increased its workforce to 75 miners, making it one of the largest employers in the drainage. Production quickly overwhelmed the Gold Dirt Mill even though the company ran it day and night, and in response, the company erected a flotation plant north of Empire in 1936. With greater treatment capacity, Odell nearly doubled the workforce and reorganized as Minnesota Mines, Inc., to consolidate assets and include additional investors. Empire had not seen an operation of this scale and intensity in decades and claimed title as the most productive community in the county for several years.[229]

During the latter half of the 1930s, Idaho Springs and Empire were the eastern and western poles of the Depression-era revival, the county's last important period of mining. A succession of three events then created conditions that the mining industry was unable to overcome, bringing the period to a close at the end of 1942. The Colorado & Southern Railroad applied to the ICC again in 1940 to abandon its mountain system. Although Clear Creek County interests protested, they inadvertently gave the ICC reason to decide in favor of the railroad. Mining companies unwilling to wait for triweekly rail service shipped much of their ore and

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[226] *Colorado Business Directory*, 1935:573; Harrison, 1964:450.

[227] Colorado Mine Inspectors' Reports, Clear Creek: Conqueror; *Georgetown Courier* 9/30/33 p1 c3; *Minerals Yearbook*, 1935:215.

[228] Colorado Mine Inspectors' Reports, Clear Creek: Gold Dirt; Harrison, 1964:443; *Minerals Yearbook*, 1938:263.

[229] *Georgetown Courier* 10/20/34 p1 c2; Harrison, 1964:443, 446; *Minerals Yearbook*, 1935:215; *Minerals Yearbook*, 1936:253.

supplies by truck even though more expensive. The railroad successfully demonstrated that its freight income was painfully low as a result and abandoned service in 1940. The mining companies now had no choice but to use trucks, and their operating costs rose.

The United States entry into World War II at the end of 1941 and subsequent War Production Board Ruling L-208 were the final events that ended gold mining as a force in the county. When the United States went to war, the federal government initiated a series of programs to organize and control economic, material, and labor resources as part of its mobilization effort. At first, supplies critical for mining, such as explosives and gasoline, became nearly unavailable in 1942 except through rationing. Mining companies then suffered a lack of labor as workers either joined the armed services or moved into industries vital for the war effort. Unlike general resource allocation programs, War Production Board Ruling L-208 specifically targeted gold mining. The Roosevelt administration, which began the Depression-era revival in 1933 with an increase in the value of gold, abruptly reversed its policy through the ruling. Specifically, the ruling mandated a suspension of gold mining by October of 1942 on grounds that it did not contribute to the war effort and drained resources from the production of strategic metals and minerals.[230]

Loss of the railroad and necessary resources put mining in the entire county under great strain, and Ruling L-208 brought the revival to an end. Without being able to produce gold as a primary metal, one-half of the mining operations in the county, and most in the eastern drainage, suspended work. A few were able to skirt the issue by claiming their intent was the production of industrial metals, and any gold they realized was a byproduct. Such companies merely had to demonstrate that their ore possessed high percentages of industrial metals, and many ores in the county did. But World War II was not a time of recovery for the county as it was for other mining regions in Colorado. The industry regressed into a permanent state of torpor. Between 1942 and 1945, the number of active mines fell from 45 to 23, and gold production decreased in parallel from $634,000 to $31,000. A little silver and industrial metals mining continued during the war, but it was too minor to offset the loss of the gold producers.[231]

Mining in the county never recovered. Although some gold and silver production continued after World War II, the industry was no longer a significant economic force or employer in the county. The small towns such as Empire, Dumont, Lawson, and Silver Plume reverted to populations similar to the local depression of the 1920s. Automobiles allowed residents to move to Idaho Springs, Georgetown, or out of the drainage altogether. Many people with roots in the county preferred to stay, however, and they optimistically worked the old mines on a limited scale into the late 1960s. Most of the activity was underground sampling, minor development, and preparation for a time in the future when the industry would revive again.

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[230] *Minerals Yearbook*, 1942:80; Saxon, 1959:17.
[231] *Minerals Yearbook*, 1942:320; *Minerals Yearbook*, 1945:313.

Section E 3: History of Mining at Frisco and Dillon, Summit County

Introduction

Summit County ranks among Colorado's most important centers of mining. The Blue River drainage was the scene of the first gold rush on the west side of the Continental Divide, and the Montezuma area was one of the earliest silver producers in the central mountains. For a brief time, the Robinson Mining District appeared to be as significant as Leadville. These regions lay in the mineralized portion of the county, well south of the I-70 Mountain Corridor. Almost no mining of importance occurred north of the highway, and the corridor passes through only one area of significance, which was around Dillon and Frisco. At Dillon, mining companies processed gravel deposited by Ten Mile Creek and the Blue River for placer gold. From Frisco south through Ten Mile canyon to the Robinson Mining District, miners developed hardrock veins for silver.

Although a few placer mines might have been in production as early as the 1860s, an industry of note did not exist until the late 1870s. Because the ore deposits were limited and most of the excitement was based on speculation instead of actual production, mining was important for only a short time and ended in 1920. And even then, activity was fitful, inconsistent, and intermittent.

Relative to the rest of Summit County, the industry around Dillon and Frisco was somewhat minor. It was, however, important on a local level. Mining was the foundation for Dillon, Frisco, and Wheeler and anchored the development and permanent settlement of the northern portion of the county. The industry and these towns also served as the customer base of a dedicated electrical grid.

Exploration and Early Development, 1859-1877

The Pikes Peak Gold Rush drew Ruben J. Spalding to the confluence of Cherry Creek and the South Platte River in 1859. When he arrived, he found that the best ground had already been staked and realized that the area had little left to offer. Spalding then accepted an invitation by George E. Spencer to join a party intent on prospecting the mountains, and they traveled west into South Park and encountered other miners already at Tarryall, Fairplay, and Buckskin Joe. In what was becoming a pattern, the party found that the prospectors held the most productive ground there and decided to venture farther afield in hopes of being first to make a new strike.[1]

The party left Fairplay, traveled northwest deeper into the mountains, and descended into the upper Blue River drainage. Spalding found gold in the gravel of the Blue River, and the party erected a few log cabins that became the seed for the town of Breckenridge. During the first part of the summer of 1859, party members tried recovering gold from Blue River gravel, but the results were poor because the metal was too finely disseminated. Had they examined the surrounding gulches, the party members would have found extremely rich deposits that were shallow and easily worked.[2]

When provisions ran low, three individuals went to Denver for supplies and could not help but discuss their Blue River strike with people they encountered. Word began to spread,

[1] Fiester, 1994:16; Stone, 1918, V.1:265.
[2] Fiester, 1994:16; Stone, 1918, V.1:265.

and it was received by an audience readied by a lack of profitable ground in existing gold fields. A few prospectors then made their way into the Blue River drainage, where they began sampling the tributary drainages and struck profitable placer gold. Prospectors began working along the Blue upstream and downstream from Breckenridge and organized the area's first three mining districts.

As winter approached, the prospectors prepared for the season in various ways. Some returned to existing settlements on the more temperate plains, where they naturally shared their experiences and reinforced the stories already circulating. As placer fields elsewhere in the Colorado Territory showed signs of exhaustion and immigrants still arrived, presenting competition for diminishing resources, a substantial number of optimistic and desperate prospectors decided on the upper Blue River drainage as soon as conditions permitted.

The spring thaw of 1860 ushered in a gold rush to the Blue River drainage on a scale that rivaled the rushes to Gregory Gulch, Idaho Springs, and Fairplay. Hundreds of wealth-seekers made their way over Boreas, Hoosier, French, and Georgia passes and took note of the existing workings and extent of land already claimed. Experienced parties turned away from the Blue and began exploring likely gulches while the inexperienced, known as tenderfeet, imitated the movements of those before them. Prospectors of both creeds experienced success almost at once and found placer gold in drainages throughout much of the Blue River valley.

The late-comers, like Spalding at Cherry Creek, found the gold-bearing ground was already claimed and had to search the outlying areas. Although archival sources make little mention, it seems likely that some of these individuals followed the Blue River north to today's Dillon. They may have found a few placer deposits along the Blue River, but because there were no parent gold veins, the deposits were thin and quickly exhausted. Without gold, the prospectors lost interest in the Dillon area and returned south to the upper valley.

Breckenridge boomed through the first half of the 1860s, and mining continued on a reduced level afterward. During the decade, knowledgeable prospectors sought hardrock sources of the placer gold and were somewhat successful. In the eastern and southern reaches of the county, individuals also found veins of silver that were rich enough to justify development, which drew attention and even started a minor rush to Montezuma. With silver now of interest, prospectors considered those portions of the county previously ignored by the placer miners. A few parties examined the Dillon area and found the geology largely unfavorable, except for the Ten Mile Range, on the west side of the valley.

In 1865 or 1866, one group of prospectors discovered a silver vein in the range's north end and claimed it as the Victoria. The vein was rich enough to attract an investor named General Buford, who purchased it in 1866. It remains unknown whether Buford's intentions were honest in the beginning, or if he realized that the ore was too impoverished after limited development. He built a mill to treat the ore, and when it failed, Buford vanished with the company funds. The net effect was twofold. On one hand, Buford demonstrated that the Ten Mile Range had silver veins, but on the other hand, the failure of his outfit fouled the range's reputation and discouraged serious investigation. Thus, the area received little attention from anyone but a few prospectors for years afterward.[3]

Henry A. Recen was among those prospectors who understood the significance of the Victoria and held optimism in the Ten Mile range. In 1871, he erected a cabin at the mouth of Ten Mile Canyon because of its strategic location and used this as a base camp to explore the range, canyon, and general area. Recen was quickly rewarded with the discovery of a silver vein on Mount Royal, on the east side of the canyon mouth and claimed it as the Juno. Although

[3] Gilliland, 1984:17.

Recen was unable to develop the vein due to a lack of funds, the find affirmed his confidence in the area but did little to restore the area's reputation among others.[4]

Recen solicited his brothers Andrew and Daniel as reinforcements in a larger prospecting effort, and in 1876, journeyed to his homeland of Sweden to retrieve them. There, he also married Catherine Matson. The family returned to Recen's cabin, the brothers erected their own, and the residences became the area's first settlement. For the next several years, the brothers developed the Juno and sought additional veins amid the peaks during the warm months, and worked elsewhere when winter set in.[5]

Settlement and the Establishment of Industry, 1878-1885

In 1878, several events came together that made the Recen camp a point of local importance. The first was the discovery of silver at Leadville, which stimulated one of the greatest rushes in the Rocky Mountains. The Recens found that their camp was on one of the most heavily traveled routes to the new mining district. During the late 1860s, several companies completed a wagon road from Georgetown west over Argentine Pass to the Blue River. There, the road met a north-south Avenue connecting Breckenridge with Kemmling. When Leadville began to boom in 1877, a toll company graded a third road from the junction past the Recen camp, south up Ten Mile Creek, and over Fremont Pass to Leadville. Georgetown was the major point of commerce at the eastern end of the road system, and the town became a gateway to Leadville. A high volume of traffic then flowed from Georgetown to Leadville, and it had several impacts on the Blue River and Ten Mile Canyon area. Dillon grew as a way-stop on the Blue River, and the traffic lessened the isolation of Ten Mile Canyon and made the area known to prospectors and investors. Most, however, overlooked the canyon and its resources in favor of Leadville, which commanded attention of the day.

The other important event of 1878 was a product of the Recens' prospecting campaign. During the previous several years, they searched Ten Mile Canyon from its mouth south and up to its head, on the north side of Fremont Pass. Daniel found the Excelsior Vein on the west side of the canyon mouth nearly opposite the Jura. Near the head, Henry discovered the Queen of the West, and Andrew struck the adjoining Enterprise. The brothers also developed the Herculean Bar gold placer on Ten Mile Creek in between. All the hardrock claims proved to be bonanzas, and the brothers sold for handsome sums. They had an easy time with the Queen of the West and the Enterprise because these were prominent properties in the Robinson Mining District, which boomed in 1878. Although the Excelsior was also potentially rich and sold readily, Leadville and the Robinson district drew interest away from Ten Mile Canyon, granting the Recens one last year to find more veins before other prospectors became aware and joined the search. In 1879, the Recens located the Recen and Frisco Belle on the canyon's east side and the Ten-Mile Chief on Chief Mountain, on the west side. Henry then sold the latter two to mining investors local to Breckenridge. The brothers did well for their efforts, disposing of five proven claims, retaining two, and running their small placer mine.[6]

The series of discoveries by the Recens and a location on the road between Georgetown and Leadville provided the material necessary to draw optimistic prospectors and entrepreneurs to Ten Mile Canyon and the Blue River. Henry A. Learned came in 1878 at age 49, joined W.A. Rand to look for silver, but suspended prospecting in favor of organizing the town of Frisco near

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[4] Gilliland, 1984:4.
[5] Gilliland, 1984:5.
[6] *Colorado Mining Directory*, 1883:788, 847; Gilliland, 1984:6.

the Recen camp to compete with Dillon. The partners proposed the idea to Denver investors, who provided money and expertise early in 1879 to formalize the Frisco Town Association and secure a tract of land. Peter Leyner moved from Boulder, provided money to the townsite company, and applied for a post office. Charles F. Shedd was among the earliest entrepreneurs and opened the first mercantile and set up a sawmill to provide lumber. David C. Crowell then erected the Frisco House hotel, and someone else established a saloon. Dillon also continued to grow during 1879 and received a post office.[7]

Because Leadville and the Robinson district commanded attention, mining was slow to develop, and travelers provided most of the business that Frisco's initial entrepreneurs enjoyed. During 1879, the Recens continued work on their Juno and Recen properties, and other outfits developed the Excelsior, Frisco Belle, Mermaid, Mogul, and New York mines into minor producers. The Victoria was also reopened, and the Golden Gate Mining & Milling and the Frisco Discovery & Mining companies began buying claims.

Mining in Ten Mile Canyon finally gained momentum in 1880 and became a small industry the following year. The mines mentioned above continued yielding minor amounts of ore, and prospectors found a few other mineralized veins. After establishing Frisco, Henry Learned resumed prospecting and discovered the Kitty Innes on Mount Royal. The vein was rich enough to interest Leadville investors William Graff, William R. Hall, and B.F. Stickey, who organized the Mount Royal Mining Company and began production. Most of the activity in the area was, however, speculation instead of actual production because few bonanzas except for the Excelsior and Kitty Innes had been proven. Learned led eastern investors in the Royal Mountain Mining & Milling Company, which bought claims near the Kitty Innes but did little with them. The Buffalo Mountain Silver Mining Company obtained a collection of properties on Buffalo Mountain to the north, and other capitalists purchased more claims in the area.[8]

These and other ventures not only supported Frisco and Dillon, but also fostered the new settlement of Wheeler at today's Copper Mountain. Wheeler grew in response to local prospecting, logging, and traffic to Leadville, and it had a mercantile and a post office secured in 1880. Wheeler remained small because Frisco and Dillon dominated commerce and business and lay at important crossroads. Frisco, in particular, boomed during 1880 and 1881. J.S. Scott and Doble & Stokes opened two more mercantiles, and B.B. Babcock, Isador Smith, and Mr. Morrow ran three saloons. Leyner finished his Leyner House hotel and livery, and the Stafford House went into business. A population of 300 lived in town, and a like number were scattered amid the surrounding mines and prospects. Dillon had a more diverse assemblage of businesses including a jeweler, barber, and surveyor.[9]

In 1881, the settlements around the Ten Mile Range received news that fueled the small boom. In their battle for supremacy of mountain freight business, both the Denver & Rio Grande (D&RG) and Denver, South Park & Pacific (DSP&P) railroads announced plans to grade lines into the Blue River valley. The histories of these two carriers are discussed in detail in the section on railroads. The D&RG already held a presence in Leadville and wanted to establish a line from there to Dillon to test the market in Summit County. The DSP&P, however, held a larger vision of incorporating Summit County into a new main line from South Park to Leadville. The route crossed over from South Park to Breckenridge and went north down the Blue River to Placer Junction. The Leadville line veered west to Frisco, up Ten Mile Canyon, and over Fremont Pass, while a branch continued north to Dillon and then east to the sawmills at Keystone. The D&RG reached Wheeler and established a station in 1881 and terminated at

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[7] Bauer, et al., 1990:45, 59; Gilliland, 1984:10.
[8] *Colorado Mining Directory*, 1883:758, 832, 853; Gilliland, 1984:16.
[9] Gilliland, 1984:12, 23.

Dillon the following year. The DSP&P was slightly behind and reached Dillon later in 1882, and ascended Ten Mile Canyon in 1883.

When the two tracks were finished, Dillon, Frisco, and Wheeler realized the dream shared by every mining community. They enjoyed the service of not one, but two railroads, which shifted the roles of the settlements. Dillon, farthest from the mines, became largely a railroad town and transportation center. Frisco and Wheeler then assumed most of the mining and logging business. For a short time, the railroads intensified the boom. Through reduced freight rates, the railroads lowered the costs of living and mine development and increased the amount and variety of goods that were available. The railroads also solved one of the most important problems that confounded the few mining companies in production and retarded the overall industry. In particular, the railroads provided an inexpensive, all-season link with smelters at Leadville. Previously, mining companies had to ship their ore by wagon, which consumed profits and restricted production to only the highest grades of payrock. The railroads allowed those companies to extract ore that was complex and lower in grade. The timing was good because the high-grade ore, in short supply, neared exhaustion.

Although the railroads held great potential for mining, they were unable to solve one of the most fundamental problems that prevented the industry from blossoming. Specifically, prospectors found relatively few veins that held ore in profitable tonnages. Only a handful of mines such as the Excelsior, Kitty Innes, and Frisco Belle produced ore, and the rest of the activity was mostly speculation based around promising claims. The bubble was ready to burst by around 1882, but the railroads prolonged the boom for a year or two. Most of the prospectors and investors conceded defeat during 1883 and 1884, and Frisco and Wheeler came to rely on the handful of anchor mines. Whereas Dillon grew slightly because of the railroads, Frisco contracted significantly and lost one-third of its businesses when the bubble deflated. The Frisco House Hotel continued business, but Leyer sold his hotel to V.J. Coyne. One mercantile closed, Morrow ran the only saloon, and the livery remained open. In need of income, the town council resorted to taxing gaming tables and prostitution and required Morrow to pay for a liquor license. Were it not for an increase in logging, Frisco would have declined more.[10]

Logging became even more important because a combination of local and external problems caused the mining industry to slump in 1885. Locally, mining companies exhausted the shallow veins, overestimated their ore reserves, and found that the deep veins decreased in value and increased in complexity with depth. In short, miners had finished off the easily treated, shallow ore and were left with the deeper and unprofitable material. Outside the area, a synergy of forces eroded confidence in the silver market and not only caused the value of the white metal to slip, but also made investors wary of silver mining. In particular, opponents of the silver standard shifted treasury policy in favor of paper currency and loudly opposed the free coinage of silver. In 1885, the value of silver decreased from $1.12 per ounce to $1.06 and continued a downward trend until it bottomed out at $.94 by 1888. The watershed year, however, was 1886, when President Grover Cleveland’s stance became well known and silver reached $1.00 per ounce, which seemed to be the threshold for mining investors. As a result of the factors, nearly all the mines in Ten Mile Canyon closed, prospecting nearly ended, and most of the workers left.[11]

[10] *Colorado Business Directory*, 1884:208; Gilliland, 1984:27.
[11] Brown, 1984:191; *Report of the Director of the Mint*, 1894:20; Saxon, 1959:7-9, 14-17.

Mining Revival, 1890-1893

The latter half of the 1880s was a difficult time for the residents around Ten Mile Canyon. The value of silver continued to decline, which ensured that most of the mines remained shut. In response, Dillon, Frisco, and Wheeler increasingly relied on alternative sources of income, and logging was one of the most important. All, however, languished to varying degrees. Dillon was the most stabile because it had railroad yards and was center to ranching. Wheeler relied almost totally on its timber resources, which proved troublesome in later years when the forests were cut over. Frisco depended heavily on logging and the small amount of mining activity that survived. The Excelsior Mine still operated, and prospectors established the Wilkinson Mining District around five miles north. Frisco was the gateway to the new district, and as such, provided the prospectors with supplies. The district, however, failed within a short time, and Frisco continued to shrink.

Those residents who remained were rewarded for their perseverance through uncertain times when politics surrounding silver turned in their favor. During the late 1880s, western legislators clamored for a return to a prosilver policy to bolster sagging mining industries in their states. Well organized, they succeeded in 1890 and passed the Sherman Silver Purchase Act, which required the federal government to buy 54 million ounces of silver per year at $1.05 per ounce. The figures fostered a demand and price capable of resuscitating the silver mining industry, which created jobs and revitalized regional economies.[12]

The result in Ten Mile Canyon and Frisco was a revival of mining. The increased value of silver rendered the marginal grades of ore profitable to produce, which renewed interest primarily in those properties known to possess ore. The owners of the Defiance, Juno, Monarch, and Myrtle resumed development on their veins, and ore actually started emerging from the Frisco Belle and Emma J. The Excelsior shifted from moribund development into sound production.[13]

The towns of Frisco and Wheeler directly benefitted from the new activity, which boosted their economies. As an indicator, Frisco's population increased from around 100 residents during the late 1880s to 175 by 1893. The community figures in Frisco were unsatisfied, however, because few of the active mines were significant in scale. They heard the mine owners express a need for local ore treatment because shipping the payrock in crude form, even by rail, consumed too much profit. A local mill, they reasoned, would reduce the bulk of the ore and concentrate the metalliferous content into a form less costly to ship. Thus, the town fathers aggressively sought investors by advertising free millsites and water rights for motive power, with lumber delivered.[14]

In this, the fathers were unsuccessful, and no mining companies spared the expense for mills. Further, the owners of the proven mines also had difficulty securing the capital needed for systematic development. The reason was that Ten Mile Canyon was in the shadow of the more important mining centers of Leadville, the Robinson district, and Breckenridge. Although the mining industry was not as vibrant as desired, it nevertheless was important to Frisco and Dillon, until the fateful year of 1893.

At the end of the year, the value of silver collapsed to previously unseen levels for reasons discussed in detail in the section on mining in Clear Creek County. The event known as the Silver Crash of 1893 not only ruined mining throughout the West, but also contributed to one of the worst economic depressions in the nation's history. Ten Mile Canyon, like the rest of

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12 Brown, 1984:193; Reyher, 2000:179; Smith, 1982:92; Voynick, 1992:62.

13 "General Mining News" *Mining Industry* 3/7/90 p118; "General Mining News" *MIT* 10/8/91 p162.

14 *Colorado Business Directory*, 1889:338; *Colorado Business Directory*, 1895:331; "General Mining News" *MIT* 7/16/91 p35.

Colorado, was devastated. Most if not all the mines around Frisco and Dillon closed, hundreds of workers lost their jobs, and the regional economy collapsed. Dillon suffered when the railroads reduced their schedules and cut back on maintenance. Wheeler was nearly abandoned. Frisco grew so quiet that there were no town board meetings until 1899. For the rest of the 1890s, Dillon and Frisco survived on ranching and a small amount of logging.[15]

The Great Mining Revival, 1898-1912

As the decade of the 1890s waned, a variety of factors came together and revived silver mining, which lifted the West and especially Colorado out of a deep depression. Even though the value of silver did not recover from the Silver Crash of 1893 and hovered at around $.60 per ounce, the residents of Frisco and Dillon saw their mining industry reach a zenith of activity during the early 1900s. Such a revival was counterintuitive given the low value of silver, but broad trends created an overall positive climate for mining and investment.

First, the nation's economy recovered from the depression, and while the rebound started in the East, it reached the West by the late 1890s. As economic conditions stabilized, investors felt secure enough to risk capital, and mining companies were able to find loans and credit for their projects. Second, railroad service increased, and goods and services were readily available again. Third, mine and mill owners, tired of bearing the costs of idle, profitless properties, were more than willing to extend themselves to bring their operations back into production or sell or lease them to investors who would. Fourth, the demand for industrial metals such as copper, lead, and zinc greatly increased due to the revival of industry and consumerism. The ore in Ten Mile Canyon offered some of these metals in addition to the silver sought in the past. Fifth, advances in mining technology and engineering decreased the costs of ore production, and improved milling methods recovered even more of the metalliferous content than ever.

The revival began in Ten Mile Canyon in 1898 when a small wave of capitalists seized upon some of the principal mines known to have produced in the past. All were idle at the time. In keeping with a statewide trend, most of the capitalists were based outside of Colorado and invested in machinery and planned underground development. They reopened the Juno and Kitty Innes, and began developing the Red Lion and Victoria. The Recens applied some of their mining proceeds to resume work on the Recen and nearby IXL mines, and installed one of the earliest electrical generators in the area. The Excelsior, Frisco's most important producer, was the target of the largest transaction. Frank Wyborg an eastern investor, purchased the mine, hired A.B. Ogden as manager, and charged him with developing it into a major operation. Although much of the high-grade ore had been removed from the vein long ago, plenty of low-grade material remained, and Ogden understood that it could be profitable if concentrated locally. Thus, Wyborg provided the money to build what may have been the first mill near Frisco. Ogden also built a hydropower plant to generate electricity for mine and mill.[16]

Colonel James H. Myers convinced wealthy investors to pour more capital into Ten Mile Canyon. Myers was born to a Virginia plantation family in 1844, joined the Confederacy when the Civil War erupted, and survived to see the family holdings destroyed by the Union Army. Ruined, the family migrated to Colorado, and Myers dabbled in mining and went to Montezuma during the 1870s boom. There, he became an expert in local mining by speculating with ventures and printing the Montezuma *Prospector*. In 1898, Myers moved to Frisco, assessed the

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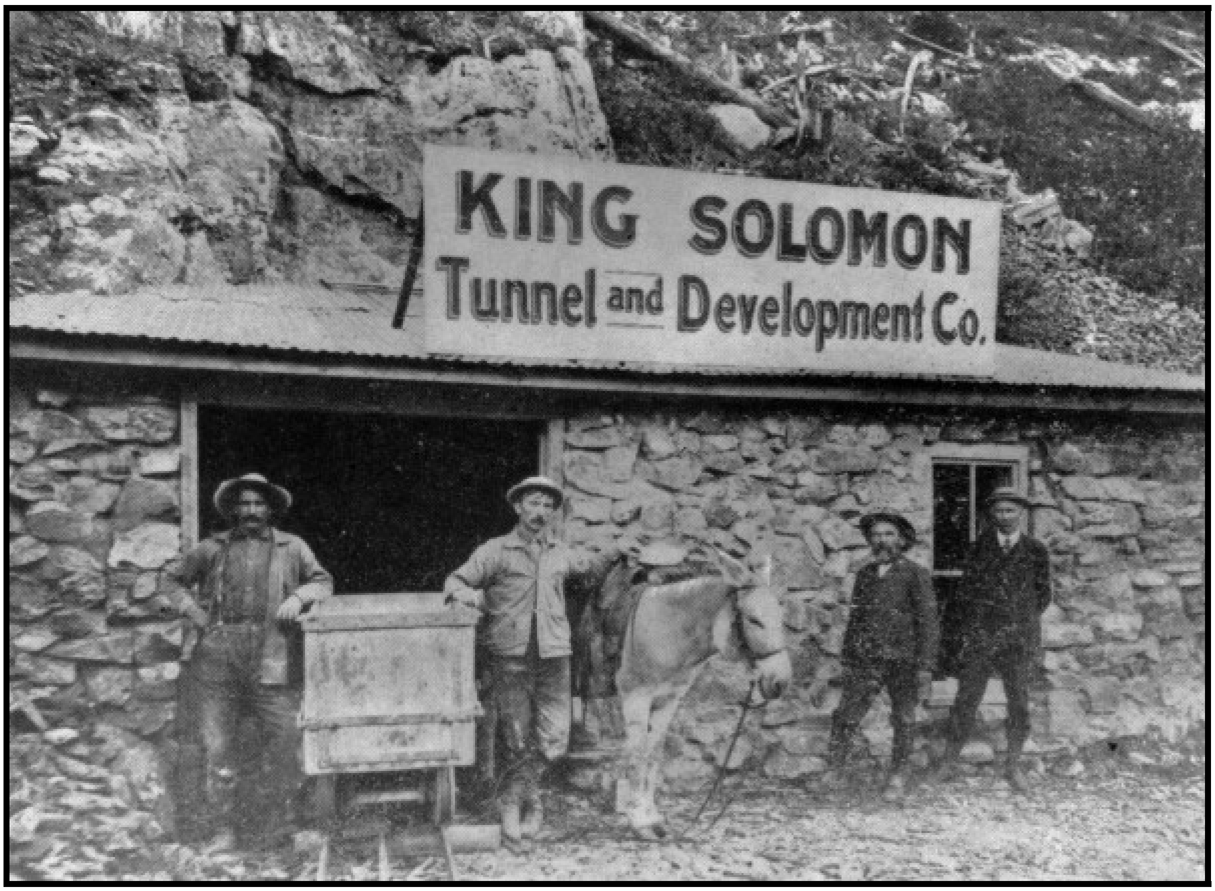
[15] Gilliland, 1984:33.

[16] *Colorado Mining Directory*, 1898:302; Gilliland, 1984:41, 58; *Summit County Journal* 12/3/98 p1; *Summit County Journal* 12/10/98 p1; *Summit County Journal* 1/21/99 p1; *Summit County Journal* 4/15/99 p1; *Summit County Journal* 10/14/99 p1.

potential offered by Ten Mile Canyon, and floated several companies to buy most of the prominent mines on the east side. He postulated that the Victoria Vein, originally developed by the Victoria Mine on the east side of the Ten Mile Range, as well as parallel formations, continued through to the east side of Ten Mile Canyon. Lengthy haulage tunnels could be driven easterly from existing mines and undercut the range at depth. Myers was not altogether wrong, but he underestimated the time and money required to achieve his goal.[17]

In 1899, Myers and distant investors organized two companies. The King Solomon Gold Mining Syndicate bought the King Solomon and began a tunnel into Royal Mountain, and the Mint Mining & Milling Company pushed another tunnel into Ophir Mountain. Both operations were well equipped and became several of Frisco's mainstays. In 1900, five more companies started their own tunnels into the range, including the Admiral, Ohio, Quandore, and Union.[18]

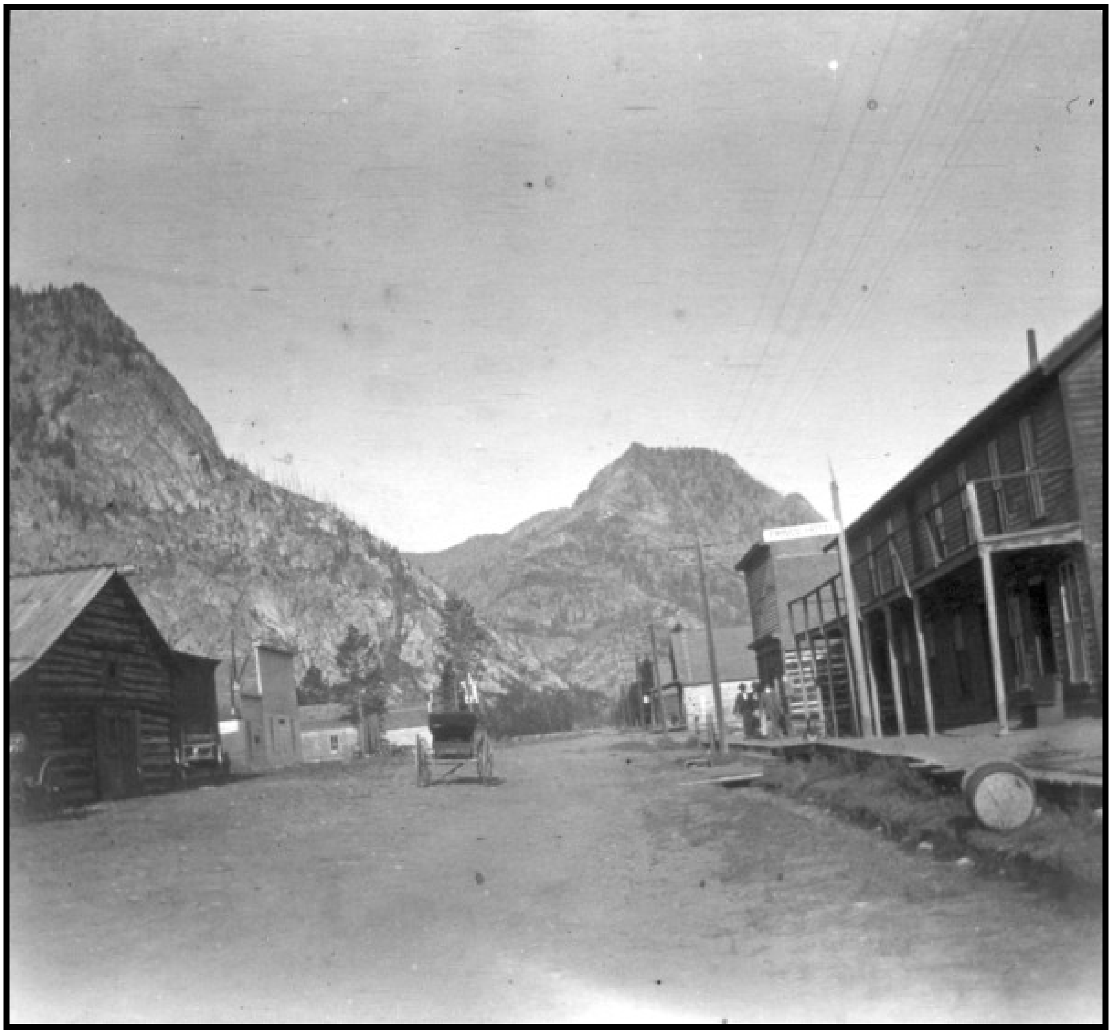


James Myers' King Solomon Mine was among the principal operations in Ten Mile Canyon near Frisco during the early 1900s revival. The mine remained relatively simple in its early years and was not immediately profitable, like most other properties in the area. Courtesy of Denver Public Library, X-62432.

The flurry of activity restored a boom atmosphere to Frisco and Wheeler by 1900. Repeating the cycle of the early 1880s, opportunity and the demand for goods and services drew entrepreneurs to Frisco, and they joined seasoned merchants who survived the Silver Crash. Travelers and new arrivals found lodging in the Thomas, Frisco, and Southern hotels, dined in

[17] Gilliland, 1984:39; Gilliland, 1999:296; Sharp, 1971:11.
[18] Gilliland, 1984:46; "Mining News" *Mining Reporter* 8/23/1900 p117; "Summit County" *Mining Reporter* 2/22/1900 p106.

several restaurants, drank in eight saloons, and kept horses in a livery. Local workers billeted in John Hays' boardinghouse or with families and purchased goods in mercantiles run by Hattie Learned, Peter Prestrund, and Nils Nilander. The number of children exceeded the capacity of the existing school, which was then moved to another building. Around 30 miners and loggers returned to Wheeler, and they and other workers living nearby supported a store and saloon.[19]



Despite the revival of mining during the early 1900s, Frisco remained small and quiet with little new construction. The architecture in this main street photo is typical of Rocky Mountain mining towns, including log buildings, false-fronts, brick business building, and boardwalks. Courtesy of Denver Public Library, X-8562.

Dillon was center to its own small mining industry. Several companies realized that they could profit from the low-grade placer gold on the flanks of the Blue River by processing the gravel in economies of scale. In 1899, J.H. Woolsey leased the Ryan Placer, built infrastructure for a hydraulic operation, and erected boardinghouses for a large workforce. At the same time, Breckenridge placer mine operator George E. West organized the Oro Grande Mining Company, acquired a group of claims adjacent to the Blue, and made the preparations for a massive operation. He not only financed a hydraulic system, but also began a deep pit equipped with

[19] *Colorado Business Directory*, 1901:762; Gilliland, 1984:46.

pumps and siphons. West imitated the deep pits in development near Breckenridge and went on to realize a fortune from gold dredging on the Blue. As a result of the activity, the population of Dillon increased from 200 to 250 residents, some of whom lived in new boardinghouses.[20]

The mining industry reached a peak during the next several years, and unlike the 1880s, deeper and more advanced projects characterized the revival. The troublesome pattern of excessive speculation, however, continued. The Excelsior Mine was one of the operations that was not speculative and instead based on sound management. The mine yielded handsomely and its mill was so effective that Ogden accepted custom ores from other mines to supplement income. In 1901, Al Moore struck a rich vein in the Etta M., began production and charted a haulage tunnel to undercut the formation at depth. The partnership of Matson & Westland encountered two more veins in an extension of the Victoria, and Cherryhome & Benton shipped ore from the Juno. Chauncey C. Warren and the Monroe Mining & Milling Company struck silver on the Monroe and built a tramway from the mine down to the DSP&P. Warren, who had a long experience mining around Breckenridge, took his proceeds to Dillon, where he was elected mayor. At Wheeler, miners drove the Ten Mile Tunnel and contracted with the Gold Pan Mining Company shops, near Breckenridge, for a waterwheel plant and compressor.[21]

The Square Deal Company was among the less-than-honest speculative ventures, organized in 1901 primarily to bilk distant investors. Termed the Crooked Deal Mine by James Myers, the outfit promoted a lengthy tunnel on North Ten Mile Creek and laid out its own townsite to excite the investors. Although the company had no hope of finding ore and never developed the townsite, it spent a huge amount of capital on advanced machinery and the tunnel.[22]

In 1903, the old Victoria Mine, on the east side of the mountain range, joined the ranks of Frisco's most important producers. E.A. Keables, J.D. Alliunde, H.D. Crawford, and S.M. Stewart organized the Masontown Mining & Milling Company, bought the property, and commissioned a major development campaign. Keables was a mining investor and merchant in Breckenridge who made a small sum with several operations in Park County during the 1880s. The company established the settlement of Masontown, built a mill, and undercut the Victoria Vein with a deep tunnel. In its first year, the company realized enough profit to pay its debts, which was a rarity.[23]

Electricity was another characteristic of the mining revival. The power source offered potential cost savings because mining companies could replace steam equipment with motor-driven machinery, which was more efficient, especially in the deep tunnels. Most companies, however, could not justify the expense of installing and maintaining their own electrical plants, and they continued to rely on steam. The Excelsior Mine at Frisco and the Oro Grande Company at Dillon pioneered electrification in the area, but only through cooperation with their host communities. Both towns lacked the money and customer bases for dedicated powerplants, and the mining companies similarly felt that they could not justify the costs for their in-house uses alone. But when Ogden erected the Excelsior Mill and powerplant in 1898, he secured a contract with Frisco to provide the town with his surplus power for lighting. The increased customer base and subscription fees offset the powerplant costs. The town of Dillon and the Oro Grande company came to a like agreement when that company built a hydropower plant immediately

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[20] *Colorado Business Directory*, 1898:414; "Mining News" *Mining Reporter* 6/1/99 p20; "Mining News" *Mining Reporter* 1/25/1900 p52.

[21] "Mining News" *Mining Reporter* 1/3/01 p7; "Mining News" *Mining Reporter* 7/25/01 p66; "Mining News" *Mining Reporter* 6/13/01 p398; "Mining News" *Mining Reporter* 8/8/01 p107; "Mining News" *Mining Reporter* 9/19/01 p216; "Mining News" *Mining Reporter* 10/10/01 p284; "Mining News" *Mining Reporter* 10/2/02 p278.

[22] Gilliland, 1984:57.

[23] "Mining News" *Mining Reporter* 3/12/03 p249; "Mining News" *Mining Reporter* 10/1/03 p316; "Mining News" *Mining Reporter* 10/15/03 p366; "Mining News" *Mining Reporter* 11/5/03 p446.

north of Dillon. The deals were of enormous benefit to the companies and towns because each received power from plants that neither could otherwise afford.[24]

During the next five years, three more mining companies in the Ten Mile valley built their own powerplants in the absence of centralized service. The Recens probably hoped to secure a similar arrangement and financed their own DC hydropower plant at the Recen and IXL mines in 1898. The owners of the Admiral Tunnel, near Wheeler, built a hydropower plant in 1902 and lured away the Excelsior electrician to oversee its operation. James Myers fronted the capital for a generator at the King Solomon Tunnel in 1904. Ultimately, the plants became the seed of a localized power grid, discussed in the section on electric power.[25]

After three years of intense activity, the mining revival began to wane. Many of the small mines exhausted their shallow ore reserves, conducted fruitless underground exploration, and then closed. At some of the large projects, investors grew weary of the constant demand for money with no return and tightened their purse strings. By 1904, the mining industry consisted primarily of operations that either yielded ore or were led by experienced individuals, and even some of these were troubled. In the Excelsior, miners lost the vein and Ogden had to spend capital on extensive exploration to find it again. Myers still pushed the King Solomon and Mint tunnels, and although he claimed that several veins had been penetrated, ore was not forthcoming. The Masontown Company was in deep financial trouble, suddenly closed the Victoria Mine, and laid off a large workforce.[26]

The Mary Verna Mining Company was a contrast to the growing trend. The company began developing the Mary Verna and North American mines, on the east side of Ten Mile Canyon around 1903. The company erected an advanced surface plant on the DSP&P, which graded a dedicated siding for the complex known as Curtin. In 1905, the Mary Verna Tunnel finally struck ore, the company installed a generator and other machinery, and the mine yielded for several years.[27]

In 1907, the vagaries of economic cycles impacted mining around Frisco and Dillon once again. This time, a national recession struck, and it exacerbated the decline of the mining industry. Credit became difficult to obtain, loans were recalled, and investors were unwilling or unable to finance projects. These conditions brought the profitless and speculative ventures around Frisco and Dillon to an end, and forced productive but overcapitalized mines to suspend.

This was the case with the Oro Grande Company, which spent too much capital on its large-scale placer operation at Dillon. The company divorced its placer workings from the powerplant built in 1899 and sold the workings to the Buffalo Gold Placer Mining Company and the electrical equipment to the Summit County Power Company. The electrical equipment was used in a new powerplant discussed in detail in the section on power generation. In Ten Mile Canyon, the Excelsior, the Mary Verna, King Solomon, and Juno were the principal operations, and most others closed. The Summit Mining Company was a late success and produced enough payrock in 1907 to justify a tramway down to the DSP&P. Curiously, investors still funneled money into the Square Deal tunnel despite the poor economic climate and lack of returns.[28]

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[24] *Summit County Journal* 12/10/98 p1; *Summit County Journal* 4/15/99 p1; *Summit County Journal* 10/14/99 p1; *Summit County Journal* 8/19/99 p4.

[25] *Breckenridge Bulletin* 12/3/04 p1; *Summit County Journal* 12/3/98 p1; *Summit County Journal* 1/21/99 p1; *Summit County Journal* 11/15/02 p1.

[26] *Mineral Resources*, 1905:211; "Mining News" *Mining Reporter* 3/31/04 p331; "Mining News" *Mining Reporter* 12/1/04 p592; "Mining News" *Mining Reporter* 6/1/05 p555; "Mining News" *Mining Reporter* 8/31/05 p219.

[27] *Breckenridge Bulletin* 10/28/05 p1; "Mining News" *Mining Reporter* 2/23/05 p224; "Mining News" *Mining Reporter* 5/18/05 p511.

[28] "Mining News" *Mining Reporter* 5/16/07 p457; "Mining News" *Mining Reporter* 7/17/07 p365; ; "Mining News" *Mining Reporter* 8/29/07 p203.

For the next five years, the above mines and limited logging were the foundation of the region's economy, and they were also the remaining vestiges of a waning revival. In 1910, the King Solomon Tunnel finally reached a vein of significant worth and, after ten years of financial drain, began repaying those investors still with the company. The tunnel was nearly 5,000 feet long by this time, made possible in part with electricity from the company powerhouse at Curtin. The Excelsior continued to produce ore, treat the material in its mill, and generate power for Frisco. The Buffalo Gold company was the largest operation at Dillon, and President Lemuel Kingsbury abandoned the deep pit on the Blue but maintained the hydraulic system in the other workings. Kingsbury was well-suited to efficient management because he previously ran the Iowa Hill hydraulic placer at Breckenridge. In 1910, Kingsbury formally quantified the extent of the gravel deposits with prospect shafts and instituted the strategy of production with a steam shovel on rails, which was an innovative practice for the time. He also developed his own sluices with what were known as Kingsbury riffles to catch the gold washed form the gravel. The operation was so successful that Kingsbury expanded the facilities several times during the next several years.[29]

The few principal mines at Dillon and in Ten Mile Canyon maintained production during the early 1910s despite a growing uncertainty regarding reliable transportation. The Colorado & Southern Railroad (C&S), which purchased the DSP&P system in 1898, determined that the Leadville line through Summit County was unprofitable and tried several times to abandon it. The C&S argued that the D&RG siphoned the traffic to Leadville via its Arkansas Valley route and the business provided by Summit County was insufficient to offset the costs of operating the Leadville line. Thus, the C&S abruptly suspended service in 1910 without formal permission from the Interstate Commerce Commission, leaving the D&RG's Dillon branch as the only rail link. But because the C&S dominated Summit County, the D&RG previously reduced Dillon service to several trains per week. The irregular schedule impacted mining throughout the county because the companies were unable to ship ore to the Leadville smelters on a consistent basis. Breckenridge business interests took the lead in forcing the C&S to restore service. The Breckenridge Chamber of Commerce successfully obtained a court order and the C&S acquiesced, but with a greatly reduced schedule.

The next year, Summit County lost the D&RG's Dillon branch, leaving the unwilling C&S as the only carrier. In 1911, the C&S and D&RG agreed that Summit County did not generate enough freight business to justify both railroads and came to an agreement. The D&RG offered to abandon its Dillon branch and grant the C&S a monopoly in Summit County if the C&S turned over its Gunnison track to the D&RG. After 1911, Summit County, and the mining companies around Frisco and Dillon, relied exclusively on the C&S, which still expressed interest in closing the line. The uncertainty discouraged further investment and had a cooling effect on the mining industry.

The mining revival was nearly over by 1911, and the transportation issue compounded a deeper problem that brought the revival to end in 1912. After more than ten years of intermittent production, the handful of existing companies exhausted their profitable ore reserves. A few properties still possessed some payrock, but it was too complex, low in grade, and deep. Thus, all but the Excelsior, King Solomon, and several small outfits closed, and even these operated on reduced levels. The mining industry was no longer a significant force. Dillon felt the loss somewhat, but it weathered the slump due to a diverse economy that included logging, ranching, and the railroad. The town's population remained at around 200, and they supported an array of businesses. Frisco, in contrast, went into a sharp decline. The population fell to around 100, and

[29] "Current News" *Mining Science* 6/9/10 p548; "Current News" *Mining Science* 8/18/10 p163; "Current News" *Mining Science* 11/10/10 p453; *Mineral Resources*, 1911:562.

only the most elementary businesses kept their doors open. The town became so quiet that the town council rarely met, and attendance was insufficient to manage basic affairs. As a result, the town let its contract for power lapse and the streets went dark, signifying the final collapse of the mining revival.[30]

World War I Revival, 1916-1920

The problem of impoverished and complex ore in Ten Mile Canyon was a permanent one and had no solution given the low metals prices of the early 1910s. Later in the decade, this changed and allowed Frisco and its mining industry to enjoy one last period of measurable activity. Although the details are discussed in the section Clear Creek County, conditions created by World War I pushed the values of silver and industrial metals to levels unseen since 1890. European governments began buying silver as an economic resource, and the demand for copper, lead, and zinc soared due to weapons production in the United States and abroad. By 1916, two years after the war began; the prices of these metals became high enough to render low-grade ores profitable to produce. And the values and demand kept climbing through the late 1910s.

Under these positive conditions, a new type of investor took an interest in the mines of Ten Mile Canyon, and they became an important local movement. The new investors were not interested in paying large sums for the existing mines or in equipping them with advanced machinery. Instead, they wanted to lease those mines known to have produced in the past, finance only the improvements necessary to support limited production, and extract ore from old workings instead of funneling money into uncertain and costly exploration campaigns. Because the mines had aged infrastructures and worn machinery, the rehabilitation efforts were capital-intensive.

In 1916, leasing companies took over the two most productive mines, the Excelsior and King Solomon. The outfits were small but had enough capital to conduct rehabilitation, which was no small undertaking for the two extensive properties. At the Excelsior, the mill was brought back into operation and apparently served as a custom plant for other mines, which was important to the success of the overall movement around Frisco. Other parties of lessees then reopened the Columbine and Queen of the West, and because these two mines were not important producers in the past, they still had ore left to offer.[31]

Other groups of lessees joined the movement in 1917. They added the Four-Most, Hyman Tunnel, and several poorly developed properties to the roster of producers around Frisco. Overall, the revival was selective, limited in impact, and a shadow of the past. The activity was insufficient to restore life to the abandoned hamlets of Wheeler, Curtin, and Masonville, nor did it involve the exhausted placer mines around Dillon. The revival was, however, important to Frisco because it provided the economy with a footing, brought life to the town, and arrested the gradual decline.

World War I came to an end in 1918, but the demand for metals remained high and the value of silver continued to increase afterward as nations in Europe rebuilt their infrastructures and economies. Unfortunately for Frisco, this was inconsequential. When World War I began, the mines had little ore left, and the various leasing parties extracted the last vestiges of what remained within several years. Thus the Excelsior closed in 1919, and when the mill ceased, the small outfits had no local facility to treat their low-grade payrock and were forced to suspend.

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[30] *Colorado Business Directory*, 1910:634, 648; Gilliland, 1984:69.

[31] Colorado Mine Inspectors' Reports, Summit County: Excelsior, King Solomon; *Mineral Resources*, 1916:380.

The lessees at Columbine and Hyman Tunnel stopped work, and only the King Solomon and Four-Most remained active. In 1920, these mines were shuttered as well, leaving Frisco with no operations of substance. Frisco's last mining revival came to an end, and the industry was never again a significant force.

During the early 1920s, Frisco and Dillon may have been without any operating mines, which was the first time in nearly 25 years. Afterward, some activity resumed, but it was too minor, intermittent, and insufficient to qualify as an industry of note. At various points during the decade, small parties of lessees gleaned ore from the King Solomon and Etta M. workings, and they suspended when the Great Depression began in 1929. When the values of gold and silver increased during the Depression, more lessees searched out the last pockets of ore in the Excelsior, Frisco, and Chief mines. The operations were minor and brief, and like many Depression-era miners, the lessees produced only enough ore for a subsistence income. As a confirmation that Ten Mile Canyon and the Dillon area would never again host mining on a measurable scale, the owners of the Excelsior dismantled the mine's surface plant in 1935, and the C&S abandoned the county's last rail line in 1937.

Section E 4: Mining and Milling Methods, Technology, and Equipment

Below is a discussion of the general methods and technologies used to find and extract metals from the hardrock and placer deposits in the Clear Creek drainage and around Dillon and Frisco.

Placer Mining

The Nature of Placer Deposits

For thousands of years, humankind sought gold for its rarity, appearance, malleability, and chemical stability. Gold oxidizes and forms compounds only under unusual physical circumstances and otherwise remains in its native state. Because gold is a relatively soft metal with a low melting temperature, superheated fluids and gases associated with geothermal and magmatic activity tended to deposit the metal in geological structures known as veins, replacement bodies, and disseminated deposits. These usually occurred in rock formations that were regional in scale. Mountain-building events such as those that uplifted the Rockies created the fluids, gases, and the geologic conditions for gold ore, which also tended to include industrial metals such as silver, lead, and copper. The industrial metals were often combined in chemical compounds.

Over the course of eons, erosion attacked the mountains and dismantled ore veins when exposed on ground-surface. Most of the minerals and metals washed into waterways where they suffered reduction and dissolution, both physically and chemically, and decomposed into sediments. Stream action mobilized the sediments, concentrated them on the floors of drainages, and high runoff washed them downstream.

Because gold is soft and inert, it only slowly disintegrates through physical reduction. Hence, as erosion freed gold from its parent veins, the particles migrated into nearby drainages and slowly sifted downward into the gravel due to their weight. Over time, the gold became concentrated in the lower gravel strata and on the bedrock floor, where it awaited the prospector's shovel and pan. High runoff events and sudden torrents carried the gold from the small, steep gulches near the parent veins and ultimately into principal drainages. Prospectors learned that fine gold disseminated throughout the upper strata of stream gravel often represented a richer deposit at depth. Overall, miners termed gold-bearing gravel *placer deposits* and referred to broad areas of such gravel as *placer fields*.

In Clear Creek and Summit counties, prospectors and miners encountered five principal types of placer deposits. The first, known as *gulch placers* or *gulch washings*, consisted of gold-bearing gravel lining the floors of minor drainages that were often steep. Because gulch placers lay near a parent vein, offered few places for fine material to settle out, and were subject to high-energy stream flows, the gravel tended to be coarse, the gold particles large and rough, and the gravel beds thin. Easily discovered and worked with relatively little effort, the gulch placers were the first to be found and yielded through hand-mining.

Miners recognized the second type of deposit as a *stream or river placer*, and it was created when minor streams introduced gold into principal waterways such as Clear Creek in Clear Creek County. The gravel was thick in these deposits and required extensive excavation and engineered structures to remove enough overburden to expose the deep gold-bearing layers.

Usually, stream placers were the domain of mining companies with capital and substantial workforces.

River bar placers constituted the third type of deposit, and the miners worked these extensively during the initial boom. The deposits were beds of gravel exposed along the sides of principal streams and especially on the inside of meanders. They represented the historical level of a drainage floor, and often consisted of a combination of glacial till and general gravel.

The fourth type, informally known as a *blanket deposit*, was limited to dry areas that featured gold veins at ground-surface, such as around Empire. Erosion and weathering attacked the veins and freed the gold, but runoff was insufficient to immediately shunt the metal into waterways, leaving a veneer of gold-bearing soil that was easily processed by hand.

Deep placers, also known as *valley gravel*, constituted the firth deposit. These filled the floors of broad drainages and consisted of gold mixed with glacial till and gravel, and concentrated along bedrock by stream action. Because of its extreme terrain and lack of rivers, Clear Creek County offered few deep placers, but the Blue River near Dillon offered valley gravel deposits.

Prospecting for Placer Gold

While some of the placer deposits lent themselves to specific types of extraction processes, all could be discovered by basic prospecting. All a prospector need do was excavate pits in stream gravel and reduce the material in a gold pan. The presence of a few flakes of gold from the upper layers suggested the potential for more at depth, spurring the prospector to dig deeper pits. By the late 1850s, when Clear Creek County experienced its first rush, experienced prospectors understood that the worth of a deposit could only be accurately assessed by testing gravel from near bedrock, which required considerable labor to expose. If the prospector confirmed the presence of placer gold in economic quantities, he was ready to begin mining.

Placer Mining Methods

Placer deposits were within practical and economic reach of both individual miners and organized companies, and the deposits were among the earliest to be exploited for this reason. Most types of placers were mined by individuals working by hand, and by companies with complex systems that depended on infrastructures. River and valley placers, however, tended to be the domain of capitalized companies because they required retaining structures, flumes, systems of sluices, and workforces to excavate high volumes of material.

When working by hand, individual miners often employed pans, cradles, and small sluices to separate gold from gravel. Miners merely excavated pits and trenches into streambeds, and when they approached bedrock, the miners shoveled the gold-bearing material into a cradle or sluice. A cradle was a portable wooden box with a rounded bottom, a slanted board featuring riffles, and a vertical handle. The miner rocked the cradle back and forth while introducing water, which washed off the gravel and left the heavy gold trapped behind the riffles. A sluice was a small, portable wooden flume with riffles nailed to the floor. The miner placed it in a stream and shoveled gravel into the interior, and the flow of water washed the light gravel away. When miners exhausted the gold-bearing gravel in their pits and trenches, they shifted laterally, began new excavations, and filled the old pits with new tailings. Over time, this created hummocky assemblages of tailings piles, pits, trenches, and buried excavations.

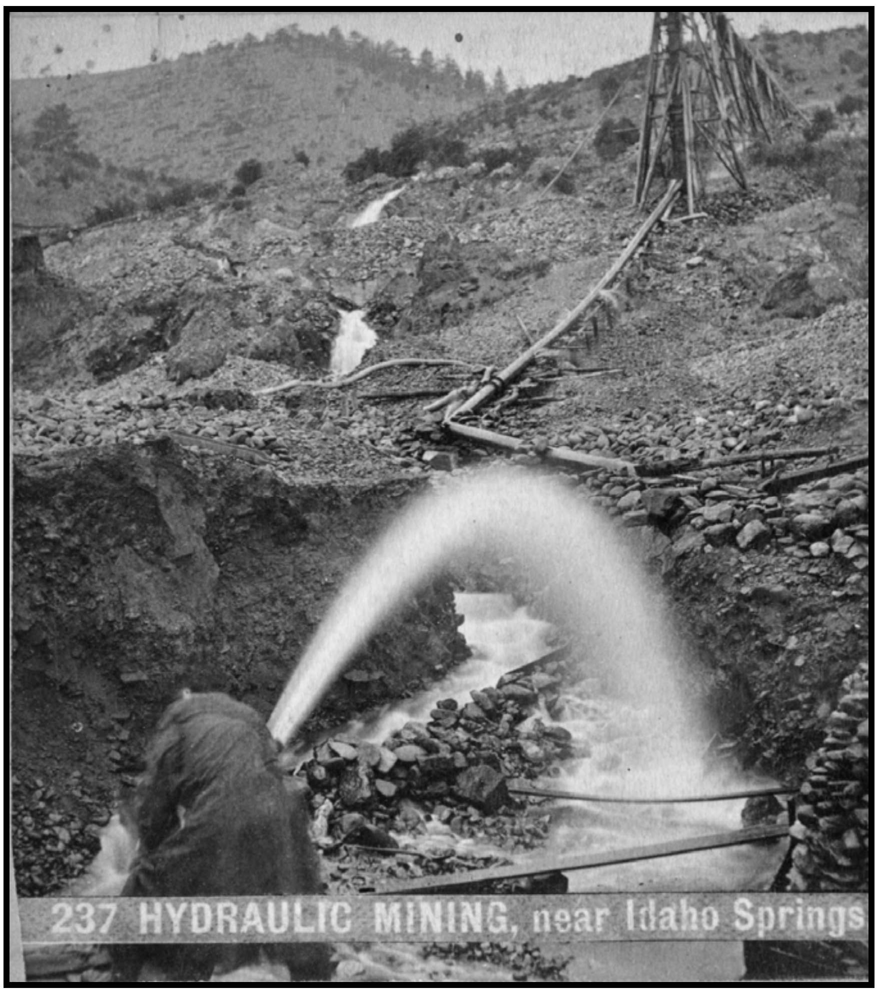
Placer miners near Breckenridge process gravel in a cradle during the 1880s. They shoveled gravel into the hopper at top and flushed it down the riffles with water while rocking the apparatus. The motion caused heavy gold to settle along the riffles while light gravel washed through and into the tub. Courtesy of Denver Public Library, X-61131.

Organized mining companies had the same goals as individual miners, but they relied on infrastructures to process gravel in high volumes from groups of claims. Companies often erected systems of sluices, work stations, water-diversion structures to move streams out their beds to expose gravel, and ditches and flumes to deliver water to otherwise dry areas. The sluices tended to be lengthy and featured either several branches feeding into a trunk line or several parallel sluices. Common sluices ranged from 2 feet wide and as deep, to 6 feet wide and 6 feet deep. They featured a relatively gentle gradient so fine gold was not washed off, and stood on timber piers supported by timber- or stacked rock footers. Workers usually installed the sluices in trenches and shoveled the surrounding gravel into the current flowing through the device. After prolonged excavation, workers reduced the height of the surrounding gravel until the sluice bed manifested as a raised berm.

When the sluice floor became choked with fine sediment, a worker closed the headgate and shut off the water flow so the gold caught behind the riffles could be recovered. Workers stepped down into the sluice and, under watch of a guard or superintendent, began removing large gold particles and scraping out gold-laden sand. The particles were collected and weighed while the sand was treated with mercury, which amalgamated with gold dust that was too fine to be easily picked out. After cleanup operations, the sluice was ready for more gravel and a worker opened the headgate, admitting water again.

While hand-methods were highly effective for gulch and blanket placers, the costs of labor were too high and the rate of processing too limited for extensive deposits. By nature, these deposits tended to feature fine gold disseminated through broad, deep gravel beds that had to be processed in economies of scale for profitability. Such conditions required capital to build the necessary infrastructures. Several distinct methods of operation governed how mining companies designed their infrastructures.

One of the most popular and earliest was known as *booming*, and it involved the sudden release of a torrent of water into placer workings from a nearby reservoir. The rush of water mobilized and carried gravel en masses through sluices, where riffles often retaining mercury collected the gold. To facilitate both the consumption of high volumes of water and the processing of large tonnages of gravel, companies formally engineered their infrastructures. Networks of supply ditches pirated water from area streams and directed it to the placer mine and the reservoir, distribution ditches shunted the liquid into the sluices, and boom ditches carried water from the reservoir into the workings. All featured headgates, and the sluice systems were as noted above.



A miner blasts and loosens gold-bearing gravel with a hydraulic monitor near Idaho Springs. The pipeline and trestle on the slope pressurized water for the monitor, and the cascade washed the mobilized gravel down through sluices. Note the high cut-banks. Source: Christine Bradley, Clear Creek County Historian.

Hydraulic mining, developed in California, was another method for processing thick gravel beds in economies of scale. A monitor, also known as a giant, was the key instrument in hydraulic mining. A monitor was a large nozzle that emitted a jet of water under pressure so high that miners were unable to pass sledge hammers through it. A worker played the jet against gravel banks, which crumbled and liquefied, and with the help of booming, were washed into sluices. The infrastructure for hydraulic mining was similar to that for booming with additional components for the monitors. To create the necessary pressure, ditches delivered water to a reservoir located far upslope from the mine, and a flume or pipe directed water into a structure known as a pressure box. A pressure box was a rectangular tank made of a heavy timber frame, often box-sets, and sided on the interior with tongue-and-groove planks. The tanks were at least 6 feet wide, 6 feet high, and 8 feet long. A pipe known as a penstock, often at least 24 inches in diameter, exited the structure's bottom and descended to the mine, decreasing in diameter incrementally to increase the water current's velocity and pressure. The pipe entered the placer workings and connected to a monitor located on a strategically placed station, which commanded a full view of the gravel banks. Several mining companies worked the banks of Clear Creek below Idaho Springs with hydraulic methods, and the Oro Grande Mining Company did likewise near Dillon.

Hardrock Mining

The Nature of Hardrock Ore Deposits

While placer gold initially drew prospectors to Clear Creek and Summit counties, it was hardrock ore that kept them in the region. In general, hardrock ore was the economical material contained in veins similar to those noted above under placer mining. The veins in eastern Clear Creek drainage primarily offered gold, while those in western Clear Creek and Ten Mile Canyon carried combinations of silver, lead, zinc, and copper. The latter three were known as industrial metals and were recovered from ore along with the silver content. Except for gold, the metals usually manifested in chemical compounds with other minerals, and these were disseminated in worthless but distinct host rock known as gangue. On rare occasions, veins offered metals in almost pure states, and such finds were considered bonanzas.

The common trait shared by most of the hardrock ores were the nature of the vein formations, and the physical structure governed how mining companies developed them for production. Most veins were functions of the forces that built both the existing Front Range mountains and the prior ancestor range. During mountain-building events, superheated, plastic magma bodies slowly intruded the basement rocks deep under the surface and exerted great pressure. As these bodies made their way upward, pockets of liquid rock, superheated fluids, and gases attempted to escape along faults and fissures. Ranging in width from microscopic to several feet, the faults and fissures tended to be oriented vertically. As the gases and fluids lost pressure and heat during ascent, insoluble minerals first precipitated out on the fault walls, followed by soluble minerals and metals. The result was irregular and mineralized bands or seams impregnated with metals, recognized as veins by the mining industry. Most veins were barren of metals, some offered disbursed ore, and a few featured rich pockets or stringers. Nearly all terminated less than 1,000 feet deep.

Prospecting for Hardrock Ore

Finding the ore formations was the first step in hardrock mining, and this was the task of the prospector. Popular history suggests that individual or pairs of prospectors found rich gold and silver veins by simply excavating pits with pick and shovel, or by wandered the countryside until they encountered rich outcrops. In actuality, successful prospecting usually involved a basic knowledge of mineralogy and geology, hard work, patience, and strategy and planning. Prospectors also rarely worked alone because parties ensured safety and security, increased the likelihood of finding ore through group efforts, and hastened examination and sampling.

The process of prospecting often began with a cursory survey of an area of interest. Where bedrock was exposed, prospectors looked for seams, joints, quartz veins, dykes, unusual mineral formations, and minerals rich with iron. Where vegetation and soil concealed bedrock, prospectors scanned the landscape for anomalous features such as water seeps, abrupt changes in vegetation and topography, and changes in soil character.[529]

If an area offered some of these characteristics, the party of prospectors shifted to more intensive examination methods. One of the oldest and simplest strategies for locating gold veins began by testing gravel and soil. By periodically panning samples, a party could track the gold uphill, and when members encountered the precious metal no more, they knew they were near the source. The party then excavated test pits and panned the soil immediately overlying bedrock in hopes of finding a continuation of the gold. They tested soil samples horizontally back and forth across the slope in an attempt to define the lateral boundaries of the gold flecks, then moved a short distance upslope and repeated the process. Theoretically, each successive row of pits should have been shorter than the previous one, since erosion tended to distribute gold and other minerals in a fan from their point sources. By excavating several rows of pits, the prospectors were able to project the fan's upslope apex where, they hoped, the vein lay. Employing such a triangulation strategy occasionally paid off, but the party of prospectors had to undertake considerable work digging prospect pits with pick and shovel, hauling soil samples to a body of water, and panning in cold streams. It seems likely that many of the gold veins in the Clear Creek drainage were found with these methods.[530]

One of the greatest drawbacks to systematic panning was that it detected only gold but missed silver and industrial metals, which were economically as important in the two counties. To find minerals in addition to gold, prospectors scanned the stream gravel and other areas of exposed soil for what they termed *float*, which consisted of isolated fragments of ore-bearing rock. As with gold, natural weathering fractured ore bodies and transported the pieces downslope, often in the shape of a fan. If the prospectors encountered ore specimens, they walked transects to define the boundaries of the scatter, narrowing the search to the most likely area. Applying the same methods used to locate gold veins, prospectors excavated groups or rows of pits and traced ore samples until they could project where the vein supposedly lay. With high hopes, the prospectors sank several prospect pits down to bedrock and chipped away at the material to expose fresh minerals.[531]

If the exposed bedrock suggested the presence of an ore body, the party of prospectors often excavated a row of pits along the formation to track its length, direction, and width. Afterward, they may have elected to drive either a small shaft or adit with the intent of sampling the mineral deposit at depth and confirm its continuation. After clearing away as much

[529] Bramble, 1980:11-13; Peele, 1918:381-385; Young, 1946:19-26.
[530] Bramble, 1980:11-13; Peele, 1918:381-385; Young, 1946:19-26.
[531] Bramble, 1980:11-13; Peele, 1918:381-385; Young, 1946:19-26.

fractured, loose bedrock as possible with pick and shovel, a pair of prospectors began boring blast-holes with a hammer and drill-steels. They often bored between 12 and 18 holes, 18 to 24 inches deep, in a special pattern designed to maximize the force of the explosive charges they loaded. Prior to the 1880s, prospecting parties usually used blasting powder, and by the 1890s, most converted to stronger but more expensive dynamite. Until ore had been proven in economic quantities, the operation was classified as a *prospect*.

Deep Exploration and the Development of Ore Bodies

A *prospect* differed greatly from a *mine*. A prospect was an operation in which prospectors sought ore. The associated workings ranged from groups of pits to shallow adits or shafts with as much as hundreds of feet of horizontal and vertical exploratory passages. A mine, by contrast, usually consisted of at least several hundred of feet of workings and a proven ore body.

The general methods by which prospectors and miners searched for and extracted ore, and equipped their operations were universal throughout the West. Clear Creek and Summit counties were no exception, and the methods fell into common patterns. The most elementary was converting the prospect into a mine once a company proved ore. Usually, the company hired a crew of miners who enlarged the prospect adit or shaft and systematically blocked out the vein. At the point where a tunnel or shaft penetrated the vein, miners *developed* it with internal workings. They drove *drifts* along the vein, *crosscuts* extending 90 degrees across the vein, internal shafts known as *winzes* dropping down from the tunnel floor, and internal shafts known as *raises* that went up. Drifts and crosscuts explored the length and width of the ore, and raises and winzes explored its height and depth.

Miners consciously chose to sink shafts or drive adits in response to fundamental criteria. A shaft was easiest and the least costly to keep open against fractured and weak ground, and it permitted miners to stay in close contact with a vein it. A shaft also lent itself to a latticework of drifts, crosscuts, raises, and winzes to explore and block out an ore body.

Mining engineers discerned between vertical and inclined shafts. Some engineers preferred inclined shafts because mineral bodies were rarely vertical and instead descended at an angle. In addition, inclined shafts needed smaller, less expensive hoists than those used for vertical shafts. Other engineers, however, preferred vertical shafts because maintenance cost less. Vertical shafts had to be timbered merely to resist swelling of the walls, while timbering in inclines also had to support the ceiling, which was more expensive. Inclined shafts also required a weight-bearing track for the hoist vehicle, which was an added cost.

An adit or tunnel, by contrast, was easier and faster to drive and required significantly less capital than a shaft. Some mining engineers determined that the cost of drilling and blasting a shaft was as much as three times more. Prospectors and mining engineers alike understood that adits and tunnels were self-draining, required no hoisting equipment, and allowed for easy movement. However, adits and tunnels were not well suited for developing deep veins because interior hoisting and ore transfer stations had to be blasted out, which proved costly and created traffic congestion. Another problem was the enormous cost of timbering against cave-in where the rock was weak. While the exact differentiation between a tunnel and an adit is somewhat nebulous, mining engineers and industry experts referred to narrow and low tunnels as *adits*. Passages wide enough to permit incoming miners to pass outgoing ore cars, high enough to accommodate air and water plumbing suspended from the ceiling, and extending into substantial workings have been loosely referred to as *tunnels*.[532]

Despite the comparison between shafts and tunnels, factors beyond the miner's control usually governed the actual choice. Geology proved to be a deciding criterion; steep hillsides, deep canyons, and gently pitching ore bodies lent themselves well to tunnels. In many cases prospectors who had located an outcrop of ore high on a hillside elected to drive an adit from a point considerably downslope to intersect the formation at depth, and if the ore body proved economical, then the mining company carried out extraction through the adit.[533]

Limitations of claim size and access were another deciding criterion. In most mining districts, including those in the two counties, the recognized hardrock claim was 1,500 feet long and 300 to 600 feet wide, which left limited work space both above and below ground. A shaft was the only means to pursue a deep ore body within the confines of such a claim. Companies interested in tunneling either had to consolidate groups of claims, or obtain easements through adjoining properties.[534]

The Mine Surface Plant

Work underground required support from facilities on the surface. Known among miners and engineers as the *surface plant*, these facilities were designed to meet a variety of needs. Large, productive mines featured sizable surface plants, while small prospect operations tended to have simple facilities. Regardless of whether the operation was small or large, the surface plant had to fulfill five fundamental functions. First, the plant had to provide a stable and unobstructed entry into the underground workings. Second, it had to include a facility for tool and equipment maintenance and fabrication. Third, the plant had to allow for the transportation of materials into and waste rock out of the underground workings. Fourth, the workings had to be ventilated, and fifth, the plant had to facilitate the storage of up to hundreds-of-thousands of tons of waste rock generated during underground development, often within the boundaries of the mineral claim. Generally, both productive mines and deep prospects had needs in addition to the above basic five requirements, and their surface plants included the necessary components.

The basic form of a surface plant, whether haphazardly constructed by a party of inexperienced prospectors or designed by experienced mining engineers, consisted of a set of *components*. In terms of underground operations, the entry usually consisted of a shaft collar or a tunnel portal, and transportation arteries permitted the free movement of men and materials into and out of these openings. At tunnel operations, miners usually used ore cars on baby-gauge rail lines, and at shafts, a hoisting system lifted vehicles out of the workings. Materials and rock at shaft mines were usually transferred after hoisting into an ore car for transportation on the surface. Most of the plant components were clustered around the tunnel or shaft and built on cut-and-fill earthen platforms. Once enough waste rock had been extracted from the underground workings and dumped around the mouth of the mine, the facilities may have been moved onto the resultant level area. The physical size, degree of mechanization, and capital expenditure of a surface plant was proportionate to the workings below ground.

In addition to differentiating between surface plants for tunnels from those associated with shafts, mining engineers further subdivided mine facilities into two more classes. Surface plants for shaft sinking, driving adits, and underground exploration were different from those

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[532] Twitty, 2002:36.
[533] Colliery Engineer Company, 1893:257; International Textbook Company, 1899:A40:8.
[534] *Morrison's Mining Rights*, 1899:17, 20; Peele, 1918:1474.

designed to support ore production. Engineers referred to exploration facilities as *temporary-class plants*, and as *sinking-class plants* when associated with shafts. Such facilities were by nature small, portable, energy inefficient, and most important, inexpensive. *Production-class plants* on the other hand usually represented long-term investment and were intended to maximize production while minimizing operating costs such as labor, maintenance, and energy consumption. Such facilities emphasized capital-intensive mechanization, engineering, and scientific calculation.

Mines underwent an evolutionary process in which the discovery of ore, installation of a temporary plant, upgrade to a production plant, and eventual abandonment were points along a spectrum. Depending on whether a company found ore and how much, a mine could have been abandoned in any stage of evolution. Engineers and mining companies usually took a cautionary, pragmatic approach when upgrading a sinking plant to a production plant. Until significant ore reserves had been proven, most mining companies minimized their outlay of capital by installing inexpensive machines adequate only for meeting immediate needs.

Mining engineers extended the temporary- and production-class classifications to machine foundations. Because of a low cost, ease of erection, and brief serviceable life, timber and hewn log machine foundations were strictly temporary-class. Production-class foundations, in contrast, consisted of concrete or masonry. Wooden foundations usually consisted of cribbing, a framed cube, or a frame fastened to a pallet buried in waste rock for stability and immobility. The construction of machine foundations is important because they are the principal evidence conveying the composition of a surface plant today.[535]

Surface Plants for Tunnels

The surface plants for tunnels and shafts shared many of the same components. And yet, because of the fundamental differences between these two types of mines, the design and characteristics were different for each. Following is a list and description of the principal components found at typical tunnel operations.

The Tunnel Portal

The tunnel portal was a primary component of both simple prospects and complex, profitable mines. Professionally trained mining engineers recognized a difference between prospect adits and production-class tunnels. Height and width were the primary defining criteria. A production-class tunnel was wide enough to permit an outgoing ore car to pass an in-going miner, and high enough to house compressed air lines and ventilation tubing. By the 1910s, some mining engineers defined production-class tunnels as being at least 3½ to 4 feet wide and 6 to 6½ feet high.[536]

Mining engineers paid due attention to the tunnel portal because it guarded against cave-ins of loose rock and soil. Engineers recognized *cap-and-post timber sets* to be best for supporting both the portal and areas of fractured rock further in. This ubiquitous means of support consisted of two upright posts and a cross-member, which miners assembled with precision using measuring rules and carpentry tools. They cut square notches into the timbers, nailed the cap to the tops of the posts, and raised the set into place. Afterward, the miners hammered wooden wedges between the cap and the tunnel ceiling to make the set weight-

[535] Twitty, 1999:30-32.
[536] Peele, 1918:459; Young, 1923:463.

bearing. A series of cap-and-post sets were required to zones of weak ground, and they were often lined with *lagging* to retain loose rock and earth. In swelling ground, the bottoms of the posts had to be secured to a floor-level cross-timber or log footer to prevent them from being pushed inward. Wood used for the purposes of supporting wet ground decayed quickly and had to be replaced as often as several times a year. Professionally trained mining engineers claimed that dimension lumber was best for timber sets because it decayed slowly and was easy to frame, but high costs discouraged its use where hewn logs were available.[537]

Mine Transportation

Both prospect operations and large mines employed transportation systems to haul waste rock out of the underground workings and send supplies in. The conveyances used by prospectors had to be inexpensive, adaptable to tight workings, and capable of being carried into the backcountry. To meet these needs, prospect outfits often used wheelbarrows on plank runways. Mining engineers recognized the functionality of wheelbarrows but classified them as strictly serving the needs of prospecting because of their light duty.[538]

Outfits with substantial underground workings required a vehicle with a greater capacity. The vehicle of choice was the ore car, which consisted of a plate iron body mounted on a turntable riveted to a rail truck. Cars were approximately 2 feet high, 4 feet long, and 2½ feet wide, held at least a ton of rock, and had a swing gate at the front to facilitate dumping.

Ore cars ran on rails manufactured in standard sizes. The units of measure were based on the rail's weight-per-yard. Light-duty rail ranged from 6 to 12 pounds-per-yard, medium-duty rails included 12, 16, 18, and 20 pounds-per-yard, and heavy rail was more. Prospecting outfits usually purchased light-duty rail because of its portability and low cost. Mining engineers used medium-duty rail or better for production because it lasted longer.[539]

The specific type of rail system installed by a mining operation reflected the experience and judgment of management, the financial status of the company, and the extent of the underground workings. The basic rail system used in nearly all Colorado mines consisted of a main line that extended from the areas of work underground, though the surface plant, and out to the waste rock dump. Productive mines and deep prospect operations usually had spurs underground extending to tunnel faces, stopes, and ore bin stations. At substantial mines, spurs also extended to different parts of the waste rock dump, a storage area, and the mine shop. Many large mines built special stake-side, flatbed, and latrine cars for the coordinated movement of specific materials and wastes.

Most companies employed workers known as trammers to manually push the ore cars to their destinations of need. At large mines, however, such practice was not cost-effective, and companies relied on draft animals to pull trains of two or three cars. During the nineteenth century, miners learned that mules were the best animals for work underground because they were reliable, strong, of even temperament, and intelligent.

The electric locomotive, termed an *electric mule*, was an efficient alternative to draft animals, but it was too costly for most operations. A small locomotive cost $1,500 and $7.50 per day to operate. A mule, on the other hand, cost only $150 to $300 to purchase and house, and between $.60 and $1.25 to feed and care for per day.[540]

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537 International Textbook Company, 1899:A40:42.
538 Twitty, 2002:36.
539 International Textbook Company, 1899:A40:53; Young, 1923:192.
540 General Electric Company, 1904:23; Peele, 1918:862, 871.

Locomotives required special mechanical and electrical engineering skills to install and operate. Upgrades to the rail line presented the engineer with additional costs. Mules were able to draw between three and five ore cars that weighed approximately 2,500 pounds each, and a track of 16 pound rails spiked at an 18 inch gauge proved adequate. But electric locomotives and their associated ore trains usually weighed dozens of tons, and as a result they required broad tracks consisting of heavier rail. Mining engineers recommended that at least 20 pound rail spiked 24 inches apart on ties spaced every two feet for small to medium-sized locomotives. Heavy locomotives required rail up to 40 pounds per yard spiked at 36 inch gauge. The reason for the heavy rails and closely spaced ties was that the machines pressed down on the track and perpetually worked uphill against the downward-flexed rails. This wasted much of the locomotive's power and energy, and engineers sought to minimize the sag with stiff rails on a sound foundation of closely spaced ties.[541]

Electric locomotives were tied to a fixed route defined by the trolley wires, limiting their range within a mine. To remedy this problem, machinery makers introduced two self-contained alternatives. One was the storage battery locomotive, developed around 1900. The other was the compressed air locomotive, and it consisted of a compressed air tank fastened to a miniature steam locomotive chassis. These varieties negotiated tight passageways, had plenty of motive power, spread fresh air wherever they went, operated on the ubiquitous 18 inch rail gauge, and did not require complex electrical circuitry. However, compressed air locomotives were expensive, costing as much as their electric counterparts, and they required a costly compressor.

Because of high cost and limited application, the locomotives were adopted slowly in the two counties proved at first. But by the 1900s, a number of companies in Clear Creek County employed the machines in their deep tunnels. The Newhouse Tunnel, which attained a length of five miles, was the best example.

The Mine Shop

Every mine employed a blacksmith who maintained and fabricated equipment, tools, and hardware. The common rate for driving a tunnel in hard rock using hand-drills and dynamite was approximately one to three feet per 10 hour shift. Over the course of such a day, miners blunted drill-steels in substantial quantities, and for this reason, the blacksmith's primary duty was sharpening those steels.[542]

Mining companies erected shop buildings so the blacksmith could work in foul weather. The buildings tended to be small, simple, rough, and industrial in appearance. Operations lacking capital often relied on local building materials such as logs, and many prospect outfits merely erected wall tents. Companies with capital preferred lumber and, by the early 1900s, corrugated sheet iron siding as building materials. One trait shared by most shops was the use of windows to afford natural light, and earthen floors. Prospecting and mining outfits almost invariably located the shop adjacent to the tunnel portal or shaft collar to minimize unnecessary handling.

In general, blacksmiths required few tools but much skill for their work. A typical basic field shop consisted of a forge, bellows or blower, anvil, quenching tank, hammers, tongs, a swage, a cutter, chisels, a hacksaw, snips, a small drill, a workbench, iron stock, hardware, and basic woodworking tools. Prior to the 1910s, outfits deep in the backcountry often dispensed

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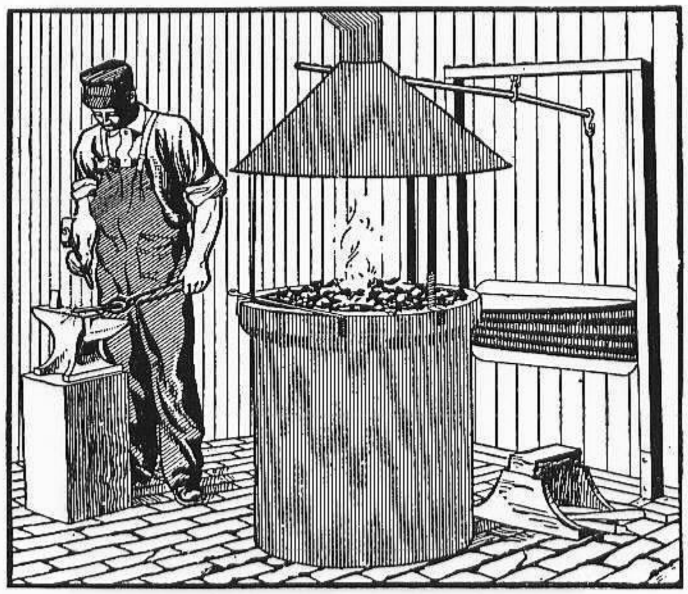
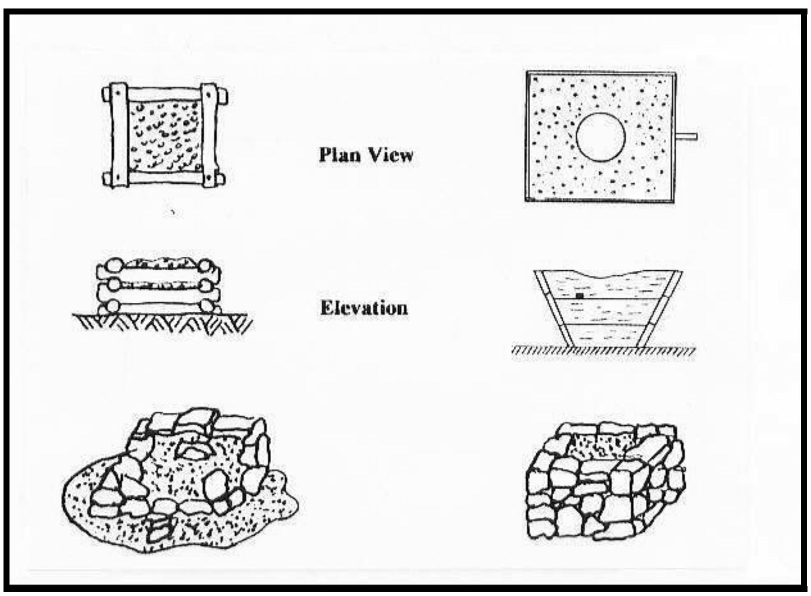
541 Colliery Engineer Company, 1916:767; International Textbook Company, 1906:A55:6; International Textbook Company, 1907:A48:2; International Textbook Company, 1926:1; Young, 1923:192.

542 Hoover, 1909:150; International Textbook Company, 1907:A48:13; Peele, 1918:184; Young, 1946:87.

with factory-made forges and used local building materials to make vernacular versions. The most popular type of custom-made forge consisted of a gravel-filled dry-laid rock enclosure usually 3 by 3 feet in area and 2 feet high, and miners in forested regions substituted small logs. A tuyere, often made of a 2 foot length of pipe with a hole punched through the side, was carefully embedded in the gravel. Its function was to direct an air blast from a blower or bellows upward into the fire in the forge.

The illustrated shop is representative of those at prospects and small mines. Such shops usually consisted of little more than a forge, an anvil, and hand-tools, which restricted work to drill-steel sharpening and the manufacture of light hardware. Source: Drew, 1910:1.





Examples of the common forges used in blacksmith shops. At upper left is a gravel-filled log forge, at right is a wood box forge, and at lower right is a dry-laid rock forge. Over time, rock forges decay and collapse, and manifest as the remnant at lower left. Source: Eric Twitty.

The size of a shop and its appliances were functions of capital, type of work, and era. At small mines, shops typically featured a forge and blower in one corner of the building, an anvil and quenching tank adjacent, a workbench along one of the walls, and a lathe and drill-press on another wall. Rarely did shops at small mines include power appliances. Mining companies employed greater numbers of power appliances during the 1890s as the costs of necessary steam engines and air compressors fell. The companies also had to build larger buildings to provide greater space. Lathes, drill-presses, and power hammers became common by the late 1890s and permitted individual blacksmith to do the work of two. By the 1890s, well-appointed shops often included a mechanical saw, grinder, and pipe threader.

The widespread adoption of compressed-air powered rockdrills during the 1890s fostered a need for new sharpening methods and shop equipment. Although rockdrills increased the speed of driving tunnels and shafts, they slowed shop work with high volumes of dulled drill-steels and broken fittings. In the first decade of the twentieth century, mining equipment manufacturers introduced drill-steel sharpening machines to expedite the sharpening process. The early models were similar in appearance to horizontal lathes, required stout concrete foundations, and ran on compressed air. Thus, they could only be used at mines equipped with compressors. Few mining companies in Clear Creek and Summit counties employed the first-generation drill-steel sharpeners because of a high cost. During the early 1910s, leading rockdrill makers introduced units that were compact and less expensive. The devices stood on cast iron pedestals bolted to timber foundations, and fit within common shop buildings. Well-funded mining companies then began installing the improved type with increased frequency over the course of the 1910s. Small companies with limited funds, on the other hand, rarely purchased the drill-steel sharpeners, instead relying on traditional forge sharpening methods as late as the 1930s. Such outfits usually lacked capital and adequate air compressors.

Mine Ventilation

Open flame lights, the use of explosives, respiration of laboring miners, and natural gases often turned the atmosphere underground into an intolerably stifling and even poisonous environment. Many mining outfits employed on one or a combination of two basic systems to expel foul air from the workings. It should be noted that because ventilation required capital, many companies also attempted to do nothing. The first system, *passive ventilation*, relied on the circulation of natural air currents to carry gases away, and such air movement could only be established when a mine featured multiple openings. Most mines and prospects, however, had only one opening, and natural circulation proved marginal to ineffective in dead-end workings. As a result, some companies employed *mechanically assisted ventilation systems* to force fresh air underground.

Prospecting outfits often employed systems that cleverly combined passive and mechanical means. One of the simplest consisted of a canvas windsock fastened to a wooden pole, and it directed natural breezes through canvas tubing or stovepipes into the underground workings. Poor performance on calm days was a major drawback. In another hybrid system, ordinary woodstoves created convection currents that siphoned foul air of the underground workings. The stove stood near the mine opening and featured a common stovepipe on top to vent exhaust gases away. The stove's air intake had a coupling for ventilation tubes extending into the underground workings. As a fire burned in the stove, the hot gases rising up the stovepipe created a vacuum in the ducting and drew foul air out of the mine.[543]

Prospectors also employed simple mechanical systems for ventilation. Outfits commonly used large forge bellows or small hand-turned blowers to force air through stovepipes or canvas tubing into the workings. A bellows could ventilate short adits and shafts but lacked the pressure to clear out deep workings. Hand-turned blowers, on the other hand, cost more money but were better at forcing foul air from workings.

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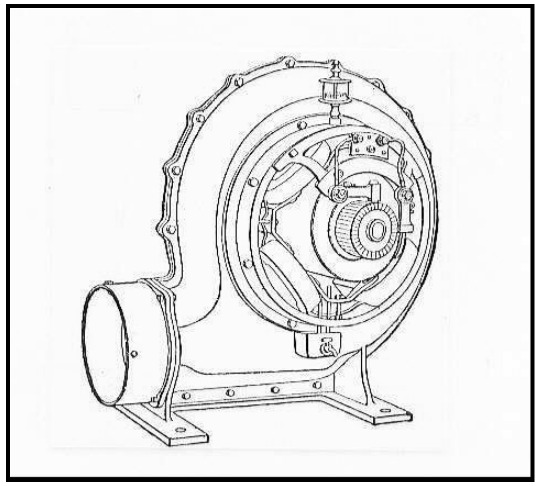
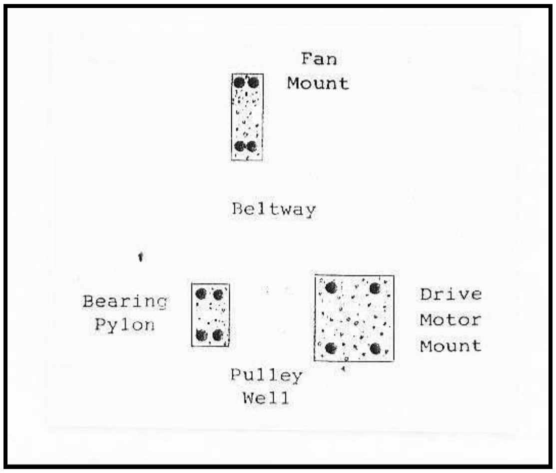
543 Twitty, 1999:51.

At right is a common ventilation blower used to force fresh air underground. Ducting was fastened to the nozzle, and a belt turned the machine. Source: International Text Book Company, 1899, A41:146.





The plan view at left depicts a typical concrete foundation for a ventilation blower and its drive motor. Source: Eric Twitty.

Windsocks and hand-turned blowers were ineffective for extensive workings, which required better methods. One of the most popular and effective was power-driven fans and blowers, and their sheet iron ducting. Machinery manufacturers offered three basic designs of blowers. Engineers termed the first, popularized by the 1870s, the *centrifugal fan*, and miners knew it as the *squirrel cage fan*. This machine consisted of a ring of vanes fixed to a central axle, much like a steamboat paddlewheel, enclosed by a shroud. As the fan turned at a high speed, it drew air in through an opening around the axle and blew it out a port in the shroud. Manufacturers produced centrifugal fans in sizes ranging from one to over ten feet in diameter. The small units were employed for both mining and general purposes such as building ventilation. The largest units saw extensive application in coal mines.

The second type of ventilation fan for mining also acted on centrifugal principles, but it was shaped differently from the squirrel cage version. The type consisted of a ring of long and narrow vanes within a curvaceous cast iron housing. The *propeller fan*, the third type of blower, was similar to the modern household fan, and it too was enclosed in a shroud.

Surface Plants for Shafts

The surface plants that supported work in shafts incorporated many of the same components as those for tunnels. However, due to the vertical nature of shafts, their surface plants also included hoisting systems, which had to meet specific engineering requirements. Typical hoisting systems at the mines of Clear Creek and Summit counties consisted of a hoist, a headframe, a power source, and a hoisting vehicle. The financial state of the mining outfit, physical accessibility, and the quantity of proven ore governed the sophistication and cost of the system.

Shaft Form and Hoisting Vehicles

Experienced prospectors and mining engineers alike recognized that crude prospect shafts were inadequate for anything other than shallow underground exploration. When companies confirmed the existence of ore, they sank better shafts designed for ore production. Engineers understood that the size of a shaft directly influenced how much ore could be hoisted out, and by the 1880s, they distinguished between temporary-class and production-class shafts.

Temporary-class shafts often featured one large compartment 3½ by 7 feet in-the-clear or less, and it served multiple needs. Miners used the compartment for ascending and descending ladders, they built stations within, and used it to hoist rock out. Production-class shafts were larger and more complex, and engineers established a standard during the 1880s for their composition. According to convention, engineers divided the interior into a *hoisting compartment* and a *manway*, also known as a *utility compartment*. Support timbering and bulkheads provided the separation. Initially, mining engineers defined production-class hoisting compartments as at least 4 by 4 feet in-the-clear. By the late nineteenth century, they determined a 4 by 5 foot hoisting compartment was better suited for ore production, and 5 by 7 feet was best because it facilitated large loads.[544]

Mining engineers also recognized the utility of balanced hoisting. The use of one hoisting vehicle in a shaft became known as *unbalanced hoisting*, and while this system was very inefficient in terms of production capacity and energy consumption, it was the least costly and hence universal. *Balanced hoisting* relied on two vehicles counterweighing each other, and as one rose the other descended. Such a design required two hoisting compartments and a double-drum hoist, which constituted a considerable expense. But the hoist only had to do the work of lifting the ore, and as a result this system was energy efficient and provided long-term savings. Well-funded companies anticipating heavy production in Clear Creek County spared the expense and installed balanced systems.

Mining companies chose from four basic types of hoisting vehicles. The first was the *ore bucket*, the second was the *ore bucket and crosshead*, the third was the *cage*, and the last was the *skip*. The ore bucket found great favor at prospects and small mines because its shape and features were well suited for primitive conditions. The typical ore bucket consisted of a convex body that permitted the vessel to glance off shaft walls without catching on obstructions. Manufacturers forged a loop into the bail to hold the hoist cable on center, and riveted a ring onto the bottom of the bucket so the vessel could be upended once it had reached the surface.

Mining companies sinking deep shaft took great risks when they used ore buckets. The vehicles had a tendency to sway during ascent, strike the shaft walls, and even empty their contents onto the miners below. Thus, some companies installed a hybrid ore bucket suspended

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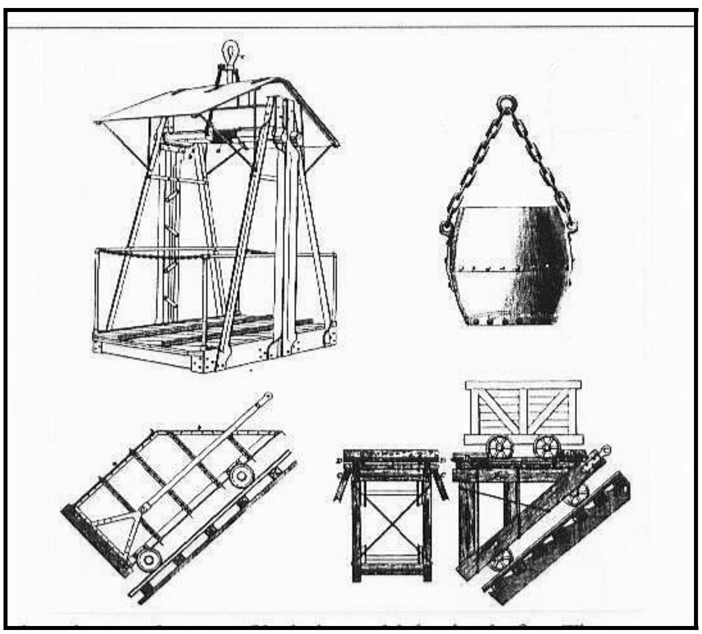
[544] Eaton, 1934:13; International Textbook Company, 1905:261; Peele, 1918:251; Young, 1923:171, 461.

from a frame that ran on guide rails bolted the length of the shaft. The frame, known as a *crosshead*, held the ore bucket steady and provided miners with a platform to stand on, albeit dubious, during their ascents and descents. Besides safety, another advantage offered by a crosshead was that miners working underground were able to switch empty buckets with full ones. Many poorly financed and marginally productive companies favored this type of hoisting vehicle. In any form, mining engineers considered ore buckets as temporary-class hoisting vehicles.

When intact, shafts often are divided into several compartments for hoisting and egress. The collars are usually timbered to retain loose material, and are flush with the surrounding ground. Intact examples are rare and important engineering resources. Source: Eric Twitty.



Mining companies employed several types of hoisting vehicles in shafts. The cage at upper left, popular from the 1870s through the 1930s, ran on guide rails and carried miners or an ore car. The sinking bucket at upper right required no rails and was common among small operations. The skip at lower left was popular in both vertical and inclined shafts by the 1900s. It ran on rails and required guides in the headframe to empty. At lower right is a vehicle for inclined shafts that became obsolete by the 1900s. Source: Twitty: 2002:151.

A mining industry institution for over 140 years, the cage consisted of a steel frame fitted with a deck for miners and rails for an ore car. Nearly all cages used in Clear Creek and Summit counties featured a stout cable attachment at top, a bonnet to fend off falling debris, and steel guides which ran on special fine-grained 4x4 inch hardwood rails. After a number of grizzly accidents in which hoist cables parted, mining machinery makers installed special safety-dogs on cages designed to stop an undesired descent. Usually, the dogs consisted of toothed cams controlled by springs kept taught by the weight of the suspended cage. If the cable broke, the springs retracted, closing the cams onto the wood rails.

Cages proved to be highly economical because mining companies did not have to spend time manipulating ungainly ore buckets. When the cage was stopped at a station underground, a miner merely had to push on an ore car, and when the cage was at the surface, another worker pushed the car off. But cages presented mining companies with several drawbacks. One of the biggest problems lay in boring a shaft that possessed enough space not only to make way for the cage, but also to accommodate timbering for the guide rails.

Cornish mining engineers originally developed the skip for haulage in the inclined shafts of Michigan copper mines during the 1840s and 1850s, and they quickly became popular in Colorado's mines. The typical skip consisted of a large iron or wood box on wheels that ran on a rail line. Skips had little deadweight, they held much rock, and because they ran on rails, they could have been raised quickly.

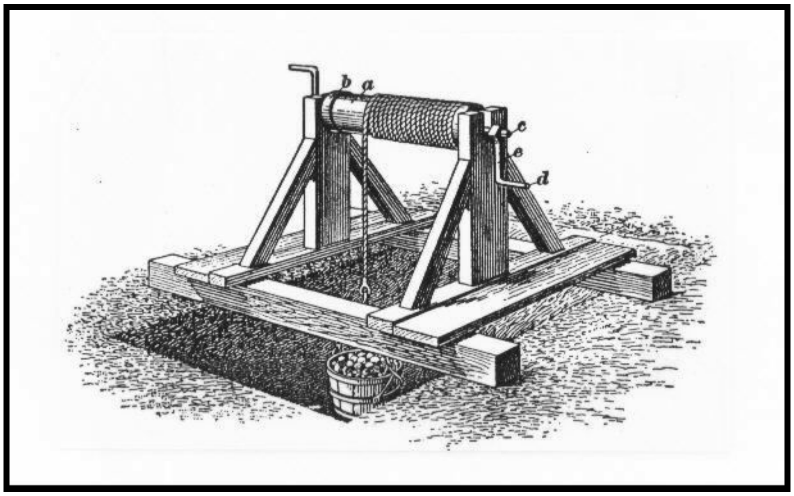
During the 1890s, mining engineers began to recognize the skip as superior for vertical shafts, as well as inclined shafts. Skips were lighter than cages because they did not have the combined dead weight of the vehicle and an ore car, and this resulted in energy savings. Skips also offered the benefit of being quickly filled and emptied, resulting in a rapid turnover of rock. Shortly after the turn-of-the-century, Western mining companies began replacing cages with skips for use in vertical shafts. The change proceeded slowly through the 1900s, it accelerated rapidly during the 1910s, and by the 1930s most large and many medium-sized mines used skips.

Hoists

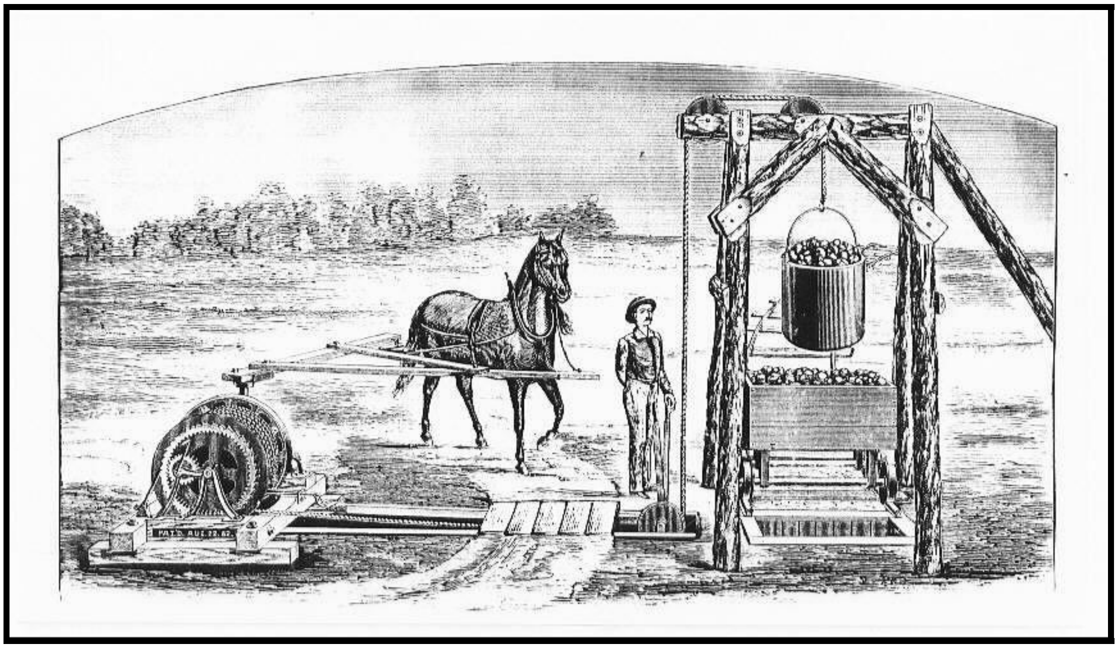
When prospectors and mining companies decided to sink shafts, they had to install hoists to raise material out of the underground workings. Like other surface plant components, hoists came in a wide range of sizes, types, and duties. Hoists designed for prospecting adhered to *sinking-class* characteristics, and hoists intended for ore production met *production-class* specifications. The *hand windlass* was the simplest form of sinking-class hoist, and prospectors used it for shallow work. The windlass was an ages-old manually powered winch, and it consisted of a spool made from a lathed log fitted with crank handles. Because the windlass was wound by hand, its working depth was limited to approximately 100 feet. Prospectors sinking inclined shafts had the option of using what was termed a *geared windlass* or *crab winch,* which offered a greater pulling power and depth capacity. Geared windlasses cost much less than other types of mechanical hoists and were small and light enough to be packed into the backcountry. The winch was not easily used at vertical shafts, however, because the rope spool and hand-crank fitted onto a frame which had to be anchored onto a well-built timber structure.[545]

Prospect operations often worked at depths greater than the limitations presented by windlasses, forcing them to install more advanced hoisting systems. The *horse whim* proved to be a favorite because it was relatively inexpensive, portable, and simple to install. Through the 1860s, the mining industry accepted the horse whim as a state-of-the-art hoisting technology for both prospecting and ore production. But by the 1870s, practical steam hoists came of age and mining engineers increasingly felt that horse whims were well-suited for backcountry prospecting, but were too slow and limited for ore production. Mining companies in Clear Creek and Summit counties used whims extensively for deep prospecting into the 1920s.

[545] Twitty, 2002:145.



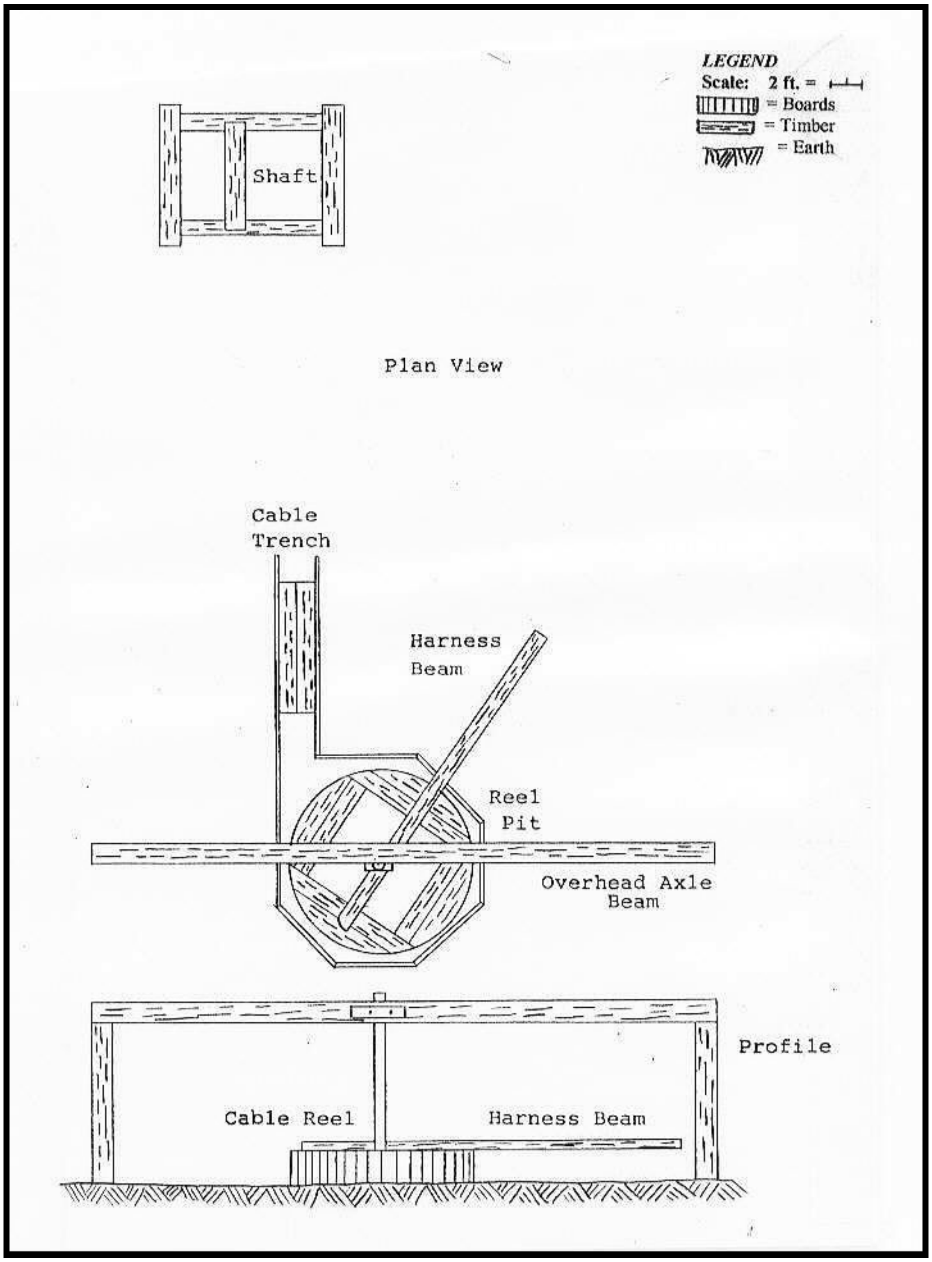
The windlass was an institution among prospectors, and nearly all shafts less than 100 feet deep were equipped with this simple, inexpensive, and portable type of hoist. Source: Twitty, 2002:145.



Horse whims were the most primitive type of mechanical hoist, and were a favorite among prospectors because of their simplicity and portability. The unit shown is a geared whim, which was popular from the 1880s through the 1910s. The hoist operator controlled a brake and clutch via levers mounted to the shaft collar. The control linkages and hoist cable passed through the trench. Source: Ingersoll Rock Drill Company, 1887:60.

Prospect outfits employed several varieties of horse whims, depending on era. The simplest and oldest version, christened by Latino miners the *malacate* (mal-a-ca-tay), consisted of a horizontal wooden drum or reel directly turned by a draft animal. Early malacates featured the drum, a stout iron axle, and bearings fastened onto both an overhead beam and a timber foundation. The drum rotated in a shallow pit lined with either rockwork or wood planking. The cable extended from the drum through a shallow trench to the shaft, through a pulley bolted to the foot of the headframe, then up and over the sheave wheel at the headframe's top. The draft animal walked around the whim on a prepared track and stepped over the cable trench on planks.

The controls consisted of brake and clutch levers mounted to the shaft collar, and they were connected to the apparatus by wood or iron linkages passing through the trench.[546]



The plan view, top, and elevation, bottom, depict a horizontal reel horse whim, which was a universal prospecting hoist prior to the 1880s. The reel was mounted to an axle on a timber footer buried in the floor of a plank-lined pit. Usually, only the pit and cable trench remain at prospect shaft sites today. Source: Eric Twitty.

Mining machinery makers offered factory-made horse whims which were sturdier and performed better than the older hand-made units. The *horizontal reel horse whim* consisted of a spoked iron cable reel mounted on a timber foundation that miners embedded in the ground. The type performed like the malacate and remained popular among prospect operations into the 1900s. The *geared horse whim* appeared in Colorado during the 1880s, and was popular among

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[546] Twitty, 2002:161.

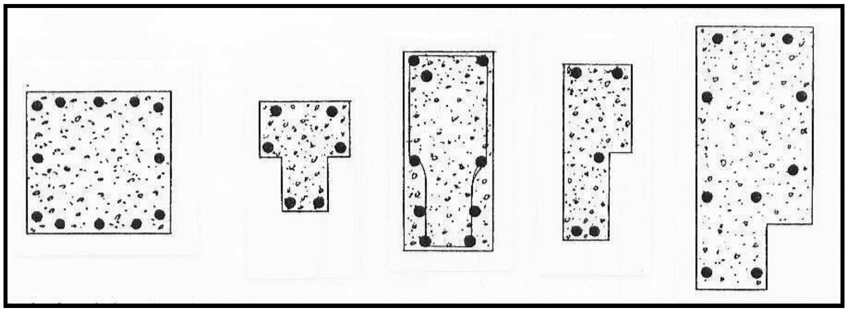
prospectors into the 1920s. The machine consisted of a cable drum mounted vertically on a timber frame, and a beveled gear transferred the motion from the draft animal's harness beam. Geared horse whims were supposedly faster than reel whims, could lift more, and featured controls and cable arrangements like the other types of whims. A horse whim required a headframe over the shaft, and the structures were small, simple, and temporary-class in duty. Prospectors favored a tripod, tetrapod, or a small four-post derrick that was just wide enough to straddle the shaft.[547]

Table E 4.1: General Hoist Specifications: *Type, Duty, Foundation*

Hoist Type	Hoist Class	Foundation Size	Foundation Footprint	Foundation Profile	Foundation Material
Hand Windlass	Shallow Sinking		Rectangular	Wood frame over shaft	Timber
Hand Winch	Shallow Sinking	3x3 ft.	Square or Rectangular	Flat	Timber
Horse Whim: Malacate	Shallow Sinking	7 to 10 ft. Diameter	Ovoid Depression	Cable Reel Axle Located in Pit	Timber
Horse Whim: Horizontal Reel	Sinking	4x4 ft.	Rectangular	Timber Footers in Depression	Timber
Horse Whim: Geared	Sinking	4x4 ft.	Rectangular	Timber Footers in Depression	Timber
Steam Donkey	Sinking	Portable	Rectangular	None	None
Gasoline Donkey	Sinking	Portable	Rectangular	None	None
Single Drum Gasoline	Sinking	2.5x8 ft. to 4x14.5 ft.	Rectangular	Flat	Timber or Concrete
Single Drum Gasoline	Sinking	2.5x8 ft. to 4x14.5 ft.	T-Shaped	Flat	Timber or Concrete
Single Drum Steam	Sinking	6x6 ft. and Smaller	Rectangular	Flat	Timber or Concrete
Single Drum Steam	Light Production	6x6 ft. to 7.5x10 ft.	Square or Rectangular	Flat	Concrete or Masonry
Single Drum Steam	Moderate Production	7.5x10 ft. and Larger	Rectangular	Irregular	Concrete or Masonry
Double-Drum Steam	Moderate Production	4x7 ft. to 7x12 ft.	Rectangular	Irregular	Concrete or Masonry
Double-Drum Steam	Heavy Production	7x12 ft. and Larger.	Rectangular	Irregular	Concrete and Masonry
Single Drum Geared Electric	Sinking	5x6 ft. and Smaller	Square or Rectangular	Flat	Concrete
Single Drum Geared Electric	Production	6x6 ft. and Larger	Square or Rectangular	Flat	Concrete
Single Drum Direct Drive Electric	Production	5x6 ft. and Larger	Square or Rectangular	Flat	Concrete
Double-Drum Geared Electric	Heavy Production	6x12 ft.	Rectangular	Irregular	Concrete
Double-Drum Direct Drive Electric	Heavy Production	6x12 ft.	Rectangular	Irregular	Concrete

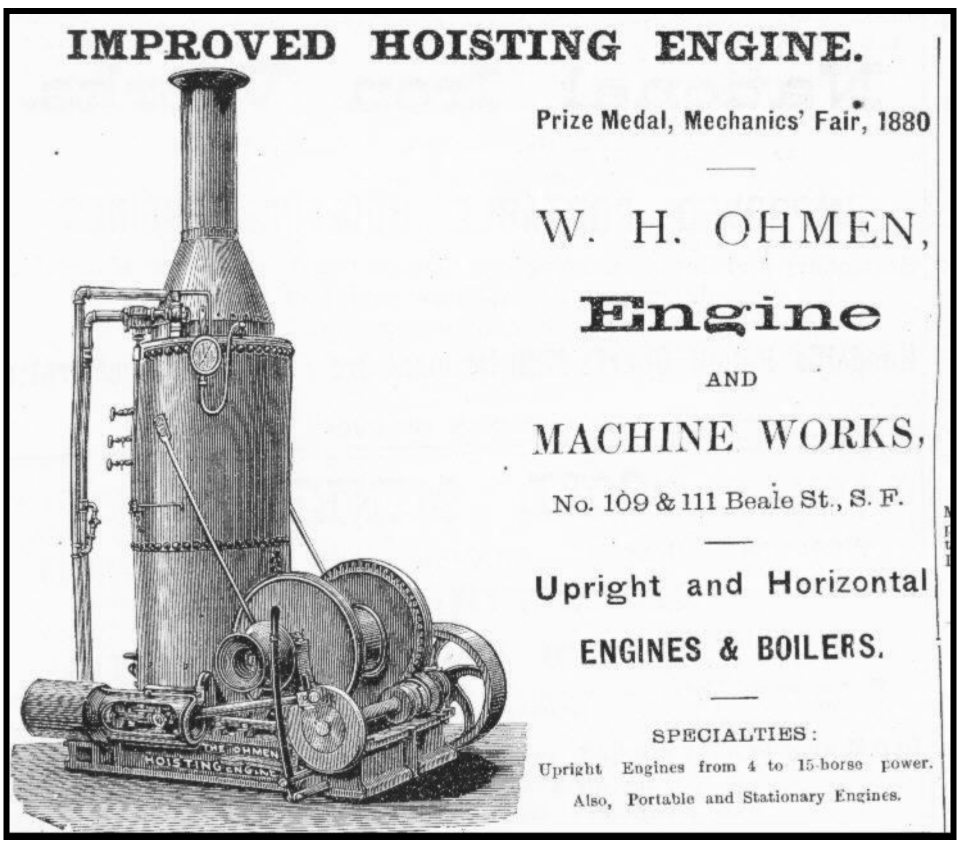
(Copied from Twitty, 2002:319).

[547] Twitty, 2002:162.

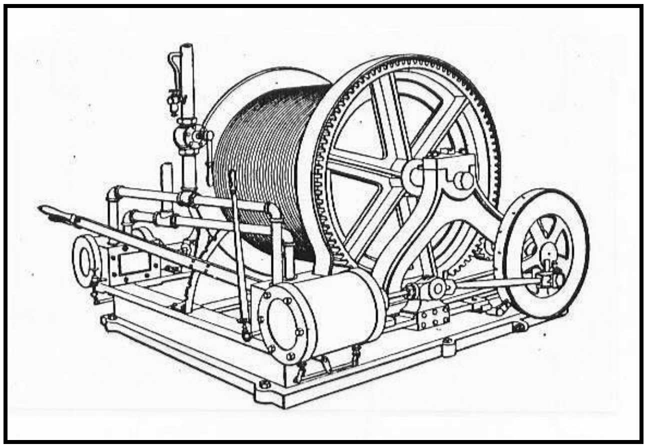


Hoist foundation plan views. Single-drum steam and electric hoists were bolted to foundations like the one at left, and the other foundations were for various types of gasoline hoists. Source: Twitty, 2002:187, 241.

A few companies in Clear Creek County employed steam hoists for deep work as early as the 1860s. The practice was rare, however, until around 1880 because of the cost, substantive infrastructure, and formal engineering. Prior to 1880, engineers had to assemble hoists on a custom basis from steam engines and cable drums, and afterward, machinery makers offered units specific for mining. Regardless of exact era, steam hoisting systems also required a boiler, cable, pipes, headframe, and foundations. The mining company also had to secure a reliable source of water and fuel for the boiler. After around 1880, the *geared single-drum duplex steam hoist*, known simply as the single-drum steam hoist, was the most popular type. These hoists became the ubiquitous workhorse for shaft mining and featured a cable drum, two steam cylinders flanking the drum, reduction gears, a clutch, a brake mechanism, and a throttle.



Donkey hoists were popular for deep prospecting after the 1880s because they were self-contained and required little site preparation other than a flat area. Source: *Mining & Scientific Press* 1881.

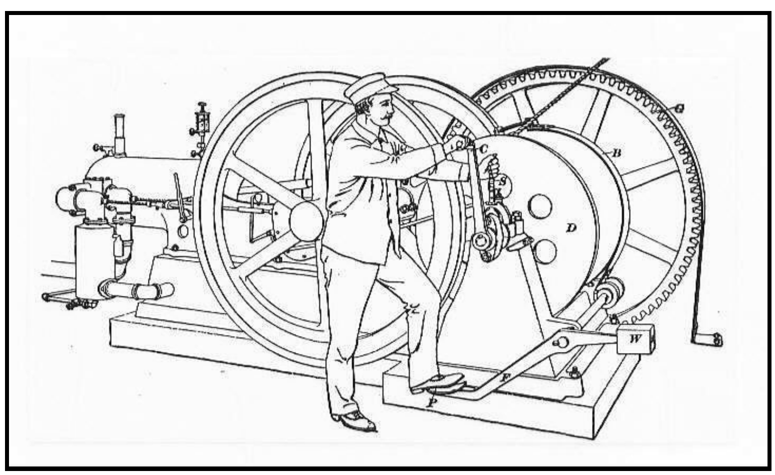


Single-drum geared steam hoists were the most common power type between the 1870s and 1910s. Gasoline and electric models became popular afterward. Source: International Text Book Company, 1906, A50:8.

Mining engineers selected the specific model and size of hoist primarily according budget and secondary on speed and the depth of the anticipated workings. Nearly all of the sinking-class hoists used for deep prospecting had bedplates smaller than 6 by 6 feet in area and were driven either by gearing or by a friction-drive mechanism. A friction-drive consisted of rubber rollers pressing against the cable drum flanges, and while these systems cost less than geared hoists, they were slow and apt to slip under load. Geared and friction hoists had limited strength, often less than 40 horsepower, slow speeds of 350 feet per minute, and payloads of only several tons. Professionally educated engineers defined such hoists as sinking-class in duty, but many mining companies used these underpowered hoists for ore production anyway.[548]

Prospect operations seeking riches deep in the backcountry spent capital on steam equipment only reluctantly. The problems they faced were twofold. Not only did these operations have to ship and erect the hoisting system, but they also had to continuously feed it fuel and water. In the early 1890s, the Witte Iron Works Company and the Weber Gas & Gasoline Engine Company both developed practical petroleum engine hoists to alleviate these issues. The innovative machines were smaller than many steam models, required no boilers, and their concentrated liquid fuel was by far easier to transport than wood or coal.

This type of gasoline hoist was employed for deep prospecting and minor ore production between around 1900 and 1930. A single-cylinder engine is at left, dual flywheels are at center, and the cable drum is at right. Source: International Textbook Company, 1906, A50:31.



[548] Twitty, 2002:319.

Despite the potential advantages of petroleum hoists, mining companies in Clear Creek and Summit counties did not immediately embrace the apparatuses. Steam technology, the workhorse of the Industrial Revolution, held convention in the mining industry into the 1900s for several reasons. First, many mining companies were by nature conservative, and out of familiarity they stayed with steam into the 1910s. Second, during this time, petroleum engine technology was relatively new and had not seen widespread application, especially for hoisting. The few operations to employ petroleum hoists during the 1890s found the engines to be cantankerous and their performances limited. Further, petroleum hoists had slow speeds of 300 to 400 feet per minute, could 4,500 pounds at most, and had working depths limited to less than 1,000 feet. For these reasons mining engineers felt they were adequate for sinking duty, and total acceptance took approximately fifteen years.[549]

The petroleum hoists available during the 1890s and 1900s were similar in form to old-fashioned steam donkey hoists. A large single-cylinder engine was fixed to the rear of a heavy cast iron frame, and its piston rod connected to a heavy crankshaft in the frame's center. Manufacturers located the cable drum, turned by reduction gearing, at the front, and the hoistman stood to one side and operated the controls. Because the early petroleum engines were incapable of starting and stopping under load, they had to run continuously. The hoistman had to delicately work the clutch when hoisting, and had to disengage the clutch and operate the brake to lower the ore bucket.

For production-class hoists, steam maintained supremacy into the 1920s, when electric motors began to out-perform steam. Prior to the 1920s, production-class steam hoists came in a wide array of sizes, as well as with *first-motion* or *second motion* drive trains. First-motion drive, also known as *direct-drive*, meant that the steam engine's drive rods were coupled directly onto the cable drum axle, similar to the drive rods and wheels of a steam locomotive. Second-motion, also known as a *geared-drive*, consisted of reduction gearing like the sinking-class hoists discussed above.

The difference in the drive mechanisms was significant in both performance and cost, and each served a distinct function. Gearing offered great mechanical advantage, permitting the use of small steam cylinders and allowing the hoist's footprint to be compact. First-motion hoists, on the other hand, required that the cable drum be mounted at the ends of large steam cylinders so that the drive rods could gain leverage. While geared hoists had nearly square footprints, those of first-motion hoists were elongated rectangles oriented toward the shaft. First-motion hoists were intended to serve as high-quality production-class machines that saved money only over protracted and constant use. Geared hoists were intended to be inexpensive and meet the short-term needs of modestly capitalized mines. They were not as strong, fast, or fuel-efficient, however. Their large sizes, high-quality steel, and the fine engines made first-motion hoists three to four times more expensive than geared hoists. The latter cost approximately $1,000 for light models up to $3,000 for production-class models. First-motion hoists had speeds of 1,500 to 3,000 feet per minute, compared with 500 to 700 feet per minute for geared hoists. Geared hoists usually relied on old-fashioned but durable slide valve engines, while first-motion hoists were equipped with Corliss valves engines, which were initially more expensive but consumed half the fuel.[550]

Although the costs of purchasing first-motion hoists were high, the installation expenses were, as well. Because geared hoists were self-contained on a common bedplate, the construction crew merely had to build a simple foundation with anchor bolts and lower the hoist

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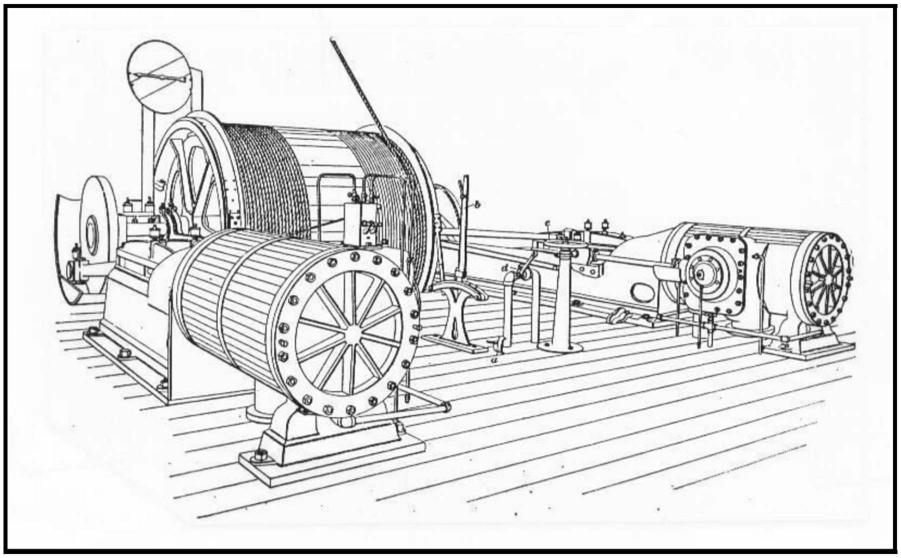
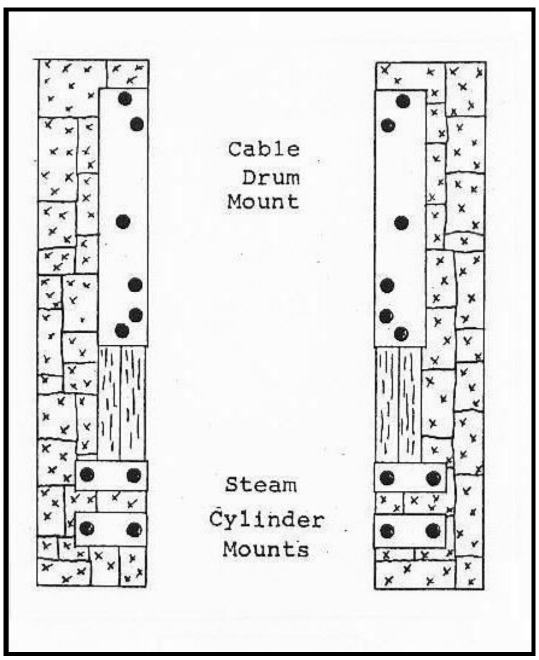
549 Twitty, 2002:173.

550 Twitty, 2002:199-201.

into place. First-motion hoists, on the other hand, required raised masonry pylons for the steam cylinders, more pylons for the cable drum bearings, a well for the drum, and anchor bolts between the pylons for the brake posts. The hoist pieces then had to be brought over, maneuvered into place, and simultaneously assembled.



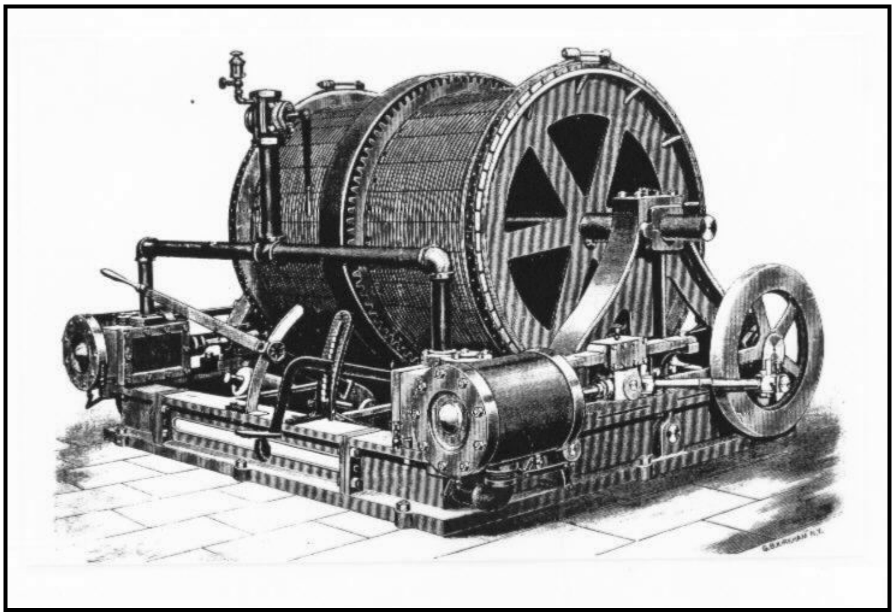
Rear quarterview of a direct-drive single-drum steam hoist. Powerful steam cylinders flank the hoist's controls, and the drive-rods are directly coupled to the cable drum. Source: International Text Book Company, 1906, A50:16.



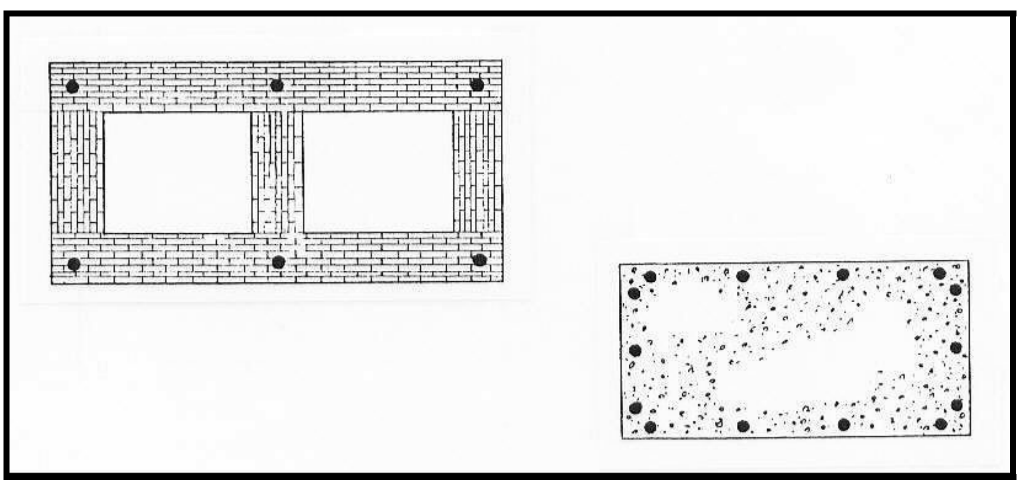
The plan view depicts a typical foundation for a direct-drive single-drum steam hoist. Such foundations are usually less than 14 by 17 feet in area. Source: Eric Twitty.

Mining engineers chose specific hoists for the power that they delivered, which had a proportional relationship with the hoist's overall size. Hoists between 7 by 7 feet and 9 by 9 feet were for minor ore production and delivered 75 to 100 horsepower. Hoists 10 by 10 feet to 11 by 11 feet were for moderate to heavy production and generated up to 150 horsepower, and larger units were exclusively for heavy production. Mining engineers rarely installed geared hoists larger than 12 by 12 feet, because they could have obtained an efficient first-motion hoist for a little more money.[551]

Regardless of the drive mechanism, single-drum hoists were restricted to shafts with single hoisting compartments. Double-drum hoists, on the other hand, offered greater economical performance through balanced hoisting as discussed above. They increased production while saving energy costs. Double-drum hoists possessed several drawbacks, however, that limited their appeal to well-financed mining companies. The hoists were considerably more expensive than single-drum models, and they required shafts with two hoisting compartments, which was even more money.

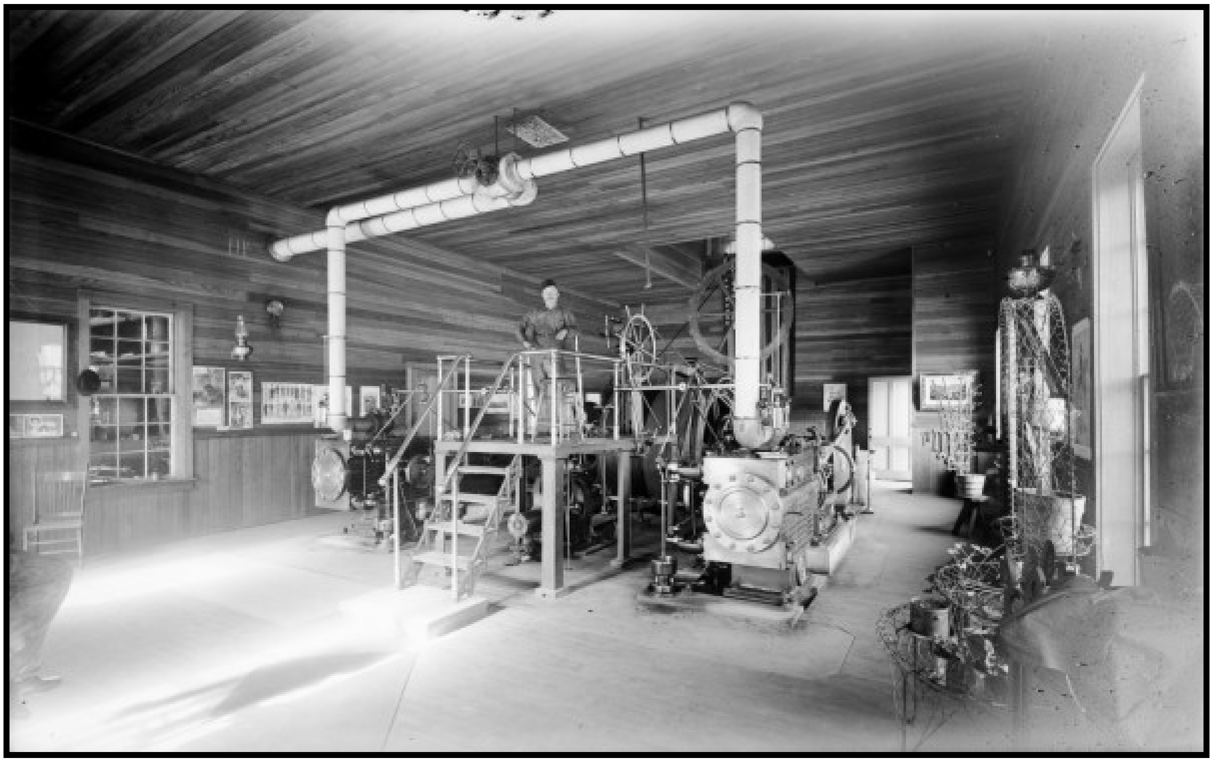


Rear quarterview of a geared double-drum steam hoist. Double-drum hoists, hallmarks of significant ore production, achieved balanced hoisting with two vehicles. Source: Ingersoll Rock Drill Company, 1887:65.



The plan views depict foundations for geared double-drum steam hoists. The foundation at left features wells for the hoist's cable drums. Source: Eric Twitty.

[551] Twitty, 2002:320.

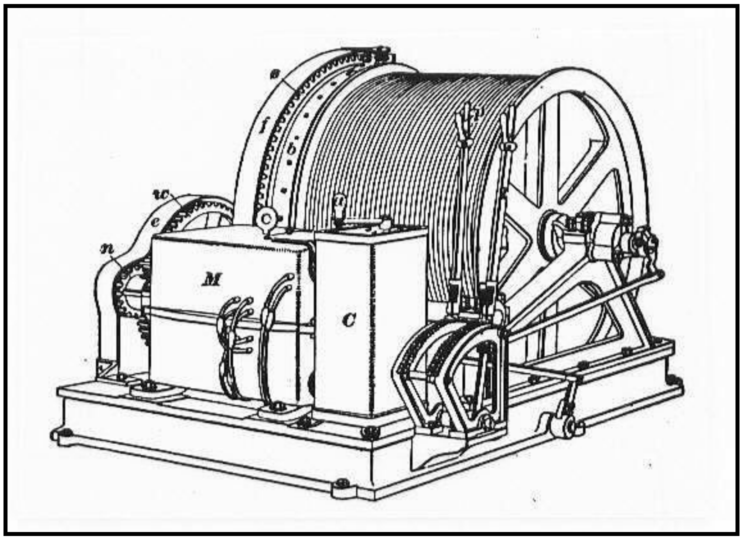


The rear quarterview illustrates a first-motion, double-drum hoist at the Gehrman Shaft, Stanley Mine, west of Idaho Springs around 1900. The hoist operator relied on the circular level gauge above the large machine to determine where in the shaft the cage vehicles were, exactly. The hoist room is immaculate, maps line the walls, and potted plants are by the window at right. Courtesy of Denver Public Library, CHS-B337.

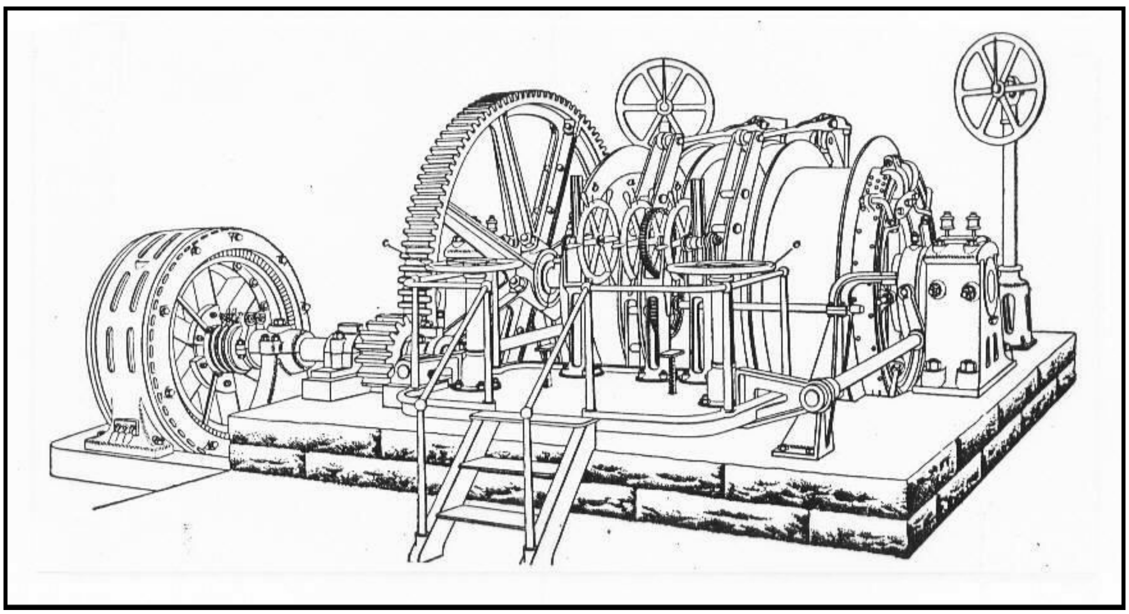
Double-drum units came with geared or first-motion drives, which were either self-contained on a bedplate or consisted of components that had to be anchored to masonry foundation piers. Geared models, ranging in size from 7 by 12 feet to 12 by 17 feet, were slower, less powerful, and noisier than their direct-drive brethren, but they cost much less to purchase, transport, and install. The ultimate answer for raising the maximum quantity of ore in minimal time was the installation of a double-drum first-motion hoist. This type of hoist ranged in size from approximately 18 by 25 feet to over 30 by 40 feet in area, and its visual impact mirrored its performance. The extreme difficulty and exorbitant costs of transporting and installing these massive machines relegated them to only the most heavily capitalized mining companies. Not only did these types of double-drum hoists permit mining companies to maximize production, but also they served as a statement to the mining world of a company's financial status, levels of productivity, and quality of engineering.

As early as around 1895, a handful of mining companies in Clear Creek County experimented with electric hoists, and by 1900, the machines gradually were accepted in Summit County, as well. Like steam hoists, electric models came in four basic varieties: geared single- and double-drum units, and direct-drive single- and double-drum units. The geared electric hoists were built much like their steam ancestors. The motor turned a set of reduction gears connected to the cable drum, and the components came assembled on a heavy bedplate. The gearing permitted hoist manufacturers to install small and inexpensive motors ranging from 30 to

300 horsepower. Direct-drive electric hoists, on the other hand, had huge motors rated up to 2,000 horsepower attached to the same shaft as the cable drums.[552]



The single-drum electric hoist grew in popularity during the 1900s where power was available. The motor is in the case in front, drive gearing is at left, and the upright box is a speed controller. Source: Twitty, 2002:224.



Rear quarterview of a double-drum electric hoist. The motor at left drove the dual cable drums via the large bull gear. Such hoists facilitated heavy production, saw use after the 1910s, and were popular among well-capitalized companies by the 1930s. Note the foundation. Source: International Textbook Company, 1906, A50:40.

As with steam hoists, mining engineers classified single-drum electric hoists smaller that 6 by 6 feet in area as sinking-class in duty. Most of the production-class hoists installed during this time featured motors rated to at least 60 horsepower for single-drum units and 100 horsepower for double-drum units. Even with large motors, these geared hoists had slow speeds

[552] Eaton, 1934:86, 295; Lewis, 1946:187; Staley, 1936:137; Young, 1946:203; Zurn, 1928:760.

of less than 600 feet-per-minute, their payload capacity was limited, and they were not able to work in the deepest shafts. During the capital-scarce Great Depression, many mining companies had to settle for small, slow, sinking-class hoists out of economic necessity. It was not uncommon for these companies to use hoists with motors rated at only 15 horsepower, which in better times might have been used instead for work over winzes underground.[553]

During the Great Depression, some outfits cobbled together hoists from machinery that had been cast off during earlier decades. Miners exercised creativity in making obsolete machinery work, and their solutions fell into several basic patterns. One common method involved stripping the steam equipment off an old steam hoist and adapting an electric motor to the gearing. The miners usually bolted the motor onto a small foundation adjacent to the hoist, and had a machine shop custom-make a pinion gear compatible to the hoist's bull gear. After ensuring that the original clutch and brake worked, the miners were ready to go to work.[554]

Mining outfits with limited funding practiced another clever means of bringing new life to antiquated steam hoists. Unlike the method described above, the miners left the steam equipment intact and substituted compressed air to power the hoist. The only drawback to such an innovation was that a costly multi-stage compressor had to supply the air. In some cases, impoverished mining operations were able to contract with neighboring companies that possessed the necessary compressors.

The third practice that capital-poor mining companies followed was to assemble hoists from odd and unlikely pieces of machinery. A favorite system involved coupling a small hoist, stripped of everything but the brake and clutch, to the power train of a salvaged automobile. Slow, noisy, and of questionable reliability, these contraptions worked well enough to allow many operations to turn a small profit. Lacking the money and possibly the knowledge of how to construct a proper foundation, miners simply bolted the hoist and salvaged automobile to a flimsy timber frame that had not necessarily been anchored to the ground.[555]

Some outfits with capital were able to buy factory-made gasoline hoists. Mining companies continued to use the old single-cylinder gasoline hoists, and they also purchased factory-made donkey hoists offered by machinery suppliers such as Fairbanks-Morse and the Mine & Smelter Supply Company. The donkey hoist manufactured during the 1930s consisted of a small automobile engine that turned a cable drum through reduction gearing. The makers designed the little machines to be portable and they affixed all of the components onto a steel frame.

Few shaft mines in either Clear Creek or Summit County still possess their hoists. In most cases, the hoists have been removed, leaving foundations that are distinct today. By examining the footprint of a foundation, the researcher can often determine the exact type of hoist. Foundations for production-class *single-drum steam hoists* and *single-drum electric hoists* tend to be slightly rectangular and flat, feature at least six anchor bolts around the outside, and usually consist of concrete or masonry. Some foundations greater than 8 by 8 feet in area may feature a depressed center that accommodated a large cable drum.

Foundations for *double-drum geared steam hoists* tend to possess an elongated rectangular footprint oriented 90 degrees to the shaft. They usually consist of concrete or masonry, feature a perimeter of anchor bolts, and wells for the cable drums. Small anchor bolts on the edges of the drum wells often braced brake shoes.

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553 Twitty, 1999:341.
554 Twitty, 1999:341.
555 Twitty, 1999:343.

Double-drum geared electric hoists were bolted to foundations similar to those for their steam-driven counterparts. The principal difference manifests as a separate mount for the electric motor, which is often rectangular, less than 4 by 5 feet in area, and features four anchor bolts.

Direct-drive hoists were usually bolted to complex foundations that anchored the machines' individual components. The foundation usually consists of two parallel masonry footers capped with dressed sandstone or granite blocks. The blocks toward the rear supported the steam cylinders and those toward the front supported the cable drum's bearings. Single-drum hoists required one depressed well between the footers for the cable drum, and double-drum hoists required two wells. In addition, a masonry pylon stood between the wells to support the drum axle. Foundations for single-drum hoists are rarely larger than 14 by 19 feet in area, and those for double-drum hoists are greater.[556]

Steam Boilers

Boilers were necessary components of steam-powered hoisting systems. While specific designs of boilers evolved and improved over time, the basic principle and function remained unchanged. Boilers were iron vessels in which intense heat converted large volumes of water into steam under great pressure. Such specialized devices had to be constructed of heavy boilerplate iron riveted to exacting specifications, and they had to arrive at the mine ready to withstand neglect and abuse. The problem that boilers presented to mining companies was that they were bulky, heavy, cumbersome, and required engineering to install.

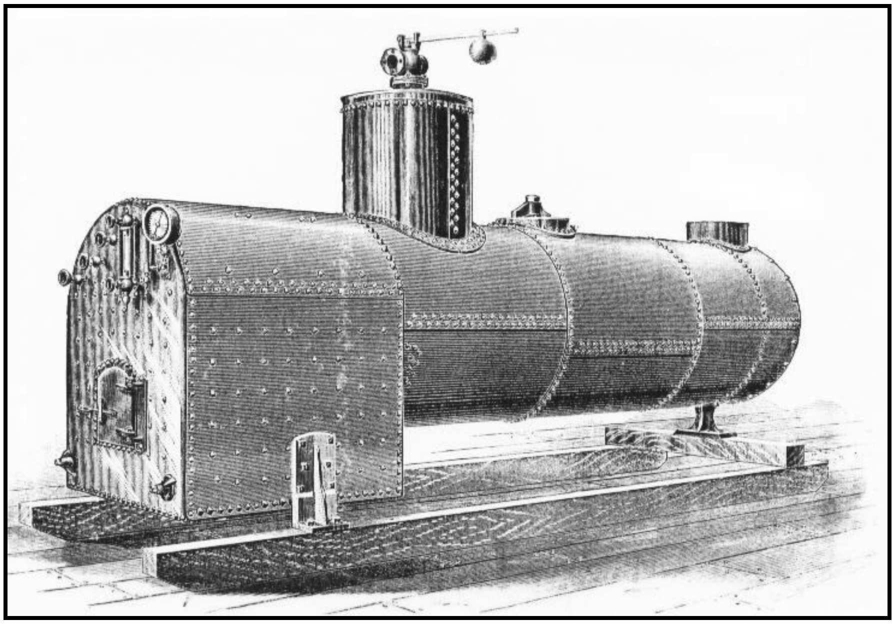
During the 1870s, the *Pennsylvania boiler*, the *locomotive boiler*, and the *upright boiler*, also known as the *vertical boiler*, quickly gained popularity among prospect operations. These boilers were well-suited to the geographic and physical environment of Clear Creek and Summit counties because they were self-contained and freestanding, ready to fire, and able to withstand mistreatment. Because the three boilers were designed for portability at the expense of efficiency, mining engineers declared them fit only for sinking duty.

In general, the above boilers consisted of a shell that contained water, flue tubes extending through the shell, a firebox inside the shell at one end, and a smoke manifold. When the fireman stoked a fire in the firebox, he adjusted the dampers to admit enough oxygen to bring the flames to a steady roar. The flue gases, which were superheated, flowed from the fire through the flue tubes, imparting their energy to the surrounding water, and they flowed out the smoke manifold and up the smokestack.

Great danger lay in neglecting the water level. An explosion was imminent if the flue gases contacted portions of the shell that were not immersed in water on a prolonged basis. Usually the front of the boiler featured a glass sight tube much like the level indicator on a coffee urn so the fireman could measure the water level. Boiler tenders, often serving also as hoistmen, usually kept the boiler three-quarters full, the empty space being necessary for steam to gather. When the fire grew low, the boiler tender opened the fire door, the upper of two cast iron hatches, and threw in fuel. Mining engineers recognized that cord wood was the most appropriate fuel in remote and undeveloped mining districts because poor roads and great distances from railheads made importing coal too expensive. However, coal was the most energy-efficient fuel, a half ton equaling the heat generated by a cord of wood, and as a result mining operations proximal to commercial centers preferred it.

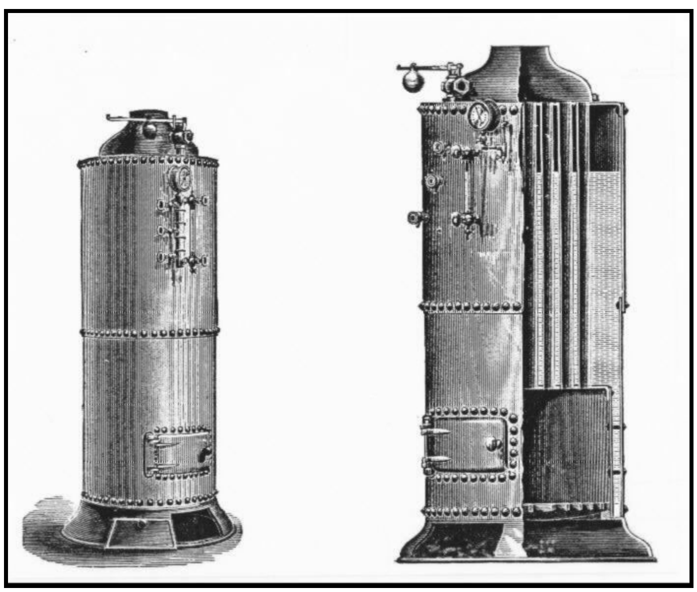
[556] Twitty, 2002:240.

During the 1880s, mining companies came to appreciate the utility and horsepower of the locomotive boiler, so named because railroad engine manufacturers favored it for building locomotives. The boiler consisted of a horizontal shell with a firebox built into one end and a smokestack projecting out of the other end. Nearly all of the models stood on wood skids and were easily portable, but some units required a small masonry pad underneath the firebox and a masonry pillar to support the other end. Locomotive boilers were usually 10 to 16 feet long, 3 feet in diameter, and stood up to around 6 feet high, not including the steam dome on top. These workhorses, the single most popular sinking-class source of steam into the 1910s, typically generated from to 30 to 50 horsepower, which was enough to run a hoist.[557]



The locomotive boiler was one of the most popular steam generators. Flue gases traveled from the firebox at left through flue tubes in the tank and out a smokestack at right. Source: Rand Drill Company, 1886:45.

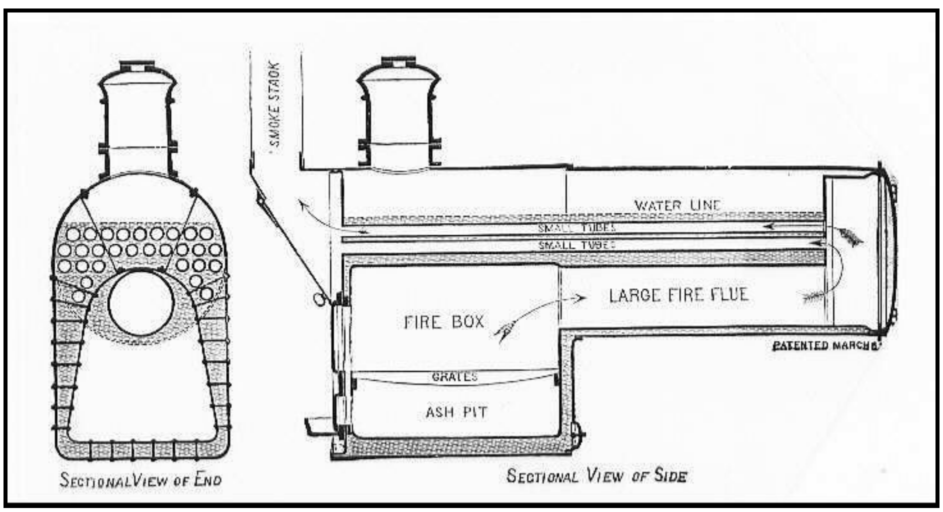
Upright boilers were the least expensive and most portable type of boiler, but also inefficient. Flue gases rose from the firebox at bottom, through the flue tubes, and out a smokestack at top. Note the water level sight tube, pressure gauge, and pressure valve. Source: Rand Drill Company, 1886:47.



[557] Twitty, 1999:204.

Upright boilers were the least costly of all models. They tolerated abuse well and were the most portable, but they were highly inefficient and could not generate much horsepower. Upright boilers consisted of a vertical water shell that stood over a firebox and ash pit that had been built as part of a cast iron base. The flue tubes extended upward through the shell and opened into a smoke chamber enclosed by a hood and smokestack, which appeared much like an inverted funnel. The short path traveled by the flue gases and intense fire put heavy heat stress on the top end, causing it to wear out quickly and leak, and the firebox and doors also saw considerable erosion. However, upright boilers required little floorspace and maintenance, and were so durable that they almost could have been rolled from site to site. Remote prospect operations saw great advantage in vertical boilers, and consequently these steam generators enjoyed substantial popularity into the 1910s.[558]

The third sinking-class boiler used in noteworthy numbers was the Pennsylvania model. This unit combined the form and portability of the locomotive boiler and the function of the Scotch marine boiler, discussed below. Like the other portable boilers, the Pennsylvania boiler featured an enclosed firebox that was surrounded by a jacket of water. The flue gases traveled through tubes in the shell, rose into a small smoke chamber at rear, reversed direction, traveled toward the front through more tubes, and escaped through a smokestack. The Pennsylvania boiler, which originated in the Keystone State's oil fields, proved to be remarkably efficient and saw use at a number of Colorado mining operations.[559]

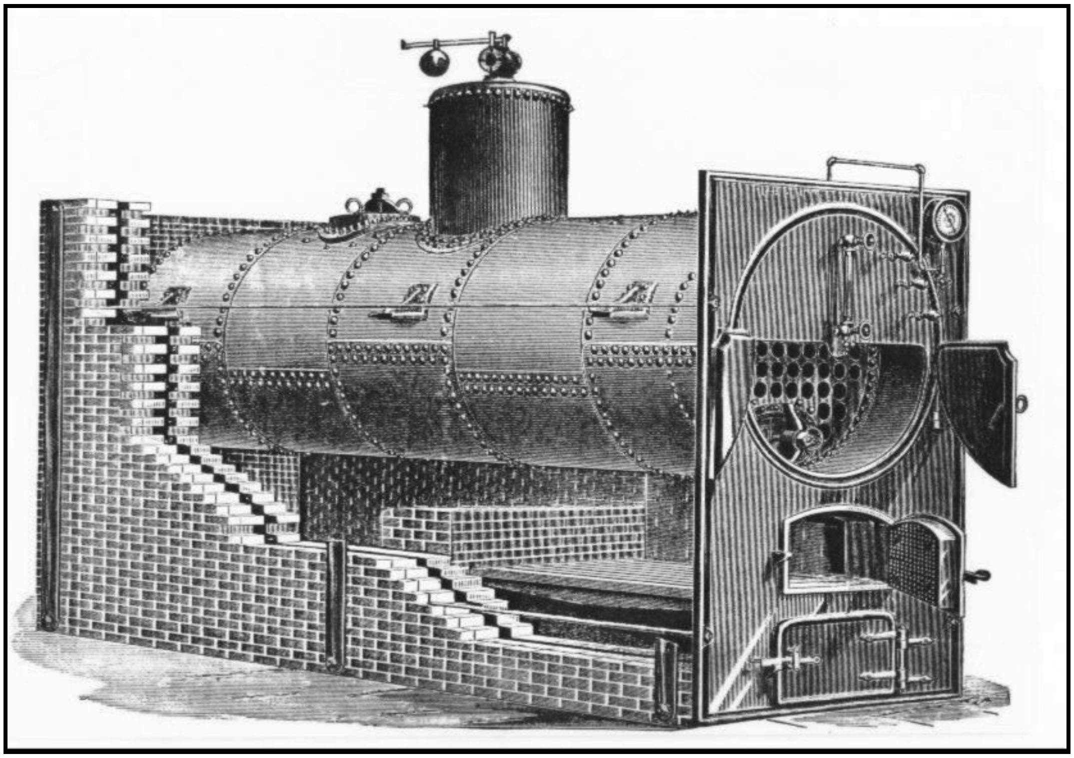


The Pennsylvania boiler was portable, stood on skids, and provided greater fuel economy than the locomotive type. Note the path traveled by the flue gases, which prolonged contact with the boiler surfaces. Source: Rand Drill Company, 1886:46.

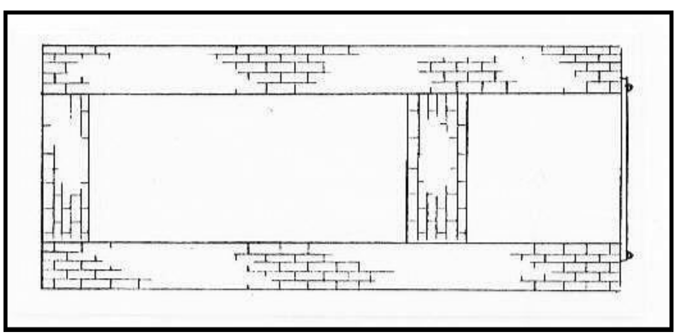
Developed in Scotland for maritime purposes, the Scotch marine boiler was the least popular sinking-class steam generator. Scotch marine boilers consisted of a large-diameter shell enclosing the firebox, and flue gas path similar to that of the Pennsylvania boiler. While this type of boiler was one of the most efficient portable units, it never saw popularity in Colorado primarily because it was heavy, large, and convention favored the other types.[560]

[558] Croft, 1921:48; International Textbook Company, 1899:A18:34; Kleinhans, 1915:12; Rand Drill Company, 1886:47; Tinney., 1906:50.
[559] Twitty, 1999:206.
[560] Colliery Engineer Company, 1893:262; International Textbook Company, 1899:A18:28; Peele, 1918:2083; Thurston, 1901 p31.

Engineers designing production-class surface plants rarely relied on portable boilers because of their inefficiency. Rather, engineers predominantly used *return-tube boilers* in masonry settings, or they erected *water-tube boilers* for the greatest fuel economy.



The return-tube boiler was the most popular industrial steam generator prior to the widespread embrace of electricity. The unit consisted of an iron shell, a masonry setting, and a cast iron façade. Flue gases traveled from the firebox behind the façade and under the shell. The gases rose into a smoke chamber at rear, reversed direction and returned through the flue tubes perforating the shell, and escaped out a smokestack over the façade. The top doors permitted workers to swab out the flue tubes. Source: Rand Drill Company, 1886:44.



ew return-tube boilers currently remain intact and have been reduced to setting remnants and foundations, such as the one in the plan view. Source: Twitty, 2002:145.

The return-tube boiler was a brilliant design. The boiler shell, part of a complex structure, was suspended from legs known as *buckstaves*, so named because they prevented the associated masonry walls from bucking outward. The masonry walls enclosed the area underneath the boiler shell, and a heavy iron façade shrouded the front. A firebox lay behind the façade underneath the boiler shell. Under the firebox lay an ash pit, and both were sealed off from the outside by heavy cast iron doors. When a fire burned, the superheated flue gases traveled from the firebox along the belly of the boiler shell and rose up into a smoke chamber at the rear of the structure. They reversed direction and traveled toward the front through large flue tubes extending through the shell, and then exited through the smoke manifold. The path under and then back through the boiler shell offered the flue gases every opportunity to transfer energy to the water within and convert it into steam.

Return-tube boilers were workhorses that withstood the harsh treatment and neglect typical of the mining industry. However, boiler tenders had to attend to a few basic services to avoid life-taking, disastrous explosions and ruptures. First, they had to keep the boiler at least two-thirds full of water. Second, the fireman had to clean the ashes out of the ash pit regularly to ensure that the fire did not suffocate. Third, the fireman ensured that the water and steam valves were operational, and that the pressure did not exceed the critical point. Last, the fireman had to feed the fire. Skilled firemen were able to add just enough fuel in an even distribution so that the fire kept a fairly constant glow. To ensure that firemen and boiler tenders had easy access to plenty of coal, the mining engineer usually had a coal bin built facing the firebox doors. In other circumstances cordwood may have been stacked in the bin's place.

Mining companies with plenty of capital installed additional devices to improve the energy efficiency and performance of their return-tube boilers. First, they may have arranged feed-water tanks to allow sediment and mineralization to settle out. Second, some companies installed feed-water heaters, which were small heat exchangers that used some of the boiler's hot water or steam to preheat the fresh feed-water. These moderated the shock of temperature changes to the boiler, prolonging the vessel's life and increasing fuel efficiency. A few engineers working at the largest mines attempted to mechanize the input of coal into the fireboxes of heavily used boilers with mechanical stokers. Although costly, mechanical stokers did a better job than laborers. Engineers also fitted heavily stoked boilers with rocking or shaking grates that sifted the ashes downward, promoting better combustion of the fuel. Last, companies wrapped the heater, the steam pipes, and exposed parts of the boiler with horsehair or asbestos plaster as an insulation.[561]

While boiler technology was nascent, in 1856 an American inventor named Wilcox devised a boiler radically different and much more efficient that the best return-tube models. Wilcox's system consisted of a large brick vault capped with several horizontal iron water tanks and as assemblage of 50 to 60 water-filled iron tubes. The vault contained a firebox, an ash pit, and a smoke chamber. The tubes drew water from one end of the tanks and sent the resultant steam to the other end. By 1870, the design, known as the *water-tube boiler*, had been commercialized and was being manufactured by the firm Babcock & Wilcox.[562]

After Babcock & Wilcox's water-tube boiler had proven itself in a number of industrial applications, mining engineers began to take an interest. The fact that the water ran through the tubes and not around them greatly increased the liquid's heating area, which resulted in much greater efficiency than return-tube boilers. In addition, the threat of a catastrophic explosion was almost nonexistent. By the 1890s, a number of mechanical engineers had devised other water-tube boilers that saw production, such as the Heine, the Sterling, the Wickes, the Hazelton, and the Harrisburg-Starr.

The problem with all of the above models, however, was that they required much more attention than the rugged return-tube boilers, were significantly more costly, and were beyond

[561] Ihlseng, 1892:581; International Textbook Company, 1924:A23:53; Keystone Consolidated Publishing Company Inc., 1925:115; Peele, 1918:2086.

[562] Croft, 1921:18, 53; Greeley, et al, 1872; International Textbook Company, 1899:A18:35; Linstrom and Clemens, 1928:30; Peele, 1918:2083; Thurston, 1901:34; Tinney, 1906:63.

the understanding and field skills of average mining engineers. As a result, water-tube boilers saw use only at large, well capitalized mines under the supervision of talented, professionally trained engineers. As the prices of water-tube boilers fell during the 1900s and capital became abundant following the Silver Crash of 1893, their popularity began growing, but the embrace of electricity in the 1910s prevented the widespread adoption of water-tube boilers.

Headframes

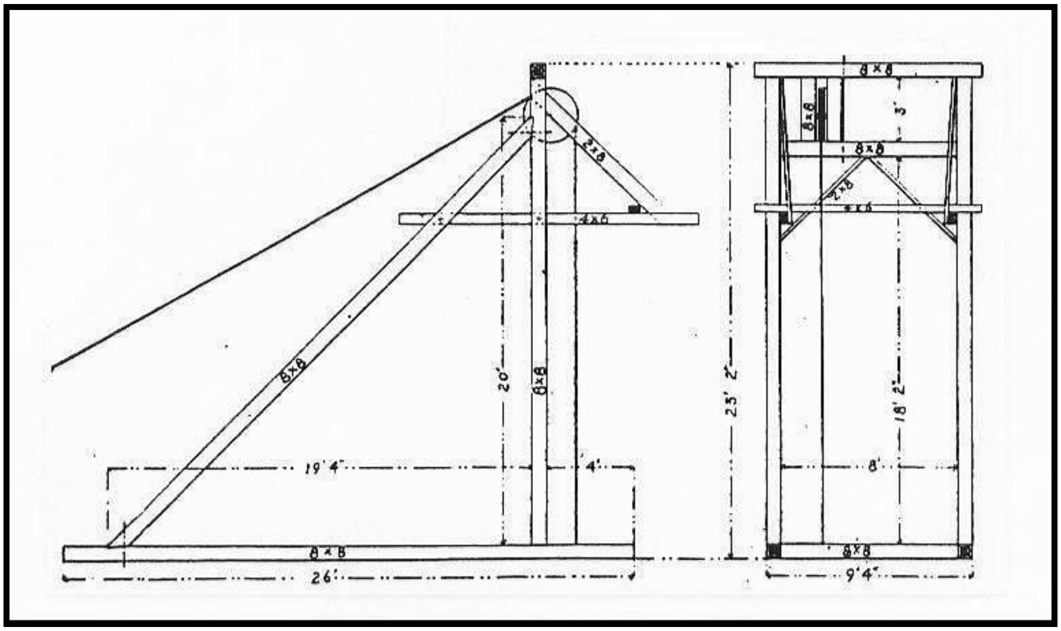
Nearly all the mechanical hoisting systems built in Clear Creek and Summit counties included a headframe over the shaft. The purpose of the headframe was to support and guide the hoist cable, and assist the transfer of rock from or supplies into the hoisting vehicle. Professionally educated engineers recognized six basic forms of headframes, including the tripod and tetrapod used with horse whims, as well as the two-post gallows, four and six-post derricks, and the A-frame.

Table E 4.2: Headframe Specifications: *Type, Material, Class*

Headframe Type	Material	Class	Capital Investment
Tripod	Hewn Logs	Sinking	Very Low
Tripod	Light Timber	Sinking	Very Low
Two Post (Gallows Frame): Small	Timber	Sinking	Low
Two Post (Gallows Frame): Large	Timber	Production	Low to Moderate
Two Post (Gallows Frame): Large	Steel	Production	Moderate to High
Four Post: Small	Light Timber	Sinking	Low
Four Post	Timber	Production	Moderate
Six Post	Timber	Production	Moderate to High
Four and Six Post	Steel	Production	High
A-Frame	Timber	Production	Moderate to High
A-Frame	Steel	Production	High

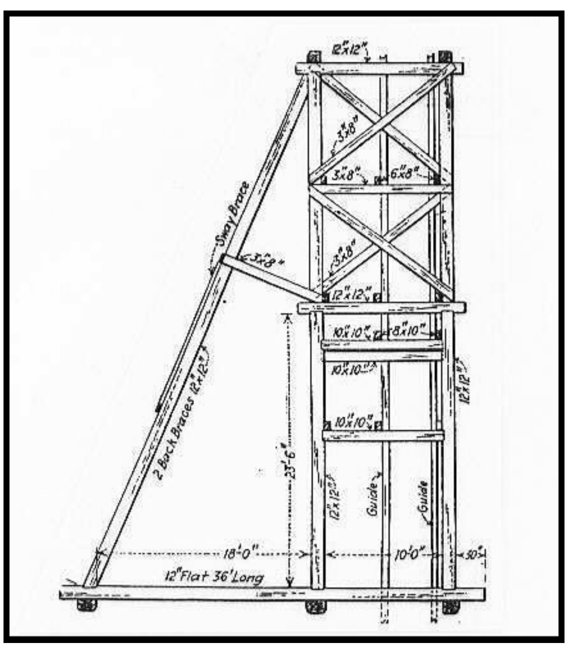
(Copied from Twitty, 1999:281).

The *two-post gallows* was one of the most common designs, and engineers unanimously agreed that it was well-suited for prospecting. The variety used by small outfits usually consisted of two upright posts, cap timber, cross-member several feet below, and diagonal backbraces, all standing at most 25 feet high. The cap timber and lower cross-member held the sheave wheel in place. The gallows portion of the structure stood on one end of a timber foundation equal in length to the headframe’s height. The diagonal backbraces extended from the posts down toward the hoist, where they tied into the foundation footers. The foundation, made of parallel timbers held together with cross members, rested on the ground and straddled the shaft collar.



The two-post gallows headframe was the most common type for prospect shafts. Sinking-class versions were less than 25 feet high and stood on timber footers. Source: *Engineering & Mining Journal* 3/7/03 p366.

The four-post derrick was a design used for both prospecting and ore production. Those for prospecting were similar in height, construction, and materials to two-post headframes, but featured four posts instead of two. The A-frame was based on the same design as the two-post gallows. The difference was that the A-frame featured fore and aft diagonal braces to buttress the structure in both directions. A-frames stood between the hoist and shaft so that the angle of the cable extending upward from the hoist equaled that extending down the inclined shaft.



The headframe at left is a four-post derrick type. Production-class headframes such as the one illustrated tend to be higher than 25 feet. Source: *Engineering & Mining Journal* 12/28/17 p1216.

The common features shared by the above structures included a small size, simplicity, minimization of materials, ease of erection, and portability. For comparison, a two-post gallows 20 feet high cost as little as $50 and a slightly larger structure cost $150, while a production-class A-frame cost $650 and a production-class four-post derrick headframe cost up to $900.[563]

When designing sinking-class headframes, the mining engineer had to consider three basic stresses. The first was live load, created by the weight of a full hoist vehicle and cable, the second was braking load, which was a surge of force created when the hoistman quickly brought a vehicle to a halt in the shaft, and the third was the horizontal pull of the hoist. To counter these forces, mining engineers often build their headframes with 8x8 timbers, and they installed diagonal backbraces to counter the pull of the hoist. Usually, carpenters assembled the primary components with mortise-and-tenon joints, 1 inch diameter iron tie rods, and timber bolts. Mining engineers specified that the diagonal backbraces were most effective when they bisected the angle of vertical and the pitch of the hoist cable. By tying the backbraces into the foundation between the shaft and hoist, engineers determined that the total forces put on the headframe would have been equally distributed among the vertical posts and the diagonal backbraces. When a mining engineer attempted to find the mathematically perfect location for a hoist after erecting a headframe, he merely had to measure the distance from the shaft to the diagonal brace, double the length, and install the hoist. Many prospect operations followed this general guideline, but a few poorly educated engineers strayed and gave the diagonal braces either too much or too little of an angle.[564]

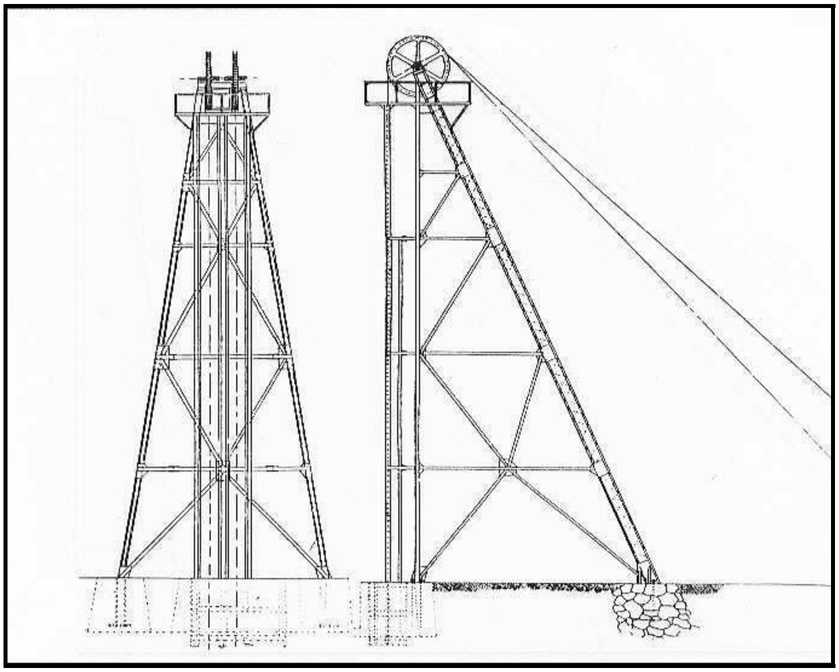
Production-class headframes were more complex than sinking-class types, and designing them was a rigorous task. Mining engineers had to account for a variety of stresses, consider the structure's multiple functions, and coordinate the structure with other hoisting system components. They had to build a structure capable of withstanding vertical forces including an immense dead load, live load, and braking load. Engineers not only had to include the powerful pull of the hoist in determining the horizontal forces, but also windshear, which was no small matter in Clear Creek County. Last, mining engineers had to plan for racking and swaying under loads, and vibration and shocks to the structure.[565]

Building a headframe that could withstand the above forces was not enough at a producing mine. Mining engineers had to forecast how they thought the headframe would interact with the mine's production goals, and how it would interface with the rest of the hoisting system. The depth of the shaft, the speed of the hoist, and the rail system at the mine directly influenced the height of the structure. Deep shafts served by fast hoists required tall headframes, usually higher than 50 feet, to allow the hoistman room to stop the hoisting vehicle before it slammed into the sheave at top. Highly productive mining operations often utilized vertical space and constructed multiple shaft landings in their headframes. Some companies using skips as hoist vehicles built rock pockets into the headframe, which also required height.

Mining engineers found four basic headframe designs adequate for the needs of heavy ore production. These included the *four-post derrick*, the *six-post derrick*, an *A-frame* known also as the *California frame*, and a heavily-braced two-post structure known as the *Montana type*. As the names suggest, engineers working in specific regions in the West favored certain headframe designs over others. While the above structures were intended to serve vertical

[563] Twitty, 1999:215.
[564] Twitty, 1999:215.
[565] Ihlseng, 1892:91; International Textbook Company, 1899:A23:105; International Textbook Company, 1906:A53:31; Ketchum, 1912:41; Peele, 1918:926; Twitty, 1999:274.

shafts, two-post gallows headframes and a variety of A-frame up to 35 feet high were also erected to serve inclined shafts.[566]



The illustrated headframe is a production-class two-post gallows structure known as a Montana type. These headframes were usually tall, well-built, and stood over deep shafts. Source: Twitty, 2002:233.

Nearly all mining engineers built their headframes with heavy timbers assembled with mortise-and-tenon joints, timber bolts, and iron tie rods. All four- and six-post headframes featured stout backbracing anchored between the shaft and the hoist, and the entire structure stood on foundation footers straddling the shaft. The posts on A-frames were set at an exaggerated batter, meaning they splayed out to absorb all of the vertical and horizontal stresses, and as a result A-frames used in association with both vertical shafts and inclines rarely had backbraces.[567]

Mining engineers determined that production-class headframes, which weighed dozens of tons, required sound and substantial foundations to remain stable. A planned and well-built foundation was one characteristic that set these structures apart from sinking-class headframes, and engineers used one of three basic designs. The first consisted of a squat timber cube of bottom sills, timber posts, and caps. The second type consisted of several log cribbing cells assembled with notch-joints and forged iron spikes. The third was a log or timber latticework consisting of open cubes between 4 and 6 feet high, capped with dimension timbers. All were covered with waste rock as ballast, but this caused quick decay especially when highly mineralized. Well-financed companies substituted concrete or rock masonry to gain lasting foundations.[568]

In the 1890s, professionally trained mining engineers working for advanced mining companies began experimenting with steel girders for headframes as an alternative to timber. According to many prominent mining engineers, steel was the ultimate building material because

566 Twitty, 1999:275.
567 International Textbook Company, 1906:A53:35; Ketchum, 1912:7; Peele, 1918:935.
568 Twitty, 1999:283.

it did not decay, was strong, did not burn, and permitted taller headframes. However, steel was significantly more expensive than timber, and as a result, few if any companies in Clear Creek or Summit counties put up such structures.

Mining operations that were active during and after the Great Depression had the same needs for headframes as their predecessors. Most Depression-era outfits attempted to reuse existing headframes to save capital, and in such cases, merely affected necessary repairs. If a mine lacked its original headframe, then the outfit had to erect another one, and the replacement structures differed according to an outfit's nature.

Large mining companies continued the practice of building four- and six-post derricks and A-frames. But by the 1930s, a certain element of quality and craftsmanship had been lost. Workers no longer assembled structures with intricate mortise-and-tenon joints, for example. Instead, they simply butted the timbers against each other or created shallow square notch joints and bolted the frame together.

Impoverished outfits with neither the funding nor the means to build substantial structures assembled small headframes designed to be functional while incorporating little material. When possible, these mining companies moved entire headframes from abandoned mines to their properties of interest. Relocated headframes tended to be old sinking-class two-post gallows or four-post derrick structures because they were simple, easy to transport, and required no formal engineering.

One practice that many mining companies shared was an extensive use of salvaged timbers in their headframes. Stout timbers were a precious and costly commodity during the Great Depression, and in hopes of saving capital, mining companies reused the heavy beams left by abandoned operations. As a result, headframes remaining from the 1930s and afterward often feature timbers differing in exact dimensions, weathering, and quality of wood. In addition, salvaged timbers frequently exhibit abandoned mortise-and-tenon joint sockets, and bolt- and nail holes. The heavy use of such material for headframes, as well as for other structures, is typical of Depression-era construction.

<u>Additional Surface Plant Components</u>

The above descriptions of tunnel and shaft mines account for basic surface plant components. Productive mining companies often installed additional surface facilities that enhanced their ability to increase production and sustain work underground. The following components could have been erected at either tunnel or shaft mines.

Air Compressors

Blasting was of supreme importance to mining because it was the prime mover of rock underground. During much of the nineteenth century, miners traditionally drilled holes by hand, loaded them with explosives, and fired the rounds. Hand-drilling proved slow, but no practical alternative existed to take its place until machinery manufacturers began selling mechanical rockdrills during the 1870s and 1880s. The Burleigh Tunnel at Silver Plume played a key role in the development of rockdrills because it was a proving ground where some of the earliest models were tested and then regularly used. When drilling by hand, miners typically advanced tunnels and shafts only one to three feet per shift in hard rock. By contrast, the mechanical rockdrills of the 1880s and 1890s permitted miners to bore greater numbers of deeper holes and advance a tunnel or shaft approximately three to seven feet per shift. As drilling technology improved during the 1890s and 1900s, miners were able to make even greater progress with lighter drills, convincing many engineers that the relatively high cost was justified. Some of the early drills were powered by steam plumbed to the point of work, but the far majority employed for mining was driven by compressed air, which was generated and distributed through a system.[569]

The air compressor lay at the heart of the system, and while those manufactured between the 1880s and 1920s came in a variety of shapes and sizes, they all operated according to a single basic premise. A piston in a relatively large cylinder pushed air through valves into plumbing connected to an air receiving tank. The assembly was similar to a steam engine. The volume of air that a compressor delivered, measured as *cubic feet of air per minute* (cfm), depended on the cylinder's diameter and stroke, and how fast the machine operated. The pressure capacity, measured as *pounds per square inch* (psi), depended on the above qualities and check-valves in the plumbing. Generally, high pressure, high volume compressors were large, strong, durable, complex, and as a result, expensive.

The mechanical workings of compressors manufactured prior to around 1890 were relatively simple. The two most popular types were *steam-driven straight-line* and the *steam-driven duplex* models, and both served as a basis for other designs that served the mining industry well for over 60 years. The straight-line compressor, named after its physical configuration, was the least expensive, oldest, and most elemental of the two types of machines. Straight-line compressors were structurally based on the horizontal steam engine and featured a large compression cylinder at one end, a heavy cast iron flywheel at the opposite end, and a steam cylinder situated in the middle, all bolted to a cast iron bedplate. The steam cylinder powered the machine, and the flywheel provided momentum and smoothed the motion.

During the 1870s and early 1880s, mechanical engineers improved many of the inefficiencies attributed to early straight-line models. First, engineers modified the compression cylinder to make it double-acting, much like an old-fashioned butter churn. In this design, which became standard, the compression piston was at work in both directions of travel, being pushed one way by the steam piston and dragged back the other way by the spinning flywheel. In so doing the compression piston devoted 100 percent of its motion to compressing air.

The other fundamental achievement concerned cooling. By nature, air compression generated great heat, which engineers found not only wore the machine, but also greatly reduced efficiency. Early manufacturers solved the problem with a misting jet that squirted a spray into the compression cylinder, cooling the air and the machine's working parts. The water, however, washed lubricants off internal parts and humidified the compressed air, all of which significantly shortened the life of what constituted an expensive system. By the mid-1880s, American machinery makers replaced the spray with a cooling jacket, leaving the internal working parts dry and well-oiled. When mining companies employed the machines, they had to include a water system for cooling, which was usually no more that a tank plumbed to the compressor.

During the early 1880s, mechanical engineers forwarded several other significant improvements. Engineers found that coupling the compression piston to the steam piston with a solid rod, so that both acted in tandem, proved highly inefficient. The steam piston was at its maximum pushing power when it was just beginning its stroke, and the compression piston, also beginning its stroke, offered the least resistance. When the steam piston had expended its energy and reached the end of its stroke, the compression piston offered the greatest resistance because the air in the cylinder had reached maximum compaction. Mechanical engineers recognized this wasteful imbalance and designed an intermediary crankshaft that reversed the relationship between the pistons. Despite the superior efficiency of this design, mining companies usually selected the simpler compressors with solid shafting because they cost less.

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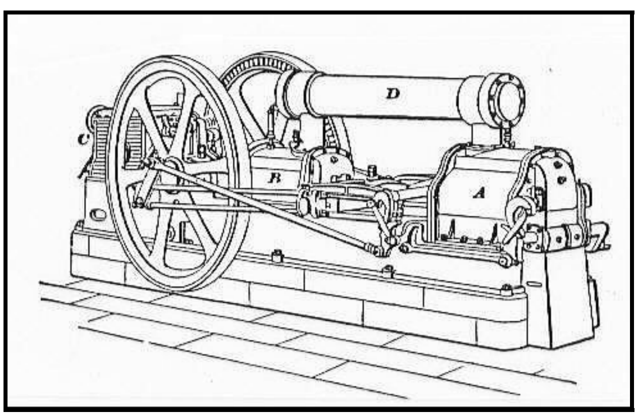
569 Gillette, 1907:15; Hoover, 1909:150; International Correspondence Schools, 1907:13; Peele, 1918:184, 213; Young, 1946:87.

Table E 4.3: Air Compressor Specifications: *Type, Timeframe, and Capital Investment*

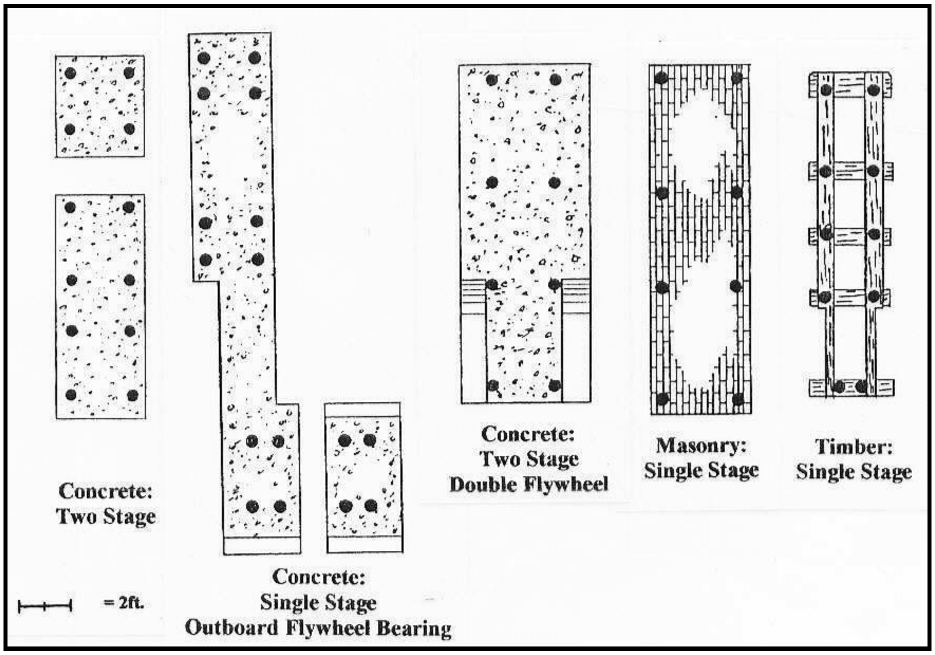
Compressor Type	Age Range	Capital Investment
Upright: 2 Cylinders, Belt Driven	1900s-1940s	Low
Upright: 3 to 4 Cylinders, Integral Gasoline Piston	1930s-Present	Moderate
V Pattern	1930s-Present	Moderate to High
Straight-Line, Single Stage, Gasoline Engine Driven	1900s-1930s	Low
Straight-Line, Single Stage, Steam Driven	1880s-1920s	Moderate
Straight-Line, Two Stage, Steam Driven	1890s-1920s	High
Straight-Line, Triple Stage, Steam Driven	1890s-1920s	Very High
Straight-Line, Single Stage, Geared to Electric Motor	1900s-1920s	Moderate
Straight-Line, Various Stages, Geared to Electric Motor	1900s-1920s	High
Straight-Line, Single Stage, Belt Driven by Electric Motor	1900s-1940s	Low
Duplex, Single Stage, Steam Driven	1890s-1920s	Moderate
Duplex, Two Stage, Steam Driven	1890s-1920s	High
Duplex, Triple Stage, Steam Driven	1890s-1920s	Very High
Duplex, Two Stage, Belt Driven	1900s-1940s	Moderate
Duplex, Three Stage, Belt Driven	1900s-1940s	Moderate to High

(Adapted from Twitty, 2002:306).

During the late 1880s and early 1890s, mining engineers fine-tuned compressed air technology used for mining. The most significant advance was a design that generated greater air pressure, which made drills run faster and improved the pressurization of the maze-like networks of plumbing. Machinery makers began offering straight-line and duplex compressors capable of achieving what the industry termed *multistage compression*. To increase pressure, mechanical engineers divided the compression between high and low pressure cylinders in several stages, instead of in a single cylinder. They designed the low-pressure cylinder to be relatively large, and it forced semi-compressed air into the small high-pressure cylinder, which highly compressed the air and released it into a receiving tank.

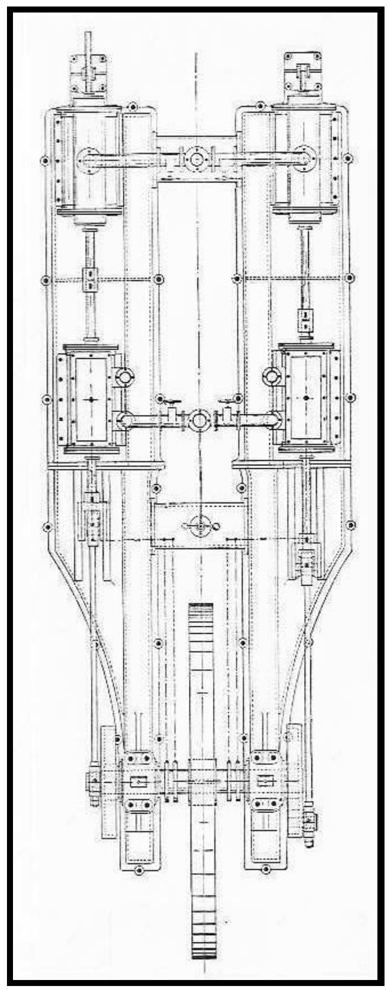


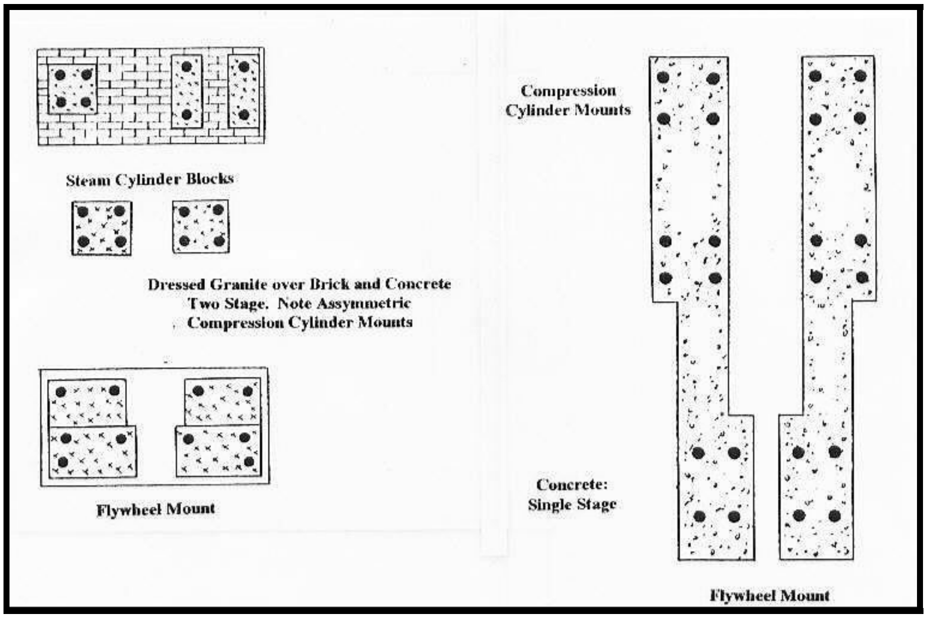
The line drawing depicts a straight-line steam compressor that provided two stages of compression. One compression cylinder is at right, another is at center, and the steam drive cylinder is at left. The flywheels imparted momentum to the machine. Source: International Textbook Company, 1899, A20:32.



The plan view depicts foundations for straight-line compressors. Source: Eric Twitty.

The plan view shows a typical pre-1910 duplex steam compressor. The compression cylinders are at top, the steam drive cylinders are at center, and the flywheel is at bottom. Source: Ingersoll Rock Drill Company, 1887:34.





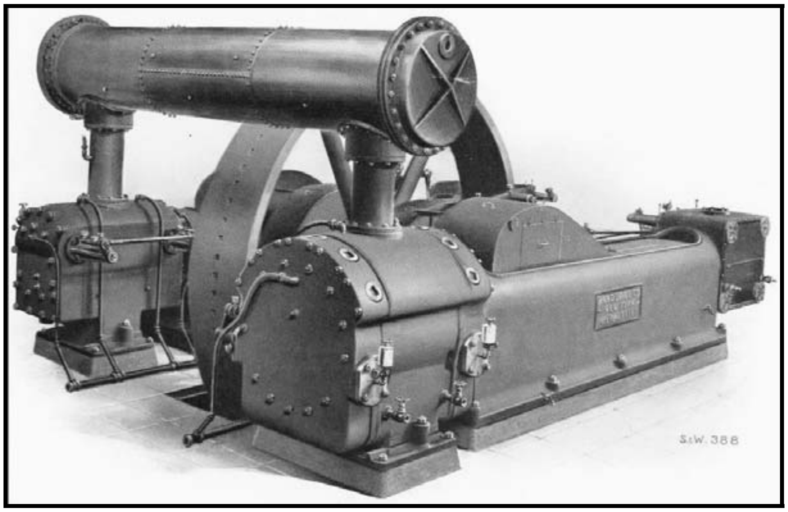
The plan views portray two common foundations for duplex steam compressors. The foundation at right was for a machine like the one above, and the foundation at left anchored a compressor with compound action. Source: Eric Twitty.

Machinery makers designed multistage straight-line compressors with two and even three compression cylinders on the steam drive piston, and duplex compressors with several multistage cylinder arrangements. The most common multistage duplex compressor was the *cross-compound* arrangement, in which one side of the machine featured the low-pressure cylinder, and the air passed from it through an intercooler to the high-pressure cylinder on the other side. In general, companies with heavy air needs installed multistage compressors while operations with limited capital continued to rely on the less costly, conventional models.

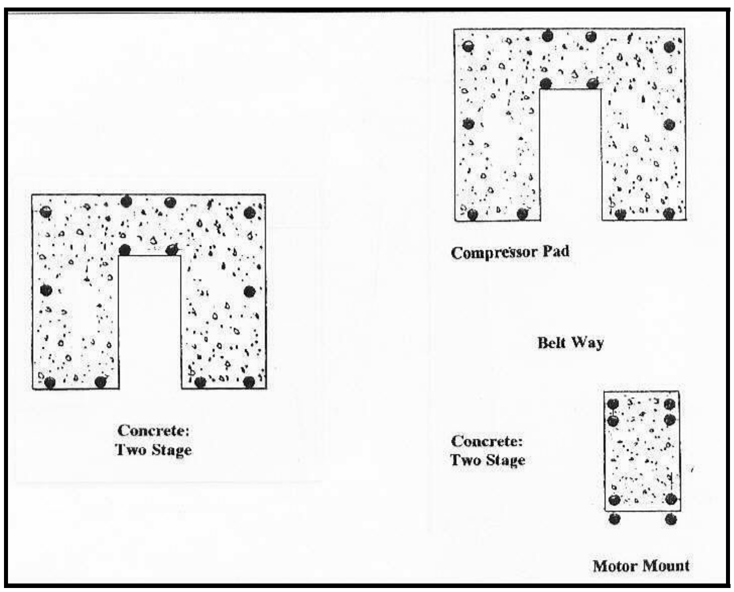
As the 1890s progressed toward the turn-of-the-century, machinery makers began to offer air compressors that were smaller, more efficient, and provided better service than early models. Machinery makers adapted several designs to be run by electric motors and gasoline engines, which were energy sources well-suited for remote mines. Gasoline and electric compressors underwent gradual acceptance rather than being embraced overnight, but once they had proven their worth by the 1910s, mining companies throughout Clear Creek County embraced them.

By the late 1890s, manufacturers offered three basic types of electric compressors: a straight-line machine approximately the same size as traditional steam versions; a small straight-line unit; and a duplex compressor. Duplex models, conducive to multistage compression, were most popular among large mining companies, while moderately sized mining operations favored the small straight-line units. Due to limited air output compared with a relatively large floor space, large electric straight-line compressors never saw popularity.

Compressor makers also developed economically attractive gasoline units ideal for remote and inaccessible operations. The gasoline compressor, introduced in practical form in the late 1890s, consisted of a straight-line compression cylinder linked to a single cylinder gas engine. Most mining engineers considered gas compressors to be for sinking duty only. Large gasoline machines were capable of producing up to 300 cubic feet of air at 90 pounds per square inch, enough to run up to four small rockdrills.[570]



During the 1890s, the above form of duplex compressor became popular. Originally, these machines were powered by steam, and by the 1900s, some were also belted to motors where electricity was available. Source: Rand Drill Company, 1904:12.



Compact duplex compressors were mounted to foundations like those in the above plan view. The foundation at left anchored a steam-powered unit, and the one at right was for a belted version, which became popular by the 1910s. Source: Twitty, 2002:109.

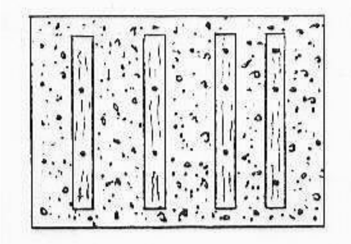
The noisy gasoline machines had needs similar to their steam-driven cousins. Gasoline compressors required cooling, fuel, and a substantial foundation capable of withstanding intense vibration. The cooling system often consisted of no more than a water tank, and the fuel system could have been simply a large sheet iron fuel tank connected to the engine by one-quarter to one-half inch metal tubing.

[570] Twitty, 1999:126.

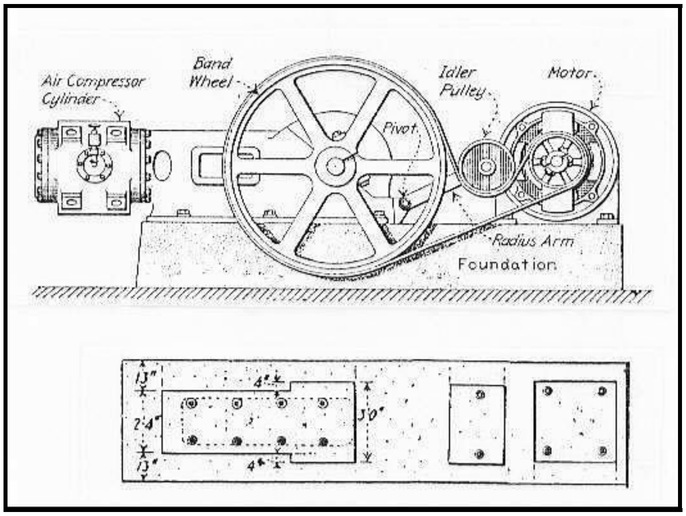
By the 1920s, the use of rockdrills rendered hand-drilling uneconomical except for special applications. The trend continued through the 1930s as rockdrill makers offered an ever widening variety of machines that accomplished even the limited specialized work previously completed by hand-drilling. Motor-driven duplex and straight-line compressors maintained supremacy among mining operations through the 1940s. Well-financed mining companies requiring high volumes of air at high pressures continued to favor belt-driven duplex compressors, while companies with slightly reduced air needs relied on relatively inexpensive single-stage belt-drive straight-line compressors.

Despite the reliance on older designs, compressed air technology underwent dynamic changes after the 1910s. Mechanical engineers began to experiment with unconventional designs beginning in the 1900s, and during the 1910s several went commercial. The *upright two-cylinder compressor* was based on the automobile engine and featured similar valves and a crankshaft. Used on an experimental basis as early as the 1900s by prospect operations, these units were inexpensive, adaptable to any form of power, and weighed little. Further, mining machinery makers mounted them onto four-wheel trailers or simple wood frames for mobility. *V-cylinder compressors*, also known as *feather valve compressors*, were adaptations of large-displacement truck engines and featured 3 to 8 cylinders arranged in a "V" configuration. The new design relied on a grossly enlarged radiator for cooling and was powered by an electric motor directly coupled onto the crankshaft.

The V-cylinder compressor, similar to a large engine, became one of the most popular compressor types during the 1930s. Note the foundation. Source: Eric Twitty.



The illustration at left is a plan view for a V-cylinder compressor foundation. Timber footers are embedded in a concrete rectangle around 3 by 4 feet in area. Source: Eric Twitty.



The profile illustrates the type of small, belted compressor popular between the 1910s and 1940s. The plan view shows the foundation, with mounts for the compressor and motor. Source: Eric Twitty.

In most cases, the compressor was removed when a mine was abandoned, leaving the foundation as the machine's only representation. Based on a foundation's footprint, the researcher can often determine the exact type of compressor. Following are descriptions of the foundations for the common types of compressors. *Straight-line steam compressors* usually stood on foundations with a rectangular footprint and a flat top-surface studded with two rows of anchor bolts. In general, workers used masonry or concrete, although they bolted some machines less than 12 feet long to timbers. Foundations for large compressors often featured individual blocks for the steam and compression cylinders and a separate pedestal adjacent to one end for an outboard flywheel bearing.

Foundations for *duplex steam compressors* manufactured between the 1870s and 1890s consisted of a pair of rectangular pads spaced several feet apart. Workers almost always used masonry or concrete, and both pads featured a symmetrical arrangement of anchor bolts. Foundations for large machines often featured individual stone blocks for the steam and compression cylinders, and the flywheel, which rotated in the gap between. The smaller, compact duplex compressors introduced during the late 1890s were bolted to foundations easily identified today. Foundations for these machines are U-shaped, slightly rectangular, and tend to be several feet high.

Straight-line belt-driven compressors were bolted to foundations similar in appearance and size to those for their steam-driven counterparts. In addition, they usually featured a separate pedestal at one end for the flywheel's outboard bearing, and a second, rectangular foundation for the drive motor, usually 3 by 3 feet in area or less.

Compact duplex belt-driven compressors were bolted to the same type of foundation as their steam-driven cousins. A small, rectangular foundation for the drive motor should be located nearby and directly aligned with the open end of the compressor foundation.

Due to severe vibrations, *petroleum compressors* were usually bolted to stout concrete foundations several feet high. The foundation is almost always rectangular, several feet wide, less than 9 feet long, and features two rows of anchor bolts.

Upright compressors, small in size, could have been bolted to either timber or concrete foundations rectangular in footprint. A pad for the engine or motor should be adjacent and aligned.

Foundations for *V-cylinder compressors* tend to be fairly distinct and often feature an adjacent mount for a motor or engine. Compressors that featured several cylinders were often bolted to rectangular foundations between 4 by 5 feet and 3 by 3 feet in area, while the foundations for machines with numerous cylinders were several feet wide and up to 10 feet long. Workers often constructed foundations with a series of closely spaced timbers bolted to either an underlying concrete pad or buried timber footer.

Electricity

Mining engineers in the West began experimenting with electricity as early as 1881 when the Alice Mine & Mill in Butte, Montana attempted to illuminate its perpetually dim passages and buildings with light bulbs. Clear Creek County was home to one of the earliest electrical projects in the Rocky Mountain west. In 1882 or 1883, the Kohinoor & Donaldson Consolidated Mining Company installed a generator at the Kohinoor Mine and provided service to Lawson. At the time, electric technology was new and its practical application was limited primarily to lighting. During the 1880s, visionary inventors demonstrated that electricity was able to do mechanical work as well, which interested progressive mining engineers.[571]

During the late 1880s and early 1890s, profitable and well-capitalized companies in technologically advanced areas, and western Clear Creek County in particular, attempted to turn their curiosity into mechanical use. They made their first attempts to run machinery in locations that featured a combination of water and topographical relief conducive to hydro-power. In 1887, the Electric Light Company at Georgetown built a hydro-plant to provide lighting. In 1890, the Georgetown Electric Company built a second facility and expanded service specifically for mining in 1892. Colorado, including Clear Creek County, continued to be a proving ground for the development of electricity through the 1890s. Engineers foresaw electricity as an alternative to steam. If electricity could be generated at a central point and transmitted to remote mines, then coal and steam equipment would not have to packed up to those mines, and this was quite costly. Inherent limitations in electrical technology, however, retarded the immediate embrace of the power source.

The first generation of electrical circuits was energized with Direct Current (DC) which had a unidirectional flow. Mining engineers also experimented with Alternating Current (AC), which oscillated. Neither power source, as they existed during first half of the 1890s, was particularly well suited for mining. AC current could be transmitted over a dozen miles with little energy loss, but AC motors were incapable of starting or stopping under load. Therefore AC was worthless for running hoists, large shop appliances, and other machines that experienced sudden drag or required variable speed. AC electricity was effective, however, for running small air compressors, ventilation fans, and mill equipment because they were constant-rotation machines that offered little resistance. DC electricity, on the other hand, had the capacity to start and stop machinery under load, but the electric current could not be transmitted far without suffering debilitating power loss. Therefore DC current had to be used adjacent to its point of generation. In addition, DC motors were incapable of running the massive production-class machines that mining companies had come to rely on for profitable ore extraction.[572]

Based on the above, electrical technology as it existed during the 1890s offered mining companies little incentive to junk their steam equipment. However, progressive engineers conducted extensive experimentation and attempted to hardness both DC and AC currents. Around 1900, electrical appliance manufacturers made several important breakthroughs that rendered the power source useful for mining. Electricians developed the three-phase AC motor,

[571] Twitty, 1998.
[572] International Textbook Company, 1899:A23:5; Peele, 1918:1126; Twitty, 1998.

which could start and stop under load while using a current that could be transmitted long distances. They also invented practical DC/AC converters, which permitted the use of DC motors on the distribution end of an AC electric line. The net result was that electricity became an attractive power source to a broad range of consumers.

Still, many mining companies were not yet willing to relinquish traditional steam technology because even the new three-phase AC motors had limitations. In addition, voltage, amperage, and current had not yet been standardized among machinery manufacturers or among the various power generators. Overall, the limitations discouraged engineers from embracing the use of motors for critical mine plant components. Many pragmatic but conservative mining companies felt that while electricity indeed offered benefits, it was no where near ready to replace steam power.[573]

The rigors of mine hoisting proved to be one of the greatest obstacles to the universal adoption of electricity. But by the 1900s, machinery manufactures developed a variety of small AC and DC hoists that were reasonably reliable. The early electric models were similar in design to sinking-class geared steam hoists, and they were manufactured with motors wholesaled from electric appliance companies such as General Electric. Even though the electric hoists were able to start and stop under load, they were very slow and had a limited payload.[574]

By the 1910s, electrical engineering progressed to the point where mining companies saw that electric equipment performed as well as steam. Thus, when steam machines became worn after years of use, mining companies replaced them with electric models. One engineer asserted that where power was readily available, a steam-driven compressor cost up to $100 per horsepower per year to run while an electric model cost only $50. The cost savings were probably even greater for hoisting. Machinery makers achieved the greatest advances with electric hoists during the 1910s. Not only had electrical engineers and machinery makers improved performance and reliability, but also they introduced effective double-drum units for balanced hoisting. Within ten more years, except for remote and poorly capitalized operations, most companies adopted electric power.[575]

Architecture

Once a mining company had proven the existence of ore, its investors fully expected the operation to perform throughout the year, during good weather and bad, until the ore had been exhausted. Attempting to comply with investor wishes, mining companies erected buildings that sheltered important surface plant components against the weather. To this end, engineers understood that buildings served two purposes: satisfying the physical needs of the mine crew, and sheltering plant components that were intolerant of or performed poorly when exposed to adverse weather. The engineer and the mining company also had a tacit understanding that mine buildings possessed the ability to inspire investors and prominent figures in the mining industry. Large, well-built, and stately buildings such as the shaft houses on Seaton Mountain conveyed a feeling of permanence, wealth, and industrial might.

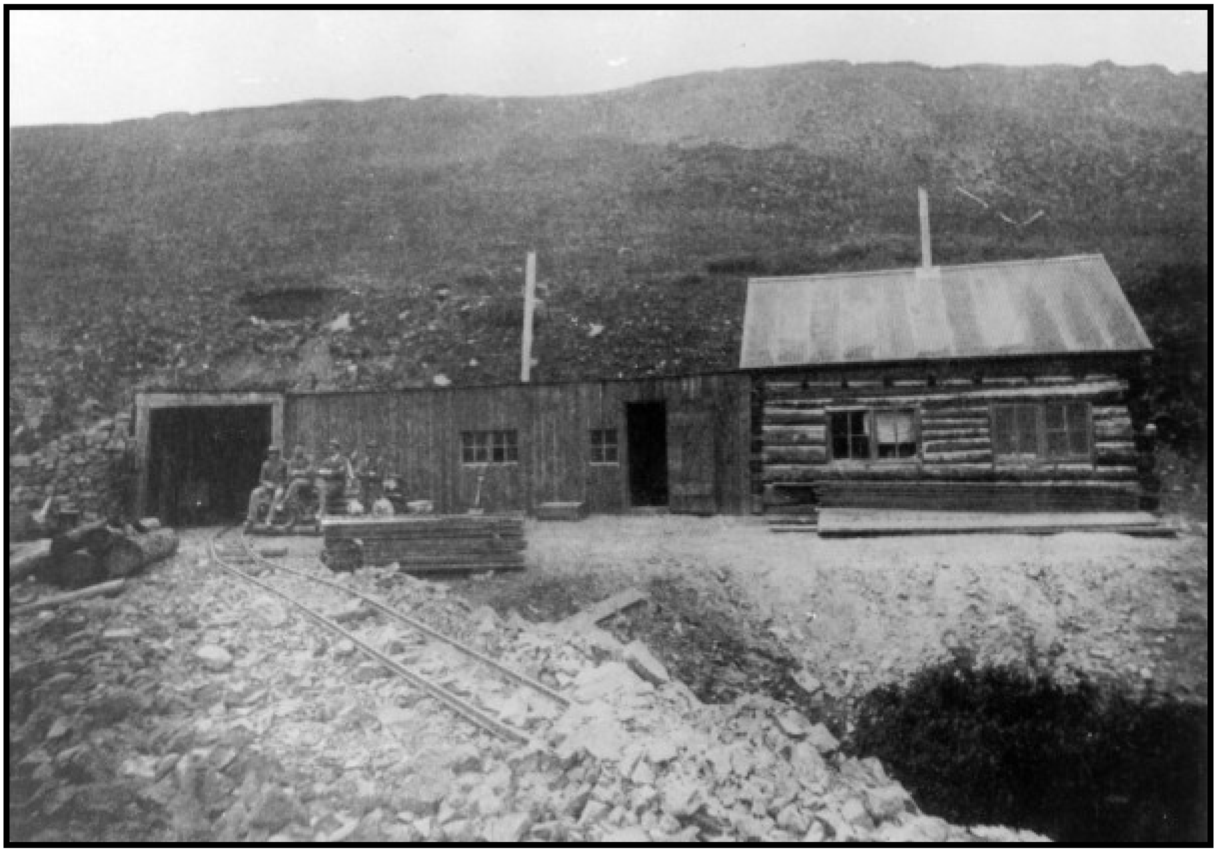
Mine buildings can be categorized into several groups defined by function. Mine architecture, however, followed no particular style or uniform design. Each building was usually a custom plan, constructed to meet specific needs of a mining company. Well-funded companies employed engineers and architects to formally design large buildings, but most planned smaller

[573] Twitty, 1999:269.
[574] Twitty, 1999:270.
[575] Twitty, 1999:270.

buildings at the mine site. Mining companies and their contractors did, however, adapt methods and workmanship that were commonly employed for other types of industrial buildings. Between the 1860s and the 1920s, building materials and methods for mine buildings in Clear Creek and Summit counties evolved. In general, the buildings erected by well-financed and large mining companies tended to be substantial and well-built, while the buildings belonging to poorly funded mining companies were crude, small, and rough.

The buildings at the Mendota Mine, Silver Plume, are typical of professionally designed, vernacular architecture specific to the mining industry. The building with smokestack is a tunnel house enclosing a blacksmith shop, air compressor and boiler, and tunnel portal. The other buildings are an office and more shop space. The buildings were probably custom-designed by a company official for function and economy, rather than appearance. Board-and-batten siding and shingle roofing was common into the 1910s, when corrugated sheet iron became universal. Courtesy of Denver Public Library, X-61693.

Professionally trained mining engineers considered four basic costs that influenced the type, size, and constitution of mine buildings. First, time had to be spent designing the structure. Second, basic construction materials had to be purchased and some items fabricated. Third, the materials had to be hauled to the site, and fourth, the mining company had to pay a crew to build the structure. From the 1870s until around 1900, well-capitalized companies attempted to meet the above considerations by erecting wood frame structures with board-and-batten siding, or simply layers of planks. During the 1860s and 1870s, small and poorly funded operations relied heavily on logs. Workers employed the same assembly methods for mine buildings as they did for residential cabins, only on a slightly larger scale. Walls usually were assembled with saddle, square, or V-notch joints, and gaps chinked with sand or mud retained by split strips. Outfits in remote locations used these methods into the 1910s, and they understood that the log structures were intended to be impermanent, to be replaced by dimension lumber or totally abandoned should the mine fail.



The buildings at the Vidler Tunnel, Argentine Mining District around 1905, are typical architecture at most mines. They were small and rough even when new, and not designed or constructed by professionals. Instead, miners planned them on-site to meet immediate needs, invested little capital, and used available materials. The building at left is a shed-type tunnel house with timber shop, and the log cabin at right may have been a blacksmith shop. The mine lacked machinery. Courtesy of Denver Public Library, X-61712.

The introduction of steel and iron building materials to the mining industry in the 1890s changed the appearance of many buildings. A number of steel makers began selling iron siding for commercial and residential construction in the 1890s. Although much of the siding was decorative, a few varieties were designed with industrial applications in mind. One of these types, corrugated sheet iron, found favor with the mining industry and its use spread rapidly. Engineers increasingly made use of the material through the 1900s, and by the 1910s it had become a ubiquitous siding for all types of mine and many commercial buildings in Clear Creek and Summit counties. The advantages of corrugated sheet iron were that it cost little money, its light weight made it inexpensive to ship, it covered a substantial area of an unfinished wall, the corrugations gave the sheet rigidity, and it was easy to work with. These qualities made corrugated sheet steel an ideal building material where remoteness rendered lumber a costly commodity.[576]

[576] Twitty, 1999:304.

The other significant use of steel in mine buildings occurred during the 1900s when a few prominent companies began to experiment with girders for framing large buildings such as mills. Architects began using steel framing to support commercial and industrial brick and stone buildings as early as the mid-1880s, but mining companies in general found that wood met their needs as well and for less money. By the 1890s, architectural steelwork had improved and steel makers offered lightweight beams that mining engineers adapted to the framing of large buildings. Further, engineers found that steel not only offered a sound structure able to rebuff high winds, but also it often cost less money than the lumber required to erect massive buildings. Steel had the added benefit of being fire-proof.

Regardless of building materials, mine buildings conformed to a few general types and plans. From the 1870s through the 1910s, most mining companies enclosed the primary surface plant components clustered around the shaft in an all-encompassing *shaft house*. The plant components associated with a tunnel were enclosed in a *tunnel house*. These buildings contained machinery, the shop, the mine entrance, and a workspace under one roof. The buildings therefore tended to be large, tall, and unmistakable. Relatively small shaft houses in Clear Creek and Summit counties were often constructed of stout frame walls, gabled roofs, and informal foundations. Post-and-girt was a common frame system, although many frames were based on modifications. Particularly spacious shaft houses required modified square-set timber skeletons capable of supporting the roof independent of the walls. Regardless of the type of frame, carpenters clad the walls with board-and-batten siding, several layers of boards, and by the 1900s, corrugated iron siding. Although electric lighting was common by around 1900, mining companies still designed their buildings with large multi-pane windows at regular intervals for daylight.

Most shaft houses conformed to a few standard footprints influenced by the arrangement of the mine machinery. Overall, the structures tended to be long to encompass the hoist, which the engineer usually anchored some distance from the shaft, and the structures featured lateral extensions that accommodated the shop, a water tank, the boilers, and either coal or cord wood storage. Professional mining engineers recommended that at least the boiler, and ideally the shop as well, be partitioned in separate rooms because they generated unpleasant soot and dust which took a toll on lubricated machinery.[577]

The roof profile of most shaft houses featured a louvered cupola enclosing the headframe's crown, and a sloped extension descending toward the hoist to accommodate the cable and the headframe's backbraces. Tall iron boiler smokestacks pierced the roof proximal to the hoist, the stovepipe for the forge extended through the roof near the shaft collar, and the shaft house may have also featured other stovepipes for stoves at the hoistman's platform and the carpentry shop. The tall smokestacks and stovepipes usually had to be guyed with baling wire against strong winds. Mining companies working at high elevations often had the shaft house floored with planks to improve heating. In some cases the shop and boiler areas, where workers dropped smoldering embers, hot pieces of metal, and nodules of fresh clinker were surprisingly also floored with planking, which presented an enormous fire hazard. Customarily, the mining engineer designed the flooring to be flush with the top surfaces of the machine foundations, permitting the steam, air, and water pipes to be routed underneath and out of the way.

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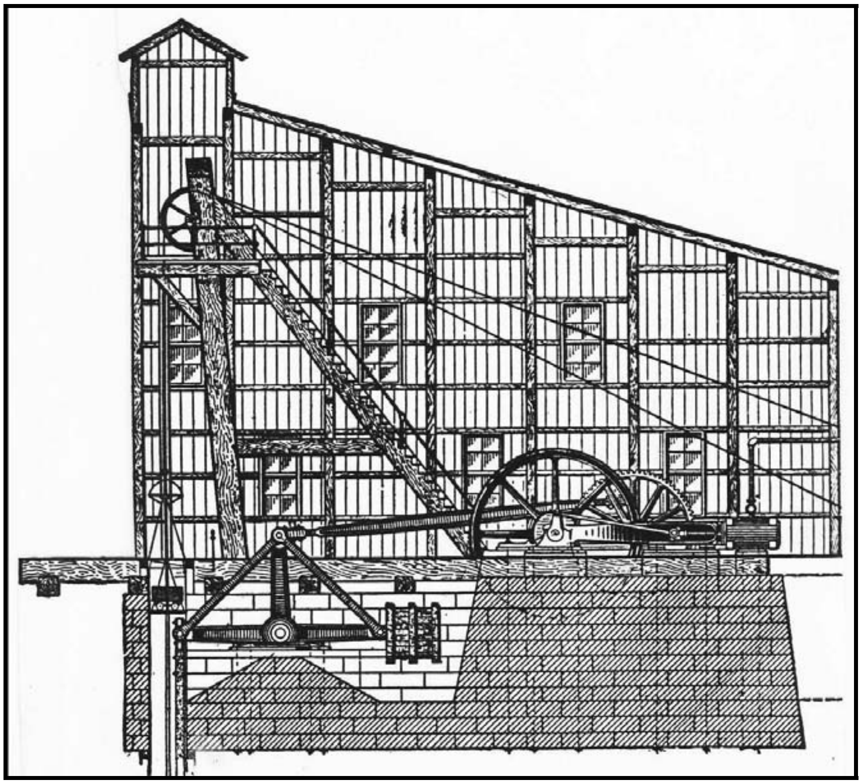
[577] Twitty, 1999:306.



Shaft houses enclosed the shaft collar, headframe, hoist, power system, and usually the blacksmith shop. The shaft house in the profile also features a Cornish pump and steam engine, rarely used in Clear Creek County. Source: International Textbook Company, 1899, A43:3.

After shaft houses were outlawed during the 1910s, mining companies erected hoist houses to enclose critical facilities. In this example dating to the 1930s, the left roofline features an angled cupola for the hoist cable, which ascended to a headframe left and out of view. Source: Eric Twitty.

By the late 1910s, the U.S. Bureau of Mines outlawed shaft houses made of flammable materials. The surface plants then changed to consist of a cluster of smaller buildings surrounding an exposed headframe. Instead of a shaft house, large and well-equipped mines featured a *hoist house* for the hoist and boilers, a *compressor house* for the compressor, and a shop in its own building. The mine plant may have also featured a miner's *change house* also known as a *dry*, a storage building, stable, carpentry shop, and electrical substation. Most of these buildings were rectangular, had gabled roofs, and were industrial in appearance.

Construction methods and workmanship characteristic of the Great Depression changed from the late nineteenth century. Mining companies with capital tended to erect spacious, frame buildings with lofty gabled roofs, multiple windows for natural light, and broad doors at important points of entry. The companies also carried over variants of post-and-girt and balloon framing systems. Engineers either floored principle structures with poured portland concrete, which was inexpensive due in part to the proliferation of the truck, or they used wood planking. The construction materials of preference included virgin lumber, virgin sheet iron, and factory-made hardware. The workers, often skilled in their trade, built lasting structures with a solid and orderly industrial appearance. In most cases, mining engineers emphasized function and cost in their designs and added little ornamentation.

Poorly funded mining outfits, by contrast, were economically forced to keep construction within their budget and construction skills, both of which were often limited. These outfits could not afford quality materials and tools, were unable to hire experienced engineers or architects, and could not pay for skilled workers. The Depression-era buildings can be divided into two categories. Small outfits with some capital and a crew with modest skills erected structures based on a crude but sound frame, often of the post-and-girt variety, and sided with salvaged, mismatched lumber and sheet iron. Doors and windows were salvaged from elsewhere and therefore were often mismatched. Some structures even had entire walls that were different in construction and materials from the others. Overall, these buildings appeared rough and battered even when relatively new, but they were fairly well-built and offered miners and equipment shelter.

For the second category, the buildings appeared even cruder, were lower in quality, and had less structural integrity than the first category. Such buildings often lacked formal frames. Instead, the workers often preassembled the walls, stood them up, and nailed them together, or established four corner-posts, added cross braces, and fastened siding to the braces. The builders may have used a patchwork of planks and sheet iron for siding, which was often layered to prevent being ripped apart by high winds. Many mining outfits favored the shed form, which featured four walls and a roof that slanted from one side of the building to the other, because it was simplest to erect.

Ore Storage

While engineers and mining companies often held differing opinions as to how to set up and run a mine, all were in agreement that the primary goal was the production of ore. Those mines with any measurable output usually featured an ore storage facility, and two basic types were popular. *Ore bins* were functionally different from *ore sorting houses*, and mining companies based their choices of structure on the type of ore being mined. Some ores were fairly consistent in quality and rock type, and they warranted storage in an ore bin. Low-grade and complex ore required sorting, separation from waste rock, and rudimentary concentration in an ore sorting house. Both types of structures required a means of inputting ore from the mine and a means of extracting it for shipment to a mill for finer concentration.

Mining engineers recognized three basic types of ore bins: the *flat-bottom bin*, the *sloped-floor bin*, and a structure which was a hybrid of the above two known as a *compromise bin*. Mining companies with regular ore production often erected large sloped-floor ore bins. These structures were lasting, strong, and had a look of permanency and solidity that inspired confidence. Well-built sloped-floor bins, which cost more than twice flat-bottomed bins, typically consisted of a heavy post and girt frame sided on the interior with planking. The structures generally stood on foundations of heavy timber footers on terraces of waste rock. To ensure the structure's durability against a continuous flow of sharp rock, laborers often armored the floor with salvaged plate iron. Small outfits with a limited output of simple ore used single-cell sloped-floor bins. Large companies erected structures that included numerous cells to hold either different grades of ore, or batches of payrock produced by multiple lessees working within the same mine.

Companies with limited funds and production erected flat-bottom bins because such structures were inexpensive to build. Rarely did these ore storage structures attain the sizes and proportions of their sloped-floor cousins because the walls were not able to withstand the lateral pressures exerted by the ore. Flat-bottomed bins had to contend with pressures on all four walls, while sloped-floor bins directed the pressure against the front wall and the diagonal floor.

Ore sorting houses were generally more complex and required greater capital and engineering than ore bins. The primary functions of ore sorting houses were both manual concentration and the storage of ore. In keeping with the gravity-flow engineering typical of mining, engineers usually designed sorting houses with multiple levels for input, processing, and storage. These structures usually featured a row of receiving bins or chutes on the top level, a sorting floor under the receiving chutes, and a row of holding bins underneath the sorting floor. Receiving chutes usually had sloped floors, and in most cases the holding bins did too. A frame structure sheltered the top level, and the sorting floor was fully enclosed and heated with a wood stove. The holding bins at bottom were similar to the sloped-floor ore bins discussed above, and the structure usually stood on a foundation of heavy timber pilings or log cribbing walls.[578]

Like the processes associated with ore milling, mining engineers utilized gravity to draw rock through ore sorting houses. The general path the ore followed began when miners underground characterized the nature of the ore they were extracting. They communicated their assessment via a labeled stake, a message on a discarded dynamite box panel, or a tag placed in the ore car. A trammer then hauled the loaded car out of the mine and pushed it into the sorting house. He emptied the contents into one of several chutes, depending on how impure the ore was. High-grade ore went into a small and special bin at one end of the structure, run-of-mine ore, which was not particularly rich but required no sorting, went into another bin at the opposite end of the structure. Mixed ore that was combined with considerable waste rock went into one of several chutes located in the center. When released from the car, the mixed ore slid down the receiving chute, which featured a heavy grate at the bottom known as a *grizzly*. The principle behind the grizzly was that the rich portions of the ore fractured into fines, and the large cobbles that remained intact through the blasting, shoveling, and unloading contained waste rock that needed to be cobbed, or knocked off by surface laborers. The valuable fines dropped through the grizzly directly into the holding bins at the bottom of the structure, while the waste rock-laden cobbles rolled off the grizzlies and onto sorting tables. There, laborers worked by daylight admitted through windows, and by kerosene or electric lighting, to separate the ore from waste.

Explosives Magazines

Explosives were a fundamental tool for mining because they were the prime mover of rock. Companies had to store enough dynamite and blasting powder to carry them between freight deliveries, and they often informally stacked 50 pound boxes, the standard shipping container, in shaft houses, cabins, storage sheds, and vacant areas underground. Worse, during

[578] Twitty, 1999:153.

cold months, which spanned much of the year at high altitude, miners stored dynamite near boilers, in blacksmith shops, and near hoists where it remained in a thawed and ready state. Such practices were absolutely dangerous. In response, progressive mining companies instituted explosives magazines for controlled and orderly storage.

Well-built magazines came in a variety of shapes and sizes, but they all shared the common goal of concentrating and sheltering the mine's supply of explosives away from the main portion of the surface plant. Trained mining engineers felt that magazines should have been bulletproof, fireproof, dry, and well-ventilated. They also felt that magazines should have been constructed of brick or concrete and if of frame construction, the walls needed to be sand-filled and sheathed with iron. These structural features not only protected the explosives from physical threats, but also regulated the internal environment. Extreme temperature fluctuations and pervasive moisture had been proven to damage fuse, blasting caps, blasting powder, and most forms of dynamite. This in turn directly impacted the miners' work environment, because degraded explosives created foul and poisonous gas byproducts that vitiated mine atmospheres.

Proper magazines manifested as stout masonry or concrete buildings around 12 by 20 feet in area with heavy roofs and iron doors in steel jambs. Usually these magazines were erected a distance away from the mine's surface plant. In other cases, mining engineers planned concrete, masonry, or timber-lined bunkers. Well-built but informal magazines, on the other hand, often took form as a chamber excavated out of a hillside, often 8 by 10 feet in area, and roofed with earth, rubble, and rocks.

Regardless of degradation and the direct and obvious safety hazards, many small mining companies stored their explosives in crude and even dangerous magazines. Miners erected sheds sided only with corrugated sheet-iron that offered minimal protection from fluctuations in temperature and moisture. In other cases, capital-poor operations stored their explosives in sheet-iron boxes similar in appearance to doghouses, in earthen pits roofed with sheets of corrugated iron, or in abandoned prospect adits. Lack of funding appears to have been a poor excuse for improper storage practices, because most operations had the ability to erect fairly safe, inexpensive vernacular dugout magazines.

Aerial Tramways

Clear Creek County was known for its extreme vertical relief, and some of the best mines were difficult to access. Sheer cliffs, excessively steep slopes, heavy snowpacks, and entire mountainsides of ragged bedrock confounded the efficient transportation required by profitable operations. The aerial tramway was an ideal solution to the problem, and the county saw some of Colorado's earliest. In 1861, the brothers George and David Griffith erected what some believe was the state's first to lower ore from the Griffth Mine down to their mill at Georgetown. As can be expected of the era, the apparatus was simple, slow, and had a limited payload.[579]

Andrew S. Hallidie, an engineer and mining machinery maker in San Francisco, was the first to develop a continuously operating tramway with a significant carrying capacity. In the late 1860s, he devised a system consisting of a series of wooden towers, an endless loop of wire rope, and loading and unloading terminals at both ends. A procession of ore buckets was fastened to the wire rope, and they traveled a circuit between the stations. The system operated under gravity, and as the loaded buckets gently descended downslope, they pulled the light empties back up to the mine. The wire rope passed around large sheave wheels in the terminals, and in between, it coasted over idler wheels on timber cross-members, bolted to the towers.

[579] *Georgetown Courier* 3/23/35 p1 c2.

When empty buckets entered the top terminal, workers loaded them with payrock while the buckets were in motion. The buckets then passed around the sheave wheel and traveled down the line to the bottom terminal. When the buckets entered the bottom terminal, a guide rail upset them, they dumped their contents into a receiving bin, and then returned to the top terminal. Hallidie's design changed little from the 1870s, when mining companies began experimenting with it, until the 1890s when other designs dominated.

Although the Hallidie design was the best tramway for moving large volumes of ore for its time, it possessed limitations. Theodore Otto and Adolph Bleichert, two German engineers, developed an alternative system that they introduced to Europe in 1874. The *Bleichert Double Rope* tramway utilized a *track rope* spanning from tower to tower, and a separate *traction rope* that tugged the ore buckets around the circuit. The track rope was fixed in place and served as a flexible rail, and the buckets coasted over it on special hangers fitted with guide wheels. The traction rope was attached to the bucket hanger via a mechanical clamp known as a *grip*. Like Hallidie Single Rope tramways, Bleichert Double Rope tramways incorporated top and bottom terminals where the buckets were filled and emptied, and they too usually ran by gravity.[580]

The principal difference lay with a releasable grip that allowed workers to detach the buckets from the traction rope and stop their motion. The workers could then manually push the buckets around the interior of the terminal on suspended rails and fill them at leisure without spillage. The double-rope system also permitted the entire tramway circuit to be extended up to four miles in length and work at almost any pitch. Given this, even though Bleichert systems were up to 50 percent more expensive than Hallidie tramways, they proved to be better for heavy production because they had greater carrying capacities.

Mining companies began experimenting with Bleichert Double Rope systems in the 1880s, and due to superior performance, the popularity of Bleichert systems eclipsed the less expensive Hallidie tramways by the 1890s. Still, some companies with limited production and moderate amounts of capital continued to install Hallidie systems after the turn-of-the-century.

Designing and building aerial tramways were beyond the skills of most mining engineers. The systems were complex and required advanced economic and engineering calculations, and even formally educated mining engineers usually required direction from technicians dispatched by the tramway maker. While mining companies purchased standardized tramway equipment from manufacturers, rarely were two systems alike, in part because the physical and economic conditions of each mine were different.

Tramway systems were materials-intensive and required substantial structures. The basic components included a top terminal near the tunnel or shaft, a bottom terminal located adjacent to either a road, railroad, or an ore concentration mill, and a series of towers for the bucket-line.

Engineers recognized four basic types of towers for both Bleichert and Hallidie systems. These included the *pyramid* tower, the *braced hill tower*, the *through tower*, and the *composite tower*. The pyramid tower consisted of four upright legs that joined at the structure's crest. The through tower resembled an A-shaped headframe consisting of a wide rectangular structure stabilized by fore and back braces, and the tram buckets passed through the framing. Composite towers usually had a truncated pyramid base topped with a smaller frame supporting a cross-member. The braced-hill tower was similar to the through tower, except it had exaggerated diagonal braces tying it into the hillslope.

Towers for both Bleichert and Hallidie systems required stout cross-members that supported the wire ropes. The cross-members had to be long enough so the buckets could swing in the wind and not strike the towers. Hallidie systems, with their single wire rope and fixed

[580] Ihlseng, 1892:138; International Textbook Company, 1905:122; Lewis, 1946:372; Peele, 1918:1563; Trennert, 1997:6.

buckets, needed only one cross-member that featured the idler wheels or rollers. Because the buckets were suspended from a long hanger fixed onto the cable, the cross-member was bolted to the top of the tower. Bleichert systems, on the other hand, required a stout cross-member at the tower crown to support the stationary track cable, and a second cross-member 3 to 7 feet below to accommodate the moving traction rope. The second cross-member almost always featured either idler wheels or a broad steel roller.

At the Pay Rock Mine near Silver Plume, a Hallidie tramway lowered ore from workings high on the mountainside down to a bottom terminal and loading station. The sheave wheel is enclosed in the slanted frame above the ore bin. The towers are unusual tripod structures. Courtesy of Denver Public Library, CHS.X4578.

Tramway terminals presented engineers with numerous design problems. Terminals had to be physically arranged to permit the input and storage of tons of ore from the mine, facilitate the transfer of payrock into or out of the tram buckets, resist the tremendous forces put on the sheave wheel by the traction rope, and in the case of Bleichert systems, they also had to anchor the track cables. When designing small-capacity tramways, engineers attempted to solve all of the above problems within a single structure, while the terminals for large-capacity tramways were enclosed in complex buildings.

Regardless of the type of tramway, the engineer had to design timber framing for the sheave wheel that was strong enough to keep the traction rope taught. The sheave in the top terminal was usually fixed to a heavy timber framework anchored to bedrock and partially buried with waste rock ballast. The wheel was canted at the same angle as the pitch of the bucket-line so that the cable did not derail, which would have resulted in a costly and potentially life-taking catastrophe. With Bleichert systems, the sheave was usually surrounded by the framing for maximum strength. Not so with Hallidie systems. Because the buckets were fixed to the traction cable, they had to pass around the wheel, which meant that the wheel had to be exposed on all but the front side. Typical sheave wheels, five feet in diameter for small systems and twelve feet for large systems, featured a deep, toothed groove for the rope, and they were fixed onto a heavy steel axle set in cast iron bearings bolted to the timbers. Brake levers, usually installed in both terminals, were typically very long to provide great leverage, and they were located adjacent to, or on a catwalk immediately over, the wheel. The lever pressed heavy wooden shoes against a special flange fastened to the sheave wheel.

At the bottom terminal, the sheave had to be moveable to take up slack in the bucket-line. In many cases, the wheel was fastened onto a heavy timber frame pulled backward by adjustable anchor cables or threaded steel rods.

As fine a solution as Hallidie and Bleichert tramways were for moving ore down from a mine, they were too big and expensive for many small operations. Yet, rugged terrain and high locations presented no less of an access problem for these limited operations. In response, the smaller companies erected *single-rope reversible* and *double-rope reversible* trams.

Well-engineered single-rope trams typically consisted of simple components. A fixed line extended between an ore bin high up at the mine, and down to another ore bin below. A hoist at the mine wound a second cable that pulled a bucket up, and when the bucket was full, a worker lowered it via a hand brake. Double-rope tramways, also known as *jig backs*, featured two fixed lines and two buckets that operated in a balanced fashion. A worker lowered a full bucket down to the bottom terminal with a hand brake, and it pulled the lighter, empty vehicle up to the top terminal. Lengthy double-rope tramways often featured a series of towers similar to those for Bleichert systems that supported the fixed lines.

Ore Beneficiation: Smelting, Ore Concentration, and Amalgamation

Mining was the first stage of a long process to convert ore as it lay in the ground into refined metals for consumption. When extracted from the ground, the material that mining companies produced was known as crude ore, and it required treatment to separate the metal content from the waste. The industry referred to the entire process as beneficiation, although numerous steps were involved.

The process was not straightforward because, in Clear Creek and Summit counties, nearly all forms of ore were highly complex blends of silver, zinc, lead, copper, and gold, and they strongly resisted treatment. This forced metallurgists to develop processes based on advanced chemical and mechanical engineering. Ores of purity or simplicity, such as that mined early in Clear Creek, required few steps, while the complex ore required time-intensive treatment and numerous steps. In overview, the process began with crushing and grinding the ore, followed by separating metalliferous material from waste in a stage known as *concentration*. The resultant *concentrates* were roasted and smelted in a furnace, which furthered the separation and yielded a blend of metals known as *matte*. Advanced smelters located in Black Hawk, Denver, Golden, and the Midwest refined the matte into pure metals termed *bullion*.

A variety of facilities carried out one or all of the steps, and they operated either as independent mills or in conjunction with specific mines. *Smelters* were turnkey facilities that reduced crude ore to metals and matte, and a few operated in Clear Creek County. Unlike smelters, *concentration mills* did not reduce ore to matte. Instead, they were designed to merely separate waste from an ore's metal content. Concentration mills were the most common type of ore treatment facility. *Amalgamation mills*, common in Clear Creek County but rare in Summit County, crushed gold ore and relied on mercury to amalgamate with the gold.

<u>Smelters</u>

To produce metals, smelters incorporated mechanical, chemical, and roasting processes that a metallurgist tailored to the general character of the ore. Basic smelting began when wagons delivered crude ore to the facility, which workers dumped into receiving bins at the smelter's head. The ore had to be broken into consistently sized cobbles either by hand or with a mechanical crusher and then loaded into the smelting furnace. If the ore contained high proportions of waste, then it was concentrated with mechanical methods prior to smelting.

The furnace was at the heart of a smelter facility, and two general types saw use in Clear Creek County. The earliest, employed primarily at Georgetown, was a masonry structure with a chamber for ore, ducts to direct blasts of hot gases against the ore, and fireboxes with special ventilation to enhance fuel combustion. Troughs were supposed to collect molten liquid as it ran off the ore and segregate the metal content from slag according to specific gravity. The exact designs of these early smelters varied, and most were failures.

The most successful furnaces were cylindrical steel vessels 4 to 12 feet in diameter and lined with fire bricks. They stood on stout rock or brick masonry foundations and featured tap spouts and tuyeres, which were ports that admitted air blasts, at graduated intervals. At center was a columnar charge of fuel, and workers dumped crude ore around the fuel column until the ore chamber was full. They usually admitted lead bullion, or lead or iron ore, first because the soft metal served as a flux, which, when molten, helped the rest of the ore liquefy. After workers arranged layers of ore, sealed the spouts, and added more fuel, they started a blower that fed air to the smoldering fire, bringing it to a great heat.[581]

As the lead or iron ore melted and the temperature increased, the liquid metals came in contact with harder metals and minerals, causing them to soften, melt, and trickle down into the base of the furnace. Over time, the lot of ore became molten and the heaviest material, usually the metals, settled to the bottom while the lighter waste floated on top. At this point, workers opened the upper slag spouts and tapped the liquid waste into slag carts, then did likewise with intermediate slag spouts. After they drew the waste off, the workers added more ore and fuel until the pool of liquid metal rose to the height of the lower slag spout. At this time, workers opened the lowest spout at the furnace base and tapped the molten metal into pots or molds until liquid slag made an appearance, indicating an end to the metal. Workers then repeated the process, keeping the furnace in continuous operation for days or weeks.[582]

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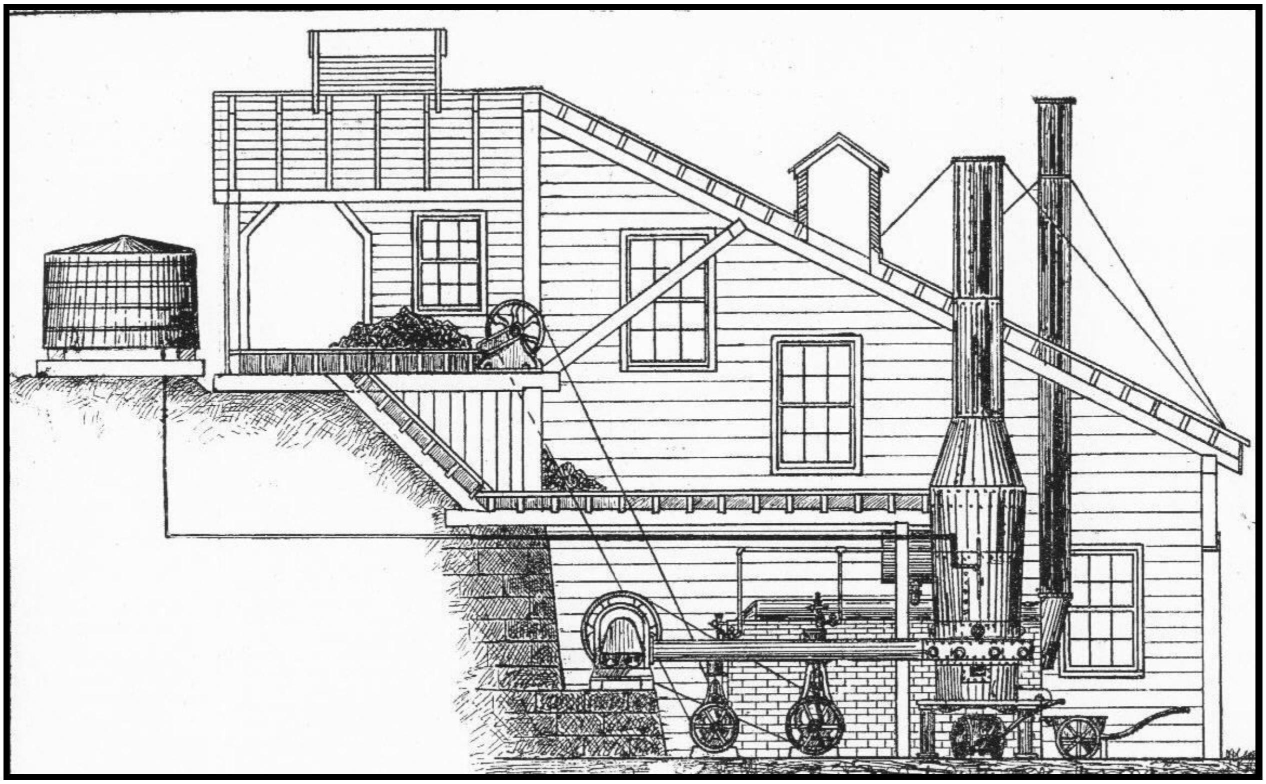
[581] Bailey, 2002:80; Meyerriecks, 2001:173.
[582] Bailey, 2002:82-83; Meyerriecks, 2001:174.

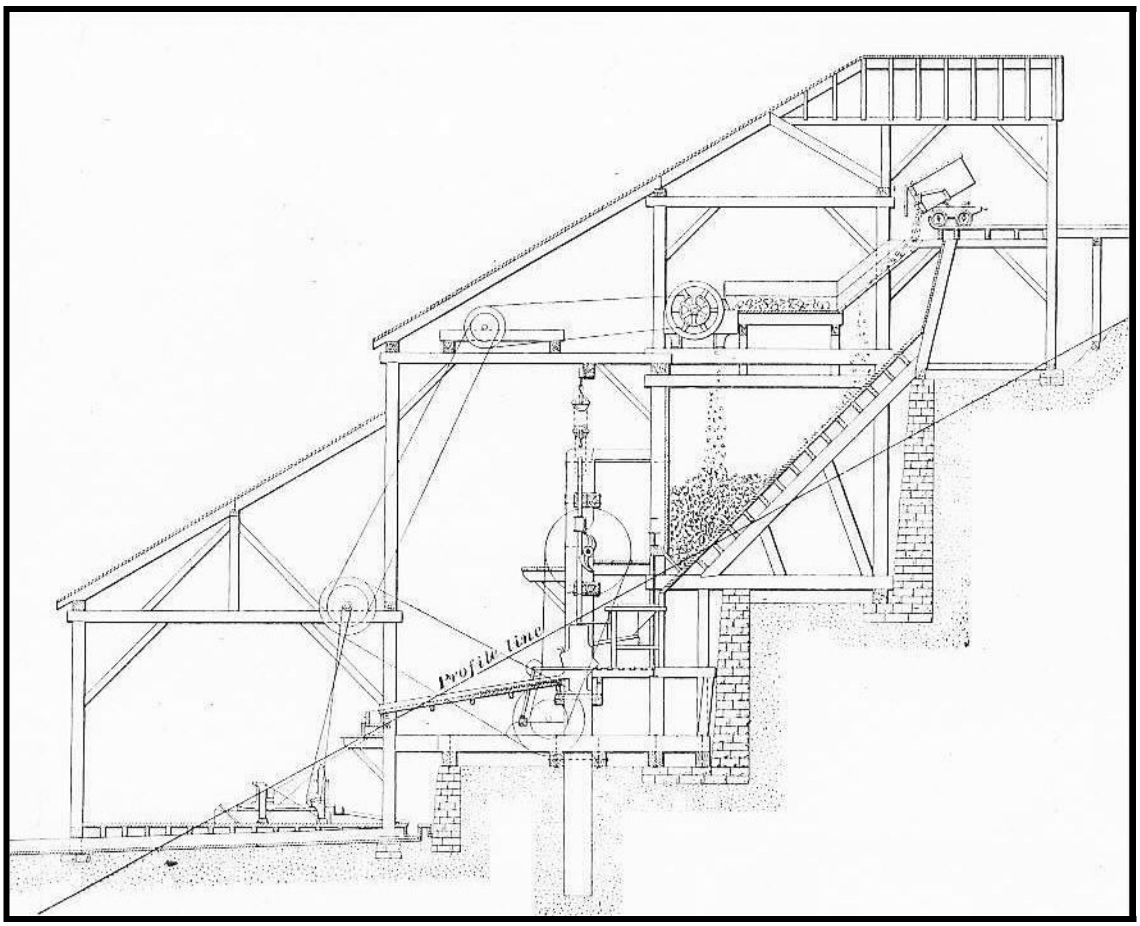


The profile illustrates a small and simple smelter. Workers sorted crude ore at top left and then fed the material into a crusher marked by the upper wheel, which is a belt pulley. The resultant cobbles and gravel accumulated on the floor at center, and workers periodically fed the material into the furnace at lower right. The type of furnace, free-standing and pre-fabricated, was common by the late 1870s. Note the blower system in front of the brickwork at bottom, which forced air into the furnace for great heat. Early smelters featured masonry furnaces instead of the free-standing unit. In many cases, smelters also had concentration machinery to process complex ore in advance. Source: *Mining & Scientific Press* 4/28/83, p281.

Because metallurgists used gravity to draw ore through the processing stages when possible, they usually sited smelters at the base of a slope. Smelting facilities usually required flat space, a source of abundant water, and well-graded roads. In addition to the furnace, smelters often featured ore bins, large fuel bins, water tanks, storage, an assay office, and a vault. The smelters in Clear Creek County usually had more than one furnace to process batches of ore simultaneously if the material was simple, or in stages if the ore was complex. The smelters also featured roasters and mechanized concentration mills to prepare the ore and enhance separation prior to smelting.

Concentration Mills

Few mining companies possessed enough capital and ore to warrant the erection of a dedicated smelter. Most companies had to ship their ores to custom smelters, which extracted the metals for a fee. The shipping charges and smelting fees constituted a heavy expense, and in response, well-capitalized mining companies attempted to save money by building concentration mills near their workings. Concentration mills relied on mechanical and some chemical processes to reduce the ore, separate the metalliferous materials, and prepare the resultant concentrates for shipment to a smelter for final treatment. In so doing, mining companies accomplished many of the steps that smelters charged for, and they did not have to pay to ship the worthless waste usually integral with crude ore. Concentration mills were not equipped, by definition, to produce finished bullion.



The profile illustrates both the stairstep configuration of a typical concentration mill and the process flow path. Workers dumped ore onto a screen at top, and fine material passed through while course cobbles were diverted into a crusher. A stamp battery at center then pulverized the ore into a slurry, which passed over amalgamating tables that extracted free-gold and silver. The slurry then descended to concentration machinery on the lower platform. That machinery separated out the gold and silver that refused to amalgamate. Source: International Textbook Company, 1899, A43:214.

Concentration mills were usually built over a series of terraces incised into a hillslope so that gravity could draw the ore through the various processing stages. Mills came in a variety of scales, and large facilities usually required stone masonry or concrete terraces to support the building and heavy machinery, while earthen terraces and substantial beamwork were sufficient for small facilities. Large mills such as the Newton were heavily equipped to process both high volumes of ore, and complex ore that resisted simple treatment. To do so, they often provided primary, secondary, and even tertiary stages of crushing, screening, and concentration, and they may have featured several parallel sequences. Small mills, by contrast, usually provided several stages of crushing and concentration in a single, linear path.

Engineers and metallurgists tended to follow a general pattern when designing concentration mills. An ore bin stood at the mill's head and it fed crude ore into a *primary crusher*, usually located on the mill's top platform. The crusher reduced the material to gravel and cobbles ranging from 1 to 4 inches in size, which descended to a *secondary crusher* located on the platform below. The secondary crusher pulverized the ore to sand and slurry, which went through a screening system. Oversized material returned for secondary crushing and material that passed the screen went on for concentration at small mills, or tertiary crushing and then concentration at large mills. By around 1900, engineers favored using *trommel screens* or *shaking screens* to sort the sand. A trommel consisted of a concentric series of cylindrical screens that rotated, allowing fine material to drop through while the oversized cobbles rolled out of an open end. A shaking screen was a stack of rectangular pans with screen floors.[583]

Machinery manufacturers offered a wide array of crushers and grinders, which metallurgists selected according to the ore's characteristics. Because no two mines featured the same ore and no two metallurgists were alike, each mill was a custom affair. However, engineers followed some patterns regarding the application of crushing machinery. Jaw crushers, also known as Blake crushers, provided primary crushing, while a few large operations employed gyratory crushers. Batteries of stamps were commonly employed for secondary crushing. A stamp battery consisted of a timber gallows frame with guides for heavy iron rods featuring cylindrical iron shoes. A cam lifted the rods in sequence and let them drop on the gravel being crushed. Crushing rolls often carried out secondary and tertiary crushing, and they consisted of a pair of heavy iron rollers similar to wheels in a stout timber frame. A narrow gap between the rollers drew in clasts of sand and gravel and fragmented them. Grinding pans and Huntington mills were used for tertiary crushing, and both featured a heavy cast iron pan and iron shoes or rollers that dragged across the floor, grinding the ore. When the ore was free-milling gold or silver, the metallurgist introduced mercury into the pan to amalgamate with the metals. *Tube mills* and *ball mills* offered the finest grinding. Each appliance consisted of a large cylinder which mill workers partially filled with sand, gravel, and water. The cylinder slowly rotated, and the iron rods in tube mills or iron balls in ball mills tumbled in the chamber, reducing the material to a slurry. Both types of grinding appliances rose to popularity around 1900, and by the 1930s they were used in place of crushing rolls and stamp batteries. The end product of crushing and grinding were *fines* and *slurry*.[584]

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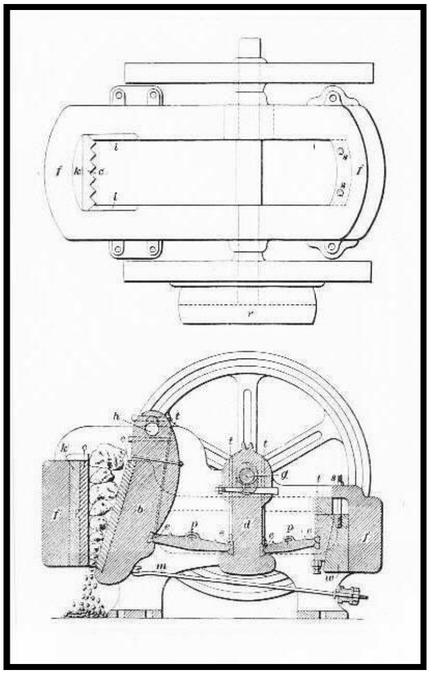
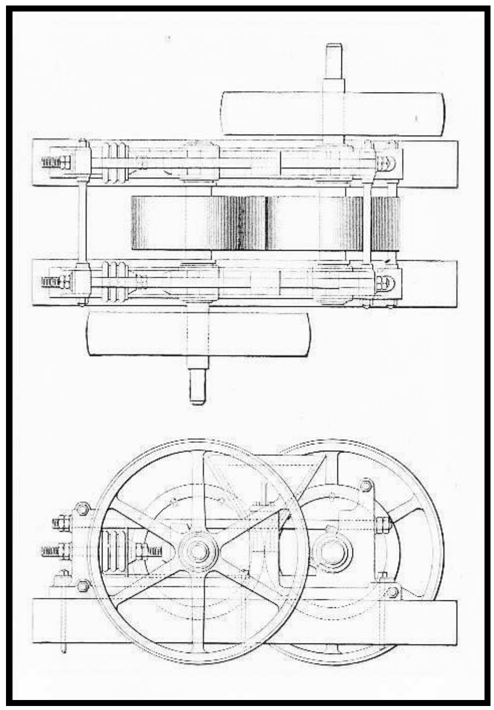
[583] Peele, 1918:1623, 1627; Tinney, 1906:191.

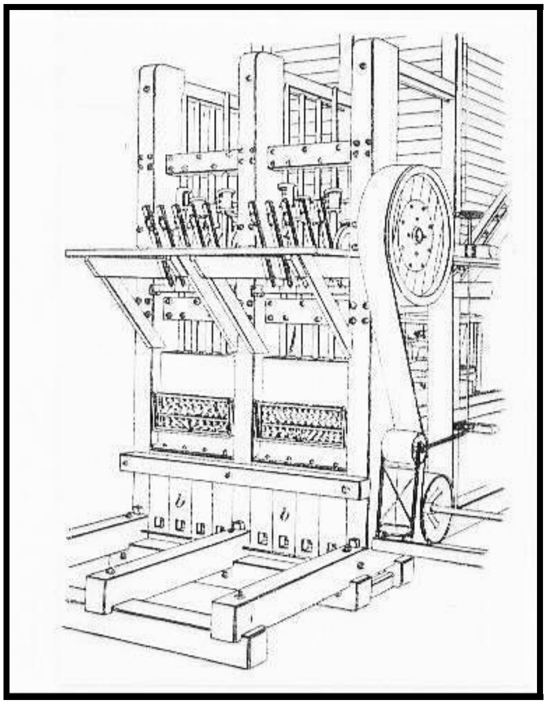
[584] Peele, 1918:1630.



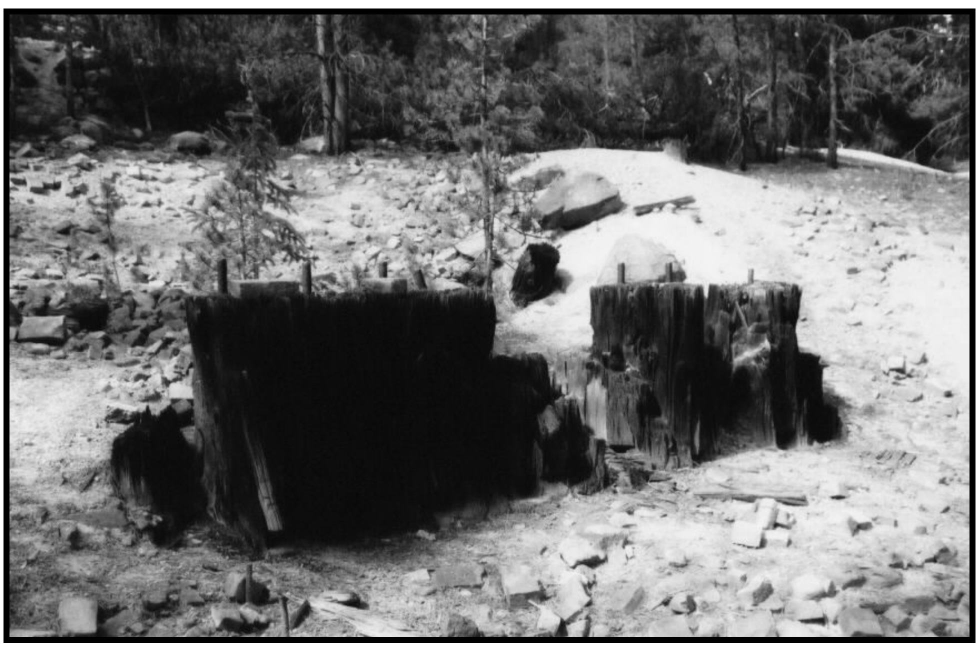
The plan view, top, and profile, bottom, illustrate a jaw crusher, which provided initial crushing at most mills. Source: International Textbook Company, 1899, A43:2.



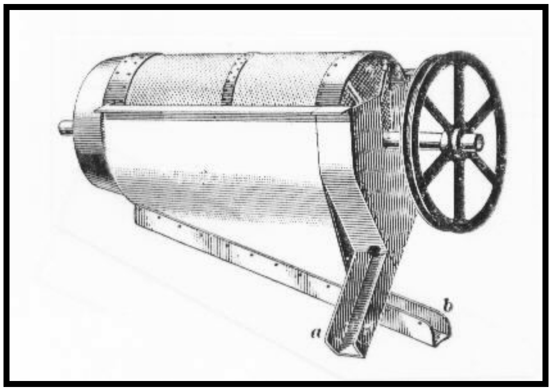
The plan view, top, and profile, bottom, illustrate a device known as a crushing rolls, which was popular for secondary and tertiary crushing. Source: International Textbook Company, 1899, A43:12.



The quarterview illustrates the front of a stamp battery, which provided secondary crushing at some mills. Stamp rods are visible between the timber posts, and their heavy iron shoes pounded ore in the battery boxes below. The battery boxes are bolted to pedestals of upright timbers, which are often the only remnants of stamp batteries today. Source: International Textbook Company, 1899, A43:27.

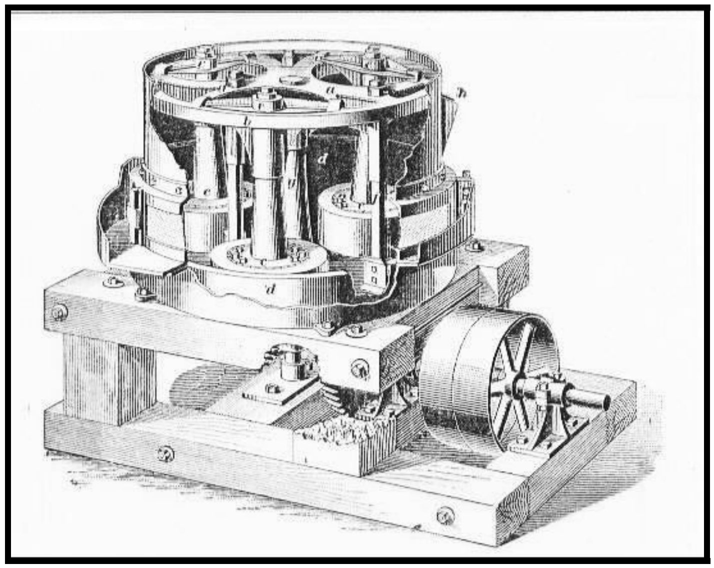


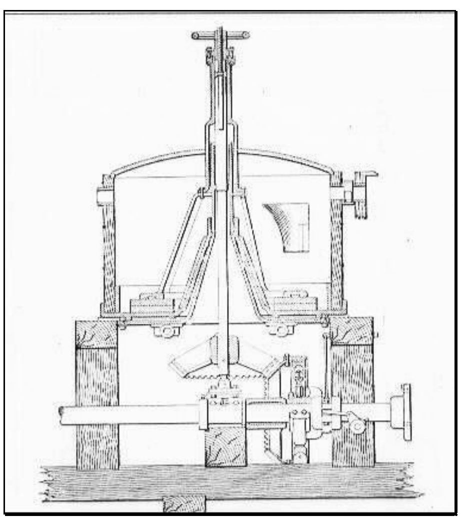
When a stamp battery was dismantled, the pedestals for the cast iron battery boxes were often left in place. The pedestals consist of timbers on-end and feature anchor bolts on top, and each is around 2 feet wide, 3 feet high, and 5 feet long. Source: Eric Twitty.



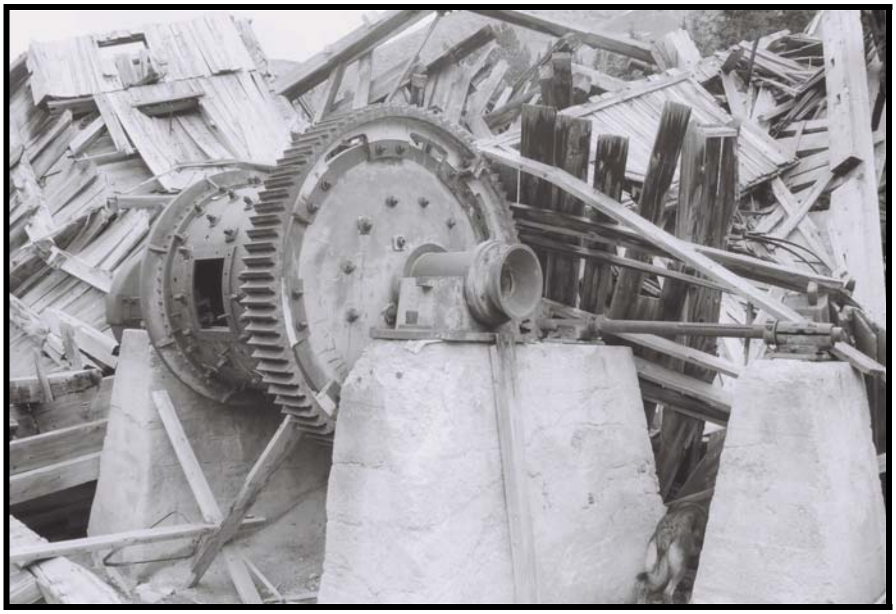
Most mills relied on trommel screens to sort crushed rock between processing stages. Source: International Textbook Company, 1899, A43:12.

The Huntington mill saw two applications. At concentration facilities, it provided secondary and tertiary crushing, and at amalgamation mills, the device simultaneously ground and amalgamated gold and silver ores. The driveshaft at right turned a capstan in the mill's pan, which caused the rollers to grind screened ore against the cast iron walls. Note the timber foundation. Source: International Textbook Company, 1899, Z43:47.





The profile depicts a grinding pan, used for tertiary crushing and sometimes to amalgamate gold ore. Heavy shoes on a central axle rotated around the cast iron floor and ground ore. They were largely ineffective on complex ore. Source: International Textbook Company, 1899, A43:172.



Ball mills became popular for fine grinding by the 1910s. As the entire cylinder slowly rotated, tumbling steel balls in the chamber ground screened ore to a slurry. A hatch covered the opening.. Note the concrete foundation, distinct in footprint. Source: Eric Twitty.

Following another screening, the ground ore descended to subsequent mill platforms for concentration. Several devices proved relatively popular for separating out metals, and many metallurgists assembled a concentration sequence involving more than one appliance. The *jig* relied on water currents and agitation to separate heavy metalliferous material and classify particles by size and weight. The jig consisted of a wooden trough, often 4 by 9 feet in area and 4 feet high, divided into cells that opened onto a V-shaped floor featuring valves and drains. Plungers agitated the slurry of ground ore in the cells, causing the heavy or large fines to settle while a gentle current of water washed the waste away. Jigs were highly popular in Clear Creek and Summit counties from the late 1870s into the 1930s.

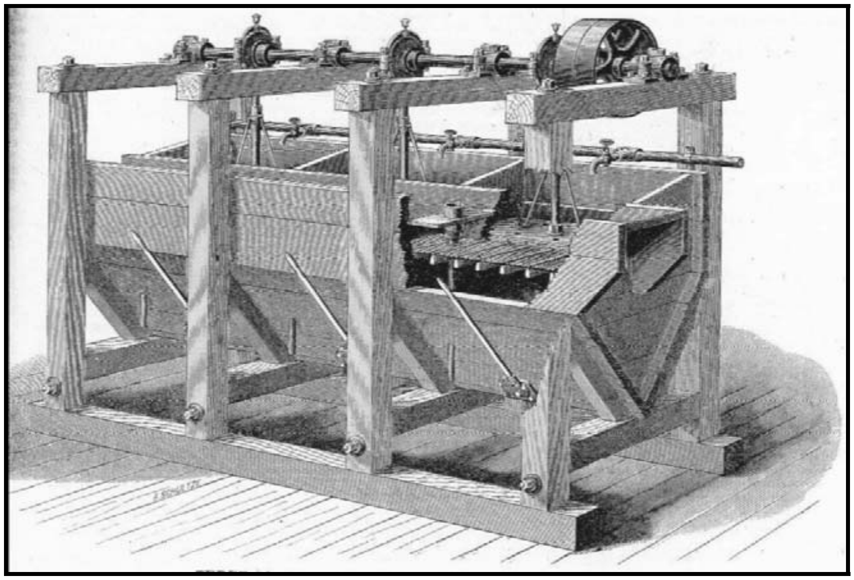
Vanners were a popular concentration appliance for silver ores from the 1870s until they were replaced by vibrating tables during the 1900s. A vanner featured a broad rubber belt on rollers mounted to an iron frame that vibrated. The belt assembly, around 5 by 15 feet in area, was suspended by an oscillating mechanism from a chassis bolted to a timber foundation. The belt was kept wet and as the machine vibrated, the heavy metalliferous material settled against and stuck to the rubber while a jet of water washed off the waste. As the belt wrapped down around one of the rollers, the metalliferous material dropped into a flume and proceeded for further concentration.[585]

Vibrating tables were one of the most effective classes of concentration appliances and rose to prominence around 1900. Arthur Wilfley designed the first model for his mill in Robinson, Summit County, in 1896, and by the 1910s, metallurgists adapted the concept for nearly all types of metal ores. A vibrating table featured a tabletop, often 5 by 15 feet in area, clad with rubber or linoleum held down with fine riffles. The tabletop was mounted at a slant on a mobile iron frame that rapidly oscillated, and the vigorous action caused heavy metalliferous

[585] Bailey, 1996:64, 112; Tinney, 1906:204.

material to settle against the higher riffles while the waste worked its way downward. Water playing across the tabletop washed the waste away.[586]

The jig was an effective and popular concentration device from the 1870s through the 1930s. The crank at top moved screen plungers up and down in the slurry-filled cells. The agitating action classified ore particles by size or weight, depending on the application. Source: *Mining & Scientific Press* 8/9/90, p83.



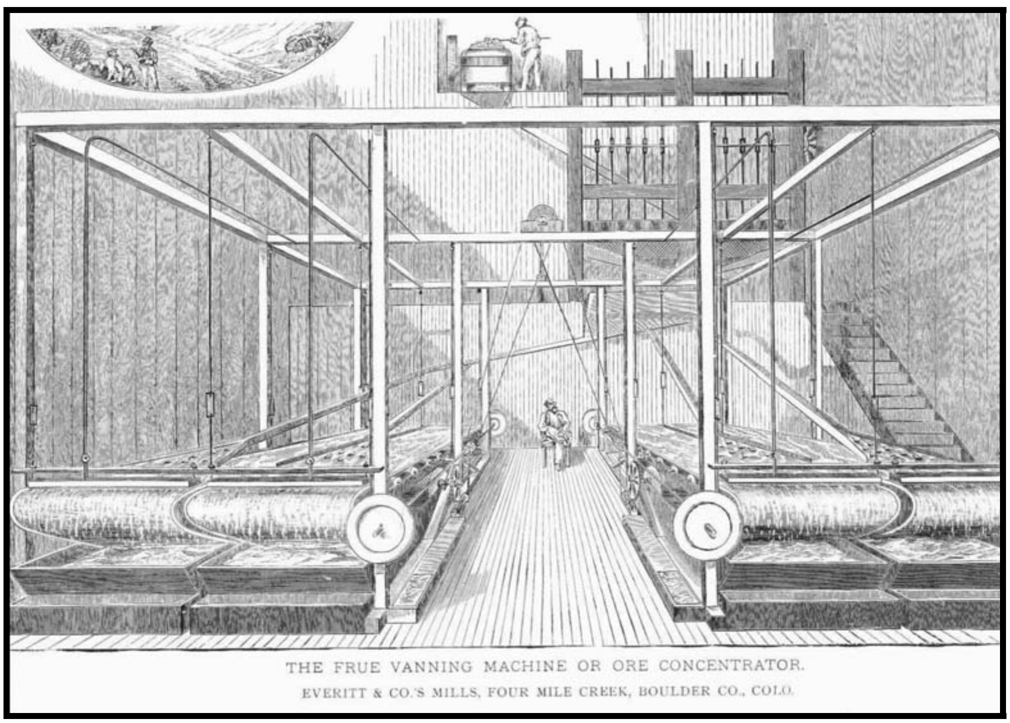
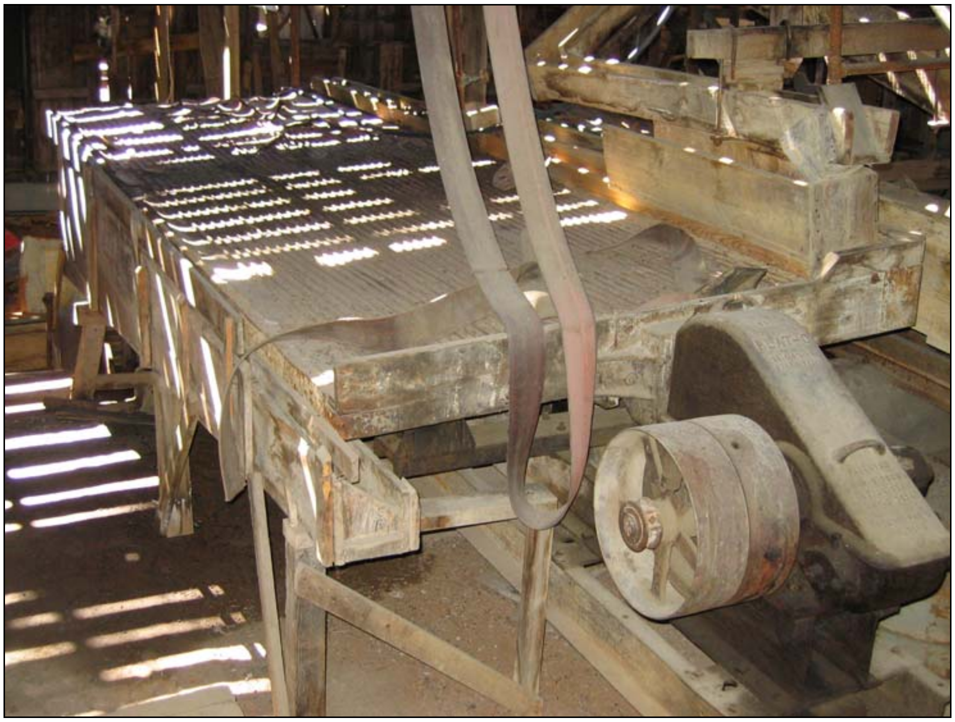
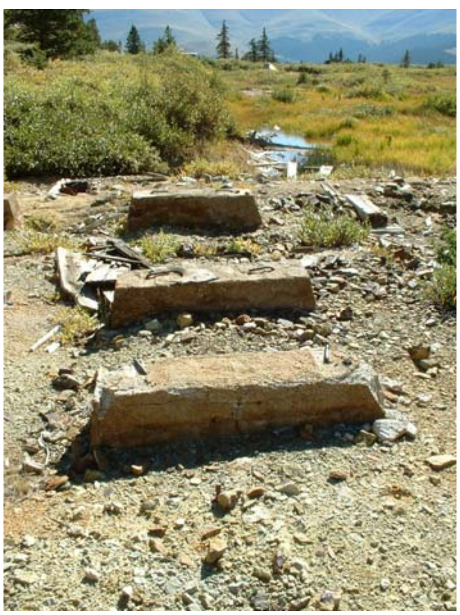


Figure E 94: Frue vanners were used with some success to concentrate complex ore prior to 1900. The drawing is of the Everett Mill in Boulder County. As the vanner vibrated, finely ground ore settled against its broad rubber belt while water jets and a scraper removed light waste material. Note the stamp battery at upper right. Source: *Engineering & Mining Journal* 11/24/77, p387.

586 Peele, 1918:1680; Tinney, 1906:204.



Following its introduction around 1898, the vibrating table was one of the most popular and effective concentration appliances throughout the Rocky Mountain west. An eccentric cam under the guard at right imparted a vibrating motion to the tabletop, and the vigorous action caused heavy metalliferous material to settle against the riffles. Water currents washed the light waste off. Source: Carol Beam, Boulder County Parks and Open Space.



Vibrating tables like the one above were anchored to foundations of three concrete or timber footers, often 5 feet wide and 15 feet long. Source: Eric Twitty.

By the late 1910s, *flotation cells* were proving their worth and operated according to principals that seemed to defy traditional concentration technology. Flotation was pioneered in San Juan County in 1914, among other places in Colorado, and became common by the early 1920s. A flotation machine consisted of a large rectangular tank divided into cells filled with water and slurry. Oils or detergent were introduced, which compressed air or agitators worked into a froth. In contrast to the above mechanical devices, the froth carried the metalliferous materials upward while wastes settled to the bottom of the cells. Revolving paddles then swept the metalliferous material into troughs.

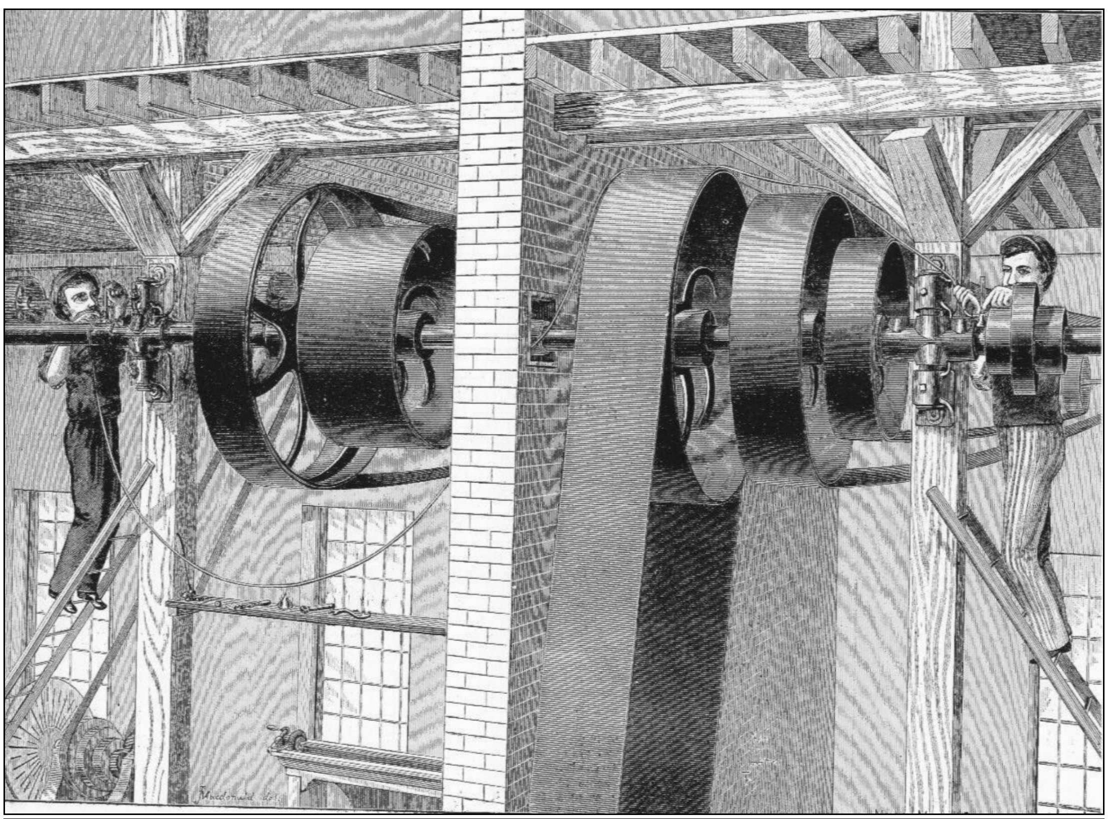
The Alma Lincoln Mill near Idaho Springs was equipped with a battery of flotation cells. Highly efficient, the apparatuses replaced other types of concentration machinery by the 1930s, when the mill was built. The cells were filled with slurry and agitated to a froth. Courtesy of Denver Public Library, CHS.X5495.

While the above appliances proved effective for silver and industrial metal ores, they provided limited success for complex gold ores, such as that found in Clear Creek County. During the 1900s, mining companies at first in Cripple Creek and then in Boulder County began experimenting with *cyanidation*, which was pioneered in New Zealand. For cyanidation, the ore was crushed and ground as above, and then concentrated as a slurry. A worker transferred the metalliferous material into *cyanide tanks*, which were large wooden vats that agitated the slurry in a dilute cyanide solution. The cyanide bonded with the gold, the waste was flumed out, and a worker tapped the solution into *precipitating boxes* where he introduced zinc, which cyanide preferred over gold. The chemical reaction caused the precious metal to precipitate out. Cyanide mills could have featured one or a series of cyanide tanks, depending on the purity and volume of ore.

Most mill processes liquefied the slurry with water to mobilize the material and to allay dust. However, at the end of the process, the concentrates had to be dried for shipment. To separate the water, engineers installed various dewatering devices that ranged from conical and pyramidal settling boxes to Dorr thickeners. Mill workers introduced watery slurries into settling boxes where the fines accumulated and were drawn out through spigots in the bottom. The Dorr thickener, devised for high volumes of material, featured a tank at least 20 feet in diameter with a conical floor. Radial arms rotated slowly within the slurry and forced the fines toward the tank's center, where the material passed through a large spigot.[587]

Gravity drew the metalliferous fines from one crushing and concentration stage to the next. However, each step had to make allowances for returning inferior material back for reprocessing, which meant defying gravity and sending the material uphill. To accomplish this, metallurgists used either bucket-lines or spiral feeds. Bucket-lines were a series of closely spaced sheet iron pans stitched to an endless canvas belt, and they scooped material from one bin and deposited it into another. Spiral feeds, which were effective for moving fines short distances, typically featured an auger that rotated in a sheet iron shroud. As the auger turned, it moved the material upward and deposited it into a bin.

Concentration mills relied on the same sources of power as mine surface plants, although the transition from steam to electricity at mills occurred slightly earlier. Most mills relied on a single, large steam engine that drove the various appliances through a system of overhead driveshafts and belts. The horizontal steam engine was most common, and small upright units powered additional appliances at large mills. By around 1900, when electricity was commonly available in the county, engineers began using motors.



A system of overhead driveshafts and belts was the most common means of transferring motion from a mill's engine to its various appliances. Source: *Mining & Scientific Press* 9/1/83, p129.

[587] Peele, 1918:1669.

Amalgamation Stamp Mills

Two definitions apply to the term *stamp mill*. As noted above, concentration mills employed batteries of stamps to crush ore prior to other processing steps. In this case the term stamp mill refers to the stamp battery, which is a component of a concentration mill.

However, under the right mineralogical conditions, companies based an entire facility around a stamp battery to recover metals without smelting or advanced concentration. The ore had to feature relatively simple gold or silver compounds and be easily crushed. A jaw crusher usually provided primary crushing, the stamps effected the rest of the physical reduction, and amalgamating tables at the battery's toe, coated with mercury, recovered the gold or silver. Workers periodically scraped off the amalgam and heated the mass in a retort, which volatized the mercury and left the gold or silver.

Because stamp mills featured a fraction of the equipment installed at the more complex concentration mills, they tended to be smaller and simpler. Regardless, stamp mills shared with concentration mills a few fundamental aspects. First, the various stages of crushing and metals recovery, as well as other facilities were arranged on a series of platforms to use gravity to advantage. Second, they usually featured a receiving bin above the primary crusher to hold crude ore destined for processing. Third, the mid- or lower platform featured the power source, which was often a horizontal steam engine and boiler. Last, the mill required a source of water. It should be noted that metallurgists installed tertiary crushing and possibly a concentration appliance in some stamp mills, which better prepared the ore for amalgamation. When this is the case, the mill was known as an *amalgamation stamp mill*. Many of the mills in the eastern portion of Clear Creek County fell into this category.

Arrastras

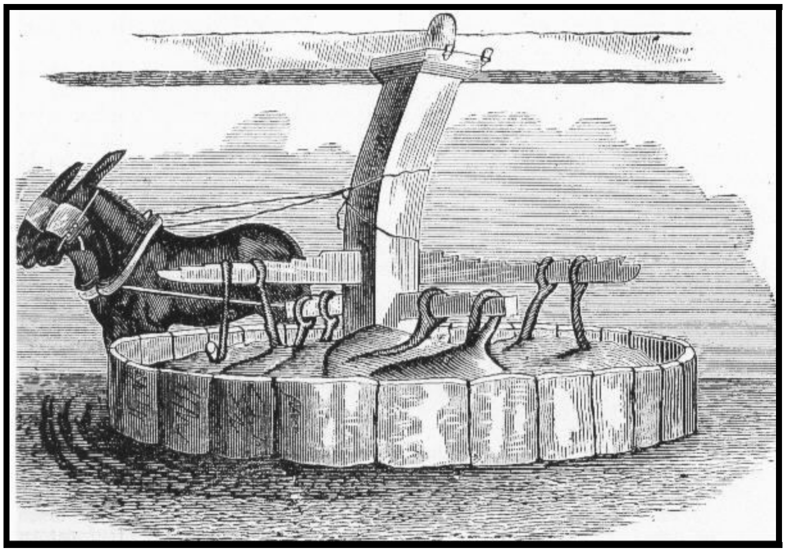
An arrastra was a simple, inexpensive, labor-intensive, and inefficient means of recovering metals from ore. Arrastras were primarily employed during the ten several years of hardrock mining in Clear Creek County to treat simple gold ore. While a few capital-starved outfits continued to employ the technology as late as the 1930s, the quick exhaustion of simple gold ore rendered these primitive treatment facilities obsolete by around 1870.

A typical arrastra featured a circular floor of carefully fitted stones, low sidewalls, and a capstan at center. They ranged in size from around 6 to 20 feet in diameter, and all featured common characteristics. A beam was attached to the capstan's top, and as it rotated, the beam dragged between one and twelve muller stones across the floor, depending on the arrastra's size. Usually, the stones, chained to the beam, were staggered so they covered the floor's entire surface-area. The floor stones had to possess flat faces and tight joints, and the mullers had to feature convex bottoms and iron hooks hammered tight into drill-holes. The Spanish, credited with popularizing the arrastra, relied on slave labor as motive power, which draft animals replaced. With the improvement of technology, scarcity of labor, and the desire for greater production, in a few cases engineers harnessed waterpower and even steam engines. The simplest form of arrastra cost around $150 to build, much of which went to the labor for dressing and assembling the rockwork.[588]

To build an arrastra, a worker leveled a platform, excavated a pit at center, and installed the capstan, which had to be stout enough to resist great horizontal force. The worker paved the platform with a layer of fine clay and carefully fitted the floor stones together using more clay as

[588] Meyerreicks, 2001:194.

mortar. With the floor complete, he erected the sidewall, which consisted either of more stonework or planks on end. During the twentieth century, concrete became a popular substitute for rocks. Once the beam and mullers were in place, the arrastra was ready for operation.[589]



The ages-old arrastra was used during the earliest years of mining in Clear Creek County to treat gold ore. The operator shoveled ore into the interior, added mercury, and waited for the rotating muller stones to grind the material into sand and slurry. As the ore fractured, mercury amalgamated with the gold. Because arrastras were simple and inexpensive, they were favored by prospectors. Source: *Mining & Scientific Press* 5/26/83.

Running an arrastra required more skill and experience with local ores, than engineering and formal training in metallurgy. First, a worker scattered a *charge* of ore across the arrastra's floor, completely covering the stones, then introduced a little water. Afterward, the motive power began rotating the beam, dragging the mullers over the fragmented ore, slowly grinding it into sand. The worker periodically added more water to convert the material into a slurry, and sprinkled mercury into the material. The mullers continued to reduce the ore into a combination of sand and fine particles known as *slimes*, and the arrastra's sidewalls contained all on the floor stones. The purpose of adding mercury was to create an amalgam with the metals as they became exposed by the continued fracturing of the ore. Fine particles offered a greater surface area, facilitating amalgamation. Here, experience and familiarity with local ores came into play, and the arrastra operator added enough mercury to form an amalgam paste, but not in excess, which created a liquid difficult to recover. Generally, one ounce of mercury recovered an equal amount of gold, or one pound of silver. In some cases, the operator added lye to bind with oils and grease, which interfered with amalgamation.[590]

The next stage of processing ore was known as *cleanup*, where worthless *gangue* was removed and the amalgam recovered from the arrastra's interior. First, the operator had to drain the interior either by bailing, breaching the sidewall, or opening a port near the wall's base. With the water gone, the operator shoveled the exhausted sand and slime out, leaving a mud and sand layer on the flooring stones. The operator may have carefully washed additional material out of the arrastra's interior, exposing as much of the amalgam, smeared on the floor stones and deposited between the joints, as possible. Here heavy labor came into play. The operator disassembled the floor stones, if small, and washed and scraped off the amalgam, or merely scraped the amalgam off the stones if large. Last, he filled a retort with the precious material and heated the vessel to volatize the mercury, leaving a sponge-like mass of metal. The retort vapors

589 Young, 1987:69-71.
590 Meyerreicks, 2001:143, 195; Young, 1987:71.

were usually routed through cool pipes to condense the mercury for reuse. Afterward, the operator rebuilt the arrastra and repeated the process with another load of ore.[591]

[591] Meyerreicks, 2001:143, 195; Young, 1987:71.

Section E 5: History of the Timber Industry, 1860-1920

Introduction

The I-70 Mountain Corridor is well known for its history of mining and railroads. These two industries were engines for the economy, development, infrastructure, settlement, and culture within the corridor. Although nearly forgotten, the timber industry was almost as important because its products made the railroads and mining possible. The industry provided materials for most forms of construction, ties for railroad tracks, timbers for mine workings, and firewood for heat and steam power. This section provides an overview of the timber industry in the corridor. The purpose is context for understanding historical resources and assessing their eligibility to the National Register of Historic Places.

Period of Significance, 1860-1920

In overview of the I-70 Mountain Corridor, the timber industry was important during the Period of Significance 1860 through 1920. The Period began in 1860 when entrepreneurs established the corridor's first sawmills on Clear Creek to supply lumber to miners. The Period ended in 1920 when the production of lumber, ties, and mine timbers nearly ceased in the corridor and no longer qualified as an industry of note.

The timber industry was not uniformly present throughout the corridor, and instead was concentrated in regions with three basic characteristics. First were substantial forests of trees desirable in both type and maturity. Second was a strong local demand for forest products. Third was proximity to efficient transportation. Although limited logging occurred in most of the corridor, three particular regions met these criteria and featured industries of significance. They include Clear Creek drainage, especially Lawson west to the Eisenhower Tunnel; Ten Mile Canyon and Straight Creek in Summit County; and along the Eagle and Colorado rivers in Eagle County.

The timber industry in each region shared an intimate and often dependent relationship with proximal mining and railroads. Thus the rise and fall of logging closely paralleled the trends of mining and railroads, which differed for each region. Local factors contributed, as well. As a result, the timber industry in each region was important during narrower timeframes within the overall Period of Significance. The timeframes are summarized separately below.

Regardless of region, the importance of the industry can be categorized under specific NRHP areas of significance. The areas of significance are Commerce and Economics, Community Planning, Exploration/Settlement, Industry, Politics/Government, and Social History. In general, the industry was universally significant for several reasons. First, it was a primary engine for permanent Euro-American settlement in the corridor. Second, loggers and tie cutters were among the earliest settlers to pioneer portions of the mountains that lacked the resources for mining and agriculture. Third, the industry supplied mining, railroads, and settlements with the physical materials for their buildings and structures. Fourth, the industry was a major employer and sector of the mountain economy. Last, the industry, and especially tie cutting, provided many people of limited means with an opportunity for self-advancement. The significance is likely to be on local and statewide levels. The industry was not important on a national level.

Clear Creek Drainage, 1860-1920

The timber industry was significant in Clear Creek drainage between 1860 and 1920. The industry began by producing lumber for placer miners and their communities mostly in the eastern drainage during the early 1860s gold rush. The initial boom collapsed by around 1864, and the county fell into a depression that lasted several years, which temporarily stalled the nascent industry. In 1866, the boom shifted to the western drainage and its silver mines, and pulled the timber industry with it. The timber industry then enjoyed steady growth there in parallel with and as a result of mining.

When the Colorado Central Railroad graded up Clear Creek to Georgetown in 1877, it significantly changed the industry. Most important, the railroad fostered a mining boom, which increased the demand for lumber and mine timbers. The railroad lowered shipping costs within the county, linked sawmills with local consumers, and provided an outlet to distant markets, mostly in Denver. The railroad also created a demand for ties, which supported a new segment of the timber industry. Completion of the Georgetown, Breckenridge & Leadville Railroad to Graymont, several miles west of Silver Plume, improved access to the county's western-most forests and provided lumber companies there with an outlet to Denver. As a result of this and an increase in mining, the timber industry reached peak production during the 1880s. Afterward, a decrease in mining, increased logging regulation, and dwindling forest reserves gradually reduced the timber industry. The industry declined substantially during the 1910s, and collapsed along with mining in 1920.

Dillon and Ten Mile Canyon, 1879-1912

Overall, the timber industry was significant in Ten Mile Canyon and the Dillon area between 1879 and 1912. The industry was, however, important only during three timeframes within these years, and nearly dormant in between. The first began in 1879 with the rise of an industry at Frisco, and it began producing lumber for mining and construction of the towns of Dillon, Frisco, and Wheeler. Completion of two railroads into the region between 1881 and 1883 brought the industry into a boom by opening external markets and consuming thousands of ties. The timeframe ended in 1886 when mining slowed and the timber industry contracted. The industry was then largely idle for four years.

The second timeframe of significance began in 1890 when a mining revival restored a strong demand for lumber, and the railroads also began replacing decayed ties. In response, the timber industry produced ties for the railroads, timbers and lumber for mining, and more lumber for Dillon, Frisco, and Wheeler. The timber industry sent products to distant markets, as well, the most important of which were Leadville and the Robinson Mining District. The timeframe ended in 1894 when the Silver Crash brought mining in the region to a halt.

The third timeframe of significance began with a major revival of mining in 1898. A strong demand for lumber returned at first in Leadville and the Robinson district, followed by Ten Mile Canyon and the Dillon area. Mining reached a peak period of production, and the lumber companies enjoyed sound business as a result. In addition, the railroads resumed maintenance of their tracks and ordered new ties. The timeframe ended in 1912 due to a combination of factors. First, timber resources became difficult to obtain, the forests showed signs of exhaustion, and the Forest Service enforced harvesting regulations. Second, the demand for lumber and mine timbers fell because of the decline of mining in Ten Mile Canyon and the Robinson district. Third, the production of railroad ties nearly ceased. The timber industry never recovered.

Eagle and Colorado River Valley, 1886-1920

The period spanning 1886 to 1920 is the only timeframe of significance for the timber industry in the Eagle and Colorado River valleys. When the D&RG graded a track from Leadville to Glenwood Springs in 1886, its contractors harvested thousands of rail ties from forests along the river valley. This large-scale tie operation constituted the region's first timber industry, although no sawmills were involved. Within a short time, however, the D&RG and its dependent towns of Minturn, Dotsero, and Eagle demanded enough lumber to support several sawmills. During the latter half of the 1880s, entrepreneurs built additional mills to supply the enormous demand for lumber and mine timbers at Leadville, Red Cliff, and Aspen. From this point until 1920, logging supplied both the D&RG tie demand and the distant markets. The timber industry declined sharply and lost its importance by 1920 for several reasons. First, the mining industry collapsed and ruined the lumber market. Second, the nation entered an economic depression that discouraged business. Third, the D&RG secured replacement ties from sources outside the county. Last, the easily logged forests neared exhaustion and possessed few trees that were suitable for railroad ties.

Overview of Forest Products

In the I-70 Mountain Corridor, the timber industry generated five general categories of forest products, which influenced logging operation types. The products included lumber, railroad ties, mine timbers, raw logs for construction, and firewood.

Lumber was one of the most important products, and it was an irreplaceable material for industry and settlement. The regularity and adaptability of lumber made it ideal for designed buildings and engineered structures. Dimension lumber came in regular sizes such 1x8s, 2x4s, and so forth, and was the standard product of sawmills. Lumber companies also produced custom pieces for special applications. Prior to the 1930s, most dimension lumber was rough-cut and true in size. During the Great Depression, however, lumber companies slightly reduced the finished sizes of lumber so they could produce more pieces per tree, and this deviation is in place today. Smooth lumber, produced by planing mills, also was smaller in dimension because the mills stripped away some of the bulk during treatment.

Although the timber industry measured finished lumber in inches, the industry had a different standard to quantify large volumes of wood. Specifically, the industry recognized the board-foot, which was a plank 1 by 1 feet in area and 1 inch thick. This unit of measure was important for estimating timber reserves, the output of individual sawmills or the entire industry, and the economics of such.

The production of lumber occurred in several basic steps that required capital, a workforce, and an infrastructure. Given this, most producers were organized companies or partnerships with financial resources. In overview, the steps were harvesting or felling trees, hauling them to a sawmill, reducing the trees into lumber, and transporting the finished product to a customer or lumberyard.

Loggers, commonly known as lumberjacks, were the individuals who felled the trees, and they were usually company employees. The loggers were highly selective and chose trees based on type and size, with the largest naturally the most desirable. In terms of type, yellow pine was prized for its clarity, grain, and uniformity, but because these were scarce, lumber companies usually settled for lodgepole pine for its similarity. Engleman spruce was harvested for general construction lumber, and blue spruce was shunned because it was fibrous and difficult to work.[1]

The stereotype of the logger cutting trees with an axe is slightly misleading. Instead, loggers usually labored in teams of two with massive steel saws. They determined the most appropriate direction in which to fell a tree, cut a shallow notch on that side of the trunk, and then sawed from the other side toward the notch. Once the trunk's structural integrity had been compromised, the tree pivoted over the notch and crashed to the ground. The team usually made its cut several feet above their footing, which, during winter, was the surface of the snowpack. If the snowpack was thick when the tree was felled, then the stump could appear quite high after the spring thaw. The team then used saws, axes, and froes to trim away the bark and branches, known as slash, and prepare the log for transportation to the sawmill.

Teamsters and muleskinners were the workers who hauled the cut logs to the mill. If the trees were harvested near the mill, then muleskinners used horses, mules, or oxen to drag the logs with chains. Whenever possible, the muleskinners used gravity to advantage and skidded the logs directly downslope along paths that had been cleared of obstacles. Over time, the traffic eroded relatively straight furrows known as skid trails and timber slides, and when these became deep, workers installed cross-logs to reduce the friction on the logs being dragged. In heavily forested areas, well-capitalized companies employed portable, steam donkey engines to winch massive logs onto loading frames. Where the distances from the sawmill were long, the lumber companies gathered the cut logs at loading stations and transferred them onto wagons for shipping. Once the raw logs reached the sawmill, they were stacked onto another platform at the mill's head.

Unlike the Pacific Northwest, the I-70 Mountain Corridor was not endowed with thick stands of lofty trees. Instead, the forests were inconsistent, thin in many places, and quickly cut. Thus, the sawmills had to be small, simple, and portable to follow the axe. A saw-frame constituted the central structure of a mill, and it was a timber assemblage 3 to 6 feet wide, as high, and 20 to 100 feet in length. Near center was another frame that featured radial ripsaws that cut the logs lengthwise, a crosscut saw that trimmed the ends, and their drive mechanisms. The power source was anchored to an adjacent timber foundation, and steam donkey engines were universal prior to the 1910s, while gasoline engines were popular afterward. A shed enclosed the entire structure to shelter the machinery and workers against adverse weather.

To mill logs into lumber, workers rolled the logs off an elevated platform at the head of saw-frame and onto a dolly. They fastened the log to the dolly, which was slowly winched on rails or rollers into the saw-blades. The radial saws cut the logs into the desired dimensions, and the crosscut blade chopped the pieces to length. The products were then pushed over more rollers to the end of the saw-frame and either loaded onto a wagon for shipment or stored on bolsters. In a few cases, well-capitalized companies, such as the Clear Creek Fluming Company near Silver Plume, floated the lumber to a yard in flumes. Sawmills on the scale of those in the corridor were run by two to five workers and could process between 2,000 to 4,000 board-feet per day.[2]

Although a sawmill was the most important component for a lumber operation, it was by no means the only facility. In most cases, the sawmill was center to a small camp that included a blacksmith shop, stables, a corral, an office, and living quarters for the workers. All were proportional to the size of the operation, and large outfits had multiple stables for draft animals and several boardinghouses for the crew.

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[1] Sudworth, 1900:134.

[2] Reich, 2008:163; Sudworth, 1900:139.

The Wapiti Sawmill is typical of most lumber facilities in the I-70 Mountain Corridor. Workers rolled logs from a stockpile in the foreground onto a dolly in the mill, and fed them into saw-blades. The dolly is at left, and the saw-blades, steam engine, and boiler are in the building at center. The mill, in this northerly view, operated between Breckenridge and Dillon for the Victoria Mining Company around 1890. Courtesy of Denver Public Library, X4929.

The production of railroad ties was much simpler than lumber and often required no sawmill. Because little capital was required, the industry consisted largely of tie cutters, also known as tie hacks, who worked in independent pairs or for small companies. Railroad companies or brokers were their customers, and they either issued contracts or paid by the tie.

Nearly all tie production occurred on-site in the forest, by hand, and without the aid of sawmills. When choosing suitable trees, tie hacks were as selective as loggers but had different criteria. They prioritized the same types of trees, except in sizes ranging from 10 to 15 inches in diameter. Larger trees, tie hacks felt, were too difficult to split and dress into the required dimensions. Acceptable ties were 8 to 9 feet long, flat on two faces, and 9 to 11 inches thick. Thus, the preferred tree could be easily dressed into ties. The hacks felled trees with saws as did loggers, lopped off the crowns, segmented the trunks into lengths of 8 or 9 feet, and then hewed the required flat faces with an axe. In so doing, the hack produced a finished tie.[3]

Although the steps were few and the concept simple, the hacks had to possess great skill in order to reduce enough logs per day to make a profit. An efficient hack could produce approximately 22 ties in 8 hours, and independent workers were paid $.10 to $.50 per piece,

[3] Reich, 2008:175; Wroten, 1956:243.

depending on ease of access. When employed by a company, efficient hacks usually earned either $3.00 per day or $30.00 per month with room and board. Both wage structures were commensurate with other resource extractive industries, including lumbering and mining.[4]

Once the hack finished the tie, teamsters or muleskinners brought them to collection points. As with logs for lumber, muleskinners skidded the ties to collection points and teamsters then loaded the ties onto wagons for shipment to the railroad. Ordinarily, producers preferred to float ties to market in rivers, but the waterways in the corridor were too unreliable. The muleskinners and teamsters may have been employed by a tie company, a railroad, or the hacks themselves. In any case, the ties ultimately ended up in stacks at railroad stations and yards. In Clear Creek County, the Colorado Central Railroad most likely stockpiled its ties at Idaho Springs, Empire Junction, and Georgetown, all of which had tie production industries in the surrounding forests. In Summit County, the Denver & Rio Grande and Denver, South Park & Pacific railroads relied on Dillon, Frisco, and Wheeler.[5]

Firewood and mine timbers were two types of forest products that fell outside the exclusive domain of companies. Mining companies required a variety of timbers to support weak ground in tunnels, shafts, and stopes. Engineers preferred milled lumber because of its regularity and used the material in those workings expected to be in service for long periods of time. Such timbers had to be milled, and although lumber companies offered milled timbers, some well-capitalized mining companies ran their own sawmills. Several of the first sawmills in Clear Creek County were established by mining companies both for in-house use and to sell commercially. Small mining companies, however, settled for both raw and hewn logs due their low cost. In these cases, independent contractors or the miners themselves produced the timbers in a manner similar to tie hacks, although almost any trees were acceptable.

In most of the corridor, cordwood was the principal heating fuel for households, businesses, and industry through the 1890s. At that time, industry switched to coal because of its greater efficiency, but firewood continued to provide heat in buildings for years afterward. The production of firewood was even less organized and centralized than railroad ties or mine timbers. Every settlement kept at least one woodcutter employed, large towns had sales yards, and in many cases, individuals harvested their own wood. Standards were low and almost any portion of a tree would do, standing or not.

As can be surmised, a considerable amount of entire forests flowed out of the mountains and to consumers in the corridor, and all manner of trees were harvested. Lumber companies cut the tallest and fattest trees, tie outfits felled the smaller ones, and mine operators and woodcutters gathered the rest. This is why entire mountains around mining communities were denuded of nearly everything apart from saplings and aspens. Of this, railroad tie industry historian William Wroten noted: "The homesteaders, miners, ranchers, and lumbermen began to cut timber regardless of size, condition, or location. With the coming of the railroads, the forests along the track for miles were overrun with cutters."[6]

Land Use Policy and the Timber Industry

Like most resource extraction industries, logging in the I-70 Mountain Corridor enjoyed an unregulated environment in the beginning and came under increased control by the federal government over time. This influenced the timber industry and where and how much of the

[4] Wroten, 1956:251, 253.
[5] Wroten, 1956:84, 244, 255.
[6] Wroten, 1956:160.

forest it cut. The greatest factor, however, remained the imbalance between consumption and the regeneration of the forests.

During the first 20 years of Euro-American presence in the corridor, the forests were a free-for-all in terms of harvest. Weak federal oversight, confusing legislation and rights, and popular sentiment were contributing factors. During the 1860s and 1870s, the federal government had in place vague legislation that was supposed to regulate removing timber, but it was antiquated and dated to an era when the eastern United States was a frontier. The legislation recognized the need of settlers to harvest trees for individual consumption but made no provision for a timber industry. In 1855, the General Land Office was charged with managing the nation's timber on public lands and made some provision to sell forest land for $1.25 per acre. But this was reserved for individual use and not commercial harvest. The timber industry was caught in a difficult position because commercial cutting was outlawed, and yet the General Land Office policy was unprepared to recognize the nation's growing demand for lumber and the commercial operations that produced the material.[7]

In Colorado and elsewhere in the West, logging interests circumvented the inadequate legislation in two ways. One thrived on the frontier environment, the assumption that natural resources were free for the taking, and the distance from concerned federal agencies. During the 1860s and 1870s, logging companies cut wherever they wanted with few repercussions, and some officers in the General Land Office even tacitly accepted the practice because they understood that frontier development depended on commercial lumber operations. When caught, which was exceptionally rare, lumber outfits maneuvered to avoid fines and taxation and easily found sympathy with nearby communities. Western settlers considered timber to be either their rightful resource or for those lumber companies that furnished their needs.[8]

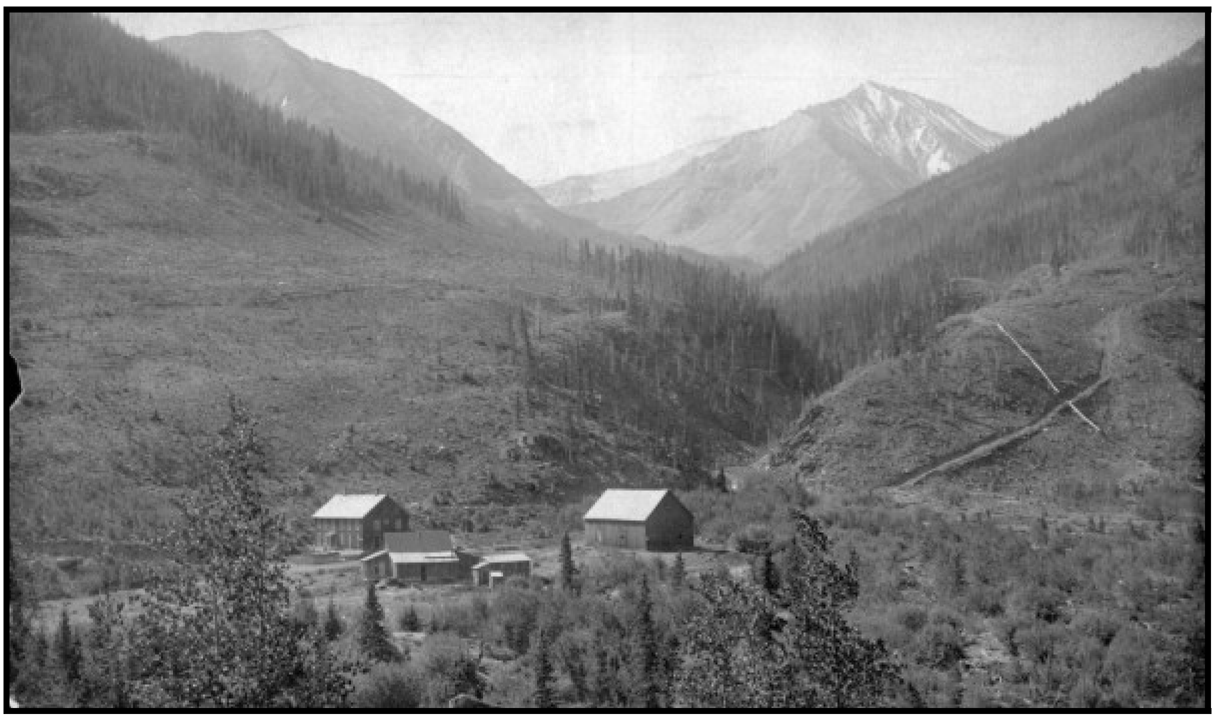
The other way in which logging interests circumvented the outdated legislation assumed overtones of legality but took advantage of loopholes in various acts. In 1862, the federal government passed the Transcontinental Railroad Act, which granted railroads rights to harvest trees in 40 to 80 mile corridors of land along their rights-of-way. Although the Act intended that the trees be for in-house railroad use only, timber interests cut them for commercial markets. The Homestead Act, passed around the same time, was a vehicle by which logging interests amassed forest land. The Act allowed individuals to patent up to 160 acres and cut the trees as needed for settlement purposes. The timber companies abused this by hiring individuals to file homesteads and sell the land to the company principals, who consolidated the holdings into considerable tracts. During the 1880s alone, as many as half of the homesteads filed in the West were under such pretenses.[9]

During the 1870s, the federal government passed two more acts that complicated the timber rights in Colorado. The 1872 mining law gave the owners of claims the right to harvest timber on their land to support mineral development and associated residence. As with the Homestead Act, logging companies paid individuals to stake claims and transfer the title. The companies that sold the products within the mining district argued that the timber was ultimately for mining, just not their own consumption. In 1878, the federal government tepidly tried to address the lack of legislation specific to timber with the Stone and Timber Act. The policy allowed individuals to buy as much as 160 acres of forest land that was unfit for agriculture at $2.50 per acre for the timber. The restriction, however, was that the land had to be for personal

[7] Steen, 1976:7, 9.
[8] Ellis and Ellis, 1983:149; Steen, 1991:9, 159, 195.
[9] Renze, 1949:22; Steen, 1991:2-3, 24.

use and not for sale to lumber companies. The industry, however, had an easy time amassing large holdings for commercial harvest.[10]

During the early 1890s, legislators finally conceded that logging was taking a toll on the forests of the West and the time for serious regulation was at hand. In 1892, Congress amended the Stone and Timber Act to permit individuals to buy land and convey the tracts en mass to lumber companies. More important and germane was the Forest Reserve Act, which president Grover Cleveland signed into law in 1891. The Act authorized the president to establish Forest Reserves, manage the timber as a resource, protect the forests from destruction, and maintain watersheds. To generate income from the inevitable logging, stands of trees and tracts of land could be sold, but only at appraised market value. The trees designated for harvest had to first be marked, cut under the supervision of the Department of the Interior, and consumed in the same state or territory. The rights granted by the 1872 mining law were unaffected, and if a claim was staked in a timber reserve (later a National Forest), the owner still had rights to harvest the timber for his own operational use. Thus in Clear Creek and Summit counties, logging continued during the 1890s as before.[11]



Lumber companies and railroad tie hacks neatly complimented each other in impact on forests, harvesting all but the smallest trees. The resulting clearcuts, such as the one around Bakerville on Clear Creek, spurred the Federal Government to regular logging through forest reserves, which became national forests. Bakerville, in the late 1860s south view, depended on logging as much as mining. Courtesy of Denver Public Library, Z-2557.

As soon as the Act was created in 1891, Cleveland designated the White River and Pikes Peak reserves, which were several of the earliest. Western representatives, and the mining and timber industries, howled in protest. Several modifications mollified their ill feelings and provided clarification for better regulation by the General Land Office. First, legislators passed a

[10] Steen, 1976:8, 295; Wroten, 1956:192.

[11] Defebaugh, 1906:383, 417; Runte, 1991:45; Steen, 1976:36; Steen, 1991:30.

bill in 1893 that clearly defined the purpose of the reserves as the protection of water sources and the sustained harvest of timber. Second, the Act stated that local inhabitants could still cut trees for their own uses at no cost, but under a permit system. They could also obtain rights-of-way through the reserves to in-holdings.[12]

During its first ten years, the law was in name only due to a lack of support, insufficient staff, and public sentiment that supported logging. Illicit logging continued in the I-70 Mountain Corridor, as elsewhere. In terms of local protection for the timber industry in Colorado, a surveyor with the U.S. Geological Survey noted:

> "Strangely enough, nearly all illicit lumbering and other timber predations are looked upon by settlers as blameless ventures. Such operations furnish a limited amount of employment to the poorer classes, and but for occasional sore enmities toward the richer mill operators, the latter are held in the light of benefactors. Indeed, by very many they are considered to be taking only what rightfully belongs alike to them and all other settlers."[13]

Most logging companies continued to harvest as before, except that they now carefully avoided being caught. The companies cut trees quickly, shipped the lumber as fast as it was milled, kept no stockpiles, and moved with frequency. They were also wary of strangers, turned everyone but the most trustworthy away, and maintained a word-of-mouth communication system. Such operations became notorious for rampant destruction in their haste, second only to woodcutters and mining interests in pursuit of timbers.[14]

In 1905, President Theodore Roosevelt and forester Gifford Pinchot began a sweeping plan to tighten federal policy regarding logging, regulation, and enforcement of the Timber Reserve Act. Both administrators advocated timber harvest, but on a sustainable level. They created the Forest Service, placed the agency under the Department of Agriculture, made more provisions for commercial logging, and increased the field staff for better enforcement of the regulations. As part of this, the Forest Service divided the Pikes Peak Timber Reserve into regions, including a Clear Creek Ranger District, which now oversaw logging in Clear Creek County. Although woodcutters and mining interests were still free to clear-cut their claims, the lumber companies had to abide by the Forest Service regulations. In Summit and Eagle counties, within the White River Timber Reserve, oversight was not as strict.

Roosevelt and Pinchot culminated their program under great opposition in 1907 with the designation of what were known as the midnight forests. Conservative legislators, who hated the idea of control over public lands, passed a bill that rescinded the president's authority to designate timber reserves. Knowing that Roosevelt would not sign the bill by itself, they attached it as a rider to a key appropriations package that he was unable to veto. During the ten day grace period that Roosevelt had before signing the package, he and Pinchot worked furiously to identify forests in need of designation and add them to the program as national forests. After they finished setting aside millions of acres, Roosevelt signed the package on the last day of the grace period and ended the president's ability to designate any more tracts.[15]

During the game of political chess, Roosevelt and Pinchot established today's forest system and its improved regulation of logging. The overall structure of the Forest Service and the national forests changed relatively little afterward. In the I-70 Mountain Corridor, the only major alterations were the division of the Pikes Peak, Leadville, and Medicine Bow national forests into the Arapahoe National Forest in 1908, and further division into the Roosevelt

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[12] Steen, 1991:29.
[13] Sudworth, 1900:143.
[14] Sudworth, 1900:167; Wroten, 1956:67.
[15] Runte, 1991:55.

National Forest in 1910. In so doing, the Forest Service increased its oversight and control of timber resources on the Front Range.[16]

The Timber Industry in Clear Creek Drainage

In Clear Creek County, logging was one of the most important industries and may have been second only to mining. Initially, the timber industry was a function of mining and associated settlement, and it produced lumber and mine timbers. When the railroad arrived in the county in 1877, it introduced new demands that changed the timber industry. The railroad required its own forest products in the form of rail ties, and also it provided access to lumber markets outside of the county. The new demands in combination with a boom in mining encouraged the timber industry to expand through the 1880s, which accelerated the consumption of entire forests. The timber industry apparently waned in the county during the 1900s, slightly ahead of statewide trends. Although the industry left few if any records for production in the county, a decrease in coverage in archival sources can be interpreted as a decline. Several broad factors were to blame, which are discussed below in the second subsection, and most were functions of a decrease in mining. The collapse of mining in 1920 ended logging as an important industry.

The timber industry in the county experienced two significant timeframes respective of the trends noted above. The first began when the first sawmills were built in 1860 and ended in 1876 immediately before the railroad ushered in changes. The second timeframe spanned from 1877 when the railroad arrived and ended in 1920 with the collapse of mining and exhaustion of the forests. In terms of historic resources, lumber and tie production left a tangible legacy in the form of logging camps, sawmill sites, and remnants of infrastructure. In contrast, the collection of cordwood and raw logs for both construction and crude mine timbers tended to leave indistinct evidence. Because of this, lumber and tie production is emphasized below.

Logging in Clear Creek Drainage, 1860-1876

Mining and the timber industry in Clear Creek County were integrally tied, and logging followed the discovery of gold by only one year. George Jackson found gold at the mouth of Chicago Creek in 1859, which stimulated a rush to what became Idaho Springs. Prospectors then staked an almost unbroken series of placer claims along Clear Creek, and their camps grew at each center of mining. Idaho Springs thrived at Jackson's discovery point, Spanish Bar materialized at the confluence of Clear Creek and Fall River, Mill City (later Dumont) was several miles to the west, Valley City (later Empire) was established on the West Fork, and Georgetown grew on the Main Fork. Most of the mining was for placer gold, although a handful of experienced prospectors began developing hardrock veins.

As the boom spread, miners and community organizers began felling the nearest trees for building materials and gathered downed wood for heating fuel. As was common on the frontier, the miners used the logs in their raw state, and this was sufficient for small buildings, retaining structures for placer tailings, and aspects of infrastructure. Lumber, however, was dearly needed for the refined structures of advanced placer work such as flumes, sluices, and pit linings. Community organizers also wanted lumber for buildings of substance in the settlements.

The demand for lumber became strong enough by 1860 for several entrepreneurs to try making more money from wood than gold. George L. Nuckolls built a mill at Empire, someone else installed a facility at Idaho Springs, and their lumber was consumed as fast as it was milled.

[16] Ellis and Ellis, 1983:246; Wroten, 1956:208.

Other entrepreneurs then quickly made arrangements to freight the necessary equipment across the plains from the East, in no small undertaking, and erected a few more sawmills during 1861. Nuckolls put up a sawmill at Georgetown, but created a void at Empire when he converted his sawmill there into a stamp mill for gold ore. Paul Lindstrom then replaced Nuckolls at Empire, and Reynolds, Hopkins & Company built a sawmill on Clear Creek several miles above Spanish Bar. A few more lumber producers not mentioned in archival sources almost certainly operated in the county during the early 1860s.[17]

All the early sawmills were small, simple, and powered by either water or steam. Their rates of production were limited, but they provided the miners and communities with the lumber needed for growth. In Clear Creek valley, forests of lodgepole pines and spruce surrounded the towns where the mills were located, and the operators had a ready supply of logs at their doors.

Just as the primitive timber industry was getting started, it underwent the first of several adjustments in response to the boom-and-bust cycles of mining. During the county's first years, most of the miners focused on placer gold and few attempted to win the metal from its hardrock source. They exhausted the placers within four years, and because hardrock mining was not yet ready to replace the loss in production, the boom collapsed. The county fell into a depression by the mid-1860s, and the demand for lumber decreased significantly. There were just enough residents and nascent hardrock mines to support a few of the sawmills, but many operators either shut their plants down or moved them elsewhere.

In 1864, prospectors discovered rich silver ore high in the mountains southwest of Georgetown, which drew interest to the western portion of the county. The following year, a rush to Argentine commenced, and prospectors began to consider the possibility of more silver around Georgetown. They found what they sought on both sides of Clear Creek valley, and the rush expanded to include Georgetown and the small camp of Silver Plume. Limited ore production began in 1866, and investors erected several smelters to process the ore. The activity evolved into a lasting mining industry of significance.

And that industry required lumber, mine timbers, and mountains of cordwood. In response, the timber industry shifted from the quiet, eastern portion of the county over to the growing demand. Empire was included both because the town was geographically close to Georgetown and some of its mines offered silver.

The Bay State Gold Mining Company operated a sawmill at Empire to supply the needs of its mines, but most new mills went up in the mature forests around Georgetown and Silver Plume. At least one sawmill produced lumber on South Clear Creek, south of Georgetown, and may have been the St. Clair plant operated by McNulty & Hawthorne. This partnership was one of Georgetown's most prolific lumber producers through the 1870s. Most of the other sawmills were on the Main Fork of Clear Creek west of Silver Plume. Here, the Baker Silver Mining Company established the hamlet of Bakerville in 1867 as a camp for its smelter, but the settlement instead assumed a role as one of the county's principal lumber centers. As the company erected its smelter, both Edward O. Kennedy and Joseph Watson built substantial sawmills. R.B. McKay then followed them several years later.[18]

During most of the 1870s, the eastern portion of the county remained relatively quiet, although enough demand for lumber existed to support several sawmills. At least one commercial facility operated in Idaho Springs, John Dumont's Hukill Mine at Spanish Bar may have featured a small mill, and another commercial sawmill almost certainly went into business at Lawson with the rush to Red Elephant Mountain in 1876.

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[17] Harrison, 1964:38, 39, 42; *Rocky Mountain News* 1/22/61; *Rocky Mountain News* 4/4/61 p2.

[18] *Daily Colorado Miner* 5/27/73, p3; Ellis and Ellis, 1983:208; Hollister, 1867:246.

The western portion of the county remained the center of logging through the 1870s as mining there increased in intensity and sophistication. During the decade, sawmills went up at the mouths of many of the tributaries to the Main Fork of Clear Creek, all of which offered handsome stands of trees. In addition to the three sawmills at Bakerville, companies produced lumber in Grizzly and Herman gulches and at Fisk's Station near today's Loveland ski area. J.S. Kearney's operation west of Bakerville was so large that the gulch where he sited his mill was named for him.[19]

In 1877, after ten years of consistent growth in the county's western portion, the timber industry underwent another major transition. Unlike the mid-1860s depression, which forced the last transition, the change brought the industry into peak production and restored activity in the county's eastern half. The agent was the Colorado Central Railroad, which laid rails from its terminus at Floyd Hill to Georgetown.

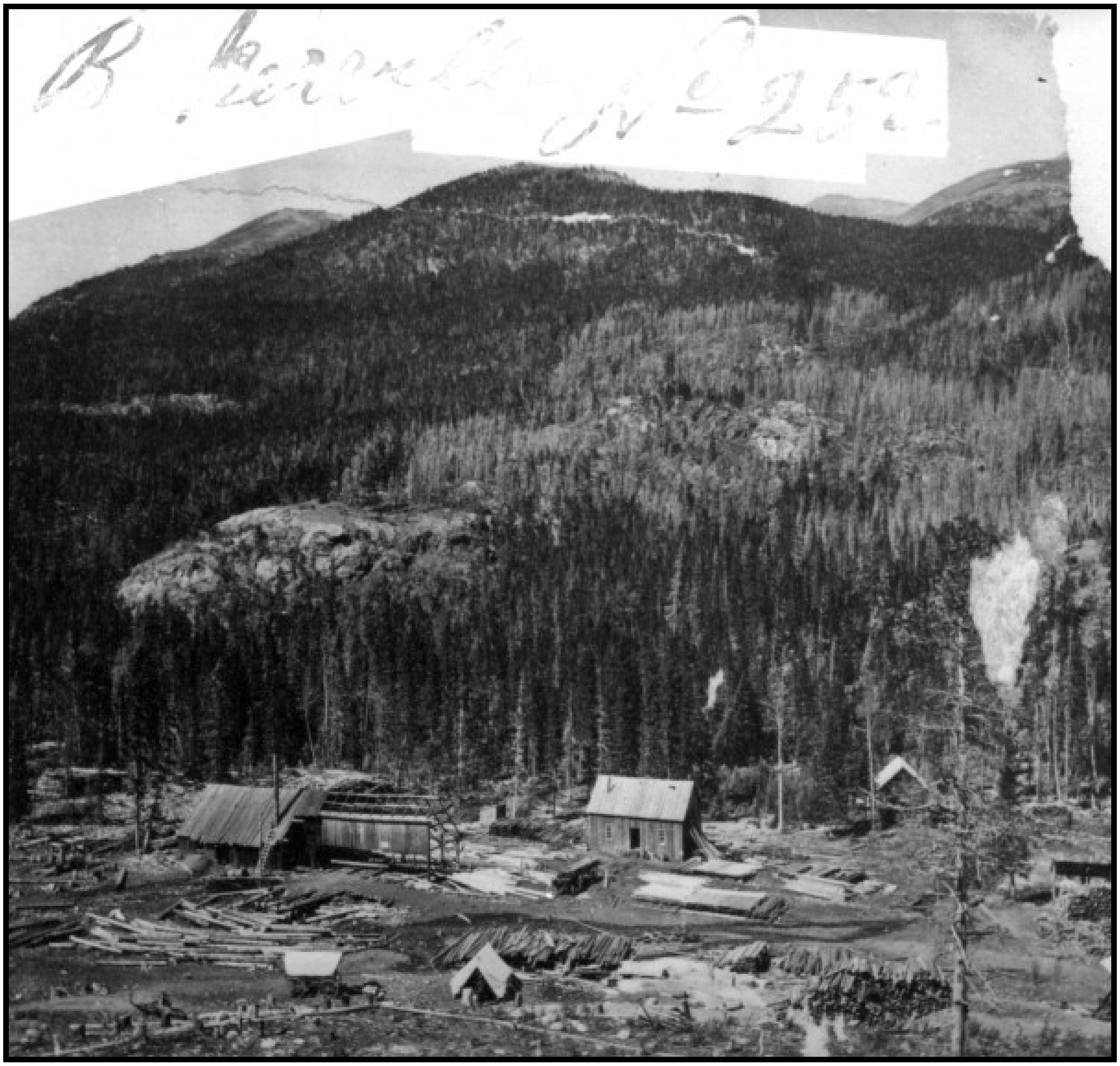
Logging in Clear Creek Drainage, 1877-1920

As early as the mid-1860s, William A.H. Loveland and other early Colorado capitalists promoted the idea of building a railroad deep into Clear Creek and Gilpin counties and connecting the system with the Union Pacific at Cheyenne. They organized the Colorado Central Railroad, finished a line to Black Hawk in 1872, and then pushed for Idaho Springs but stalled at the base of Floyd Hill in 1873 due to a financial crisis. Three years later, Loveland and others finally had the money to finish the project. In 1877, track gangs went to work and completed the long-desired route through Idaho Springs and up Clear Creek valley to Georgetown, which was the designated terminus. In so doing, the Colorado Central passed through nearly all the county's principal towns except for Empire, which was represented by the nearby station of Empire Junction.

The railroad introduced a new set of variables that dramatically changed conditions for the timber industry. One of the principal impacts was indirect and transmitted through the mining industry. In particular, the railroad reduced transportation costs and improved service within and to the county, which stimulated a major mining boom. Because lumber and mining were wed, the demand for lumber soared in parallel. In a direct impact, the railroad eased the logistics and reduced the costs of moving lumber from sawmill to consumer. The lumber companies in the western portion of the county were able to distribute their products to buyers in the eastern portion of the county at low rates. Similarly, the railroad provided a link between the lumber companies and markets outside the county, primarily in Denver. At first, little of the lumber passed beyond the county boundaries because most went to local mines and settlements. But by the early 1880s, the timber industry was productive enough to ship lumber to Denver.

An entirely new wing of the timber industry was another direct result of the railroad. The Colorado Central employed a small army of tie hacks to provide the thousands of necessary rail ties when it began grading. Previously, the timber industry gave little thought to ties because they were uneconomical without a railroad to consume them. When the Colorado Central resumed construction of the Clear Creek line in 1877 and 1878, tie production spiked and then fell off gradually. For several years after the Colorado Central completed its main line, the railroad continued to buy ties on a reduced level for switches, sidings, and stockpiles at the principal stations. The tie production was unkind to the county's forests. Tie hacks neatly complimented the footprint of stumpage already established by the lumber companies and miners. The hacks harvested many of the trees that the lumber operations left in place as too small, and worked in areas that were too remote for gatherers of cordwood and mine timbers.

[19] Ellis and Ellis, 1983:149.



Arrival of the Colorado Central Railroad at Georgetown in 1877 opened upper western Clear Creek drainage to intensive logging. Bakerville, established during the 1860s as a mining hamlet, became the drainage's sawmill center. In this southern view, a sawmill operates on the valley floor a short distance east of Bakerville during the late 1870s. Courtesy of Denver Public Library, X-7157.

In 1881, four years after the county received its first railroad, the Union Pacific announced plans to build a second line ascending west from the Colorado Central terminus at Georgetown. As the name indicates, the Union Pacific hoped to grade the Georgetown, Breckenridge & Leadville Railroad (GB&L) over Loveland Pass through Summit County and to Leadville, but never progressed beyond the Main Fork of Clear Creek. Shortly after the railroad was organized, track crews began work, struggled to finish the track to Silver Plume by 1884, and pushed west up the canyon to Bakerville. Although the railroad built the instant hamlet of Graymont as its terminus instead of the nearby lumber community, the railroad penetrated the heart of the county's principal logging area.

From the moment workers first broke ground, the GB&L exacerbated the trends that the Colorado Central already set in motion for the timber industry. The GB&L provided direct rail service into a concentration of lumber companies, lowered the costs of distribution within the county, and improved access to the Denver market. In addition, the GB&L revived the demand for ties during construction, and although the demand fell somewhat when the track was finished, the Union Pacific used both the GB&L and the Colorado Central as a tie collection system to supply maintenance programs on its plains routes.

The impact on the timber industry was predictable. Where the forests still offered enough trees, tie hacks went to work and entrepreneurs built additional sawmills to feed the high demand for lumber. A few new mills were almost certainly installed on Chicago Creek south of Idaho Springs and on the South Fork of Clear Creek, but most went up on the Main Fork west of Silver Plume.

Even before the GB&L announced its plans, lumber interests were already moving west up the Main Fork. During the late 1870s, brothers J.S. and Frank Kearney opened one of the most important sawmills at Fisk's Junction, renamed High Line around 1880 after the brothers' plant. Because the facility was the western-most in the county, wagons had to carry finished lumber a great distance to Silver Plume. The other logging companies in the area faced the same problem, and this was expensive. When the GB&L began grading, it offered the promise of lower transportation costs, but the brothers were unwilling to wait for the railroad to finish its line. Instead, they began constructing their own efficient transportation shortcut to Silver Plume. In 1881, they interested William Loveland in the Clear Creek Fluming Company and built a flume on the south side of Clear Creek from High Line to a yard several miles west of Silver Plume. The flume replaced the wagons and carried both finished lumber and raw logs for the Kearneys and probably the other companies.[20]

The Clear Creek Flume, left, and Georgetown, Breckenridge & Leadville Railroad, right, granted lumber companies in upper Clear Creek drainage with two means of shipping forest products to market. As a result, lumber companies quickly exhausted the forests, evident by the large clear cuts in the background of this 1885 photo of the Bakerville area. Courtesy of Denver Public Library, CHS-J882.

[20] Ellis and Ellis, 1983:150.

The High Line mill and the flume were the foundation of a small empire in which the Kearneys became the most important lumber producers in the western portion of the county. In 1883, the brothers extended the flume to Silver Plume and ran another sawmill at Graymont. Although the sawmill could have been the brothers' third plant, it was more likely relocated from their original site at the mouth of Kearney Gulch. Regardless, the Kearneys had at least two mills in operation during the early 1880s, and once the GB&L was finished, they opened a lumber yard in Denver and began shipping surplus lumber by rail.[21]

The Kearneys were by no means the only large lumber firm in the Main Fork valley during the 1880s. Other outfits were already producing lumber prior to the GB&L, and they were joined by new ventures. Henderson & Company ran a mill at Graymont, Anderson & Porter was in business by 1886, and the Walter Brothers followed the next year. It remains unknown if these plants started because of the nearby GB&L railhead or moved from other locations that were cut over.[22]

Two developments caused logging to slow during the late 1880s, and Henderson & Company was the subject of one of them. As was common of the era, the lumber companies logged public land unregulated and as they wished. Federal and state laws were nebulous about commercial logging, but the General Land Office knew that a commercial industry was necessary and often overlooked the Clear Creek operations as long as the lumber was consumed locally. It appears that by shipping their products to Denver, the lumber companies in the western county crossed the threshold of tolerance. Either a state or General Land Office forester decided to put a stop to the practice in 1887 and started with Henderson & Company. Although the outfit was ordered to stop, it continued to send lumber to Denver anyway, and the forester made an example of owner J.S. Henderson by having him arrested. This reduced, if not eliminated, the practice of exporting lumber from the county. The timber industry reverted to a local demand, and because this was finite, lumber production slowed and several operators left the business.

The other development that reduced logging was, after ten years of harvesting, the most accessible stands of trees had been cut over. The lumber companies had to settle for smaller trees that were farther from their mills, which reduced profitability. It should be noted that this was only the beginning of a trend, and the forests in the western portion of the county still offered enough trees to sustain the industry on a reduced scale.

It appears that the regulatory enforcement and expanding stumpage footprint caused the industry in the western county to contract. Some mills closed and others changed ownership as operators moved on. The Kearney brothers continued to run their Graymont facility, but sold their High Line mill to Frank L. Johnson, who closed it in 1887. Henderson sold his Graymont mill and bought one of the other plants at High Line under the firm of Jennings & Henderson. Charles R. Waters purchased the other operating High Line mill. Henry L., Lewis L., and Phillip L. Roberts and J.S. Graham formed Roberts Brothers & Graham to fill the void that Henderson left at Graymont. They may have even bought Henderson's mill. Although archival sources make little mention of logging elsewhere in the county, it seems likely that other areas such as Chicago Creek and the South Fork of Clear Creek experienced a similar pattern.[23]

During the early 1890s, the local demand for lumber remained sound, but retreating forests eroded the profitability and attractiveness of logging. It remains unknown whether any companies suspended during this time, but many certainly did by the middle of the decade. At the end of 1893, the Silver Crash caused the value of silver to collapse, which brought mining to

[21] Ellis and Ellis, 1983:153.
[22] Ibid.
[23] Ellis and Ellis, 1983:150, 154.

an abrupt halt across the West and contributed to a nationwide depression. Like most of Colorado, Clear Creek County was hit hard at first, forcing marginally profitable lumber companies out of business. The county's timber industry contracted again as a result.

Those outfits that remained solvent through the depression returned to prosperity within a short time. Rather than allow their mines and mills to remain idle, most of the substantial mining companies in the western portion of the county accepted the low price of silver and resumed ore production anyway after the Silver Crash. To offset silver's poor value, they increased the tonnage of ore brought out of the ground. Mining in the eastern portion of the county recovered quickly as well. Most of the mines at Empire and east to Idaho Springs produced gold, which investors sought as a means of economic stability in the climate of the 1890s depression. Between the eastern and western regions of the county, a demand for lumber and mine timbers returned, and the existing producers enjoyed an atmosphere of less competition. During this time, it seems likely that sawmills continued to operate in the upper reaches of all three forks of Clear Creek, as well as Chicago Creek.

The prosperity was not long, as several broad factors caused the timber industry to shrink yet again during the latter half of the 1900s. The cliché but inarguable trend of dwindling stands of suitable trees was the most fundamental. To manage the remaining resources, the Department of the Interior began enforcing the procedures stipulated by Forest Reserve Act of 1891. The act required logging outfits to apply for a permit, mark the individual trees to be cut, have them approved by a forester, and harvest them under the forester's supervision. Although necessary to protect those stands that remained, the process reduced the number of trees available to logging companies and added a layer of administrative overhead. The Roberts brothers, who opened a new sawmill on the Main Fork in 1904, ignored the regulations and suffered severe consequences. Their mill was shut down in 1906 and permanently closed in 1908. Overall, the increased regulation had a chilling effect on the timber industry, which was already vulnerable.[24]

Mining continued to be the other major factor for the timber industry during the latter half of the 1900s. The mines in the eastern portion of the county still produced plenty of gold, but many of the silver mines in the western county went idle because their ore reserves were exhausted after nearly 50 years of production.[25] The railroads, settlements, and the overall economy hinged on mining, and when mining declined, so did the demand for lumber and mine timbers. The demand for railroad ties, however, underwent a brief spike in the western county during 1906 and 1907. In 1906, Edward J. Wilcox and other investors who were interested in the Argentine Mining District, southwest of Georgetown, organized the Argentine Central Railroad to grade a line from Silver Plume. Wilcox finished the main line to his Waldorf Tunnel during the year and completed spurs to other mines in 1907. The railroad naturally stimulated a small wave of construction in the district, but the demand for ties and lumber was not enough to offset the slump in mining around Georgetown and Silver Plume.

During the first half of the 1910s, conditions grew worse for the timber industry. Silver production still ebbed, the Argentine district went quiet, and gold mining in the eastern county began to taper. At the same time, the Forest Service enforced regulations and loggers had to pull trees from farther distances. Given these factors, and little coverage of lumber in archival sources, it seems likely that the county featured relatively few sawmills by this time. Those that remained in business were important, though, because their products supported the mining industry, which was still the county's economic foundation.

During the latter half of the 1910s, that industry enjoyed a notable revival due to World War I. Because the war ruined much of Europe's economy, governments there sought some

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[24] Ibid.

[25] The trend in mining is based on production figures for gold and silver.

stability in American silver, whose value then rose. In addition, both European and American manufacturers consumed industrial metals such as lead and zinc for weapons. The mining industry in the western county naturally responded by increasing the production of silver and industrial metals ore, and activity more than doubled from the previous several years. In the eastern county, gold production remained constant. As can be expected, the demand for lumber and mine timbers rose in tandem with mining, which stabilized the timber industry for a while. The production of ties, already low, most likely fell farther because the Railroad Administration seized control of all rail carriers as part of a wartime mobilization effort and minimized track maintenance to save costs.

In 1918, Armistice brought an end to World War I. Almost simultaneously, manufacturers ceased military production, European governments reduced their silver acquisitions, and the demand for silver and industrial metals then collapsed. For this and other reasons, the national economy began to slip into a postwar depression. In 1919, the poor economic conditions caught up with Clear Creek County, whose mining industry ran on borrowed time. While the prices and demand for metals were high during the war, mining companies were able to profit from the low-grade ore that was available, and when the prices and demand fell, that ore became unprofitable to produce. Gold mining collapsed first, and most of the operations in the eastern county closed permanently in 1919. Silver and industrial metals mining followed in 1920. Hundreds of miners were laid off and had to leave for jobs elsewhere. The railroad, already in financial trouble due to declining tourist traffic, cut back on maintenance to save costs.

With little mining, few residents, and no tie consumption, the market for all forest products in the county evaporated. As if this was not bad enough, the poor economy made running a logging operation difficult, especially when suitable trees were scarcer then ever. The net result was that the timber industry dissolved. It seems likely that several small sawmills may have operated after 1920, but even these probably struggled because of high operating costs and the widespread availability of lumber salvaged from abandoned structures. The timber industry was no longer a significant institution, nor would it be again. Like the mines the timber industry originally served, the resources that it depended on had been exhausted.

The Timber Industry in Dillon and Frisco Area

The timber industry in Summit County paralleled its Clear Creek neighbor in overall trends and patterns. The principal difference is timeframe, which was shorter in Summit County. The area of study includes Straight Creek from Eisenhower Tunnel to Dillon, the Blue River valley around Dillon and Frisco, Ten Mile Canyon, and the area around Copper Mountain. Mining stimulated logging in these areas in 1879, and the two industries were then wed until collapse in 1912. At first, the timber industry produced lumber, mine timbers, and cordwood for a local market. Completion of two railroads during the early 1880s allowed the industry to boom. They introduced a demand for rail ties and also provided access to lumber markets outside of the county, mostly in Denver and Leadville. But because the principal market was local, the industry mostly followed the cycles of mining around Dillon and Frisco. Logging contracted in 1885 when mining slowed, rebounded in 1890, and slumped in 1894 because of the Silver Crash and associated economic depression. During the 1900s, a regional mining boom revived the timber industry, which enjoyed a peak and then gradually declined until the 1912 collapse. The timber industry in the county experienced three Timeframes of Significance respective of the trends noted above.

As with Clear Creek County's timber industry, archival sources offer few comprehensive records for that in Summit County. The history of the industry in Summit County had to be pieced together from a few sources and interpreted from trends in related fields such as mining. In terms of historic resources, lumber and tie production left the most tangible legacy in the form of logging camps, sawmill sites, and remnants of infrastructure. In contrast, the collection of cordwood and raw logs for both construction and crude mine timbers tended to leave indistinct evidence. Because of this, lumber and tie production are emphasized below.

Logging in Dillon and Frisco Area, 1879-1886

Logging began in Summit County during the gold rush of 1860, and placer miners cut trees for cabins and mining structures. But because they needed more than merely raw logs, entrepreneurs brought several sawmills in from Denver to produce finished lumber. Most if not all the logging during the 1860s was local to Breckenridge where the gold deposits were. Because Ten Mile Canyon and what became Dillon lacked noteworthy gold deposits, the area drew little interest and saw nothing more than occasional prospecting for nearly 20 years.

During the late 1870s, Henry A. Recen and brother suspected that Ten Mile Canyon offered a high potential for ore and established a prospecting camp at the present site of Frisco. In 1878, they were rewarded with several rich silver discoveries that would have ordinarily sparked at least a minor rush. But they worked within the shadow of Leadville, which was proving to be one of Colorado's most important silver bonanzas. Leadville drew prospectors away from Summit County and commanded the attention of investors, leaving few individuals to join the Recens in their examination of Ten Mile Canyon. In 1879, the Recens and the few prospectors curious about the canyon found more silver veins, which finally piqued other individuals. A few investors local to Summit County provided capital for claim development, and their interest lent some legitimacy to the area. Community organizers then platted the towns of Frisco and Dillon because the development of a mining industry seemed assured, and the locations were important crossroads. Both communities were at a convergence of roads that crossed from Clear Creek County over Loveland Pass and Argentine Pass and from South Park over Boreas Pass. These roads then met the route to Leadville, and all bore heavy traffic.[26]

The development of prospects in Ten Mile Canyon and community-building at Dillon and Frisco created a demand for lumber. Although sawmills already existed at Breckenridge ten miles south, the producers there either sold locally or shipped to Leadville at premium prices. Charles F. Shedd, a Frisco founder and mercantile operator, realized that a sawmill was necessary for the success of his town and its mines. Thus, in 1879, he established the first in the Frisco area. Within a short time, other entrepreneurs built additional sawmills farther south up Ten Mile Canyon, and they wanted not only to supply the Frisco area, but also the new Robinson Mining District at the base of Fremont Pass. The hamlet of Wheeler, near today's Copper Mountain, attracted at least several of the ventures because it was almost equidistant between the two markets. Wheeler became large enough by 1880 to receive a post office due in large part to the nascent lumber operations.[27]

Logging began to mature into a timber industry during the early 1880s due to several factors. First, prospecting intensified around Frisco, and a number of companies brought their mines in Ten Mile Canyon into production. Second, Frisco and Dillon grew significantly in response. Third, the two towns became the destination of not one, but two railroads. The Denver & Rio Grande Railroad (D&RG) graded its Blue River Branch from Leadville to

[26] *Colorado Mining Directory,* 1883:847; Gilliland, 1984:6.

[27] Bauer, et al., 1990:151; "Breckinridge's Boom" *Colorado Miner* 3/20/80 p3; *Colorado Miner* 5/8/80 p3; Gilliland, 1984:10.

Wheeler in 1881 and finished the track to Dillon the following year. In direct competition but slightly behind, the Denver, South Park & Pacific Railroad (DSP&P) pushed its High Line from South Park over Boreas Pass to Dillon in 1882 and continued to Leadville in 1883. Although the two railroads approached Summit County from opposite directions, they held a similar goal, which was to capture the mining trade. By extension, they were also interested in forest products, which could be shipped to Leadville or Denver. In regards to this point, the first spur line that the DSP&P graded after it reached Dillon was east and up the Snake River specifically to the sawmills at Keystone.

The two railroads had significant impacts on the timber industry. As can be concluded, they made distant markets accessible to the lumber companies, and Leadville was the most important. In response to this and a local demand, a number of entrepreneurs established sawmills in Ten Mile Canyon and around Dillon in 1884 and 1885. J.S. Scott, another Frisco founder, organized the firm of Scott & Officer and built a sawmill most likely at today's Officer Gulch in the canyon. C.F. Williams ran another sawmill near Frisco, and Shedd continued business, as well. Dillon had the Malaby, Israel May, and O.W. Decker mills, several of which were most likely on Straight Creek. Individuals undoubtedly operated other mills at Wheeler and elsewhere, although these were not well documented in archival sources.[28]

The railroads also fostered a new wing of the local timber industry, which was rail tie production. The demand for ties was heavy between 1881 and 1883 as the railroads constructed their tracks through Summit County. After construction, the demand slowed but remained firm for several years as contractors provided tie stockpiles at stations and sidings.

Just as the timber industry showed signs of a boom, two trends softened the demand for forest products and forced the industry to contract during the mid-1880s. First, the value of silver had been declining during the first half of the 1880s and became low enough to impact mining by 1886. Mining companies in Leadville scaled back and cancelled development projects, and the entire Robinson district went quiet. Thus, the most important, external market dried up. Local demand was no better because the mines in Ten Mile Canyon closed, and the DSP&P and D&RG stopped contracting for ties. Frisco then went into a recession so deep that residents and businesses left, and the timber industry withered. A number of sawmills closed by 1886, and Frisco and Dillon had one lumber firm each while none existed in Wheeler. During the late 1880s, conditions only worsened for the struggling timber industry, which was now a shadow of what it had been only several years earlier.

Logging in Dillon and Frisco Area, 1890-1893

Beginning in 1890, the timber industry in Ten Mile Canyon and the Dillon area returned to prosperity, although the period was brief. The federal government passed the Sherman Silver Purchase Act, which restored the price of silver to levels exceeding $1.00 per ounce and required the treasury to buy specified amounts of the metal. A climate conducive to mining returned to the central mountains and revived activity in Leadville, the Robinson district, and around Frisco.

A demand for lumber returned, and the timber industry began shipping its products to the remote markets of Leadville and the Robinson district. The mines in Ten Mile Canyon and around Dillon were slow to respond, however, leaving the local lumber market somewhat soft. This prompted business interests in Frisco to offer incentives to mining companies. In particular, they claimed that the town would provide millsites, waterpower, and lumber at no charge to those companies willing to engage in serious development. Whether it was the free lumber or,

[28] *Colorado Business Directory*, 1884:189; *Colorado Business Directory*, 1885:215, 239; Gilliland, 1999:94.

more likely, the high value of silver, nearly all the principal mines resumed work by 1892. The towns of Frisco and Dillon then enjoyed a parallel wave of construction.[29]

The timber industry expanded and lumber outfits opened a number of new sawmills due to the above factors. John Safford, Shad Smith, and others ran mills in Ten Mile Canyon, and Wheeler featured the Cogswell and Geberson sawmills. Win Shaw and a Mr. Morgan sawed lumber on Miner's Creek, and Israel White continued his operation on Meadow Creek, both near Frisco. J.B. Cunningham maintained a sawmill in town. Dillon had at least three sawmills including Caldwell & Black, Williams & Wood, and Israel White's second facility.[30]

In addition to lumber, railroad ties came back into demand. In general, untreated pine ties had a lifespan of 10 to 15 years on mountain railroads, and the DSP&P and D&RG lies in Summit County neared this threshold. Thus, the two railroads began not only to replace the ties on their tracks within county, but also on other branches elsewhere. Tie hacks returned to the forests in force, and several contractors established offices in Dillon and Frisco.[31]

At the end of 1893, the federal government repealed the Sherman Silver Purchase Act, which precipitated the Silver Crash and helped push the nation into one of its worst economic depressions. The value of silver fell to its lowest point in decades because of the crash, and this devastated mining and its dependent industries, including logging. When the market for forest products evaporated, the revival that the timber industry enjoyed during the early 1890s came to an abrupt halt.

Logging in Dillon and Frisco Area, 1898-1912

When the Silver Crash struck with full force in 1894, a year after the price of silver collapsed, the central mountains descended into a deep depression. Most of the mines in the region from Leadville north to Frisco historically produced silver and industrial metals, which were now half their early 1890s values. Nearly all prospecting ceased, many of the mines shuttered their entries, and the unemployed left. The DSP&P and D&RG railroads reduced their schedules, idle residents were forced to leave the region, and businesses closed.

Few industries felt these dismal conditions worse than timber. The local demand for lumber evaporated, and because the railroads cut back on maintenance to save costs, they requested no more ties. Most of the lumber outfits that were active during the early 1890s suspended work, leaving only several sawmills in Frisco and Dillon. Israel White still operated in Frisco and Dillon, and Caldwell & Black and Williams & Wood ran two more mills in Dillon. Wheeler was apparently abandoned. Given the lack of local demand, it seems likely that the existing lumber outfits shipped their products outside of the county, probably to Denver and Pueblo. Although the sawmills were important to their host communities during the depression, the timber industry overall was no longer an economic force.[32]

This changed later in the decade. During the late 1890s, several factors came together and revived the mining industry throughout the region. The economy improved, investors were again willing to risk capital on mining ventures, and most of the substantial companies accepted the low price of silver and resumed ore production. Although Leadville and the Robinson district responded immediately to these conditions, the revival slowly took hold in Summit County. By the early 1900s, however, mining companies in Ten Mile Canyon and the Dillon area fully participated, and they brought the area into its most important period of production.

[29] "General Mining News" *MIT* 7/16/91 p35.
[30] *Colorado Business Directory*, 1891:331; *Colorado Business Directory*, 1892:342; *Colorado Business Directory*, 1893:679; Gilliland, 1984:34.
[31] *Colorado Business Directory*, 1891:331.
[32] *Colorado Business Directory*, 1895:331.

The mining boom restored a demand for lumber and mine timbers, and the railroads began replacing old ties again. The lumber producers that weathered the depression enjoyed an atmosphere of less competition, and at first shipped lumber and timbers to Leadville. When the revival swept Ten Mile Canyon, the companies began fulfilling a growing local need. The demand became strong enough to support several new logging ventures. A.L. Wilson established a lumberyard in Dillon, and C.A. Wilder opened the first sawmill to operate at Wheeler in years.[33]

During the mid-1900s, the mining revival began to wane in Ten Mile Canyon, and with it, the timber industry. Most of the ore bodies proved shallow and limited in extent and were exhausted within several years. As a result, the small and marginal mines closed, and the large operations scaled back and focused their efforts on finding more ore. Few were successful. Only the principal companies were able to maintain full production, and even they began to experience trouble by the late 1900s. The mines in Leadville and the Robinson district followed similar trends. For the timber industry, this translated into a reduced demand.

At the same time, the forests from which the timber industry drew its resources showed signs of exhaustion. The easily harvested trees near the old milling centers were gone, and lumber companies had to work on higher mountainsides and deeper in the surrounding valleys. The greater transportation distances increased operating costs and discouraged some production. In addition, the Department of the Interior began enforcing the regulations stipulated by Forest Reserve Act of 1891, which added a layer of administrative overhead.

The net result was a sharp contraction in the timber industry during the mid-1900s and a gradual decline afterward. Wheeler was totally abandoned when its sawmills and handful of marginal mines closed. Frisco also lost most of its sawmills, although several may have operated north of town. The partnerships of Arduser & McCleod and McCleod & Company bought the only two sawmills left at Dillon and apparently filled much of the demand there.[34]

During the latter half of the 1900s, the timber industry stabilized at a relatively low level. But during the early 1910s, it shrank again, although not entirely among the remaining lumber operations. This time, negotiations between the two railroads were to blame. In 1898, the Colorado & Southern (C&S) bought the DSP&P system and competed with the D&RG for mountain traffic. When the mining revival declined throughout Colorado during the latter half of the 1900s, the two railroads suffered significant decreases in business and entered into cooperative agreements instead of struggling against each other. One of these agreements, formalized in 1911, involved the D&RG line from Leadville to Dillon. The D&RG offered to relinquish Summit County to the C&S in exchange for all traffic in Gunnison County. The railroads agreed and the D&RG then abandoned its line to Dillon, leaving the C&S as the only railroad passing through Summit County.

The timber industry was a casualty of the agreement because it lost one of its two consumers of railroad ties. The C&S, however, was not able to offset the slack in demand due to its severe economic problems. For several years, the railroad operated the High Line to Leadville at a loss and requested permission from the Interstate Commerce Commission (ICC) to end service. The ICC did not grant permission and instead required the C&S to continue. The C&S then relied on profitable segments of its large system to cover the costs of the High Line but conducted as little maintenance as possible to minimize its losses. Thus, the railroad purchased few new ties for the track and pursued this policy until it finally abandoned the High Line in 1937.

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[33] *Colorado Business Directory*, 1901:486, 762.
[34] *Colorado Business Directory*, 1906:579.

The conspiracy of negative trends during the first half of the 1910s reduced logging in Ten Mile Canyon and around Dillon to a marginal industry. Closure of the D&RG Dillon branch and financial problems on the High Line ended meaningful tie production. At the same time, the Forest Service enforced regulations, and lumber companies had to pull trees from farther distances. Mining contracted around a handful of profitable producers, which operated at low levels and engaged in no new development of note. The demand for lumber was enough to support the Arduser & McCleod in Dillon and possibly another facility elsewhere, but these entities were small, family operations. Although the Arduser & McCleod mill continued to run for several more decades, the timber industry was no longer a significant institution, nor would it be again.

The Timber Industry in Eagle River Valley

Eagle County hosted a timber industry that was limited in size, timeframe, and productivity. For this reason, archival records make almost no mention of logging, but a timber industry did exist. The Denver & Rio Grande Railroad produced ties for the line it graded down the Eagle and Colorado rivers in 1886, and the railroad continued the practice for years afterward. Although speculative, it is almost certain that at least a few sawmills produced lumber and mine timbers for Leadville, Red Cliff, and Aspen after the railroad provided access to these markets. The area of study includes the Eagle River valley from Minturn to Dotsero and the Colorado River valley from the confluence at Dotsero to Glenwood Canyon.

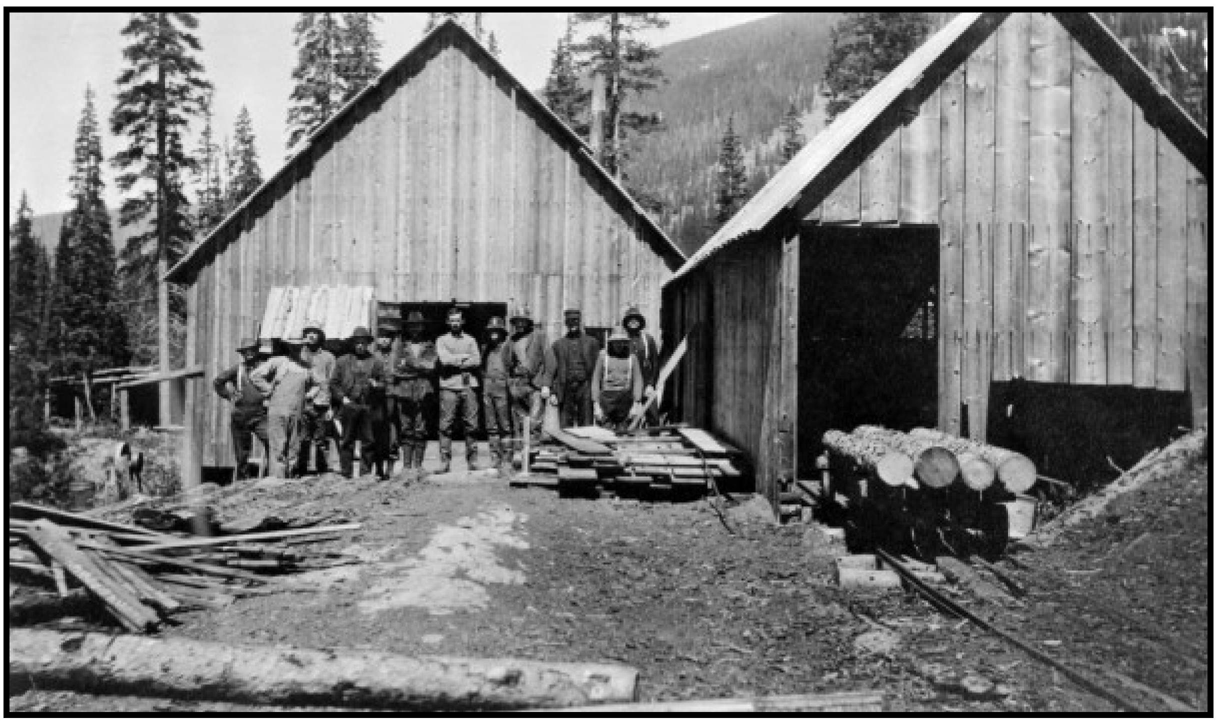
Logging in Eagle River Valley, 1886-1920

Because Eagle County was remote, difficult to access, and had little internal demand for lumber, it can be assumed that logging of substance did not begin until the Denver & Rio Grande (D&RG) established a presence on the Eagle and Colorado rivers. The D&RG did so when it entered a heated race with the Colorado Midland Railroad to be the first to reach Aspen from Leadville. The Colorado Midland chose a route west and directly over the Sawatch Range, while the D&RG planned to descend the Eagle River to the Colorado River, continue to Glenwood Springs, and ascend the Roaring Fork to Aspen. The D&RG completed the grade along the Eagle and Colorado rivers in 1886 and finished the track to Glenwood Springs the following year. The railroad established the town of Minturn on the Eagle River as a service center, and Dotsero at the confluence of the Eagle and Colorado rivers as a fuel and water stop.

When the D&RG pushed its line down the river valley, it fostered a small timber industry. At first, that industry was limited to the production of railroad ties for the new track. Within the span of two years, a swarm of tie hacks, probably on contract, invaded the forests on both sides of the river valley and generated thousands of ties. The initial demand for ties was high and spanned from 1886 to 1887, the years of peak construction. After the D&RG finished the track, intensive production ended, but the railroad retained at least a few tie hacks to provide stockpiles at strategic points, primarily Minturn and Dotsero.

Besides an appetite for ties, the D&RG was the first organization in the Eagle River valley to demand lumber in significant amounts. The railroad required the lumber for right-of-way structures and for its outposts of Dotsero, Minturn, and Castle (now Eagle). Instead of hauling the material into the region from elsewhere, it seems highly likely either the D&RG established its own sawmills or contracted with entrepreneurs. It remains unknown where the assumed mills operated, although Castle and Minturn are the best possibilities. The sawmills were small and produced lumber for the D&RG and the growing towns. Within several years, Minturn and Castle probably had enough need to support their own dedicated facilities.

In 1890, an increase in the value of silver simulated a significant boom in the mining cities of Aspen, Red Cliff, and Leadville. The demand for lumber and mine timbers rose in parallel, but these communities had an increasingly difficult time satisfying their own requirements. The reason was that during the previous ten years of intensive ore production, miners and lumber companies exhausted the surrounding forests. The cities then looked to forests farther afield, and the D&RG made lumber economical to ship the short distance from Eagle County. In response, a few lumber outfits may have established operations along the Eagle River where the best stands of trees grew. Logging for the purpose of export contracted in 1894 when the Silver Crash impacted mining in Red Cliff and Aspen, but the market in Leadville remained sound.



Eagle was center to a small logging industry. Most of the sawmills, such as the East Lake facility in 1908, were located in forests on the surrounding mountains. But their forest products flowed through Eagle, onto the Denver & Rio Grande Railroad, and to market. Courtesy of Denver Public Library, X-8015.

During the late 1890s, several factors both within and outside Eagle County stimulated logging. Given that the lifespan of untreated railroad ties was 10 to 15 years, the D&RG had to replace most of the ties on its Glenwood Springs line, which created a huge demand. At the same time, a statewide revival of mining swept Colorado, and although Aspen remained relatively static, Leadville and Red Cliff boomed. By the late 1890s, these communities were more dependent than ever on distant sources of lumber and mine timbers, which sawmills in Eagle County provided. Several mills immediately around Minturn, Eagle, and Wolcott also produced lumber for a local demand. During the early 1900s, the J.W. Thorpe and Lumley sawmills operated near Eagle (changed from Castle in 1891), and Jack Hall began running the Armstrong sawmill at Wolcott, where he owned a saloon.[35]

It remains uncertain exactly how long the timber industry held a substantial presence in the county. Because the local demand for lumber was limited, the industry relied on D&RG tie needs and the distant mining markets for full viability. The industry also required timber reserves, which retreated deeper into the mountains and farther away from points of easy access in the river valley. Lumber companies still shipped products to Leadville and Aspen as late as the mid-1910s, but this came to an end by 1920. At that time, the mining industry collapsed and the nation entered a deep economic depression, which ruined the distant markets on which logging relied for viability. The D&RG continued to harvest some of its ties from the county's forests, but by 1920, most of the suitable trees were gone from the river valley.[36]

[35] *Eagle Valley Enterprise* 5/22/03 p1; *Eagle Valley Enterprise* 1/8/04 p4; *Eagle Valley Enterprise* 10/4/07 p1.

[36] *Eagle Valley Enterprise* 3/6/14 p1.

Section E 6: History of High-Altitude Agriculture, 1860-1955

Introduction

This section provides an overview of homesteading, farming, and ranching along Clear Creek and the Blue, Eagle, and Colorado rivers. The intent is to aid in the identification of related historical resources and provide a context for recommending eligibility for the National Register of Historic Places. Below is a broad overview of the history of these forms of agriculture in the central mountains, with an emphasis on their manifestations in the drainages traversed by the I-70 Mountain Corridor.

Period of Significance, 1860-1955

Homesteading, ranching, and farming were different forms of agriculture, but as a category, the agricultural industry was important in the I-70 Mountain Corridor during the Period of Significance 1860 through 1955. The Period began in 1860 when settlers established the earliest homesteads in the Clear Creek drainage. Homesteading then spread throughout the I-70 Mountain Corridor, and ranching and farming followed. The Period ended in 1955 when agriculture declined to a point where it was no longer a significant industry. Individually, homesteading, ranching, and farming were important during narrower timeframes, largely because they followed a westward progression through the corridor. The timeframes are summarized separately below. The three forms of settlement and agriculture were also significant under specific NRHP areas for slightly different reasons. The areas of significance are Agriculture, Commerce and Economics, Exploration/Settlement, Industry, Landscape Architecture, and Politics/Government. The significance is likely to be on local and statewide levels. The three forms of settlement were important within the corridor and were also tied to statewide events and trends. The industry was not, however, important on a national level.

Homesteading

Homesteading was important in the Clear Creek drainage from 1860, when prospectors platted the first homesteads, through 1880. After that time, several factors reduced the importance of homesteads. First, the movement slowed substantially because most land along Clear Creek was already claimed by 1880. Second, many of the existing homesteaders expanded from mere subsistence agriculture into ranching or other businesses. Third, the Colorado Central Railroad finished its line from Denver to Georgetown and brought a wide variety of agricultural goods at reduced prices. Homesteaders then had difficulty competing.

Homesteading was important along the Blue River from 1865, when a homesteading movement took hold, until 1890. Ranching then began to dominate, and many homesteaders either sold to cattlemen, expanded into ranching themselves, or left agriculture altogether. In addition, the Denver & Rio Grande and the Denver, South Park & Pacific railroads provided the local markets with inexpensive agricultural products.

Homesteading was important along the Eagle and Colorado rivers from 1870 through 1920. Although ranching and farming dominated agriculture in the drainage by 1890, homesteaders continued to settle undeveloped land in significant numbers until 1920.

In general, homesteading was significant during the above timeframes for several reasons. First, it was one of the primary engines for permanent Euro-American settlement in the corridor. Second, homesteaders were among the earliest settlers to pioneer portions of the mountains that lacked the resources for mining and logging. Third, homesteaders established the foundation for an agricultural industry in the central mountains. Fourth, homesteaders supplied the mining, logging, and railroad industries with food and fodder until other sources of goods became available. Last, homesteading provided many people who had limited means with an opportunity for self-advancement.

Ranching

Ranching was important in the Clear Creek drainage from 1870 until 1900. During this time, homesteaders and professional cattlemen established ranches and profited from a strong local market for meat. By 1900, the business declined because the market contracted and the Colorado Central Railroad provided competition by hauling in inexpensive meat from elsewhere. Ranching was important along the Blue, Eagle, and Colorado rivers from 1875, when the first commercial ranches were established, until 1955. Changes in the economy, ranch practices, demography, operating costs, and the overall cattle industry caused ranching to decline.

As an industry, ranching was significant for many of the same reasons as homesteading. In addition, ranching became an economic cornerstone for many of the communities in the corridor. Because ranching was sustainable, the industry moderated the boom-and-bust cycles of resource extraction and outlasted mining and logging.

Farming

The Clear Creek drainage saw little farming on a commercial scale, and because of this, the industry was not important in this region. Farming was important along the Blue River from around 1900 until 1920, although most commercial enterprises were limited to grain. A combination of market conditions and climatic extremes brought the business almost to an end by 1920. Farming was important along the Eagle and Colorado rivers from 1885, when commercial agriculture began, until 1955. Changes in the economy, land use, demography, operating costs, and the overall industry caused farming to decline. Farmers in the region grew a wide range of products such as root vegetables, cold weather vegetables, fruit, grain, and especially fodder.

HISTORY OF HOMESTEADING, RANCHING, AND FARMING

This section provides an overview of the history of homesteading, ranching, and farming in Clear Creek, Summit, Eagle, and western Garfield counties, with an emphasis on the I-70 Mountain Corridor. The intent is to aid the identification and interpretation of the historic resources that remain from the significant period of time for these activities, as well as provide a context for assessing the eligibility of those resources to the National Register of Historic Places.

Homesteading in the I-70 Mountain Corridor immediately followed the 1859 discovery of gold on Clear Creek and moved west to the Blue River during the mid-1860s. Ten years later, homesteaders also settled the Eagle and Colorado River drainages. Ranchers and farmers then followed the homesteaders with the intent of selling agricultural products primarily to local markets. By the late 1870s, ranching and farming were productive enough to constitute an agricultural industry. Because the high-altitude climate discouraged most forms of agriculture, that industry had the greatest presence along the Eagle and Colorado rivers, where the climate was less severe than other segments of the I-70 Mountain Corridor. Ranching and farming weathered economic cycles and environmental problems and remained vital to the region until 1955.

Early Agricultural Settlement in the Mountains, 1860-1892

As forms of land use, homesteading, ranching, and farming are integrally tied. Nearly all homesteaders farmed and grazed cattle to some degree, and many ranches and farms either began as homesteads or expanded by absorbing neighboring homesteads. The three forms of land use fostered settlement, formed an agricultural business sector, and provided the goods and food that supported the mining, logging, and transportation industries in the mountains. Homesteading, ranching, and farming had similar environmental requirements, relied on the same markets, and were encouraged by a common set of federal land use policies.

Homesteaders, ranchers, and farmers filled different niches in the agricultural sector. Homesteaders were settlers and often pioneers, and they generated a variety of agricultural products for their own consumption primarily and to sell at local market when a surplus existed. Farmers, by contrast, ran agricultural businesses that grew crops on a commercial scale for local and statewide markets. The business model for ranching was similar, except that cattle or sheep were the commercial specialty.

In regions founded on agriculture, homesteading, ranching, and farming are perceived as sequential stages of settlement and occupation, often preceding industrial development. In the I-70 Mountain Corridor, however, resource extraction industries arrived first, and agricultural settlement followed. A clear sequence is difficult to identify because all three forms of land use coexisted for decades. In general, homesteading was first throughout the corridor, and it continued into the 1910s, long after ranching and farming were well established. Thus, through shared timeframe, reliance on the same markets, similarity of products, interaction, and even competition for land, the three types of land use can be considered together.

In the I-70 Mountain Corridor, homesteading was the earliest type of settlement that was not directly based on resource extraction. The movement began in the Clear Creek drainage, Clear Creek County, in 1860 when prospectors established the first homesteads. Georgetown founders George and David Griffith, and others, settled the drainage floor and quickly assumed those tracts of land not already claimed for mining. During the remainder of the 1860s, miners exhausted much of the placer gold and increasingly turned to homesteading. Some saw homesteading as a means of subsistence, many wanted to sell surplus agricultural products to the local market, a few tried running supplementary businesses, and a good number used their homesteads as bases for prospecting. Most Clear Creek County homesteaders embodied all four motivations.

Homesteading began in Summit County during the late 1860s for similar reasons. The discovery of gold near Breckenridge incited one of Colorado's important rushes in 1860, and when the boom declined, some of the miners resorted to homesteading along the Blue River. They were few in number at first because the region was remote, the local market for products very limited, the climate troublesome, and the growing season short. But as markets improved with logging and mining during the 1870s, more homesteaders took up claims.

Homesteading spread along the Eagle and Colorado rivers in Eagle and Garfield counties during the 1870s. The best land was already claimed in the valleys to the east, including Blue and Clear Creek, forcing the pioneers to consider areas to the west. During the late 1870s and early 1880s, a wave of homesteaders moved into Eagle and Garfield counties in response to new markets for agricultural products in the central mountains. The market grew suddenly due to the rush to Leadville and nearby mining towns and expanded yet more because of booms at Aspen, Battle Mountain, and Red Cliff. In 1881, the Denver & Rio Grande Railroad established its Red Cliff railhead, granting homesteaders a strategic shipping point for their products. This and the sustained market created by mining in Lake, Chaffee, and Pitkin counties drew yet more homesteaders to the Eagle and Colorado River valleys.

Although the demand in the mountains governed where many homesteaders settled, a combination of larger trends encouraged them to migrate westward from the East and Midwest. On one hand, relatively young people low in socioeconomic status faced limited employment opportunities and even, in some regions, an informal caste system. Those interested in farming had a difficult time affording arable land because the river valleys in the Midwest had already been claimed. Immigrants exacerbated these conditions through increased competition, and economic depressions during the late 1850s and mid-1870s kept wages low. On the other hand, the open West seemingly offered opportunity and resources for those willing to apply themselves. The promise of mineral riches drew many individuals to Colorado, while a reliable and steady income from agriculture interested others. Most were attracted by an equality of frontier society and the potential for self-advancement through hard work.

Because many of the homesteaders were failed prospectors and miners, the demography of Clear Creek County may be representative of those who settled the I-70 Mountain Corridor. In ethnicity, most individuals initially came from the United States, and numerous others were immigrants from England, Ireland, Germany, and Scandinavia. A few African-Americans and Jews homesteaded, as well. From the 1890s through the 1900s, Colorado saw a shift in immigrant ethnicity toward Italians and eastern Europeans. Relying on the homesteading movement of the South Platte River as an example, most of the Americans already had agricultural experience. Many lived in Nebraska, Kansas, and elsewhere in Colorado before claiming land in the South Platte valley. Over 50 percent previously lived in Nebraska, and 80 percent had either farmed or grown up in farming families and brought the methods and crops of Midwestern prairie agriculture. This prior experience may have slowed the acceptance of new techniques needed to deal with the mountain environment, but the settlers were at least well acquainted with the uncertainties and intense work of farming.[1]

Some of the initial homesteaders were satisfied with self-sufficiency, but most produced surplus goods for local markets. Many grazed cattle at the least because the mountain environment was conducive, and cattle translated into dairy and meat. A few also grew produce,

[1] Harris, 1993; Leyendecker, et al., 2005:190.

which the difficult mountain climate limited to cold-weather crops such as root vegetables, greens, hay, and tree fruit.

Because subsistence agriculture was arduous and uncertain at best in the mountains, some homesteaders supplemented their income with other forms of business. During the 1860s, when distances between towns were great, many homesteaders advertised their establishments as stage stops and road houses where travelers could billet overnight. For example, Merrill Floyd ran a stage stop at his homestead on the summit of Floyd Hill in eastern Clear Creek County. Other individuals kept frontier mercantiles and sold dry goods, some provided blacksmithing, and a few ran post offices.

Perhaps the most important factor that lured homesteaders to the mountains was land that the federal government provided at little cost. The government established several programs specifically to encourage settling of the West, although in most cases the land was territory taken from dispossessed Native American tribes. The Homestead Act of 1862 was designed to expand and liberalize the Preemption Act of 1841, providing title to 160 acres (quarter section) after five years occupation and payment of application fees. In turn, the Timber Culture Act of 1873 attempted to make barren land attractive for settlement and bring it into production. Settlers could buy a quarter section for $1.25 per acre if they planted 40 acres with trees and maintained them for ten years. The Desert Land Act, passed in 1877, appealed to homesteaders, ranchers, and farmers alike. Individuals could purchase 640 acres (one section) for $.25 per acre if they proved irrigation within three years.[2]

Even though these programs made land available, the land had to possess three general environmental conditions for homesteading. First, it had to be arable, which meant nearby water and few if any rocks and trees. In the absence of a natural water source, homesteaders often sank wells by hand. Second, the land had to possess gentle topography and a climate that could support at least grass if not other types of crops. Last, the property had to be relatively near a market or shipping point.

By definition, homesteads were small and simple agricultural complexes. Some type of residence, often little more than a rudimentary shelter, was usually the first building erected, and in time, it became the center of the homestead. The most primitive and temporary residences were small dugouts. As the term implies, dugouts were built into hillsides so that only their façades were above grade. Building into a slope simplified construction, minimized building materials, and afforded maximum protection from the elements once the dugout was complete. Once a homesteader incised a chamber of sufficient size into the slope, he usually finished the dugout with locally available materials. Settlers faced dugouts with logs, hand-hewn timbers, rough-cut lumber, or rock masonry. Logs, when used, were either round or squared into timbers by hand with an axe or adz. The homesteaders roofed the excavated chambers with ridge-beams, rafters, decking, and earth. Dugouts were rectangular in shape and had earthen floors and barrel-shaped or front-gabled roofs. Entry doors were narrow, made of wood planks, and hinged within door frames made of squared hand-hewn logs or rough-cut lumber.

The construction of homestead dwellings, ranch houses and farmhouses, may be viewed as a progression, providing insight into the practicality, frugality, and upward mobility of their builders and earliest owners. When resources and time permitted, homesteaders replaced their dugouts with semi permanent log cabins, and in turn replaced these with modest wood-frame houses. Homesteaders sometimes enlarged their cabins but usually replaced them entirely with new houses. The early residences were not completely abandoned in such cases, however, and were converted to other uses. Dugouts became root cellars or pit silos, while original homestead

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[2] Harris, 1993; Mehls, 1988:113, 115; "Pre-Emption, Homestead and Timber Culture."

cabins were retrofitted as needed into a variety of agricultural outbuildings. At a minimum, building materials were salvaged for use in new construction.

This bunker-like structure in the Colorado River valley, photographed during the 1880s, is a typical homesteader's dugout. Its primitive façade and lack of windows indicates that it was temporary, later to be replaced by a cabin or house. Courtesy of Denver Public Library, CHS.J959.

Homestead residences may be regarded as vernacular in that they were built from locally available materials, without a professional architect or builder, and to meet the perceived needs of the homesteader. Most homesteaders possessed a wealth of practical knowledge, and were experienced, capable builders despite a lack of formal training. With a can-do spirit, homesteaders employed a basic understanding of geometry, linear measurements, and building principles learned elsewhere. As a result, homestead residences reflect the construction techniques, traditions, and cultural influences passed down through generations, brought west, and adapted to the Colorado frontier.

A variety of factors influenced the construction and form of vernacular residences, as well as outbuildings. The environment was a primary consideration, and homesteaders responded to the climate, topography, soil conditions, availability of water, and other physical characteristics specific to a region. Homestead buildings were also influenced by the economic resources of their owners, and in time by the dissemination of popular building materials, techniques, styles, and details. As commercial lumber became available, homestead houses were increasingly of wood-frame construction, with multiple rooms, and eventually with stylistic influences and ornamental details reflecting homesteaders' tastes and traditions and the architectural fashions then in vogue. For example, some houses erected late in the homestead movement were not constructed solely of local materials, but rather with manufactured lumber and other building supplies, which were delivered by the railroad and purchased from local retail suppliers. Similarly, although later houses continued to reflect their owners' traditions, they were also increasingly influenced by the spread of architectural styles and ornamental details, made popular by the nationwide diffusion of architectural pattern books and magazines. House plans became available through Sears, Roebuck & Company in the late 1890s, and by the turn of the twentieth century, popular magazines such as *House Beautiful* and *Ladies Home Journal*.

Whereas houses sheltered the homesteaders, outbuildings such as barns, stables, and chicken coops accommodated their livestock. Settlers usually erected such buildings near the house, but far enough to keep insects and vermin at a distance. Systems of corrals and pens, often fenced with local logs, impounded the livestock. Over time, successful homesteaders diversified their agricultural products, and the size and complexity of the homesteads increased as a result. Settlers added other outbuildings such as storehouses, milking sheds, grain sheds, hay barns, and potato cellars. They also sank wells and excavated stock ponds for more livestock, expanded hay fields, and maintained garden plots.

Although most homesteaders kept at least a few cattle, they were not considered ranchers, also known as cattlemen. A ranch can be defined as a business that bred, grazed, and kept large numbers of cattle as the dominant land use. Because many ranches were in remote locations, they had some attributes in common with homesteads and farms, such as small garden plots and livestock other than cattle. Ranching started in the I-70 Mountain Corridor around the time that homesteading was already a strong movement.

As with homesteading, a market for food associated with the mining and logging industries convinced the earliest cattlemen to try their fortunes in Colorado. They were few in number at first, their herds small, and their ranches concentrated around the nascent plains towns. During the mid-1860s, Texas cattlemen discovered the resources offered by the Colorado plains and drove the first large herds into the region, which became the foundation of a permanent industry. Although entrepreneurs brought small herds of cattle into the mountains during the mid-1860s to feed hungry miners, few cattlemen attempted large-scale ranching there because the plains were a superior environment. Only after the large cattle outfits subsumed nearly all the open grassland did cattlemen move west into the mountains.[3]

Although the movement was slow at first, several factors fostered a cattle boom that expanded into western Colorado during the 1870s. The factors took effect both within and outside of Colorado. Outside, the demand for beef soared, fostering the so-called Beef Bonanza. Cattlemen could purchase stock for a few dollars per head, graze and fatten them at little cost, and sell them for $40 to $50 at stockyards in the Midwest. Completion of the Denver Pacific and Kansas Pacific railroads in 1870 provided Colorado ranchers with inexpensive transportation to the stockyards, which allowed them to profit from the Beef Bonanza. Within Colorado, mining spread throughout the central mountains and created a significant regional market for both beef and the fodder that draft animals consumed by the ton. Because the regional demand for beef was so high, nearly all the cattle raised in the mountains were consumed locally, leaving mountain ranchers with little surplus for external markets. Still, some drove cattle overland to Denver, the shipping point for the Rocky Mountains. As a reflection of the boom, the number of cattle increased from 291,000 in 1870 to 809,000 by 1880. The boom was not limited to cattle alone, as ranchers also brought in sheep primarily for wool and secondarily for meat. In 1870, there were less than 20,000 sheep in Colorado, but by 1879, there were 2 million.[4]

As ranching operations grew in size, cattlemen recognized the need for an overall state association to promote and protect the industry, and provide structure. They organized the Colorado Cattlemen's Association in 1867, the oldest comparable organization in the United States, and the Colorado Stock Growers' Association in 1871. The organizations coordinated

[3] Reyher, 2002.

[4] Mehls, 1988:115; Reyher 2002; Simmons and Simmons, 1999:4; Stone, 1918, V.1:512.

roundups, governed the passage of herds through Colorado, established an official branding registry, and hired range detectives to reduce cattle rustling. In 1879, the state took over the responsibility of registering brands and enforcing laws.[5]

By 1880, investors who had no actual range experience acknowledged the enormous profits to be made from large-scale ranching and entered the industry. English and Scottish capitalists formed companies and poured money into sprawling operations. These companies literally dominated the plains but limited their presence in the mountains because the high-altitude environment was unable to support the herd sizes that the outfits preferred. Instead, small and medium-sized outfits were prevalent in the mountains. Together, the plains and mountain ranchers ushered in a major boom that lasted through much of the 1880s, when beef prices reached record levels.[6]

Other forms of development allowed ranching to thrive in the high country. First, mining and logging continued to spread, strengthening the regional market for beef and fodder. Second, the railroad network expanded in parallel, linking shipping points with the markets. In particular, the Denver & Rio Grande and the Denver, South Park & Pacific railroads graded trunk lines through prime grazing land in the Blue and Eagle river drainages. Ranchers in these areas could chose from markets including mining towns, Denver, or the Midwest stockyards. As a result of the overall boom and diverse regional development, dozens of range outfits grazed around 50,000 cattle through portions of western Colorado by the mid-1880s.[7]

Although the Clear Creek drainage had a few ranches, the industry swept the Blue, Eagle, and Colorado rivers where open range and clean water were readily available. On the Blue, ranching provided a foundation that allowed Dillon to grow into one of the most important towns in the valley. Dillon, founded in 1878, was center to a collection of ranches and homesteads, which at first supplemented an economy based on mining in the nearby Ten Mile Range. In 1882, the arrival of the Denver & Rio Grande and the Denver, South Park & Pacific railroads cemented Dillon's role as a cow town. Because of the railroads, Dillon not only did business with local ranches, but also became the regional shipping point for their cattle. During the rest of the 1880s, additional cattlemen established operations around Dillon, and many were local investors such as A.C. Graff, who applied the capital he saved from mining in the Ten Mile Range. In the long run, ranching benefited Dillon as a sustainable industry and, along with the railroads, stabilized the economy. Whereas the population of Frisco, the nearby mining town, fluctuated wildly with the revivals and busts of silver, that of Dillon held steady between around 250 and 300 through the 1920s.[8]

Ranching followed a similar trend on the Eagle and Colorado rivers. A handful of individuals established the first ranches during the latter half of the 1870s with small operations almost as primitive as the area's homesteads. During the late 1870s and early 1880s, several groups of investors pooled their limited financial resources and started large-scale company operations. Henry J. Hermage, Robert Matthews, and W.E. Frost ranged a herd on Brush Creek; W.W. Livingston, R.M. Sherwood, C.M. White C.B. Stone, and J.L. Howard worked along the Eagle River; and A.F. Grundel and Casper Schumm claimed the Gypsum Creek area. These companies drew the attention of other cattlemen.[9]

Ranching gained enough momentum during the early 1880s to constitute an industry, and it fostered a local economy that supported several permanent settlements. Gypsum and Dotsero

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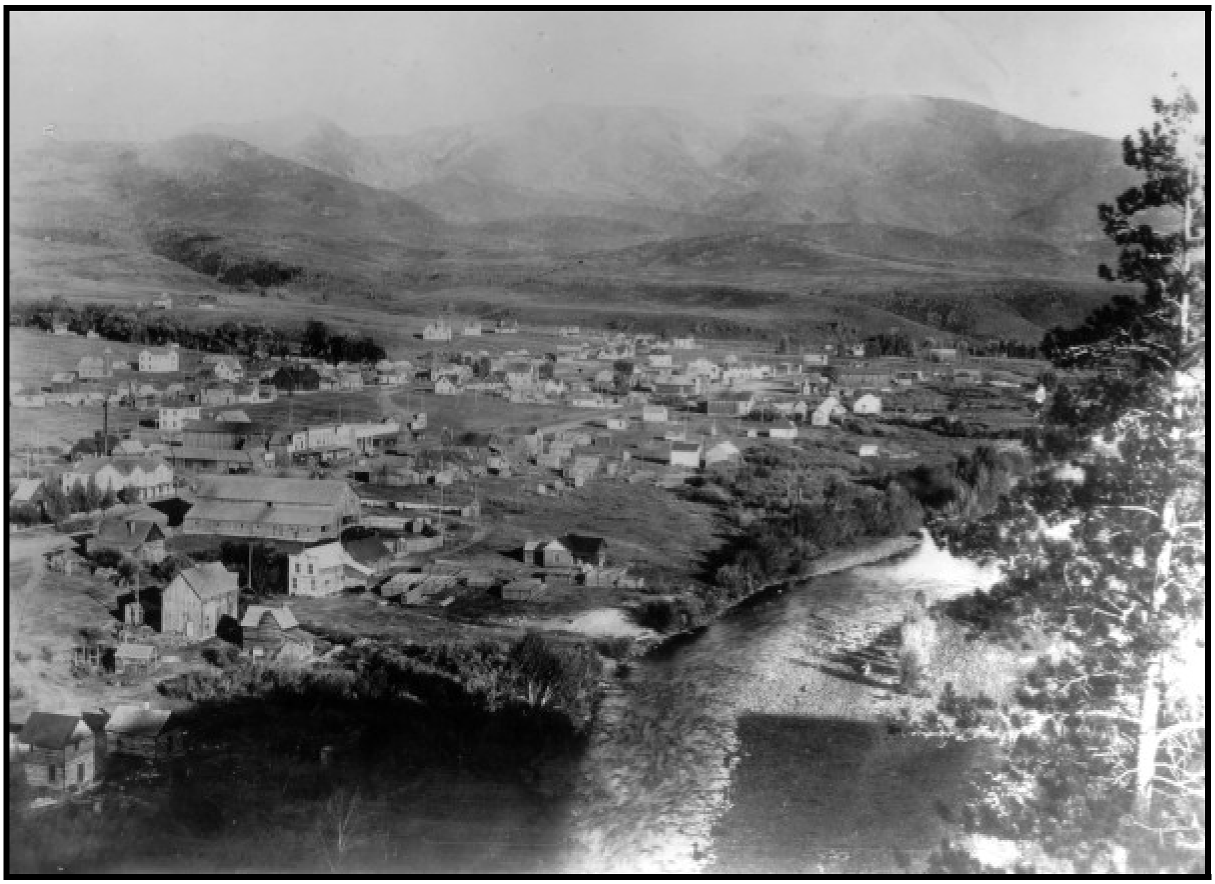
[5] Abbott, et al., 1994:170; Whittemore 1990.
[6] Abbott, et al., 1994:171; Simmons and Simmons, 1999:7-8.
[7] Reyher 2002.
[8] Crofutt, 1885:88; Gilliland, 1999:87; Schulze, 1976:1890-8; Schulze, 1976:1920-13.
[9] Stone, 1918, V.1:520.

were among the earliest, both formalized in 1883 with post offices. The Gypsum Ranch was the seed for Gypsum, and by 1884, the area attracted approximately 30 other range outfits. Dotsero began as a homestead community at the confluence of the Eagle and Colorado rivers and quickly attracted its share of ranches. The Hermage ranch near the confluence of Brush Creek and the Colorado was the seed for Brush Creek, which the Postal Service formally recognized as Castle in 1885. As with Dillon, the arrival of the Denver & Rio Grande in 1887 cemented the region as a cattle center, and the industry grew significantly. The town of Wolcott became the shipping point for the Eagle River valley, justifying a post office by 1889. Castle became the other loading station and was renamed Eagle in 1891.[10]



Agriculture, and especially ranching, made Eagle one of the most important towns in western Colorado during the 1880s, when this photo was taken. Ranches surrounded the town. Courtesy of Denver Public Library, X-8003.

The first cattle that ranchers brought to western Colorado were Texas longhorns. Although the animals did well on Colorado's plains, they suffered in the mountains and died in alarming numbers. Ranchers soon realized that the animals were ill suited to the rigorous mountain climate, and calves born during the coldest winter months often perished. Thus, ranchers adapted by breeding longhorns with Hereford and Durham bulls and abandoned the practice of calving year-round in favor of early spring. These adaptations and hybrid breeds proved successful, and ranchers began to see their herds thrive.[11]

[10] Bauer, et al., 1990:31, 46, 67; Knight and Hammock, 1965:29; Mehls, 1988:119.
[11] Reyher, 2002.

Ranchers also had to become conversant with the mountain environment to be successful. Water and grassland were the two most important aspects, second only to weather, and both were limited in the mountains. Herds of economic sizes required plenty of both, and ranchers quickly concluded that water was the key to controlling grassland. Without water, adjoining dry land was worthless for grazing. As on the plains, ranchers actively secured land with water first, either by filing a homestead claim through the Timber Culture Act or via the Desert Land Act. Although ranchers settled for springs when nothing better was available, they preferred to occupy as much stream-front land as possible. This they found in valleys, which also offered open grassland. Once the ranchers secured land with water, they assumed by association large tracts of public land on all sides. As competition increased between cattlemen, sheep ranchers, and even homesteaders, many cattlemen formalized their holdings, including adjacent public land, with fences. While this was illegal, it prevented confusion between herds, secured rangeland for cattle, and kept livestock off farmland.[12]

The latter issue became increasingly important between the late 1870s and early 1890s. During this timeframe, cattlemen and homesteaders shared relationships that were sometimes hostile and other times cooperative. Because both groups settled the mountains at the same time, they perceived each other as competitors for suitable sites. Ranchers viewed homesteaders as occupying important water sources, and homesteaders fenced their land to keep cattle out, dividing rangeland in the process. Homesteaders and ranchers, however, cooperated on irrigation and road projects. Further, ranchers amassed huge holdings by buying out struggling homesteaders, and, conversely, some homesteaders expanded into ranching and farming by acquiring neighboring operations when they left the business. Ironically, some cowboys without work became homesteaders.

Physically, ranches followed a development pattern similar to homesteads. A rancher began by building a house or cabin, bunkhouse for cowboys, barn, stable, and corrals. In remote areas, ranchers used local building materials such as logs or rocks, but they substituted lumber when the transportation infrastructure improved. The ranch house was the center of operations and housed the rancher's family, an office, large kitchen, and communal dining space. The physical appearance of a ranch house depended on a combination of environmental and economic factors as well as the needs and vision of the rancher.

Over time, successful ranchers developed complexes of buildings and structures to both accommodate the family and facilitate the ranching operation. A root cellar, smokehouse, a well with a pump house or windmill, a privy, and perhaps an ice house would be located close to the ranch house to serve the needs of the ranch family and hired hands. Cooking during warm months often took place in a summer kitchen, a semi open structure located in close proximity to the ranch house or bunkhouse. Several other function-specific buildings and structures comprised the remainder of the ranch complex. Depending on the size of the operation, such infrastructure consisted of barns, stables, loafing sheds, corrals, loading chutes, feed troughs, stock tanks, a blacksmith shop or workshop, machine sheds, and an irrigation system with a stock pond. In terms of setting, ranch complexes were located within mountain valleys surrounded by pastures, grazing lands, and timbered slopes. On the range, ranching outfits also maintained watering holes, wells, corrals, and line camps for cowboys working far from the ranch complex.

Beginning in the mid-1880s, a sequence of trends forced ranching into transition and ultimately brought the boom to an end. The first was the Big Die Up. Between 1885 and 1887, exceptionally severe winters and summer droughts killed high numbers of cattle already weakened because their range was overgrazed. The plains ranches lost thousands of cattle, and

[12] Abbott, et al., 1994:170; Mehls, 1988:113; Simmons and Simmons, 1999:1.

the mountain ranches were hit hard as well. At the same time, the beef bubble burst and prices fell, which threatened those operations in debt. Many of the large cattle companies sold their holdings at a loss, and the cattle industry adjusted. In the mountains, the small and medium-sized outfits grazed fewer cattle because of the poor market conditions. Sheep ranchers quickly filled the void on the range and contributed to the problem of overgrazing. Conditions grew even worse in 1890 when a major drought impacted the entire state. As water sources dried up and grass refused to grow, some ranchers who survived the Big Die Up finally succumbed during the early 1890s. Because of competition for resources, animosity and violence developed between cattle interests and sheep ranchers. All increasingly relied on hay produced by local farmers to survive the winters, and this raised both operating costs and tensions.[13]

While the cattle industry went from boom into decline during the late 1880s, farming followed an opposite trend. The same positive market conditions that fostered the cattle boom early in the decade stimulated a wave of farming across Colorado. In the mountains, however, farming began on a diminutive scale because the environment was simply unsuitable for large-scale agriculture. As the decade progressed, individuals settled the valleys along the Eagle and Colorado rivers to Grand Junction to supply a growing market. In this belt, the growing season was just long enough for cold weather produce and tree fruit. Many homesteaders in the region expanded their holdings into farms while the Big Die Up encouraged failed ranchers into farming, and a decline in mining also forced many miners into agriculture. Thus, farming grew as an industry through the decade and into the early 1890s.

A farm can be defined as a business that grows and harvests crops in commercial quantities for market. Although farmers grew cold weather produce and fruit as noted above, the most popular crops capable of surviving mountain winters were hay and grain. Farm complexes were similar to ranches in function and layout with facilities for growing crops and storing produce. Because most farms were isolated and had to be self-sufficient, they included arrangements for limited livestock such as cattle, hogs, and fowl.

Irrigation was an imperative for farming in the mountains, and farms had systems more sophisticated than those on either ranches or homesteads because their needs were greater. The early systems were primitive, however, by later standards. Farmers excavated feed ditches from diversion points on streams and created smaller distribution ditches and gates to flood the fields. Problematically, the ditches seeped and were wasteful, became silted, and carried inadequate volumes of water. Further, they had to be formally surveyed and required the farmer to acquire water rights, which many were unable to do. For these reasons, farmers increasingly turned to irrigation and ditch organizations for their water during the late 1880s. Some of the organizations in Eagle and Garfield counties were cooperatives, others were for-profit companies, and in Summit and Clear Creek counties, most were involved with the mining industry. For-profit companies typically applied their capital to buy rights for plenty of water and build fairly extensive distributions systems. In so doing, the companies helped farming spread from the floors of the principal valleys up and into tributary drainages and elevated land.[14]

Mountain Agriculture Perseveres, 1893-1919

By the early 1890s, the pattern of agriculture and associated settlement became apparent in the I-70 Mountain Corridor. Homesteading passed its peak in Clear Creek and Summit

[13] Reyher, 2002.
[14] Holleran, 2005; Mehls, 1988:140.

counties and gave way primarily to ranching. The climate in both counties discouraged commercial farming of anything except hay, which many ranches also produced. In Eagle and Garfield counties, when both homesteading and ranching were well under way, farming rose as an industry. In 1893, several factors changed the pattern and created considerable difficulty for ranching and farming. Economic conditions were among the most important. At the end of 1893, the value of silver collapsed and forced most of Colorado's silver mines to close. Colorado was now without one of its foundation industries, and while this alone was enough to ruin the economy, a nation-wide depression also affected the state. The market for agricultural products imploded. Clear Creek County was an exception, and its ranches continued to supply the local market.

Elsewhere, economic conditions were dismal and remained so through the 1890s. Farmers struggled as both the demand for and prices of produce fell. Many were unable to repay debts for land and water and lost their farms to foreclosure. The price of beef dropped below wholesale levels, and many of the cattle companies that survived the Big Die Up and range exhaustion left the business. Some ranchers, primarily in Eagle and Garfield counties, survived through diversification. They increased their acreages of pasture land, began to supplement grazing with the production of hay and grain, and raised cattle that were better suited to the mountains. Some of the favored breeds were Shorthorns, Herefords, Ayrshires, Jerseys, Alderneys, Devons, and Galloways.[15]

In contrast to ranching and farming, homesteading increased as a result of the 1890s depression. Miners thrown out of work saw homesteading as a means of subsistence and did not have to travel far from the silver towns to find land. Dispossessed farmers came from the Midwest, and European immigrants unable to find employment in cities also arrived. Because most of the arable land in Clear Creek and Summit counties was already claimed, the movement was greatest in western Colorado.[16]

The trouble that plagued ranching and farming, and the concurrent increase in homesteading along the Eagle and Colorado rivers may explain curious trends regarding population figures for that region. Between 1890 and 1900, the population of Eagle County fell from 3,725 to 3,008, largely due to closure of ranches and farms, and the abandonment of many mines. In contrast, the populations of Eagle, Gypsum, and Wolcott increased slightly. Dillon suffered as well, its population falling from approximately 250 to 200.[17]

By the late 1890s, the national economy began to recover. Colorado entered one of its most important periods of industrial growth, and for reasons discussed in the sections on the mining and timber industries, the mountains enjoyed a major revival. Although the activity restored the markets for agricultural products, farming and ranching did not benefit evenly. Just as farmers prepared to supply the enormous demand for produce, one of the state's worst droughts struck and reduced crop yields. The drought also affected cattlemen and created conditions that permanently changed their industry. In particular, the federal government grew deeply concerned with overgrazing and the destruction of forage, which the drought exacerbated. In response, the government moved to regulate on several fronts. First, the Department of Agriculture began a program of grazing permits in 1899 on land within the Forest Reserves, which were designated several years prior. Second, the General Land Office introduced a similar program on Department of the Interior lands in 1901. Both agencies controlled most of the federal land in the west, and the programs both reduced herd sizes and limited abuses.[18]

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[15] Front Range Research Associates, 1991.
[16] Mehls, 1988:137.
[17] Schulze, 1976:1890-3; Schulze, 1976:1900-11.
[18] Abbott, et al., 1994:178; Mehls, 1988:117; Reyher, 2002.

Cattlemen had little time to adjust before catastrophe struck again and compounded other problems. The winter spanning 1902 to 1903 was the worst since the Big Die Up, and even though ranchers ranged breeds of cattle suited for Colorado, starvation and severe weather killed thousands. As during the late 1880s, the plains were hit the hardest, but mountain ranches suffered as well. When the winter abated, ranchers found that cattle fetched relatively low prices, which limited their annual income. During the early 1900s, five meat packing companies including Swift & Company, Armour, Cudahy, Wilson, and Morris formed what was known as the Beef Trust and conspired to suppress the value of cattle more.[19]

Overall, the winter losses, increased regulation, and controlled prices culled more cattle outfits from the business and forced the industry into another transition. In the mountains, small outfits and sheep ranchers filled the void left by the large cattle companies, and they continued to adopt practices pioneered during the previous decades. Specifically, cattlemen concentrated further on ranch land, reduced their dependence on the open range, and balanced herd sizes with the carrying capacity of natural resources. They prepared for winter by irrigating and growing grass, grazing herds on the ranch, and adding dedicated land. They also drilled wells and excavated stock ponds to ensure the cattle water both on ranch land and the open range. In so doing, cattlemen successfully weathered the 1907 economic recession and enjoyed stability for nearly 20 years.[20]

Like cattlemen, farmers faced difficulty in the mountains after the late 1890s, but not to the same degree. The winter of 1902 and 1903 damaged fruit trees, and farmers endured crop failures in 1903 and 1904. In addition, the farms on marginal land in Eagle and Garfield counties suffered the same trend as enterprises farther north. In particular, poor agricultural practices and the arid climate contributed to soil loss, rendering entire fields infertile in as little as 15 years. In such cases, farmers had no choice but to move on.[21]

The Newlands Act of 1902 softened the problems presented by weather and land. The Act created an administration that built not only local irrigation systems, but also entire large-scale infrastructures. The Bureau of Reclamation administered to diversion, storage, and distribution networks, and in Colorado, the plains and the western slope received the most attention. As a result of this and existing irrigation systems maintained by local companies, Garfield and Mesa counties became one of the state's important agricultural centers and entered a fruit boom. The festival of Strawberry Days began in Glenwood Springs in 1898 and still continues as the oldest continuous town celebration in the state. Peaches were so successful along the Colorado River between New Castle and Silt that the area became known as Peach Valley. East of Glenwood Springs, Eagle and Garfield Counties enjoyed growth as well, and common crops included hay, plums, strawberries, apples grapes, and pears.[22]

Both ranching and farming enjoyed one last period of tranquility and prosperity during the latter half of the 1910s. World War I created the conditions for a sound national economy, and in the Colorado mountains, another revival of mining. The demand for agricultural products increased in part due to greater consumption on both local and national levels, and to supply Allied forces in Europe. The positive climate even encouraged some optimistic farmers to try commercial agriculture in mountain valleys previously considered too high in elevation. With advanced practices, adventurous farmers were producing potatoes, cabbage, grain, and hay by 1917 in North, Middle, and South parks, and the Blue River valley. The high country farmers were successful at first, but they learned some of the hard climatic lessons that the cattlemen

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[19] Simmons and ,,Simmons, 1999:14; Stone, 1918, V.1:513.

[20] Abbott, et al., 1994:172; Front Range Research Associates, 1991; Simmons and Simmons, 1999:13.

[21] Abbott, et al., 1994:176; Stone, 1918, V.1:514.

[22] Abbott, et al., 1994:179; Gulliford, 1983; Abbott, et al., 1994:181.

suffered in earlier years. The growing seasons were short, winter freezes deep, droughts unpredictable, and the thin soils prone to overuse.[23]

Despite the fluctuations and adjustments, ranching and farming continued to be among the most important industries along the Blue, Eagle, and Colorado rivers. These business sectors moderated the busts and declines of logging and mining and stabilized populations and economies within the corridor. Dillon's population changed little between the early 1900s and 1920 and remained at around 200 people. Eagle and Minturn grew by around 25 percent, and both populations increased from 400 and 480, respectively, to 600 and 620. Gypsum and Wolcott maintained populations of around 410 and 120.[24]

Ranching and Farming during the Depression, 1920-1940

Agriculture declined abruptly throughout Colorado in 1920 and then became mired in one of its longest periods of stagnation. The nation descended into a post-World War I depression that caused the value of and demand for many commodities to fall. In addition, the resource extraction industries in Colorado, especially mining, collapsed and wrecked the state's economy. As a result, the markets for agricultural products tightened and prices fell. As if these conditions were not bad enough, more droughts and severe winters reduced crop yields and cattle herds. Repeating a pattern, inadequate income and outstanding debt pushed ranchers and farmers into insolvency, and many left the business. Some farmers got by through subsistence, and many ranchers reduced their herds and focused on Denver as the principal market. A study conducted by the Colorado Agricultural College in Fort Collins between 1922 and 1928 characterized cattle ranches in the mountains of Colorado; as Table 6.1 illustrates, most were small, had relatively few cattle, relied on Denver as the principal market, and were saddled with debt.[25]

Table E 6.1: Characteristics of Cattle Ranches in the Colorado Mountains During the 1920s

Characteristic	**Statistic**
Herd Size	800 head (not including calves)
Ranch Area	860 acres to 55,000 acres
Average value of land	$9.65 per acre
Percent of ranches free of debt	5%
Months of labor per ranch	68-52
Average labor cost per month	$86 (including value of boarding)
Principal market for cattle	Denver (received approximately 60% of cattle sold)

Source: Burdick, R.T., Reinholt M., Klemmedson, G.S. *Bulletin 342: Cattle-Ranch Organization in the Mountains of Colorado* Colorado Experiment Station, Colorado Agricultural College, Fort Collins, CO, 1928.

The 1930s brought no relief to farmers and ranchers, and instead delivered them into greater adversity. At the end of 1929, the nation entered the Great Depression, the worst economic catastrophe in its history. In the agricultural industry, the markets for all goods collapsed, creditors recalled loans, businesses dissolved, and thousands of farms and ranches went bankrupt. Those farms and ranches that survived the first years of the Great Depression teetered due to volatile cattle and produce prices, supply exceeding demand, severe winters, and

[23] Simmons and Simmons, 1999:15; Stone, 1918, V.1:484.
[24] *Colorado Business Directory*, 1906:579; *Colorado Business Directory*, 1917:545; Schulze, 1976:1910-11; Schulze, 1976:1920-8.
[25] Burdick, Reinholt, and Klemmedson, 1928; Mehls, 1988:156; Simmons and Simmons, 1999:15.

debt. Conditions worsened in 1934 when the severest drought in a century swept the West. The plains became a wind-blown desert and water sources dried up in the mountains, ruining many marginal farms and ranches. Agriculture in the mountains was slightly better off than on the plains because water was available and local markets still existed, but some establishments were abandoned. Ranchers responded by forming cooperatives and consolidating their operations for stability. The Roosevelt administration initiated several programs that provided relief, but until water returned and the economy improved, farmers and ranchers operated at a subsistence level.

Ranching and Farming Declines in Importance, 1941-1955

Water did return and markets finally improved during the early 1940s. As early as 1939, the Roosevelt administration began mobilizing for World War II and directed attention to the agricultural industry. This fostered confidence in the industry, and when Roosevelt offered Britain direct support in the form of food, the markets for beef and produce awoke. When the United States entered the war at the end of 1941, food production became of utmost importance. In the Colorado mountains, farms and ranches returned to solvency, increased output, and contributed to the war effort. The number of operations, however, changed little. Mountain beef and produce may not have reached the battlefields, but it fed the workers who harvested the raw materials and assembled the machinery for war. Some by-product goods from the mountain ranches, such as leather and wool, did go directly to the military.

Agricultural markets remained sound after the war ended in 1945, and mountain ranches and farms continued business. But during the 1950s, ranching and farming in the I-70 Mountain Corridor began to decline again. Farming practices shifted to large-scale and chemical-intensive methods, which were not suited to the small operations typical of the corridor. Similarly, ranching evolved away from limited herds and range practices and over to massive feed lots that enclosed thousands of cattle. The farms and ranches in the corridor had an increasingly difficult time competing with corporate agriculture in economies of scale. In addition, another drought struck in 1953 and 1954. Many farmers and ranchers either quit, consolidated, or adapted by moving into niche markets. Farmers grew hay for feed lots and fruit for local food distributors, and ranchers started cattle for feed lots and raised specialty breeds.

Changes in land use, demographics, and water allocation were also major factors in the decline of ranching and farming in the I-70 Mountain Corridor after World War II. In terms of demography, cities and suburbs drew young people away from the rigors of agriculture, leaving ranchers and farmers with few qualified heirs to run their family operations. Affordable automobiles allowed unprecedented numbers of people to easily access the mountains. Many came as tourists, others purchased property, and all placed new demands on the land. South Park serves as an example of the rest of the corridor, and ranches and farms there were subdivided for development, recreation, and roads. South Park also exemplifies the impacts of water allocation. Cities such as Denver and Colorado Springs assumed the rights for key sources of water, either through purchase, condemnation, or eminent domain, leaving less for agriculture.[26]

Table 6.2 illustrates the trend that farming and ranching followed in the I-70 Mountain Corridor after World War II. The number of farms declined by more than 35 percent in Eagle, Garfield, and Summit counties and by more than 50 percent in Clear Creek County. By the mid-1950s, ranching and farming in the I-70 Mountain Corridor diminished to the point where the industry was no longer a significant entity. Today only a few active ranches remain along the corridor, primarily in Eagle and Garfield counties, and they are the stewards of what was once a major cultural and economic trend.

[26] Simmons and Simmons, 1999:18.

Table E 6.2: Farms in Clear Creek, Eagle, Garfield, and Summit Counties 1945 to 1960

County	1945	1950	1960
Clear Creek	23	26	10
Eagle	256	235	166
Garfield	831	781	532
Summit	47	42	34

Source: U.S. Census of Agriculture 1945, 1950, 1960.

Section E 7: History of Electric Power Generation, 1883-1970

Introduction

The I-70 Mountain Corridor is important in the history of electric power generation. A direct current hydrofacility built at the Kohinoor Mine near Lawson in 1883, and another at Georgetown in 1886, were among the earliest powerplants in the Rocky Mountains. A third plant erected at Georgetown in 1892 contributed to the development of alternating current when the technology was still experimental. The Shoshone Plant, one of Colorado's important generators, was built in Glenwood Canyon in 1907, and it anchored an advanced grid linking the entire central mountains between Glenwood Springs and Denver. The Shoshone Plant and several facilities at Georgetown are still in service, and the remnants of numerous other powerplants can be found throughout the I-70 Mountain Corridor.

The plants and their grids were significant for a variety of reasons. They changed the course of history within the corridor by replacing steam power and kerosene and gas lighting with more efficient, inexpensive energy. The new form of energy lowered the costs of industry and business and dramatically improved the quality of life among the corridor residents. Electricity ultimately allowed the residents and businesses to modernize at the same pace, and with the same technology, as elsewhere. The plants and grids also participated in the overall development of electrical machinery and systems. Through some of the powerplants, introduction of current types, and coordination of service, the power industry provided examples imitated by engineers elsewhere.

This section provides an overview of electrical generation in the corridor. Its history and contributions provide context for understanding existing historical resources and assessing their eligibility to the National Register of Historic Places.

Period of Significance, 1883-1970

In terms of historic resources in the I-70 Mountain Corridor, electrical generation was important during the Period of Significance 1883 through 1970. The Period began in 1883 when a mining company built the corridor's first powerplant near Lawson, Clear Creek County. Over time, the number and size of powerplants grew until the early 1910s when most were drawn into a unified grid connecting the corridor. The Central Colorado Power Company, succeeded by Public Service, assumed control over the grid and gradually culled duplicate and inefficient plants. The Period ended in 1970 when Public Service finished modernizing the grid, replacing many old components with new equipment. Vestiges and facility sites of the original system, however, still remain throughout the corridor.

The history of power generation in the corridor was not a single movement, but rather separate developments in three different regions. The extent of the electrical systems and their associated historic resources define the regions, which are Clear Creek County, Summit County; and the Eagle and Colorado rivers in Eagle County. The individual power industries were shaped by local events and people, had their own chronologies, and responded in their own way to broad trends in effect throughout the corridor. Because of this, power generation in each region was important during timeframes that were narrower than the overall Period of Significance. The timeframes of significance for each region are summarized separately below.

The importance of power generation and its historic resources can be summarized under three NRHP areas of significance. The areas of significance are Engineering, Industry, and Invention. Some of the areas of significance are more relevant in the corridor's regions than others. Depending on the region and historical trend, significance can range from local to statewide to national levels.

Clear Creek Drainage

Electric power was significant in Clear Creek County between 1883 and 1970. The corridor's first powerplant, and one of Colorado's earliest, went into service near Lawson in 1883. Three years later, another powerhouse was built at Georgetown, and it was in some ways more important. A mining company designed the Lawson plant primarily for in-house use, but investors dedicated the Georgetown facility for municipal service. The Georgetown facility then became the foundation for a primitive, subscription-based grid.

At first, service was limited to electric lighting in Georgetown. Investors wanted the mining industry throughout western Clear Creek valley to adopt electricity for mechanical application, but the technology was not yet ready. On the premise that improvements would shortly be realized, local experts built several powerplants anyway during the early 1890s. Further, they began experimenting with alternating current (AC), even though it was not well understood, because the current could be transmitted throughout the valley. The experiments proved successful where AC current was used for lighting and small motors, but the technology was still unable to do the heavy work of mining. Regardless, demand increased enough through the 1890s to foster several new powerplants and expansion of service.

By the late 1890s, manufacturers finally developed AC motors capable of meeting the needs of mining, which stimulated a small powerplant boom in Clear Creek valley. The valley's two principal electricity providers added several powerplants and enlarged their grids, and some of the important mines built their own generators primarily for in-house consumption. Clear Creek reached its peak during the 1900s in number, size, and diversity of electrical systems, and then it declined. The principal providers continued to expand until they saturated the local market, and at the same time, the demand contracted as mining slowed. When generating capacity exceeded demand, providers retired several plants and cut rates, which eroded their profitability. The rate reduction, however, reduced operating costs for mining companies and prolonged the industry as a significant force in the county.

In 1910, the Central Colorado Power Company completed its long-distance transmission line from the Shoshone Plant to Denver. The line passed through the county and tied into the principal providers, drawing them into a larger electrical grid. Because the providers were able to sell their surplus power to Central Colorado instead of retiring redundant plants, the power generation industry entered a low-level stability that lasted into the 1910s.

In its attempts at monopolizing the central mountains, Central Colorado, now the Colorado Power Company, began buying the providers in the county, already weakened by decreased local demand. Colorado Power closed several plants, assumed the market, and then merged with Public Service. Only one plant in Georgetown remained in service by the 1930s and it provided the county with most of its needs, while the Public Service grid contributed the remainder. In 1964, Public Service built the first new plant in the county since 1907 above Georgetown, and began modernizing the county's grid. By 1970, the provider replaced most major electrical facilities, leaving the Georgetown plant and smaller aspects unchanged.

Summit County

The timeframe of significance for electric power generation in northern Summit County spans 1898 through 1936. A mining boom began around the towns of Dillon and Frisco in 1898, bringing capital, expert engineers, and an increase in population. The principal mining companies understood that electricity could their lower operating costs and improve efficiency, and town residents wanted the energy for its modernity and lighting. Neither group of interests, however, had the money for a powerplant capable of centralized service. The owners of the Excelsior Mine then devised a plan in 1898 that made a powerplant economically feasible. They built a plant primarily for in-house use but offset the cost by selling service to the town of Frisco and other nearby mines. The strategy was a success, and the plant was the foundation for a small grid local to Frisco and its mines. Within a few more years, five more companies built as many powerplants, and two followed the Excelsior model and provided electricity to the communities of Dillon and Curtin. Even though the systems were independent, the mines and communities enjoyed electricity for the first time in the area's history.

In 1907, utility investors established the Summit County Power Company and bought the powerplant at Dillon to fulfill a twofold plan. One was to expand service throughout the county, which had no centralized service and only two small grids at Frisco and Breckenridge. The second was to sell surplus electricity to the Central Colorado Power Company once the large provider completed its main transmission line through the county.

Summit County Power tied into Central Colorado's line in 1909 and began selling the surplus electricity as planned. This relationship allowed Summit County Power to survive when the mining industry collapsed during the late 1910s. The rest of the powerplants in the area closed, leaving Frisco and Curtin without service.

Summit County Power was the county's only provider through the 1920s. Public Service bought Summit County Power in 1928, replaced the Dillon powerhouse with the new Summit plant, and held a monopoly over the county. Public Service then dismantled the Summit plant in 1936, ending the history of electrical generation in Summit County.

Eagle and Colorado River Valley

During timeframe of significance 1906 to 1970, electrical generation was historically important in the Eagle and Colorado River valleys. In 1906, investors organized the Central Colorado Power Company to build a massive electrical grid linking Glenwood Springs, Denver, and disparate electrical systems among the mining districts in between. The company finished the Shoshone plant on the Colorado River in 1909 and began service to Leadville and Summit County. During the next year, the company tied its system into those of other large providers in Denver and Boulder, creating Colorado's most extensive grid for the time.

The Central Colorado Power Company went bankrupt in 1913 and was reorganized as the Colorado Power Company without interruption of service. The Shoshone plant continued to perform as designed and contributed electricity to the unified grid, fostering growth and supporting industry throughout the central mountains and Front Range. In 1924, Colorado Power merged the Shoshone system and other assets with the Public Service Company, which became the principal energy provider in the northeast quarter of Colorado. Although the Shoshone plant is still in use by Xcel Energy, the timeframe of significance ended in 1970 with modernization of early grid components.

ELECTRIC POWER IN CLEAR CREEK COUNTY, 1883-1970

Table E 7.1: Clear Creek County Power Grid Chronology

Year	Company	Powerplant
1886	M.T. Morrell organized the *Electric Light Co.* as the first provider in Clear Creek County	Morrell built a small hydropower plant at Georgetown.
1886	*Green & Clear Lakes Co.* was organized to buy water rights for power and milling.	The company was exclusively interested in water, and became important later (see below)
1888	Morrell suspended service due to competition from the gas company.	Morrell moved his machinery to Golden.
1890	The *Georgetown Electric Co.* was the second provider in the county.	The company built a small DC hydropower plant in Georgetown.
1891	George Hall organized the *Electric Light & Power Co.* to serve Georgetown.	The company built the *George Hall plant* at the Hall Sampling Works.
	Investors formed a partnership to provide Idaho Springs with power. The organization became the *Seaton Mtn Electric Light, Heat & Power Co.* around 1895.	The company built the *Idaho Springs hydropower plant* at Idaho Springs.
1892	The *Georgetown Electric Co.* expanded service.	The company added an AC generator, now among the earliest AC plants in the state.
1893	The *United Light & Power Co.* formed by a merger of the *Georgetown Electric Co.*, the *Electric Light & Power Co.*, and the gas company in Georgetown.	The company operated two plants. It inherited the *George Hall plant* and built anew the *Georgetown hydropower plant* in Georgetown.
1895	Idaho Springs investors formalized their organization as the *Seaton Mtn Electric Light, Heat & Power Co.*	The company continued to run the *Idaho Springs hydropower plant* at Idaho Springs.
1899	*United Light & Power Co.* installed a three-phase AC system to Silver Plume.	The company added AC equipment to the *Georgetown hydropower plant* in Georgetown.
1900	The *United Light & Power Co.* expanded capacity.	The company built a new hydro and steam plant in Georgetown, and extended three-phase AC service to Lamartine. The company now operated the two *Georgetown plants* and the *George Hall plant*.
1901	The *Cascade Electric Co.* was organized to provide power to the Idaho Springs area.	Cascade Electric wholesaled power from United Light & Power's Lamartine substation.
	The *Seaton Mtn Electric Light, Heat & Power Co.* planned an extensive grid to serve the valley.	Seaton Mtn Electric bought and rebuilt the 1891 *Idaho Springs plant* and built the *Seaton Mtn hydropower plant* two miles below town.
1902	*United Light & Power Co*. continued to serve upper Clear Creek valley.	The company operated its Georgetown plant and bought *Green & Clear Lakes Co.* for water rights.
	Cascade Electric and *Seaton Mtn Electric* served lower Clear Creek valley.	Seaton Mtn operated two plants and bought the George Hall plant, which burned.
1906	The *United Hydro Electric Co.* formed by a merger of *United Light & Power Co.* and *Cascade Electric* for power, and *Green & Clear Lakes Co*. for water.	United Hydro Electric operated its Georgetown plant and served all upper Clear Creek valley and customers in lower valley.
	Seaton Mtn Electric Light, Heat & Power Co. continued service to the Idaho Springs area.	The company operated its *Idaho Springs* and *Seaton Mtn* plants.
	John J. White organized the *Two American Sisters Mining, Milling, Power & Electric Company*.	White built the *American Sisters AC plant* several miles north of Georgetown to provide power for the American Sisters Mine and central valley.
1907	White began service to mine and central valley	White operated the *American Sisters plant.*
1908	White began service to Empire.	White operated the *American Sisters plant.*

Table E 7.1, continued

Year	Company	Powerplant
1910	The *Central Colorado Power Co.* began service in Clear Creek County.	The company completed a transmission line to the county in 1910 and built the *Idaho Springs Substation* to distribute power.
	W.E. Renshaw leased the *American Sisters plant* near Georgetown.	Renshaw linked the plant with the Seaton Mtn system.
1911	The *Seaton Mtn Electric Light, Heat & Power Co.* was reorganized as the *Boston-Colorado Power & Water Co.*	The Boston-Colorado company operated the *Seaton Mtn plant* and probably closed the *Idaho Springs plant*.
1913	The *Colorado Power Co.* bought the bankrupt *Central Colorado Power Co.*	The *Idaho Springs Substation* continued to distribute power.
1915	The *American Sisters company* went bankrupt.	The plant was sold at auction.
1916	The *Boston-Colorado Power & Water Co.* was reorganized as the *Gem Electric Co.*	Gem Electric operated the *Seaton Mtn plant*.
	The *Colorado Power Co.* bought control over the *United Hydro Electric Co.* and maintained the company as a subsidiary.	United Hydro Electric maintained the Georgetown plant.
1917	The *Gem Electric Co.* was purchased by the *Colorado Power Co.* and dissolved.	The *Seaton Mnt plant* was closed.
1924	*Public Service Co.* merged with the *Colorado Power Co.*	The companies joined to increase capacity and diversify power sources.
	Public Service Co. absorbed *United Hydro Electric*.	The *Idaho Springs Substation* distributed power from the Shoshone plant. Public Service continued to operate the *Georgetown plant*. No other powerplants contributed to the grid.
1926	*C.L. Brown* enlarged the American Sisters plant.	American Sisters was known as the Pirie plant.
1964	*Public Service Co.* built Cabin Creek pump storage plant.	The plant was built, and it recycled water.

Table E 7.2: Independent Powerplants in Clear Creek County

Powerplant	Builder	Operators	Equipment	Built	Retired
Bertha Mill (Idaho Springs)	*Bertha Mining Co.*	1901-1904: *Bertha Mining Co.*	DC hydro	1901	1900s
Peck (at Empire)	Frank Peck	1900-1901: *Frank Peck* 1900s: *Empire Power & Light*	Dynamo, gas engine	1900	1900s
Kohinoor Mine (at Lawson)	*Kohinoor & Donaldson Consol. Mining Co.*	1883-1901: *Kohinoor & Donaldson*	DC hydro	1883	1910s
Newhouse Tunnel (Idaho Springs)	*Argo Mining, Drainage, Transportation & Tunnel Co.*	*Argo Mining, Drainage, Transportation & Tunnel Co.*	Unknown	1905	1910s
Stanley Mill (at Spanish Bar)	*Consolidated Stanley Mining Co.*	1890s-1902: *Consol. Stanley Mining Co.* 1902-1907: *Stanley Consol. Mining & Milling Co.* 1907-1920: *Stanley Mines Co.*	AC hydro	1890s	1910s
Sydney Tunnel			DC hydro	1906	1910s

Beginning of Clear Creek Electric Grid, 1883-1905

Electrical technology was new and in an experimental state during the first half of the 1880s. Thomas Edison had only recently pioneered its brilliance for lighting, and industrial applications were intriguing but still theoretical. As the decade progressed, however, electrical experts made rapid strides in generation, circuitry for lighting, and even practical motors capable of running small mechanical appliances. The technological improvements rendered electricity attractive and economically accessible to greater numbers of consumers. In the beginning, electricity was mostly used for municipal lighting, while industry only tepidly adopted it for motive power. Industry already had steam equipment in place, understood the technology well, and was unwilling to junk costly machinery for unproven motors. Further, motors were unable to run many types of machinery, and engineers were not versed in their mechanics, circuitry, and adaptation for motive power.

Electricity spread quickly in the eastern states as experts continued their improvements, but it took hold more slowly in the west, including Colorado. Municipalities had the greatest interest in electricity because it solved the chronic problem of poor lighting. During the 1880s, nearly all of Colorado was illuminated by kerosene lamps and candles, with gas lighting the only alternative. Although gas was far superior, high system costs limited the light source to the largest and wealthiest towns. Gas systems involved coal gasification plants, mountains of fuel coal, distribution plumbing, and maintenance staff. Thus, municipalities looked to electricity for its promise of better lighting to more consumers for less money.

Like gas systems, however, electric lighting was not without an initial investment. The new energy source depended on a powerplant, electrical equipment, transmission and distribution lines, and light bulbs, all of which cost tens of thousands of dollars. In Colorado, it was the mining communities and their resident investors that possessed the necessary capital, and they began building powerplants during late the 1880s and early 1890s. Most of the plants were small, hydroelectric facilities, and all generated direct current (DC).

Investors in the mining communities not only funded powerplants for lighting, but also to reduce high energy costs faced by their industry, so they hoped. Like most industrial sectors, mining ran on steam power, which was expensive in the mountains. Boilers and steam machinery had to be hauled to the mines, and a continuous supply of coal freighted up from the plains. Motors powered by locally generated electricity had the potential to reduce these needs by replacing some types of mining machinery. But the mining industry responded slowly. The initial system cost was too great for most companies, the technology was simply not ready for mining applications, and engineers had few if any design templates to follow. As a result, lighting continued to be the principal use of electricity through the late 1880s, but powerplant investors gambled that the technology would become practical for mining within a short time. Those in Clear Creek County were correct.

Based on the above trends, Georgetown was among the earliest mining towns in Colorado to receive an electrical system. In 1886, M.T. Morrell organized the Electric Light Company, built a tiny DC hydro plant supplement to the Clear Creek Mill, and began providing service at year's end. Even though the benefits of electricity were well known at the time, he met with only qualified success due to a significance oversight. The town already had a contract with Charles Fish's Georgetown Gas Company, and Fish was a well-entrenched local banker, mining investor, and community figure. Newcomer Morrell struggled against Fish for a year, trying to gain a foothold, but acceded and packed his plant to Golden in 1888. Although Fish commanded a strong local influence in favor of his gas system, a growing interest in electricity ensured his tenure was temporary. The tide turned in 1890 when local interests established the

Georgetown Electric Company and built a DC hydro plant around an existing waterwheel at the Litchfield Millsite. The following year, the Electric Light Company investors returned and finally gained a foothold through local mining magnate George W. Hall. Confident in the future of electricity, Hall provided capital, reorganized the firm as the Electric Light & Power Company, and donated a site adjacent to his Hall Sampling Works. The George Hall plant, Georgetown's second, provided necessary momentum for real growth in electric service.[1]

Although Georgetown enjoyed the status of possessing two powerplants by the early 1890s, a rarity among mountain communities, it conceded the title of first in the county to Lawson. During the early 1880s, Alfred Rickard was manager of the Kohinoor & Donaldson Consolidated Mining Company, a British company that owned several of the best mines in lower Clear Creek valley. The company operated the Champion Mine on Bellevue Mountain, the Donaldson on Kelly Mountain, and a mill at Spanish Bar. The company also worked the Kohinoor, at Lawson, which was the most advanced of the properties. Alfred, brother to famed mining engineer Thomas A. Rickard, was professionally trained and highly progressive, and he immediately saw the potential offered by electric lighting. Well in advance of the rest of the mining industry, he installed one of the earliest electrical plants in the Rocky Mountain states at the Kohinoor in 1883. The plant energized lighting circuits primarily in the mine buildings and possibly at stations underground and secondarily in Lawson. While the Kohinoor plant was the county's first, it was intended to be exclusively a company affair with Lawson as a serendipitous beneficiary. The two plants in Georgetown, in contrast, were the foundation for what became a countywide grid.[2]

But before the county could realize widespread service, electrical experts had to reconcile problems inherent in the technology, and especially current type. As designed, the Kohinoor plant and Georgetown's two power companies generated DC current for lighting and, they hoped, to run motors for industrial applications. DC current was the technological convention largely because all commercial generators, circuitry, and lights were designed to operate with that type of electricity. During the early 1890s, electrical engineers also experimented with alternating current (AC), and although superior in theory, limitations in AC equipment retarded its adoption. The principal problem the two currents posed to Georgetown interests was that neither was well suited for the specifics of mining. DC current was able to run the types of motors required for mining, but could only be transmitted several miles before suffering a debilitating power loss. Given this, DC current had to be used near the point of generation, while most mines were too far from the powerplants. In contrast, AC current could be transmitted for dozens of miles, but AC motors were unable to start and stop under load, which was a performance required by mining machinery. Most mining companies did not immediately embrace electricity as a result, reinforced by their investments in costly steam equipment.[3]

Despite these problems, the demand for electricity continued to grow in Clear Creek County during the early 1890s. The economy was sound because the high value of silver stimulated mining, and money was available for service subscriptions and equipment. The populations of Georgetown, Silver Plume, and Idaho Springs were sophisticated and wanted modern amenities such as lighting. Also, machine shops and mills close to the powerplants increasingly installed motors to power constantly rotating appliances. In response, investors, mostly local, moved to not only meet the immediate need, but also to prepare for the huge increase in demand that the AC current experts forecasted once they solved the problems with AC technology. The early 1890s then saw a small wave of electric power projects in the county.

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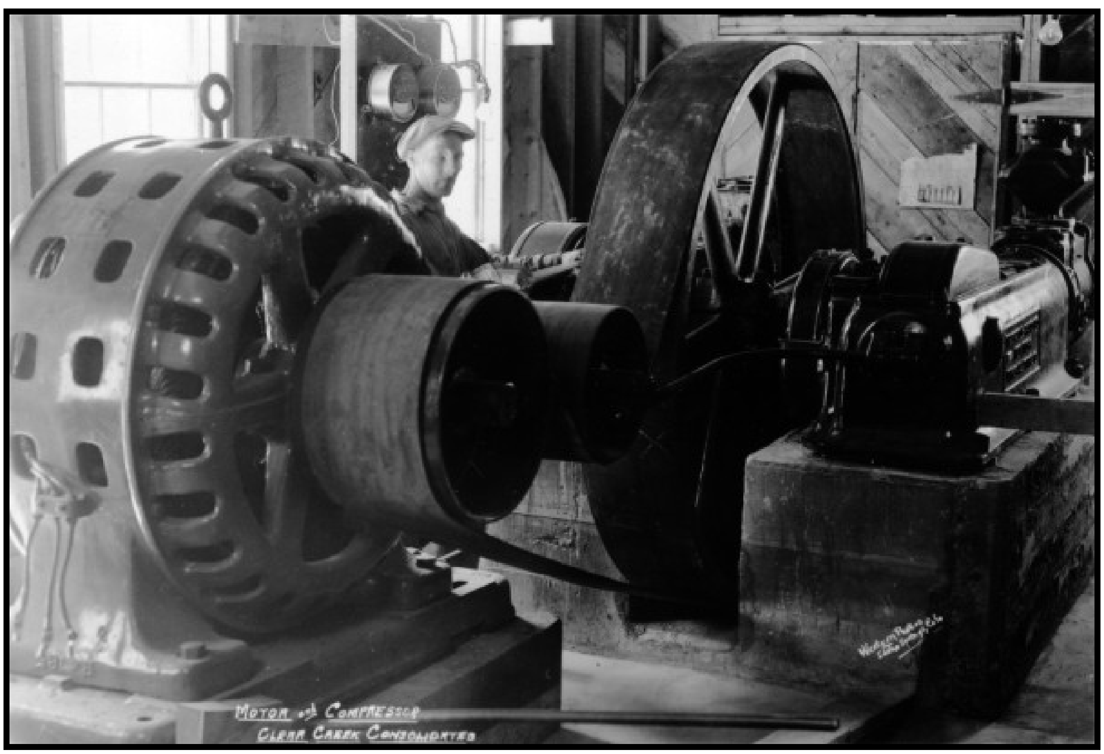
[1] *Colorado Miner* 7/31/86 p3 c1; *Georgetown Courier* 8/8/91 p3 c2; Gidlund, 1925; Leyendecker, et al., 2005:250.

[2] *Colorado Mining Directory*, 1883:147.

[3] Twitty, 2002:222.

Local investors at Idaho Springs built a combination hydropower and steam plant in 1891 to provide lower Clear Creek valley with electricity. The following year, the Georgetown Electric Company installed the county's first AC generators in its George Hall facility and began transmitting power to Silver Plume, at first for lighting. The plant's DC equipment still provided local service. Then, in 1893, Frederick P. Dewey brought Georgetown's utility companies together and established a primitive electrical grid. Dewey, Georgetown mining investor and cashier at the Bank of Clear Creek County, convinced the Electric Light & Power Company, the Georgetown Electric Company, and the Georgetown Gas Company to consolidate as the United Light & Power Company. The organization operated the George Hall facility, built another AC powerhouse in Georgetown, and may have continued to run the Litchfield plant. The emphasis on AC generation was significant because the technology was still in an experimental state, and engineers had little precedent to follow. Forecasting the adoption of AC current, Dewey and other investors arranged to provide service to both Silver Plume and the Lamartine Mine, around five miles east of Georgetown and leased by Lafayette Hanchett. The deal with Hanchett was both strategic and symbiotic. Hanchett enthusiastically supported United Light & Power's move toward AC power because he could reduce the use of steam and lower his operating expenses. At the same time, Dewey realized that a substation built at Lamartine could serve as a platform for service to the eastern portion of the valley. In preparation for the coming competition, W.E. Renshaw and other Idaho Springs investors formalized their partnership as the Seaton Mountain Electric Light, Heat & Power Company in 1895 or 1896.[4]



Mining companies gradually replaced old steam equipment with motorized versions, such as this belt-driven air compressor at the Clear Creek Consolidated operation near Idaho Springs. Motors saved companies the costs of installing boilers and feeding them with coal. Courtesy of Denver Public Library, X-63213.

[4] Dates of Original Construction, 1938; "Electricity in the Clear Creek County Mines"; *Georgetown Courier* 8/15/91 p3 c2; *Georgetown Courier* 4/14/93 p 3 c 5; History of the Company, 1935; Leyendecker, et al., 2005:250.

During the late 1890s and early 1900s, electrical equipment manufacturers finally made the breakthroughs necessary to render AC current practical for the mining industry. First, they began producing three-phase motors that could start and stop under load, and second, engineers developed an AC/DC converter that allowed a long-distance AC current to be used with DC motors. Most mining companies were still unwilling to junk their serviceable steam machinery merely because electricity was available. However, many outfits did switch as they replaced worn equipment, and others incorporated electricity when designing new surface facilities. Thus, demand amid the mines and mills began to soar, and the two providers and their technology were ready to meet the need.[5]

United Light & Power engaged in a campaign to increase its capacity and reliability, primarily for mining. The company extended a three-phase line to Silver Plume in 1899 and a similar one to Lamartine the following year. With demand higher than ever, United Light & Power built a new AC hydropower plant at Georgetown, with a steam engine on standby for winter freezes. The company then retired the George Hall plant and probably removed the machinery. In 1902, the company bought the Green & Clear Lake Company and began a campaign to dam anew or improve Murray, Silver Dollar, Naylor, Green, and Clear lakes to provide enough water for its powerhouses.[6]

In 1900, United Light & Power built this Alternating Current hydro plant in Georgetown as part of an expansion campaign to reach more mines in western Clear Creek drainage. The plant, among several others operated by the company, is still in operation. Courtesy of Denver Public Library, X-1029.

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[5] Twitty, 2002:23.

[6] Baker, 1927, V.2:725; Colorado Power Company, 1920:4; *Georgetown Courier* 11/18/99 p5 c2; *Georgetown Courier* 5/26/1900 p3 c4; Gidlund, 1925; "Mining News" *Mining Reporter* 10/25/1900 p253; *Report of the Director of the Mint*, 1900:116.

Lower Clear Creek valley, which lagged behind the Georgetown area during the 1890s, suddenly became the center of electrical development. W.L. Bush was well acquainted with the promise of electricity as operations manager for the Kohinoor & Donaldson Consolidated Mining Company, which still ran the small generator installed in 1883. He and Hanchett rallied other investors in the Cascade Electric Company in 1901 to wholesale electricity from United Light & Power. Through Cascade Electric, United Light & Power pursued Dewey's strategy of using the Lamartine substation as a platform for a line to Idaho Springs, enlarging its service area. Alarmed at the direct invasion of their territory, Renshaw and the Seaton Mountain Company principals moved to wire a grid almost as extensive as United Light & Power. The company purchased the 1891 Idaho Springs powerhouse and enlarged it with AC dynamos, built a second hydrofacility several miles east of town, and planned a third, massive station at the base of Floyd Hill. While this was never built, the company presented Cascade Electric with stiff competition and strung distribution lines to mines throughout the area.[7]

The largest of those mines were not interested in service because they already had their own generators. J.E. Bowden installed a small hydro plant at the Stanley Mine during the late 1890s, and the Bertha Gold Mining Company did likewise near its mine in Elkhorn Gulch in 1901. These two outfits curiously invested in costly new dynamos at a time when service from one of the common providers seemed inevitable. Several reasons may explain the odd decisions. First, the companies may have been unwilling to wait and see if service would actually be forthcoming, and second, the engineers relished the idea of having their own in-house plants. Last, the owners of the Stanley probably entertained the idea of establishing their own power company and went as far as providing service to some of Spanish Bar. The Kohinoor Company's initial relationship with Lawson served as a model.

It appears that in their competition, the two large power providers overlooked the town of Empire. Frank Peck, Empire pioneer and mine owner, built a small powerhouse around the waterwheel of an old mill and began service in 1900. The plant was so small that it could be driven by a gasoline engine, kept on standby for freezes. In 1901, Peck formalized his service as the Empire Power & Light Company and saw his customer base slowly grow as the stodgy mine owners in the area eventually gave in to electric power.[8]

With four powerplants in the county by 1902, not including Empire and the Stanley, Bertha, and Kohinoor mines, generation capacity threatened to exceed the customer base. The United Light & Power interests and Idaho Springs companies aggressively solicited contracts, saturated their immediate markets, and had nowhere else to go except into each other's territory. United Light & Power pushed the most, in part because capitalists involved in the Bank of Clear Creek County purchased the organization and wanted an immediate financial return. United Light & Power then tightened its relationship with Cascade Electric in 1902, enlarged its powerplant, and extended its territory to Black Hawk through the Cascade Electric system. This irked the Seaton Mountain Company, which then bought the idle George Hall plant to gain a foothold in United Light & Power territory. The company even applied to the Georgetown city council to provide service to Georgetown, but before Seaton Mountain was able to operate the George Hall plant, it mysteriously burned. The Seaton Mountain Company conceded defeat in the upper valley, although it continued to dominate the lower valley and provide electricity to some companies in the upper valley.[9]

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[7] Acquisitions and Divestitures, 1966; Gidlund, 1925; History of the Company, 1935; "Mining News" *Mining Reporter* 5/30/01 p361; *Silver Standard* 3/9/01 p3 c4.

[8] *Colorado Business Directory*, 1901:506; Harrison, 1964:391.

[9] Baker, 1927, V.2:725; Colorado Power Company, 1925:2; *Georgetown Courier* 9/6/02 p 1 c5; Gidlund, 1925; "Mining News" *Mining Reporter* 2/20/02 p211; "Mining News" *Mining Reporter* 6/19/02 p583; "Mining News" *Mining Reporter* 10/9/02 p296.

If at least eight powerplants were not enough in Clear Creek valley by the mid-1900s, mine owners added several facilities. Samuel Newhouse, funded by the Argo Mining, Drainage, Transportation & Tunnel Company, built a plant in 1905 to provide power to the Newhouse Tunnel and associated mines. The tunnel was around two miles long and served as a deep haulageway for complex and well-developed mines such as the Gem and Sun & Moon. The electric locomotives used to pull ore trains, the Gem's motorized equipment, various electric pumps, and lighting constituted such a demand that Newhouse decided his own generator was less costly than a subscription service.[10]

Newhouse was among the last mine operators to install an independent powerplant. As competition between the common providers increased, rates fell to the point where subscription was the most economical means of securing electricity. Further, the service was reliable and required no upfront capital. While the mine and mill operators benefited from the situation, United Power & Light, Cascade Electric, and the Seaton Mountain Company suffered from dwindling income. Such a trend was unsustainable, and the competition forced a significant adjustment in the county's power industry.

Consolidation and Contraction, 1906-1920

The economic outlook for Clear Creek County's power companies was not very bright in 1907. Due to competition and the loss of market shares to the independent plants built by mining outfits, profits for the industry declined. The Seaton Mountain Company closed its Idaho Springs steam plant and had no choice but to hold fast with its hydropower facility below town. The Georgetown interests responded to the conditions by consolidating the companies associated with their grid in an attempt to streamline overhead. F.P. Dewey, C.J. Nicholas, and Silver Plume investor C.S. Desch represented both United Light & Power and their water provider Green & Clear Lakes Company. W.L. Bush and Lafayette Hanchett represented Cascade Electric. All joined forces as the United Hydro Electric Company in 1906. With some refinancing and retirement of the Cascade plant, the new organization was better equipped to provide service in a profitable manner.[11]

Afterward, the power industry entered a period of temporary stability leading to slow decline. The problem was that the power industry depended on mining. While many companies increasingly replaced their worn steam equipment with electric appliances, the exhaustion of ore bodies forced a greater number of operations to suspend. In the upper valley, the closure of mines outpaced the replacement of machinery, and the demand there decreased. As a result, both the Seaton Mountain Company and United Hydro increasingly relied on the lower valley for income. Business was sufficient to keep the Seaton Mountain Company's single plant and all the United Hydro facilities running at capacity and support one last venture.

In 1906, John J. White became interested in the American Sisters Mine near Lawson and used this as a platform to support a power venture. He organized the Two American Sisters Mining, Milling, Power & Electric Company not only to generate electricity for the mine, but also to serve other customers in the central valley. It seems that in concentrating on Idaho Springs, Lamartine, Georgetown, and Silver Plume, the county's principal providers missed an important customer base in the central valley, which White captured. In 1907, he completed an AC powerplant on the Wilson & Cass millsite several miles north of and downstream from

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[10] "The Newhouse Tunnel" *Summit County Journal* 8/5/05 p2.

[11] Acquisitions and Divestitures, 1966; Baker, 1927, V.2:725; *Georgetown Courier* 1/20/06 p4 c5; Gidlund, 1925; "Mining News" *Mining Reporter* 2/1/06 p117; United Hydro Electric Company.

Georgetown and enlarged the reservoir there. Once White finished the plant in 1908, he made inroads in nearby Georgetown and began service in Empire.[12]

A combination of factors pushed the county's power industry into another major transition period beginning around 1910. The Central Colorado Power Company was completing one of the state's largest powerplants on the other side of the mountains, and it changed Clear Creek's grid. In 1906, the company began building a massive hydro plant at Shoshone Falls near Glenwood Springs (discussed below in the section on Shoshone) with the intent of extending a transmission line to Denver and providing power to the mining districts in between. The company planned to tie into systems in Leadville, Dillon, and Clear Creek County, provide power when needed, and otherwise buy surplus electricity for the market in Denver. The company finished its transmission line and installed a large substation in Idaho Springs during 1910. Central Colorado then tied into the United Hydro system, which was both an economic and moral blow to the Seaton Mountain Company. Not only did Central Colorado build the substation in Seaton Mountain's territory, but also Seaton Mountain now had to cooperate with United Hydro if the company wanted to contribute its surplus power to the grid.[13]

Although the Central Colorado Company presented competition and had the potential to depress rates further, its presence was not entirely troublesome for United Hydro and the Seaton Mountain Company. Central Colorado may have gained a few customers as they became available, but most stayed with their existing service arrangements. Should the market in the county contract further, however, Central Colorado was an insurance policy for United Hydro and the Seaton Mountain Company because it offered them income for their extra electricity.

The mining industry was the most important factor in forcing the county's electric providers into transition during the 1910s. After a spike in 1902, ore production gradually declined, and silver more so than gold. The mid-1910s saw a brief revival, but the continued closure of mines eroded the customer base of both the Seaton Mountain Company and United Hydro.

John J. White's Two American Sisters Company was the first of the county's providers to adjust. In 1910, he left the field and leased the American Sisters plant to Renshaw, who tied the system into the Seaton Mountain grid. But the Seaton Mountain Company was in trouble, and directors reorganized it as the Boston-Colorado Power & Water Company in 1911. Although Central Colorado never depended exclusively on Clear Creek County, the decline of mining there contributed to its bankruptcy in 1913. The decline was a symptom of a larger trend throughout Central Colorado's territory. The company predicated its finances on the state of mining during the mid-1900s and was unable to meet its debt obligations when the decline became widespread. During the year, Eastern investors purchased Central Colorado and reorganized it as the Colorado Power Company.[14]

When mining in Clear Creek enjoyed a brief revival due to World War I metals demands, the owners of Boston-Colorado Power and United Hydro took advantage of the brightening economic conditions. They suspected that the revival was only temporary and decided to dispose of their interests while the demand for power was stable. In 1916, Bush, Desche, Hanchett, and other capitalists sold United Hydro to the Colorado Power Company, which then maintained the organization as a subsidiary. At the same time, Norman B. Reed bought Boston-Colorado Power and reorganized it as the Gem Electric Company, presumably after the Gem Mine, the largest single consumer. Reed held the company for a year and then turned it over to

[12] *Georgetown Courier* 6/2/06 p1 c1; *Georgetown Courier* 6/8/07 p1 c1; *Georgetown Courier* 11/28/08 p5 c5.

[13] Acquisitions and Divestitures, 1966; Colorado Power Company, 1920:8; Dates of Original Construction, 1938.

[14] Acquisitions and Divestitures, 1966; "Current News" *Mining Science* 10/5/11 p331; *Georgetown Courier* 11/19/10 p5 c4; Gambrill, 1983:7; Gidlund, 1925; History of the Company, 1935; Stone, 1918, V.I:318.

the Colorado Power Company, as well. In 1918 or 1919, Colorado Power dissolved Gem Electric. Renshaw apparently left Boston-Colorado Power in 1915 and relinquished his lease on the American Sisters plant. No one filled the void, and the plant went bankrupt. Renshaw and Kansas investor C.L. Brown apparently bought the facility at foreclosure auction under the Clear Creek Power Company and found enough business to sustain the plant into the 1920s.[15]

The owners of the two large companies sold none too quickly, because during the early 1920s, the mining industry completely collapsed as metals prices tumbled and the nation entered an economic depression. Demand in the county reached an all-time low and offered room for only two providers, which were now the Colorado Power Company and the Clear Creek Power Company.

Public Service Company and the Last Major Changes, 1921-1964

During the 1920s, most of the Clear Creek County grid remained under one operator and saw few significant changes. Only five electrical facilities remained in service, including the Colorado Power Company substation at Idaho Springs, the Seaton Mountain facility below Idaho Springs, the hydro plant built at Georgetown in 1900, the American Sisters plant north of Georgetown, and a plant at Fall River. The latter plant was independent, not tied to the main grid, and too small to rouse much interest. The Idaho Springs substation continued to be a collection point because the county's generating capacity exceeded consumption, and the surplus electricity was diverted into the main grid at the substation.

During the 1920s, the Clear Creek facilities were completely absorbed by Colorado's largest power provider. In 1923, the Denver Gas & Electric Company and the Western Light & Power Company merged to form Public Service Company to increase generating capacity and achieve economies of scale. The following year, the Colorado Power Company joined this consolidation under the Public Service Company name and drew in its subsidiary United Hydro. This left the Fall River facility and C.L. Brown's American Sisters plant, also known as the Pirie plant, as the only independent facilities in the county. Public Service purchased them in 1927.[16]

During the Great Depression, the local power grid continued its role as underwriter of the local economy and directly supported an important mining revival. In 1934, President Franklin Roosevelt signed into law the Gold Reserve and Silver Purchase acts, which increased the values of both metals and stimulated mining throughout Colorado. Clear Creek County, and in particular the gold mines around Idaho Springs, joined the movement, and they relied primarily on electricity for operations. In 1933, on the eve of Roosevelt's two pieces of legislation, the American Sisters plant was struck by lightning and burned. During the rest of the depression and through World War II, Clear Creek County mines consumed all the power that the remaining Georgetown plant generated.[17]

Mining collapsed again following World War II, local demand for electricity fell, and the Georgetown plant reverted to providing surplus energy to Public Service for consumption elsewhere. The system remained unchanged until 1964, when Public Service built the Cabin Creek pump storage facility above Georgetown. The plant was unlike the others in that it was not a net energy contributor and instead merely manipulated Public Service's customer rate structure. During off-peak hours when rates were lowest, the plant consumed electricity and pumped water from a lower reservoir below the plant up to another storage pond above the plant.

[15] Acquisitions and Divestitures, 1966; *Georgetown Courier* 7/24/15 p1 c2; *Georgetown Courier* 7/1/16 p1 c3; Gidlund, 1925; History of the Company, 1935; McCrary, 1938:24; Stone, 1918, V.I:324; United Hydro Electric Company.

[16] Brief History of Public Service, 1931; Gambrill, 1983:7; *Georgetown Courier* 9/3/27 p1 c3; Gidlund, 1925.

[17] *Georgetown Courier* 8/12/33 p1 c4.

During peak hours, the system was reversed, and water flowed from the upper reservoir, through the plant, and collected in the lower pond. In so doing, the facility consumed power for pumping when the rates were low and returned it to Public Service when the rates were at their maximum. The Cabin Creek plant was the last significant addition made to Clear Creek County's system, although Public Service continued to improve its grid. During the 1960s, Public Service pursued a campaign of replacing aged equipment and facilities with modern versions, eventually bringing its grid close to today's system.[18]

ELECTRIC POWER IN SUMMIT COUNTY, 1898-1936

Table E 7.3: Ten Mile Power Grid Chronology

Year	Company	Powerplant
1898	Frank Wyborg reopened the Excelsior Mine at Frisco and installed a powerplant.	The *Excelsior powerplant* was installed near the Excelsior Mill and was Frisco's first provider.
1901	The *Oro Grande Mining Co.* built a hydropower plant north of Dillon.	The company built the AC *Dillon hydropower plant* to serve primarily its own needs and secondarily Dillon. The plant was the seed for a local grid.
1906	The *Central Colorado Power Co.* was established and began building its Shoshone Plant near Glenwood Springs.	No service to Summit County until 1909.
1907	The *Summit County Power Co.* was organized to provide power to Blue River and Ten Mile valley areas.	The company bought the Oro Grande *Dillon plant*.
1909	The *Summit County Power Co.* expanded.	The company enlarged and moved the Oro Grande *Dillon plant* 1 mile north of Dillon.
	The *Excelsior Mining, Milling & Electric Co.* expanded service.	The company enlarged its private plant and continued service to Frisco and surrounding mines.
	The *Central Colorado Power Co.* began providing service to the Ten Mile and Blue River valleys.	The company finished its Shoshone Plant and built the *Dillon Substation* to distribute power. The system was linked with the Dillon plant.
1913	The *Colorado Power Co.* bought the bankrupt *Central Colorado Power Co.*	Service continued uninterrupted.
Early 1920s	The *Excelsior Mining, Milling & Electric Co.* suspended service when it closed the Excelsior Mine.	The *Excelsior plant* stopped. Frisco contracted with the Colorado Power Co. and Summit County Power for service.
1924	*Public Service Co.* merged with the *Colorado Power Co.* to increase capacity and diversify power sources.	Service and relationship with Summit County Power remained unchanged.
1928	*Public Service Co.* bought *Summit County Power Co.*	Public Service Co. retired the *Dillon plant* and replaced it with the *Summit plant*.
1936	*Public Service Co.* reduced service.	The company closed the *Summit plant* and provided power from the *Dillon Substation* alone. The substation distributed power generated at Shoshone.

[18] Robertson, 1982:18.

Table E 7.4: Ten Mile Independent Powerplants

Powerplant	Builder	Equipment	Built	Retired	Operators
IXL Mine		DC hydropower	1899	1900s	
Admiral Tunnel Plant (Served mine and Wheeler).	*Admiral Mining Co.*	DC hydropower	1902	1900s	1902-1900s: *Admiral Mining Co.*
King Solomon Mine (Served mine)	James H. Myers	Unknown	1904	1910s	1904-1912: James H. Myers 1914-1922: various lessees
Curtin Plant (Served Curtin, Mary Verna Mine, North American Mine)	*Southwestern Brokerage Co.*	AC hydro, steam	1905	1910s	1905: *Southwestern Brokerage Co.* 1906-1912: *Mary Verna Mining Co.* 1912-1910s: various lessees

<u>Beginning of the Ten Mile and Dillon Electric Grid, 1898-1906</u>

Centralized powerplants were costly propositions and were economically feasible only under certain conditions. First, the demand for electricity had to be high enough. During the 1880s and 1890s, lighting constituted most of the demand, and industrial consumption was limited because technological problems retarded the transition from steam engines to electric motors. Second, the service area had to possess customers willing to pay a subscription fee.

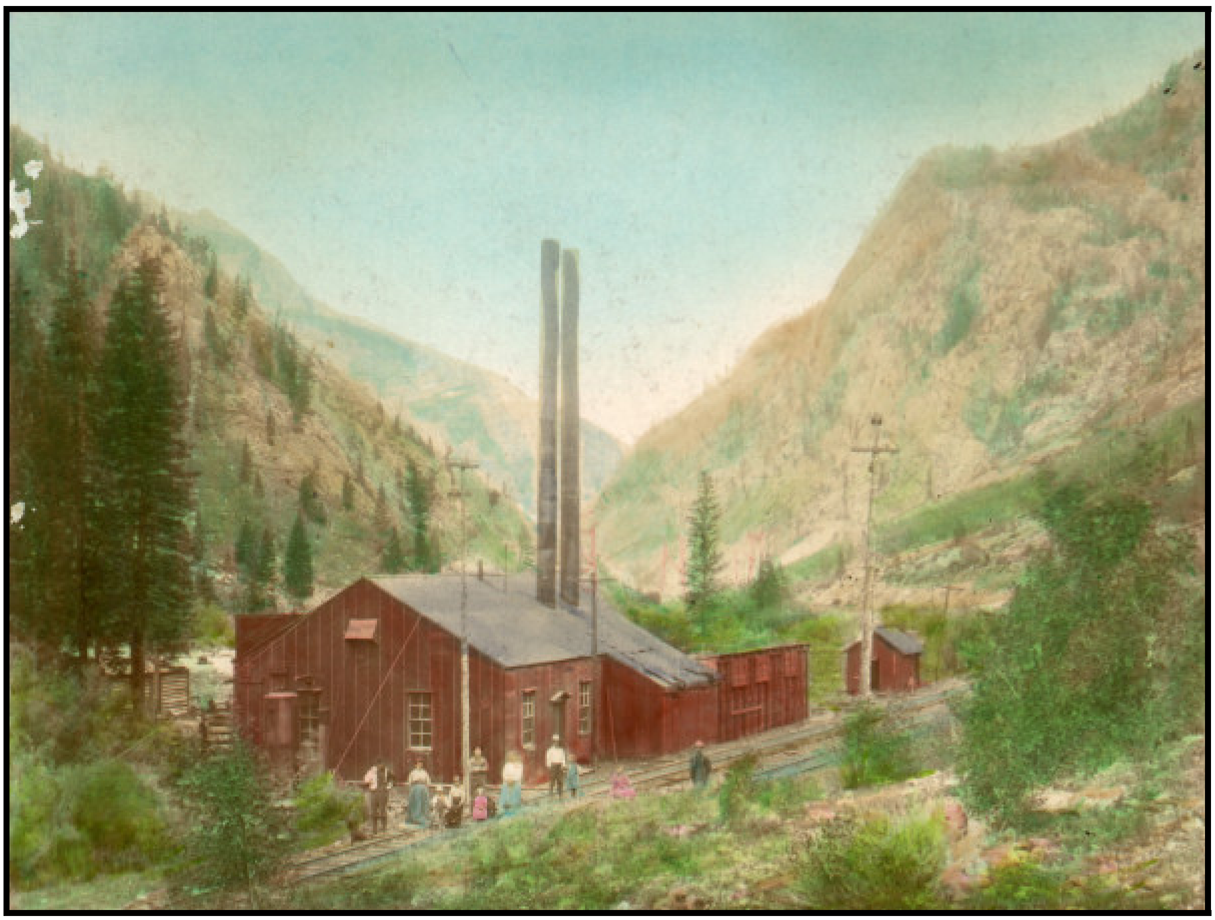
In the mountains, these two conditions existed primarily in substantial municipalities with large populations and sound economies. As discussed above, Clear Creek County, with its vibrant towns and mining industry, was an excellent model for service by a centralized plant. In contrast, the Ten Mile valley and Dillon area lacked the necessary conditions. The area featured a relatively small population, the economy was slow, and although silver mining was its foundation, the industry suffered from slipping metals prices during the late 1880s and the depression following the Silver Crash of 1893. Thus, the region inspired little confidence among capitalists in the financial success of centralized service.

During the late 1890s, the conditions began to change in the area. At that time, the national economy recovered, improvements in milling methods rendered complex and low-grade ore profitable to produce, and investors began to reopen idle mines and equip them with advanced technology. As a result, Colorado saw a major revival of its mining industry, and the Ten Mile valley in particular entered its most significant period of activity.

During the late 1890s, James H. Myers and other investors perceived the potential offered by the shallow and poorly developed mines, and they acquired the most promising properties. They funded a wave of improvements at the Etta, Excelsior, King Solomon, Mary Verna, North American, and other mines, and then began significant development. The managers, many of whom were trained engineers, understood that electricity had great potential to lower operating costs and improve working conditions. The problem they faced, however, was that because the area lacked electric service, the mining companies would have to generate their own if they wished to employ electrical machinery. A powerplant, no matter how small, was too costly for in-house use alone, and so nearly all the companies relegated themselves to steam equipment and kerosene lamps.

Engineer A.B. Ogden, who managed the Excelsior Mine, devised a clever solution to the economic problem. Frank B. Wyborg, New York City investor, purchased the Excelsior Mine, which included a mill near Frisco, and hired Ogden in 1898 to bring it into production. Ogden recommended electrification, and to offset the cost, secured a contract with Frisco to provide the town with surplus power for lighting. The deal was of enormous benefit to both parties because the Excelsior Mine and Frisco received power from a plant that neither could otherwise afford. The party that owned both the Recen and IXL mines, also near Frisco, probably hoped to secure a similar arrangement and finance its own DC hydropower plant. Either through a cooperative arrangement or alone, the investors came up with the capital necessary for a tiny powerplant, installed it near the Recen Mine, and probably provided power to other, nearby operations.[19]

On the Blue River, the town of Dillon and the Oro Grande Mining Company came to an agreement similar to that between Frisco and Ogden. Oro Grande operated a massive hydraulic placer mine west of Dillon and required power both for lighting and large pumps. In 1899, manager and president George E. West commissioned a hydropower plant immediately north of Dillon and secured a contract to provide the town with his surplus power. The plant, a small DC facility, was more important than West realized because it became the seed of a localized power grid.[20]



During the 1900s, the Dillon and Frisco area lacked a coordinated grid. Instead, several mining companies built their own powerhouses to provide electricity for themselves and associated communities. The Mary Verna Powerhouse generated for the Mary Verna and North American mines, and the settlement of Curtin. The powerhouse in the 1900s photo is a typical steam plant of the era. Courtesy of Denver Public Library, X-62730.

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[19] *Summit County Journal* 12/3/98 p1; *Summit County Journal* 12/10/98 p1; *Summit County Journal* 1/21/99 p1; *Summit County Journal* 4/15/99 p1; *Summit County Journal* 10/14/99 p1.

[20] *Summit County Journal* 8/19/99 p4.

During the next five years, three more mining companies in the Ten Mile valley built their own powerplants in the absence of centralized service. The owners of the Admiral Tunnel, near Wheeler, built a hydropower plant in 1902 and lured away the Excelsior electrician to oversee its operation. James H. Myers, who lived in Frisco and developed the most important properties, fronted the capital for the other two facilities. One was a generator installed at the King Solomon Tunnel in 1904. The other, second in importance only to the Excelsior plant, went up at the settlement of Curtin in Ten Mile valley under supervision of engineer D.H. Lawrence. The plant, a DC hydrofacility with steam backup, provided lighting at Curtin and ran compressors and other machinery at the Mary Verna and the North American mines.[21]

By 1906, the Ten Mile valley and Dillon area hosted six independent powerplants built by mining companies largely for in-house use. Frisco, Dillon, and Curtin featured primitive electrical systems energized on a subscription basis by three of the companies, and none of the systems were tied together. While six plants at as many mines, and lighting in the three settlements, was certainly a major achievement, such arrangements presented problems in terms of long-term service. The towns were secondary in priority because the mining companies built the powerplants to serve their own needs first and merely sold the surplus power. As the lower priority, the towns found the service unreliable at times due to brownouts, freezes of hydro water lines, and temporary suspension for maintenance. Last, the communities could expect the powerplants to operate only as long as the mining companies were solvent, and there were no long-term plans to ensure service once the companies closed down. Thus, residents understood that service was temporary at best, leaving opportunity for centralized service.

Centralized Electrical Service, 1907-1920

Frisco, Dillon, and Curtin enjoyed electricity only a short time before the problems forecasted by leading community figures came to the fore. In 1907, a severe economic recession impacted the mining industry and forced many operations to suspend. The Excelsior and Mary Verna mines continued ore production and ran their generators, but the Oro Grande Mining Company sold its mine to another organization. While Frisco's service was unaffected by the recession, local business interests sought some level of stability by organizing the Frisco Light & Power Company to ensure independent operation of the Excelsior plant. Curtin also saw no changes, although its stability was uncertain because the settlement was strictly a function of James H. Myers and his adjacent mines. Dillon faced the greatest threat, and service there may have been interrupted when the Oro Grande Company ceased work.

When the Oro Grande Company offered its assets for sale, a consortium of Denver utility investors saw the powerplant as a foundation for a grand scheme larger than service to Dillon alone. In 1907, F.W. Frueauff, W.J. Parker, C.A.F. Porrine, and C.W. Stearne organized the Summit County Power Company, bought the powerplant, and prepared for a multifaceted venture. All the investors had extensive backgrounds in large utilities, which clearly suggested that the Oro Grande plant was destined for a significant role in a large project. Parker was manager of the Denver Gas & Electric Company and president of the Northern Colorado Power Company, Frueauff acted as vice-president of Denver Gas & Electric, and Stearne served as vice-president of the Arapahoe Light & Power Company.[22]

At first, it appeared that the investors planned on wiring much of Summit County for power. Until 1907, most of the county lacked electricity, and apart from Dillon and Frisco, Breckenridge was the only other town with service. During the year, Summit County Power

[21] *Breckenridge Bulletin* 12/3/04 p1; *Breckenridge Bulletin* 10/28/05 p1; *Summit County Journal* 11/15/02 p1.

[22] *Breckenridge Bulletin* 10/5/07 p1; *Summit County Journal* 8/1/08 p1.

moved the Oro Grande plant to a new site around one mile north of Dillon, increased its capacity, and probably converted the current to AC. Then, confirmations that the Central Colorado Power Company was building its massive Shoshone facility and a major line to Denver revealed the larger purpose of the Dillon plant. In particular, Summit County Power planned on not only serving Summit County, but also linking with the Shoshone system and selling surplus power to Central Colorado. Ultimately, the Parker group also hoped to sell Summit County Power in entirety to Central Colorado at a high price once the local system proved successful. No one in the county objected because they would realize a widespread and reliable grid.[23]

While the Parker group did not sell their company to Central Colorado, they realized the rest of their plan over the course of several years. During 1908, Summit County Power strung distribution lines to most of the mining districts, including Breckenridge, and connected with Frisco Light & Power. In 1909, the company tied into Central Colorado's transmission line and began selling the surplus electricity as forecasted. Summit County Power built a large concrete substation at Dillon, which was now an important node on a grid that extended from Glenwood Springs to Denver and served nearly all the mining communities in between. The grid was Colorado's largest at the time, and the Dillon substation became the distribution hub for the Summit County region.[24]

Summit County Power proved to be a profitable venture and continued to serve the region through the 1910s. The only major change was the financial overextension of Central Colorado, its bankruptcy in 1913, and immediate sale to the Colorado Power Company. Service in Summit County and the relationship with Summit County Power were unaffected. Demand for electricity was sound because the mining industry was relatively stabile, maintained a population in the region, and the large companies replaced aged steam equipment with motorized apparatuses. The demand for electricity even grew somewhat during the World War I revival of 1915 to 1918. In response, the owners of the Excelsior Mine reorganized their operation as the Excelsior Mining, Milling & Electric Company to take over Frisco service, and all the electricity generated by Summit County Power went to customers with no surplus left over.[25]

In 1920, these conditions changed abruptly. At that time, the nation entered an economic depression and metals prices collapsed, which ruined the mining industry in Summit County. As can be assumed, the demand for power decreased significantly, which impacted Summit County Power and the Frisco interests differently. Nearly all the Frisco mines closed, including the Excelsior, and without the mine's generator running, the area went dark. The Frisco system was still linked to Summit County Power and the town could have switched service, but most of the population left and revenue was insufficient to justify maintenance of the system. Summit County Power, on the other hand, remained solvent and continued providing power to Dillon, Breckenridge, and the small hamlets in between. The arrangement that the company had with the Colorado Power Company was the most important factor, and Summit County Power returned to being a net contributor to the Colorado Power Company grid.

Public Service Company and the Last Major Changes, 1921-1936

In the decade following the 1920 collapse of mining and electrical demand, the system in the Dillon area was operated by the Summit County Power Company and saw few significant changes. For those residents and businesses that stayed in the area following the abrupt collapse of mining, the availability of electricity continued to be very important. The generating capacity

23 Baker, 1927, V.2:727; *Breckenridge Bulletin* 10/5/07 p1; *Breckenridge Bulletin* 6/29/07 p1.

24 Colorado Power Company, 1920:7; Dates of Original Construction, 1938; *Summit County Journal* 8/14/09 p1.

25 Colorado Mine Inspectors' Reports, Summit County: Excelsior, King Solomon.

of Summit County Power far exceeded the regional consumption, and the surplus electricity was diverted into the main grid at the Dillon substation.

While Summit Count Power's relationship with the region remained the same, the company's ties to the greater grid changed. In 1923, the Denver Gas & Electric Company and the Western Light & Power Company merged to form Public Service Company and increased generating capacity in economies of scale. The following year, the Colorado Power Company joined this consolidation under the Public Service Company name. Summit County Power now sold its power to Public Service, which began a campaign to purchase the independent generators tied to its grid. In 1928, Public Service targeted Summit County Power, purchased the company, and dissolved it. Public Service then closed the Dillon plant, dismantled the machinery, and incorporated it into the larger Summit facility built nearby. Because little local demand existed, Public Service planned the plant as a contributor to its overall system.[26]

During the Great Depression, the local power grid resumed a critical role as underwriter of the local economy, and specifically the mining industry. In 1934, President Franklin Roosevelt signed into law the Gold Reserve and Silver Purchase acts, which increased the values of both metals and stimulated a revival of mining throughout Colorado. Summit County, and in particular the gold mines around Breckenridge, joined the movement, and they relied primarily on electricity for operations. For several years, the Summit plant then furnished the electricity that literally powered the county's mining revival. Public Service determined that the facility was unnecessary and probably not cost-effective, and by 1936, suspended its operation. Summit County no longer had a dedicated powerplant, although the region was not without service because the Dillon substation continued to distribute power generated elsewhere. By closing the Summit plant, Public Service brought to an end the last vestige of the Dillon area's local power industry.[27]

SHOSHONE PLANT AND COLORADO RIVER VALLEY, 1906-1970

Central Colorado Power Company Builds the Shoshone Plant, 1906-1909

In terms of the history of electric power in Colorado, the Shoshone plant was a relatively late development. It was, however, one of the largest energy undertakings of its time in the state, and is still an important generation facility. The history of the plant began during the 1890s with visionary engineers Henry Hine and Leonard E. Curtis. Even though electrical technology was in a developmental state, they sought to imitate the massive generation projects in the heavily industrialized East and began studying how to harness the Colorado River for hydropower. Hine and Curtis were well aware that they faced major challenges in both financing and physical conditions, and the partners knew that planning alone would take years.

[26] Brief History of Public Service, 1931; McCrary, 1938:28.
[27] McCrary, 1938:28.

Table E 7.5: Eagle River Valley Power Grid Chronology

Year	Company	Powerplant
1886	The town of Glenwood Springs built a hydropower plant.	The *Glenwood Springs plant* served the town and its resorts.
1890s	Leonard E. Curtis and Henry Hine began studies of harnessing the Colorado River for power.	No plants built.
1903	The *Colorado Power & Irrigation Co.* was organized to develop a hydropower plant at Shoshone Falls.	The companies built no plants but obtained water rights and plant sites, possibly for speculation.
	The *Grand River Power & Transportation Co.* was organized to develop a hydropower plant at Shoshone Falls.	
	The *New Century Light & Power Co.* was organized to develop a hydropower plant at Shoshone Falls.	
1906	Curtis and Hine organized the *Central Colorado Power Co.* and absorbed the *Grand River Power* and *New Century Light* companies for water rights and plant sites.	The company built a *temporary hydropower plant* at Shoshone Falls and began building the main plant nearby. The company also established the temporary workers' camp of Shoshone.
1909	The *Central Colorado Power Co.* began service.	The company finished its *Shoshone Plant* and built a transmission line through Red Cliff and Leadville to Dillon. The company provided service throughout Lake and Summit counties.
1910	The *Central Colorado Power Co.* began service to Clear Creek County and Denver.	The company completed its transmission line from Dillon to Denver in 1910 and built the *Idaho Springs Substation* to distribute power in Clear Creek County. The company tied into existing systems in Denver and Boulder.
1913	The *Colorado Power Co.* bought the bankrupt *Central Colorado Power Co.*	Service continued uninterrupted.
1916	The *Colorado Power Co.* bought control over the *United Hydro Electric Co.*	*United Hydro Electric* provided power throughout Clear Creek County. Service in Clear Creek County continued uninterrupted.
1917	The *Colorado Power Co.* purchased and absorbed the *Gem Electric Co.* which provided power to the Idaho Springs area.	The *Colorado Power Co.* closed the *Gem Electric Co.* plant.
1923	The *Western Light & Power Co.* and *Denver Gas & Electric Co.* merged to form *Public Service Co.*	*Public Service* served the Denver area and northeast Colorado.
1923	The Eagle River Electric Co. began providing service to Eagle, Gypsum, and Eckley.	
1924	*Public Service Co.* merged with the *Colorado Power Co.* to increase capacity and diversify power sources.	The companies consolidated their systems.
	Public Service Co. absorbed *United Hydro Electric Co.*	Service in Clear Creek County remained unchanged. *Public Service Co.* continued to operate the three Georgetown plants.
1928	*Public Service Co.* bought *Summit County Power Co.*	Public Service Co. retired the *Dillon plant* and replaced it with the *Summit plant*.
1936	*Public Service Co.* reduced service to Summit County.	The company closed the *Summit plant* and provided power from the *Dillon Substation* alone. The substation distributed power generated at Shoshone.
1940s-1950s	*Public Service Co.* served Pitkin, Eagle, Lake, Summit, Clear Creek, Gilpin counties.	*Public Service Co.* operated the Shoshone, Georgetown, Boulder, and Denver plants.
1964	*Public Service Co.* built the *Cabin Creek hydropower plant* at Georgetown.	

Hine and Curtis were not the only electrical experts who thought of diverting the Colorado River for power. Three groups of investors made their intentions known by organizing companies in 1903. Leadville mining investor Albert Sherwin, Glenwood Springs businessman E.E. Lucas, and others organized the Colorado Power & Irrigation Company to develop a hydro-plant at Shoshone Falls east of Glenwood Springs. A series of three reservoirs on tributary drainages would ensure a supply of water, and a transmission line was supposed to carry power primarily to Leadville, which had a very limited electrical system at the time. Sherwin had a direct interest in the project because his mines would benefit, and Lucas may have brought experience to the company from the Glenwood Springs powerplant, built in 1886. The other entities were the Grand River Power & Transportation Company and the New Century Light & Power Company.[28]

Sherwin and Lucas' firm was legitimately interested in building a powerplant, while the latter two companies were probably speculative and sought water rights and plant sites for resale. All, however, lacked the expertise and practicality of Hine and Curtis, who had concluded that a massive powerplant was feasible and then designed a practical system. Ready to build, Hine and Curtis interested a lengthy list of investors in both the East and Colorado, who organized the Central Colorado Power Company at the end of 1906. The investors included Copley Amory, George R. Bucknam, T.P. Hanscom, J.A. Hayes, Myron T. Herrick, Horace G. Lunt, Charles A. MacNeill, J.R. McKee, David Moffat, George B. Tripp, and Orlando B. Wilcox. David Moffat was the most important individual among the Colorado group and represented a large and wealthy investment syndicate, whose mines in Summit and Lake Counties would benefit from inexpensive power. Myron Herrick was particularly significant among the eastern investors because he had direct experience with electrical projects and had access to money.[29]

And money was crucial, because Hine and Curtis' massive project would be very costly. According to calculations, the hydropower plant at Shoshone Falls was intended to be merely a temporary facility. In particular, the plan included installing a small, pilot generator at the falls to provide power for building the Shoshone plant a short distance downstream. The Shoshone plant in turn was supposed to provide limited service to mining districts while Central Colorado completed two permanent plants at Glenwood Springs and in Gore Canyon. A dam was to divert the Colorado River into a 12 mile tunnel that provided some water to Shoshone and sent the rest to a reservoir on Grizzly Creek for the Glenwood Springs plant. The Williams Fork and two other tributaries were to be dammed to ensure the Gore Canyon plant with enough water for its continuous operation. The company planned to string a high-voltage transmission line to Denver and connect with providers already there and then follow a circuitous route through the principal mining districts in between to maximize the customer base. Further, the company knew that it could unify the grids in Leadville, Summit County, and Clear Creek County and siphon surplus electricity from their powerplants, when available.[30]

It was difficult to conclude which aspect of the project was more complicated and fraught with potential trouble. The hydraulic engineering was daunting and required damming one of the largest rivers in the Rocky Mountains, boring one of the longest tunnels in Colorado, and creating a high-volume water system in rugged conditions. On the other hand, the electrical engineering had to coordinate not only the company's three plants on the river, but also with primitive grids in the project area. Each grid had its own voltage, amperage, type of current, and equipment. Transformers and other appliances had to interface with Central Colorado's transmission line, and this required the application of electrical theory.

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[28] "Colorado Power Company Formed"; Gidlund, 1925.

[29] History of the Company, 1935; Stone, 1918, V.I:317; *Summit County Journal* 11/16/06 p2.

[30] "Comprehensive Plans"; Gambrill, 1983:13; History of the Company, 1935; Stone, 1918, V.I:317.

At the end of 1906, Hine, Curtis, and investors moved to bring the plan into fruition. Central Colorado absorbed the Grand River and New Century companies for their sites and water rights, and they filed a petition to assume the water rights for all the Colorado River flowing into Shoshone Falls specifically for generation and irrigation. Sherwin and Leadville associates established the Leadville Light & Power Company to consolidate that mining town's grid, including the Leadville Gas & Electric Company and its DC current hydrofacility with the steam AC current plant at the Yak Tunnel. When the Colorado River slowed during the fall, Central Colorado dispatched workers to build the preparatory infrastructure for the Shoshone plant. In particular, they completed the pilot hydro plant at the falls and erected the company camp of Shoshone near the Shoshone plant site.[31]

In 1906, the Central Colorado Power Company erected the instant settlement of Shoshone on the left (south) side of the Colorado River to house workers building a massive hydro plant on the right side. The camp was no longer needed after they finished in 1911, and company dismantled it. Courtesy of Denver Public Library, MCC.3804.

Central Colorado spared little expense providing for its workers. The camp of Shoshone had apartments for families, boardinghouses for single men, individual houses for managers and superintendents, a dining hall, commissary, school, doctor, and post office. Some of the

[31] Gambrill, 1983:3, 6; Gidlund, 1925.

buildings and a freight terminal lay on the Denver & Rio Grande Railroad on the south side of the river, and a bridge and cable tramway crossed to the main portion on the north side. The Taylor State Road graded from Glenwood Springs in 1899 provided a link with the outside world, but the railroad had to deliver nearly all supplies because the road was rough.[32]

During the winter of 1907, while the river was still low, workers began building the diversion dam above the falls. At the same time, the company hired miners to bore the tunnel and other workers who did the earthwork for the plant and water system. The tunnel was to be two miles long, start at the falls, end above the Shoshone plant site, and parallel the north side of the canyon. To expedite progress, eight access adits were bored into the canyon wall, and from within these, teams of miners turned 90 degrees and simultaneously bored toward each other. The various segments would then be linked to form the two-mile tunnel. Activity on the system was not restricted only to the canyon. During 1907, workers successfully hung the transmission line from the pilot powerplant through Red Cliff to Leadville and as far as Summit County. The transmission towers were steel and the wire consisted of copper strands woven around a hemp center for tensile strength. Much of the power that the pilot plant generated was consumed by Central Colorado, with the rest sent to Leadville.[33]

The Shoshone Dam, on the Colorado River several miles above the powerhouse, was an engineering achievement. Steel gates known as bear traps could be raised or lowered, depending on river flow, to ensure diversion into the power plant's intake tunnel in the cliff on the left side. Courtesy of Denver Public Library, MCC-3850.

[32] Bauer, et al., 1990:131; Gambrill, 1983:6.
[33] Brief History of Public Service, 1931; Gambrill, 1983:3-5; Robertson, 1982:11.

In the thick of construction, Central Colorado suffered a severe blow that forced the investors to rethink their master plan. In 1907, the nation fell into a sharp recession that tightened credit and ruined several banking institutions in the East. The Knickerbocker Trust Company of New York, which meted out loan funds to Central Colorado, teetered on the brink of collapse and was forced to suspend its payments. Central Colorado, as a result, ran out of money, halted the entire project, and laid off 600 employees. In 1908, Knickerbocker extracted itself from financial disaster and resumed the loan payments, but its investors reduced the amount of capital available to Central Colorado. Thus, Hine, Curtis, and associates had to cancel the most significant aspects of their master plan and settle for a lesser version. Gone were the massive Glenwood Springs and Gore Canyon plants, the reservoirs, and the 12 mile tunnel. The Shoshone plant, the two mile tunnel, and its diversion dam became the company's principal project.[34]

The Shoshone powerhouse, under construction in 1908, became the western terminus of a grid linking most of the principal towns in the central mountains. Water diverted from a dam upriver flowed through the tunnel in the cliff above, down through the penstocks, and into the building. Although modified, the system is still in operation today. Courtesy of Denver Public Library, MCC-3397.

[34] History of the Company, 1935; "Power Company to Rush Work"; *Summit County Journal* 12/28/07 p1.

In 1909, everything but the transmission line to Denver was finished, and Central Colorado prepared to start service. During May, Superintendent Eldridge opened the headgate for the water tunnel and admitted a flow of 125 cubic feet per second to test the machinery. In a ceremony one month later, Lieutenant Governor Fitzgerald pushed a button that opened the tunnel gates for their full flow of 1,250 cubic feet per second, formally beginning service. At a cost of $10,005,000, the powerplant generated 10,000 kilowatts of AC current transmitted in 100,000 volts, which was equivalent to 20,000 horsepower. For context, the motors used in the mining industry were typically 25 to 75 horsepower, and each mine or mill usually employed only one or two. The tunnel was 12 by 17 feet in-the-clear, the powerplant was a steel frame building sided with corrugated steel, and two turbines within generated the electricity. Each had a penstock 9 feet in diameter with a fall of 165 feet. The voltage was very unusual and the second highest in the nation, exceeded only by a powerplant in Michigan. The voltage was high to ensure transmission across the 150 miles to Denver, but this complicated unification of the Central Colorado system with those in Lake, Summit, and Clear Creek counties as predicted. Central Colorado also laid claim to another record in terms of high figures, which was the altitude of the line. The wires crossed several passes, including Argentine between Summit and Clear Creek counties, and physical conditions there presented problems no engineers in the greater power industry had yet faced. Hurricane-force winds were the worst of the problems and regularly parted the power lines. To study what was happening, Central Colorado engineers installed wind velocity gauges, and these were swept away and destroyed after registering winds of 165 miles per hour. In response to the conditions, the company deviated from the convention of using the copper wires and replaced them with hardened steel. Overall, the system was a success, and Central Colorado completed the largest power system in Colorado, if not the Rocky Mountains, for the time.[35]

The Shoshone Plant Changes Ownership, 1910-1924

After the Central Colorado Power Company operated the Shoshone plant for a year, it was clear that the system was a technological success. The company made a few adjustments to the associated infrastructure but did not change the powerhouse or circuitry. With construction finished and the large workforce gone, the company disassembled the camp of Shoshone and cancelled the post office. The pilot plant at the falls was also dismantled, but the company left several residences and a garage there for a permanent crew of dam workers. At the Shoshone plant site, the company maintained a boardinghouse and residence for the manager and built a machine shop to service equipment.

While the electrical system functioned as engineered, the company principals could not make similar claims about the finances. The principals may have been quietly thankful that they did not build the Glenwood and Gore Canyon powerplants, after all, and settled for the Shoshone facility instead. The reason was that the company's financial structure was predicated on a steady increase in demand, mostly from the mining industry, and this failed to materialize. During the early 1900s, when Hine and Curtis were working on their grand scheme, Colorado was at the peak of one of its most important periods of mining. The company principals not only assumed that heavy production would continue, but even increase when inexpensive electricity became available to the mining companies. They erred, and instead mining gradually declined. The Central Colorado Company wisely secured an agreement with the Denver Gas & Electric

[35] Brief History of Public Service, 1931; Gambrill, 1983:5; Gidlund, 1925; "Hot, High and Powerful Voltage"; Robertson, 1982:13; "Shoshone Plant in Operation*";* "Shoshone Plant Turns on Water".

Company to buy the surplus power wired to Denver, but this did not offset the missed revenue. In 1910, for example, the Shoshone plant generated only around one-half its capacity. As a result, the Central Colorado Company began missing interest payments on its loans, struggled for several years, and went bankrupt in 1913.[36]

The news shocked Colorado but was of great interest to General Electric investors in the East. When it was rumored that Central Colorado was to be sold, they immediately organized the Colorado Power Company and bought both the Shoshone system and the Northern Colorado Power Company, which operated Barker Dam and a hydropower plant at Boulder. The investors considered these two entities as a foundation for their aspirations of assembling a larger electrical empire in Colorado.[37]

The timing of the acquisitions was good. Within several years, a heavy demand for silver and industrial metals due to World War I stimulated a significant revival of mining in the territory served by the Shoshone plant, and growth around Boulder and surrounding agricultural communities drew power from the Boulder facility. With sound finances, the Colorado Power Company began an expansion campaign. In 1916, the company purchased the United Hydro Electric Company, which dominated Clear Creek County and fed the Shoshone system with extra power, and kept the entity as a subsidiary. Around the same time, Colorado Power also took over small systems at Salida and Alamosa, and a powerplant in Sterling. Along with these companies came some of Colorado's notable investors, who were awarded high positions in Colorado Power.[38]

In 1920, the mining industry collapsed due to a decrease in metals prices and a postwar national depression. Demand for electricity fell along with the mining industry, and while this certainly affected Central Colorado, the company remained in sound condition because of its diversified customer base. The company commanded the central portion of the state from Alamosa north to Dillon, and from Glenwood Springs east through Clear Creek County, and on the plains from Boulder to Loveland.

The principals with Colorado Power were not the only capitalists interested in expanding service territory through consolidation. In 1923, the Denver Gas & Electric Company and the Western Light & Power Company merged to form the Public Service Company of Colorado to increase generating capacity and achieve economies of scale. Denver Gas & Electric held the Front Range communities, and Western Light dominated the agricultural region to the north. The directors of Colorado Power and Public Service concluded that a union of the two systems was a sound economic policy and joined in 1924 under the Public Service name. The power giant now had a monopoly over all of central, north-central, and northeastern Colorado.[39]

The Public Service Company and Its Unified Grid, 1925-1970

When the Colorado Power Company and Public Service merged in 1924, they assumed control over nearly all of northeastern Colorado, which was also the fastest growing market in the state. While merging the company structures was fairly straightforward, incorporating the physical infrastructure of the different systems was complex. Company experts coordinated voltage, amperage, current types, demand, and generation sources to the best of their abilities. Within a short time, they wove a number of disparate small grids into what Public Service termed the Central System. In particular, the Shoshone line was linked with the Denver system

[36] Gambrill, 1983:7; History of the Company, 1935.
[37] Gidlund, 1925; History of the Company, 1935; Stone, 1918, V.I:318.
[38] Gidlund, 1925; History of the Company, 1935; Stone, 1918, V.I:318; United Hydro Electric Company.
[39] Brief History of Public Service, 1931; History of Predecessor Companies, 1942; Gidlund, 1925; Robertson, 1982:9.

and separately with the Boulder grid. The Boulder grid, in turn was tied in to the Denver system. From this triangle, transmission lines radiated outward to stations in the service area, and distribution lines carried current to points of consumption. These connections gave the company engineers great security because service would continue should a powerplant fail, and the energy sources were relatively diversified.[40]

In the I-70 Mountain Corridor, three pockets of customers escaped immediate integration into the system. One was in Eagle County where, in 1923, local businessmen organized the Eagle River Electric Company and began providing power to Eagle, Gypsum, and Eckley. It remains unknown whether the provider built its own small plant or wholesaled electricity from the Shoshone circuit. The second pocket was Summit County, served by the Summit County Power Company since inception in 1907. The last was Empire and Lawson, which the Clear Creek Power Company served from its American Sisters hydro plant. Outside the I-70 Mountain Corridor but in Clear Creek County, a small, independent plant also served the mining community of Fall River.

During the 1920s, Public Service made its last major effort to draw in the independent power companies and establish a total monopoly. In 1924, Public Service absorbed United Hydro Power, and three years later, bought both the American Sisters plant at Georgetown and the Fall River facility. In 1926, Public Service looked farther east and west, and purchased power companies in Ovid, Brush, Rifle, and Grand Junction. In 1928, the company also finally acquired Summit County Power's Dillon plant, which had been independent but wholesaled most of its electricity to Public Service. It remains unknown whether Public Service connected the Grand Junction and Rifle plants to the Shoshone circuit, but by the late 1920s, the Central System generated around 82,000 kilowatts of electricity.[41]

While Public Service increased its territory elsewhere in Colorado, the company made relatively few major changes to the grid in the central portion of the state after the late 1920s. The company possessed a permanent infrastructure, necessary water rights, and plant sites. Most of the changes were improvements such as increased generating capacity to meet a growing demand, replacement of aged equipment and structures, the introduction of efficient wiring and appliances, and the retirement of inefficient plants. By the 1970s, the only generators left on the Central System were Shoshone, the United Hydro and Cabin Creek facilities at Georgetown, and the hydropower and Valmont steam plants at Boulder. These still produce most of the electricity consumed in the region between Glenwood Spring and Denver, and they share a grid that, while modernized by 1970, has changed little in overall form since 1909.

[40] Gidlund, 1925.
[41] Brief History of Public Service, 1931; Gidlund, 1925; History of the Company, 1935.

Section E 8: History of Railroad Transportation, 1873-Present

Introduction

Railroad transportation is an important historical theme throughout the I-70 Mountain Corridor for several reasons. First, associated resources can be found throughout the principal river drainages, where five different companies operated eight distinct railroad lines. Second, railroads played a fundamental role in corridor history, shaping patterns of growth, natural resource extraction, economic development, and culture. The railroads literally tied together the corridor's people, places, industries, and institutions and linked them with the outside world.

This section provides histories of the corridor's railroad lines, a topic made complex by industrial politics, economics, and the geography of greater railroad systems. Respective of historic resources in the corridor, the discussion focuses on the railroad lines in the three principal drainages: Clear Creek, Blue River and Ten Mile Creek in Summit County, and the Eagle and Colorado rivers in Eagle County. Overviews of the parent systems are necessary for context of the individual lines.

Period of Significance, 1873-Present

As a historic theme, railroad transportation was universally important in the I-70 Mountain Corridor during the Period of Significance 1873 to present. The Period began in 1873 when the Colorado Central Railroad established the corridor's first railhead at the base of Floyd Hill in the eastern end of Clear Creek valley. The Period continues to present because two of the lines are still in use today. The Denver & Rio Grande Western route along the Colorado River, in the corridor's western portion, carries regional and transcontinental traffic. The Georgetown, Breckenridge & Leadville grade, between Georgetown and Silver Plume, is a heavily ridden tourist attraction in much the same way as the past. All the corridor's other rail lines have been dismantled except for the disused track from the Colorado River to Leadville.

Each of the corridor's drainages has its own history of railroading. The lines were manifestations of local industry and settlement, politics among railroad giants, and topographical conditions. Railroad companies chose the drainages for their existing markets, potential for future growth, and natural resources such as ties and building materials. As important, the drainages were natural railroad routes, with gentle gradients for steam locomotives and broad floors for rail beds and their sweeping curves. Politics also influenced the choice as the companies claimed the drainages as strategic routes in larger, competing systems.

Although the Period of Significance applies to the corridor as a whole, narrower timeframes of importance may be more relevant for the individual drainages. The timeframes, summarized below by drainage, are based on when railroads actually operated and influenced the course of history.

The importance of the railroads and their historic resources can be generalized under six NRHP areas of significance. The areas of significance in order of relevance are Transportation, Engineering, Industry, Commerce and Economics, Community Planning, and Landscape Architecture.

Clear Creek Drainage, 1873-1940

Railroads were important to Clear Creek drainage between 1873 and 1940. The Colorado Central Railroad established its Floyd Hill railhead in 1873, instituting the region's first all-season link with the outside and greatly reducing transportation costs. This changed the drainage in fundamental ways. First, the railroad ushered in a mining boom. Companies were able to import better equipment and produce higher tonnages of lower grade ore from deeper workings than before. They also shipped the ore by rail to effective smelters. Second, the railroad made a wider variety of household good and fresh food available, which improved the quality of life. The conditions fostered a productive mining industry, quality workforce, and stabile population with a high proportion of families.

When the Colorado Central Railroad graded up Clear Creek to Georgetown in 1877, it intensified the above trends. The boom matured into one of Colorado's most important industries, which spread its footprint deeper into the mountains around the valley. The railroad also supported logging through tie production and by linking sawmills with local consumers and distant markets mostly in Denver. Completion of the Georgetown, Breckenridge & Leadville Railroad to Graymont in 1884 improved access to the Silver Plume mines and the county's westernmost forests. Silver Plume and the local timber industry then reached peak production during the 1880s. The two railroads were also a conduit for culture, bringing refined goods, architectural pieces, performers, and a tourist trade.

The Colorado Central, and especially the Georgetown, Breckenridge & Leadville, became instruments of railroad industry politics. To pay a huge debt for its transcontinental line and to control the Rocky Mountain region, the Union Pacific Railroad waged a battle to secure the Colorado Central as a feeder. The Union Pacific also wanted to dominate service to Leadville and Summit County, both highly productive mining centers, for similar reasons. The Union Pacific then built the Georgetown, Breckenridge & Leadville as a first segment in a larger system planned over the Continental Divide. The Union Pacific abandoned the project, but the short-line became an important extension from Georgetown to Silver Plume.

The Clear Creek drainage railroads declined with mining during the late 1910s and never recovered. Although they struggled during the Great Depression of the 1930s, the railroads were important to the region because they supported a mining revival and kept the cost of goods low. The revival created jobs and generated income for residents and businesses in a time of need. The railroads ended service in 1940 because traffic was unable to pay operating costs.

Blue River and Ten Mile Canyon, 1882-1937

The Blue River valley and Ten Mile Creek drainage were routes for Summit County's only two railroads. Although they overlapped in time and place, each railroad has its own history. The Denver & Rio Grande Railroad built the dead-end Dillon Branch from Leadville, down Ten Mile Creek, to Dillon in 1882. The branch was the first railroad in Summit County and had an impact similar to that in Clear Creek drainage above. Concerned over competition from other railroads, the Denver & Rio Grande hastened the branch both to secure Summit County and position itself to push into northern Colorado ahead of the Union Pacific. The branch went no further, however, because the Denver & Rio Grande ran out of funds.

The Denver, South Park & Pacific Railroad arrived in Dillon in 1883. That railroad's route, known as the High Line, curved from its South Park yards through the Blue River valley to Dillon, and from there paralleled the Denver & Rio Grande to Leadville. The High Line was as much a function of railroad politics as an attempt to provide service to Summit County. The

Union Pacific bought the Denver, South Park & Pacific and built the High Line to out-maneuver other railroads. The High Line became the Union Pacific's sought-after route to Leadville, means for dominating Summit County, and barrier discouraging other railroads from the region. Completion of the High Line multiplied the positive effects that the Denver & Rio Grande brought to Summit County's industries and residents.

When mining slowed in Summit County during the 1900s, the competing railroads agreed that business was insufficient to support both of their lines. The railroads turned cooperative in 1911, the Denver & Rio Grande forfeiting its Dillon Branch in exchange for a Denver, South Park & Pacific branch in Gunnison County. The High Line then became Summit County's only railroad until the Great Depression forced its closure in 1937.

<u>Eagle and Colorado River Valley, 1886-Present</u>

The Eagle and Colorado rivers, both in Eagle County, were routes for two connecting railroad lines built by the Denver & Rio Grande. One descended the Eagle River from Leadville to Minturn and went west to Dotsero at the confluence of the Eagle and Colorado rivers. The line continued westerly along the Colorado River through Glenwood Canyon to Glenwood Springs. The Denver & Rio Grande graded down the river valley in 1886 not because of the small market there, but rather as a route between more important points. The Denver & Rio Grande simultaneously used the valley in a race against a rival from Leadville to Aspen, and to keep the Union Pacific out of the region. In 1888, the Denver & Rio Grande broadened the line's function, at first as an artery capturing the Colorado River valley down to Grande Junction, followed by a segment in the only transcontinental route through the Rocky Mountains.

The other track in the drainage ascended the Colorado River north from Dotsero and joined the Denver & Salt Lake Railroad. The Denver & Rio Grande built the Dotsero Cutoff in 1934 to link its mountain system with Denver, increase transcontinental traffic flowing through Colorado, and hence boost earnings. The Leadville line was idled in 1996, and the Dotsero Cutoff is heavily used today as the only transcontinental route through Colorado.

CLEAR CREEK DRAINAGE RAILROAD SYSTEM

The Clear Creek drainage and its important industries attracted Colorado's earliest mountain railroad, the Colorado Central. The company began work on the system in 1871 and laid rails up Clear Creek canyon as far as Floyd Hill, within a short distance of Idaho Springs, by 1873. Six years later, the Colorado Central extended the system to Georgetown and stopped, leaving Silver Plume and points farther west without service. In 1881, Union Pacific Railroad investors organized the Georgetown, Breckenridge & Leadville Railroad to continue where the Colorado Central left off. The company, second in the drainage, completed a tortuous route from Georgetown through Silver Plume to Graymont in 1884. Both railroads followed the floor of Clear Creek valley, but the Argentine Central Railroad, the system's third addition, deviated from this pattern. In 1905, mining investors graded a line that ascended from Silver Plume southeast up McClellan Mountain, and continued southerly to Waldorf in the Argentine Mining District. Each railroad was an independent entity, although they shared close relationships as members of a single system.

Colorado Central Railroad (CCRR)

Organized:	1868
Construction of System:	1868-1881
Completion of Floyd Hill Railhead:	1873
Completion of Georgetown Extension:	1877
Operating Timeframe:	1870-1940
Operation of Georgetown Extension:	1877-1939 to Georgetown, 1940 to Idaho Springs
Predecessors:	Colorado & Clear Creek Railroad Company, 1865-1866 Colorado Central & Pacific Railroad Company, 1866-1868
Headquarters:	Central City
Traffic/Service:	Common carrier emphasizing mining and tourism
Disposition:	1890, consolidated into Union Pacific, Denver & Gulf RR 1898, included in reorganization as Colorado & Southern RR

Georgetown, Breckenridge & Leadville Railroad (GB&L)

Organized:	1881
Construction of Line:	1881-1884
Operating Timeframe:	1884-1939. Spur to Graymont, closed in 1890 1975-Present, Colorado Historical Society rebuilt line
Predecessors:	None
Headquarters:	Denver
Traffic/Service:	Common carrier emphasizing mining and tourism
Disposition:	1890, consolidated into Union Pacific, Denver & Gulf Railroad 1898, included in reorganization as Colorado & Southern Railroad

Argentine Central Railroad

Organized:	1905
Construction of System:	1905-1906
Operating Timeframe:	1906-1917
Predecessors:	Silver Plume & Gray's Peak Railway & Reduction Co., 1904
Headquarters:	Denver
Traffic/Service:	Common carrier emphasizing mining and tourism
Disposition:	1909, sold to Gray's Peak Scenic Development Company 1911, reorganized as Georgetown & Gray's Peak Railway Company 1911, leased to Argentine & Gray's Peak Railway Company

Colorado Central Railroad: Organized, 1865-1870

As early as the 1860s, Colorado entrepreneurs and community activists understood that their territory required a railroad to transcend its frontier state. As demonstrated east of the Mississippi River, railroads were a requisite for growth of industry, agriculture, infrastructure, communications, and population. They lowered transportation costs, increased productivity, improved quality of life, and hastened the movement of people. This was especially important to Colorado during the 1860s because the region languished with decline of the short-lived Pikes Peak gold rush. Colorado's entrepreneurs and activists knew that the region's stability and their own aspirations of economic growth were at stake.

Although the community of businessmen and activists was small, it was not in agreement over who should build a railroad and where. One group represented by John Evans, David Moffat, Bela M. Hughes, and Walter Cheesman felt that Denver should be Colorado's hub of commerce, communications, and politics. Thus, they reasoned, it should also receive Colorado's first railroad. A rival group argued that Golden was better suited because it was the gateway town to the mountain settlements, source of Colorado's wealth at the time. Gilpin County mining capitalists Henry M. Teller, Enos K. Baxter, and Jerome Chaffee supported William A.H. Loveland's push for Golden.

Both the Denver and Golden camps hoped, even assumed, that the Union Pacific Railroad (UPRR) would grade its transcontinental rail line, then under construction, across the plains and into Colorado. Each petitioned the railroad for exclusive service to their communities, even though the UPRR was far from choosing a route through the territory at all. Colorado offered the only significant market between Kansas and Salt Lake City, but the Rocky Mountains formed a barrier that discouraged UPRR engineers. Instead, they considered Wyoming, where the Continental Divide was gradual.

In this uncertain climate, Loveland convinced the mountain town capitalists to proactively build their own railroad and connect it with the UPRR, regardless of its final route. They still hoped, however, to draw the UPRR to Colorado. In 1865, Loveland, Baxter, Teller, A. Gilbert, Milo Lee, John T. Lynch, Thomas Mason, and John A. Nye chartered the Colorado & Clear Creek Railroad Company. An ambitious master plan outlined a system that harvested both mining business in the mountains and agricultural trade on the plains. Loveland planned Golden as a hub with western lines up Clear Creek to Black Hawk, Central City, Idaho Springs, and Empire. Eastern lines would serve Denver, the surrounding plains, Boulder and nearby coal mines, and connect with the UPRR. The company even talked of crossing Berthoud Pass to Middle Park and pushing on to Utah.[1]

[1] Abbott, et al., 2007:19; Hall, 1889:410; Harrison, 1964:202; Hauck, 1979:13; Jessen, 1982:26.

In 1866, the UPRR decided not to cross the Divide in Colorado because the Rocky Mountains were too much of an impediment, and Wyoming instead had coal and an easier crossing. Loveland realized that if he wanted a railroad, he would have to build a connecting line to Wyoming. He sought assistance from the UPRR, which considered Loveland's railroad a strategic feeder but was unwilling to provide direct funding because of transcontinental charter restrictions. Loveland and partners then reorganized their venture as the Colorado Central & Pacific Railroad to make way for needed outside capital, which came only at a trickle.[2]

Evans and his Denver associates became concerned that they were being bypassed by the railroad activity. The UPRR kept its distance from Denver with its Wyoming route, and Loveland's proposed railroad recognized Denver only with a minor spur. The Union Pacific Eastern Division, separate from the transcontinental UPRR, planned a line west toward Colorado from Kansas, but it avoided Denver and instead veered north to join the main UPRR in Wyoming. The Evans group needed to take aggressive action to secure a position in the coming railroad network or else remain a stunted community. They also realized that UPRR delays and Loveland's inability to secure financing granted them a window of time.

Moving quickly, Evans and associates organized the Denver Pacific Railroad in 1867 to grade north to the UPRR at Cheyenne. The Denver interests ran into the same problems as Loveland: they had capital to establish the company but not enough to build and operate the railroad. Evans appealed to the UPRR like Loveland and met with similar results, a lack of cash but an offer of rails and rolling stock in exchange for control and a trade agreement. Evans disagreed with the terms, ended negotiations, and sought help from the federal government instead, which was strongly interested in fostering a rail system in the West. The government offered the Denver Pacific 900,000 acres of land if Evans would use his railroad as a link connecting the Kansas Pacific in Kansas with the UPRR at Cheyenne. The deal was better than anyone had hoped, providing links with not one, but two rail lines to the East. Evans then sold some of the federal acreage and borrowed against the rest for needed cash.[3]

Meanwhile, Loveland had been holding secret meetings with the UPRR to secure tangible support. The UPRR officials realized that, following their rejection by the Denver Pacific, Loveland's railroad would not only serve as the strategic feeder that they wanted, but also a conduit for the mountain trade, which would blossom with rail service. The two parties then struck a deal where the UPRR granted Loveland labor, rails, and rolling stock in exchange for an exclusive trade relationship and an interest in Loveland's venture. In addition, Loveland's organization had to demonstrate earnestness by grading the rail beds, furnishing ties, and securing $600,000 in capital for construction and operations.[4]

In 1868, Loveland reorganized his railroad once again as the Colorado Central (CCRR) to initiate construction, receive the UPRR materials, and include UPRR officials, who made up half the board of directors. With sparing use of capital and volunteer labor from Golden, the CCRR finally began work. The first line Loveland chose to build extended from Golden northeast down Clear Creek to a proposed junction of the Denver Pacific and Kansas Pacific in hopes of capturing Kansas Pacific traffic. Before the construction crew reached the destination, however, the CCRR ran out funds and volunteers, and suspended.[5]

Although T.J. Carter and other UPRR officials dominated the CCRR board, the UPRR still provided no financial support. In addition, president Carter mismanaged the railroad's development, appointed favorites over Loveland's personnel, and ignored local interests. This

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[2] Hall, 1889:412; Harrison, 1964:231; Hauck, 1979:16; Jessen, 1982:26.
[3] Hall, 1889:424.
[4] Hauck, 1979:16; Poor, 1976:37.
[5] Abbott, et al., 2007:23; Harrison, 1964:232; Hauck, 1979:16; Jessen, 1982:27; Poor, 1976:39, 41.

infuriated the possessive Loveland, who came into heated conflict with the UPRR directors. The CCRR stagnated through 1869, while the Denver Pacific neared its connections with the Kansas Pacific in Colorado and the UPRR at Cheyenne. The best that the organization accomplished in 1870 was a roundhouse and freight yard at Golden and completion of the line to the Kansas Pacific and Denver Pacific.

Colorado Central Railroad: Expansion, 1871-1876

In 1871, the CCRR broke free of its constraints with the controlling but noncontributing UPRR. Through insider manipulation Loveland regained control of the CCRR, removed Carter, fired most of his appointees, and made way for a new administration. A revised board of directors elected Teller president, Loveland vice-president, and John B. Taft of Boston secretary and treasurer, and they immediately put the CCRR into functional order. The railroad aggressively solicited business, reduced overhead, paid its debts, and began realizing a profit for the single line between Golden and the Kansas Pacific.

Loveland and associates revived their original plans to capture the mining business in the mountains, where the greatest profits lay. As early as 1868, CCRR chief engineer E.L. Berthoud surveyed a route up Clear Creek with branches to Black Hawk and Idaho Springs, and reported that the route was feasible but costly. A lack of funds initially blocked progress, but this time, a solution quickly materialized. The deposed UPRR was one component. Even though the UPRR lost control of the CCRR, it still perceived the railroad as an important feeder system and could be used to block rival Kansas Pacific from the mountains. Taking action, UPRR officials improved their relationship with Loveland and offered more rails and rolling stock in exchange for another financial stake. For the next component of the solution, Loveland and Teller convinced Gilpin County to provide the CCRR with a $250,000 bond to build the line to Black Hawk and Central City. Last, UPRR officials solicited an additional $50,000 bond from Clear Creek County to push a branch up to Georgetown.[6]

The CCRR aggressively pushed construction through 1871 and into 1872, but progress was slow because of the formidable conditions presented by Clear Creek canyon. The floor was so narrow and the bedrock walls so steep that the rail bed had to be blasted out and retained by masonry walls, and Clear Creek was bridged numerous times. By September 1872, the CCRR reached the forks of Clear Creek, the gateway to Gilpin County, and established a station. From there, construction crews continued up the North Fork to Black Hawk, providing service to the Black Hawk Smelter and one of Colorado's most important mining regions.[7]

The CCRR did not rest on this achievement and instead grew anxious over a potential competitor organized by John Evans. In 1871, the Kansas Pacific bought the Denver Pacific and proposed a railroad to Georgetown in hopes of circumventing the CCRR and capturing upper Clear Creek. With Kansas Pacific backing, Evans established the Denver, Georgetown & Utah Railroad and surveyed a route from Denver. Such a threat put the UPRR and CCRR in a defensive position, but they were unaware that Evans planned the Denver, Georgetown & Utah (DG&U) more as a bargaining tool than an actual railroad. Evans wanted the CCRR to bring its mountain traffic directly to Denver and offered to sell the DG&U in exchange. The CCRR directors knew that they had a major advantage because their railroad was already near Clear Creek County. If the CCRR could grade a line from its forks station far enough up Clear Creek and establish a presence in the county, Evans would be unable to secure financing. Thus, when Evans presented his offer, Teller prolonged negotiations in an attempt to buy time. The CCRR

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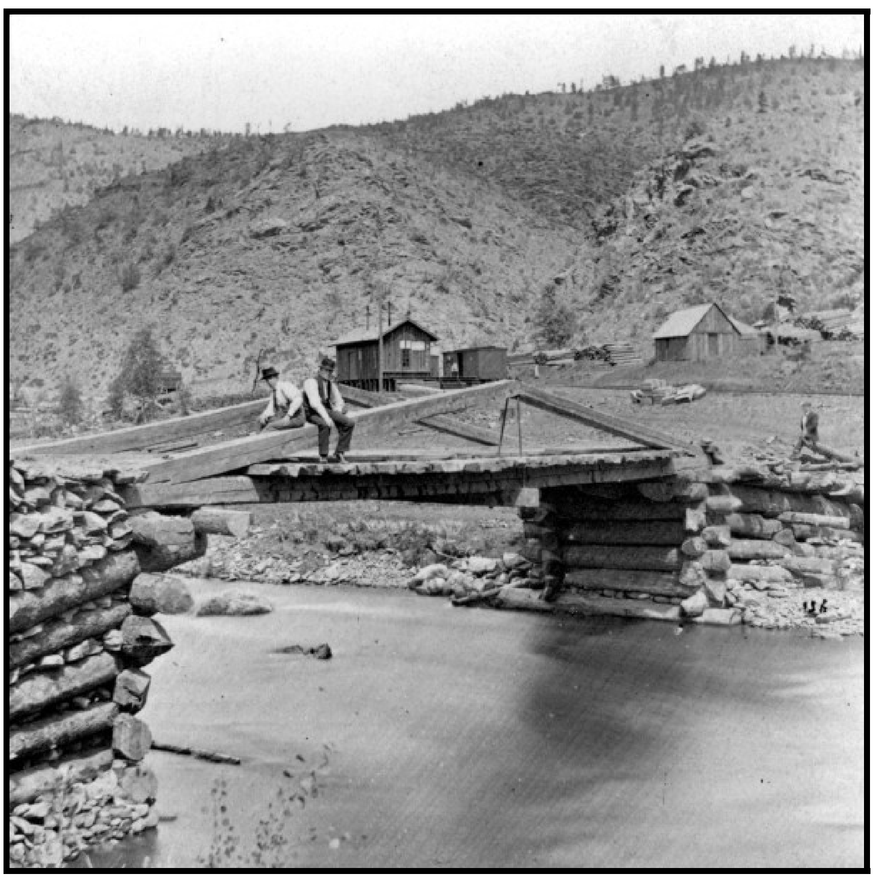
[6] Hauck, 1979:21.

[7] Abbott, et al., 2007:115, 182; Griswold, et al., 1988:6; Hauck, 1979:25, 35; Osterwald, 1991:66; Poor, 1976:57.

then feverishly pushed a new track up the canyon while officials aggressively solicited $200,000 in county bonds for service to Georgetown. Once these were secure, Evans realized he had been outflanked and cancelled the deal for the DG&U.[8]

Even though the CCRR had bonds from Clear Creek County, it was not yet ready to finish the line to Georgetown, formally known as the Georgetown Extension. In its attempt to cut off the DG&U, the CCRR laid rails up Clear Creek Canyon to the base of Floyd Hill, where the valley widened. There, the CCRR established a railhead in 1873, stopped construction, and turned its attention to other matters. The CCRR directors had little incentive to continue construction beyond Floyd Hill for several reasons. First, the CCRR successfully thwarted competition by winning the county bonds and parking its railhead in the valley. Second, the county provided all the bonds up front instead of awarding them upon completion of the Georgetown Extension. Third, the Floyd Hill station was already overwhelmed with traffic, and the railroad did not need to rustle additional business. Last, the economic panic of 1873 tightened the railroad's finances and not only stopped the Georgetown Extension, but also two other lines that the CCRR had been grading north from Golden to join the UPRR in Wyoming. Although county residents became angry, they agreed that the existing station was a vast improvement over the primitive system of wagon roads.



When the Colorado Central Railroad reached the base of Floyd Hill in 1873, it stopped construction and established a railhead. Expecting the railroad to reach Georgetown, Clear Creek residents were disappointed in the suspension. Regardless, the railhead revolutionized industry, quality of life, and the economy by reducing transportation costs and time. Courtesy of Denver Public Library, X-8461.

[8] Abbott, et al., 2007:63; Hauck, 1979:37; Poor, 1976:31, 51, 59.

The CCRR revolutionized the region by providing an easily accessed station and all-season transportation at lower costs than wagon companies. The prices of goods and industrial materials decreased and the variety and volume increased. This proved crucial to mining for three reasons. First, operating costs fell. Second, large machinery and other forms of technology could be hauled in at affordable prices. Third and perhaps most important, the rates for shipping ore to smelters at Black Hawk, and even Omaha, Nebraska, were substantially reduced. The net result was that mining outfits were now able to pursue lower grades of increasingly complex ore from greater depths than possible before the CCRR. As an illustration of this trend, the production of gold and silver in the county steadily rose after 1872. In that year, mining outfits produced $25,000 in gold and $1.5 million in silver. By 1874, the outfits generated $43,000 in gold and a significant $2.1 million in silver. The CCRR also had a major impact on the county's population. The decreased prices and increased variety of goods improved the quality of life and lowered the cost of living. County residents had access to better food and household goods and were no longer isolated.[9]

The panic of 1873 brought the CCRR's expansion to a temporary halt and exacerbated friction between Loveland and UPRR directors. As happened before, the UPRR slowly increased its leverage over the CCRR through stock ownership, acquisition of bonds from creditors, and the provision of rails and equipment. While Teller, Loveland, and Taft continued to hold the company's high offices, the UPRR appointed more directors in an attempt to steer the railroad to their priorities. The UPRR rasped over Loveland's inability to complete a line to Wyoming, as well as the railroad's growing economic drain. Until connections with the Wyoming track could be finished, the UPRR continued to lose transcontinental traffic to the Kansas Pacific and grew impatient with the CCRR.

Colorado was, however, only part of a larger problem that the UPRR had with the Kansas Pacific, which robbed traffic throughout its system. In 1873, Jay Gould, who now controlled the UPRR, decided to put an end to this competition. Gould initiated a rate war that drove the Kansas Pacific into bankruptcy in 1875 and forced that railroad into negotiations. Gould and the Kansas Pacific officials came to a complex agreement involving the CCRR, although no one at the CCRR was aware of this. In control of the Kansas Pacific, Gould demanded most of Colorado's transcontinental business for the UPRR, and as a token, he offered the CCRR. The Kansas Pacific was then to provide the CCRR with the necessary funding to complete the lines to the UPRR in Wyoming and allow the CCRR to fulfill its role as a feeder to the UPRR. The two railroads consummated the deal, and the UPRR conveyed its majority stock interest in the CCRR to the Kansas Pacific. Despite this, the UPRR still retained a significant influence over the CCRR through the board of directors.[10]

At the same time, the Kansas Pacific attempted to increase its ownership over the CCRR by acquiring its loans, which placed the CCRR in debt to the Kansas Pacific. Officials approached those counties that held large CCRR bonds, including Clear Creek, Gilpin, Boulder, and Weld, and offered to buy them. But because the Kansas Pacific could not afford face value, the officials engaged in trickery. They explained that the CCRR was on the brink of bankruptcy and if this happened, the CCRR's debts would be erased and the bonds rendered worthless. They pledged to buy the bonds for 20 percent of their original value, better than nothing.[11]

Loveland and partners were horrified when they learned of the backroom deals and secretly vowed to extricate the CCRR. In 1876, Loveland and Teller seized an opportunity

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[9] Henderson, 1926:109.
[10] Abbott, et al., 2007:43; Hauck, 1979:58; Jessen, 1982:31; Poor, 1976:63.
[11] Poor, 1976:64.

before the UPRR and Kansas Pacific finalized the transfer. Loveland organized the annual company meeting and sent out a last-minute announcement that it was to be held in Colorado. As Loveland and associates had hoped, most of the UPRR officials were unable to attend, leaving a majority of pro-Loveland individuals at the meeting. They promptly voted the UPRR officials off the board and appointed members that were hostile to the UPRR. The new board then declared the stock owned by the UPRR and the Kansas Pacific invalid and elected Loveland president. Loveland did not stop with political control and dispatched armed men who took the railroad by force. He had full support of the counties and their sheriffs, because they realized that the CCRR would remain solvent, continue service, and their bonds would retain full value.[12]

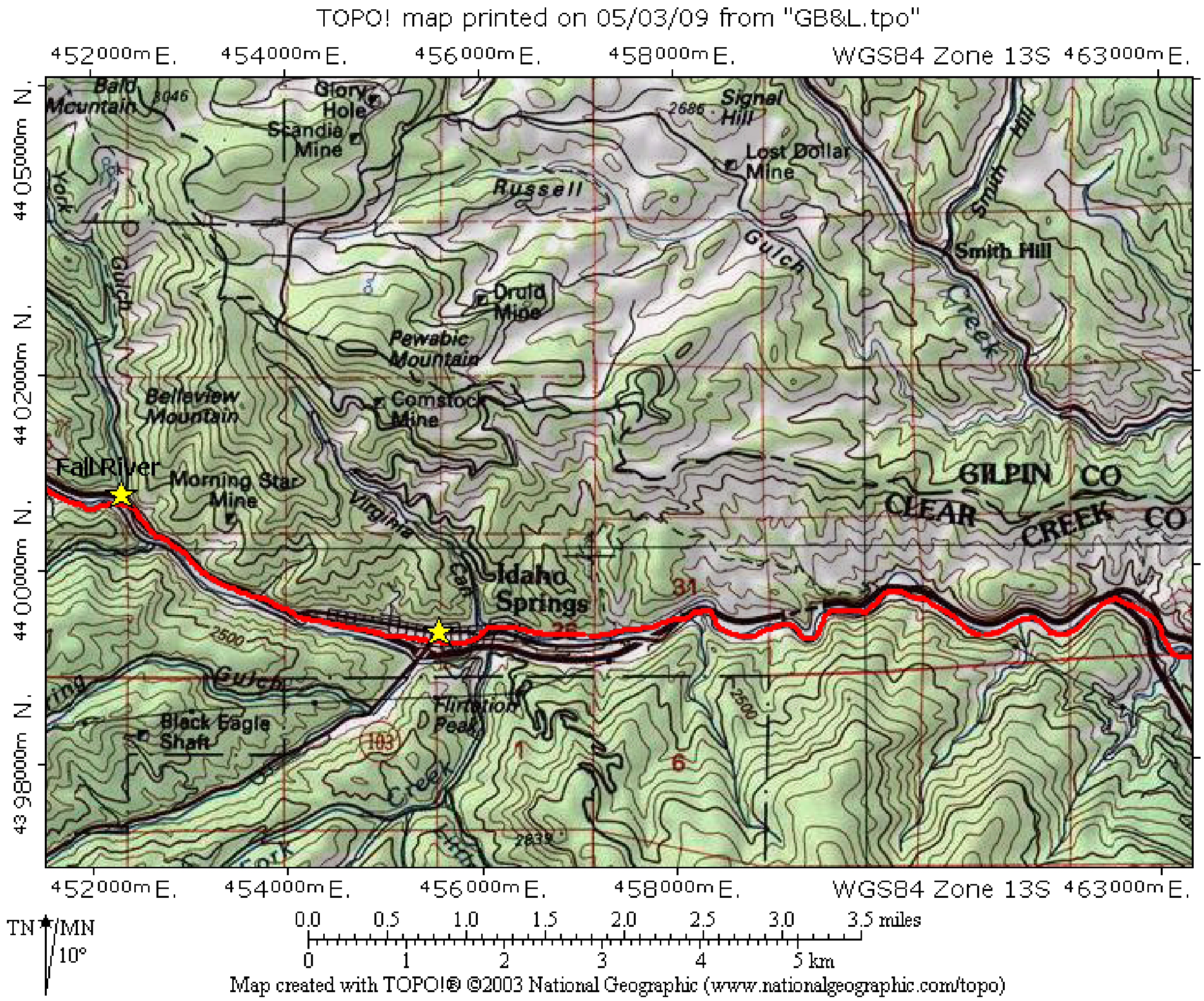
The UPRR retaliated through its only means, which was demanding payment on debts in hopes that the CCRR would default. The CCRR fought the UPRR in court for a year, but the case was too tangled for ready resolution. Unwilling to invest further in the battle, the UPRR finally conceded defeat and admitted that the CCRR was now independent. The UPRR did not, however, sever relations with the CCRR because it still wanted the railroad as a feeder for its Wyoming line. Instead of trying to wrest control through debt collection, UPRR officials recognized Loveland's power and solicited him as an ally. The UPRR then revived its original policy of underwriting the CCRR and helping the railroad finish the extensions as planned at the beginning. The first step was to complete the line to Wyoming so Colorado traffic could begin flowing to the UPRR's transcontinental track.

Colorado Central Railroad: Georgetown Extension, 1877-1880

During the late 1870s, Loveland and associates and the UPRR officials, previously at odds, celebrated the completion of several key projects. First, the CCRR finally finished its piedmont line from Golden north to the UPRR transcontinental track at Colorado Junction, Wyoming, in 1877. This shifted the balance of power among Colorado's railroads in favor of the UPRR and at the expense of the Kansas Pacific and the Denver interests. The CCRR benefited substantially because it now provided service to the growing agricultural communities of Boulder, Longmont, and Fort Collins.[13]

Also in 1877, Loveland et al. finished the Georgetown Extension from the Floyd Hill railhead to Georgetown. The climate was right because the national economy recovered from the mid-1870s depression, capital was now available, and Clear Creek County was in the midst of a mining boom. When the first train arrived at Idaho Springs in June, 1877, the town naturally celebrated with speeches, a parade, and other events. Work crews had an easy time pushing farther up gently sloped Clear Creek valley during the summer, established the station of Swansea near Empire, and reached Georgetown in August. Georgetown residents turned out in number to greet the first train and then engaged in the usual excitement.[14]

[12] Hauck, 1979:58; Jessen, 1982:33; Poor, 1976:64.
[13] Hauck, 1979:59; Poor, 1976:69.
[14] Abbott, 1977:14; Abbott, et al., 2007:291; Griswold, et al., 1988:6; Harrison, 1964:277; Hauck, 1979:59; Morgan, 1976:12; Osterwald, 1991:68; Poor, 1976:67.



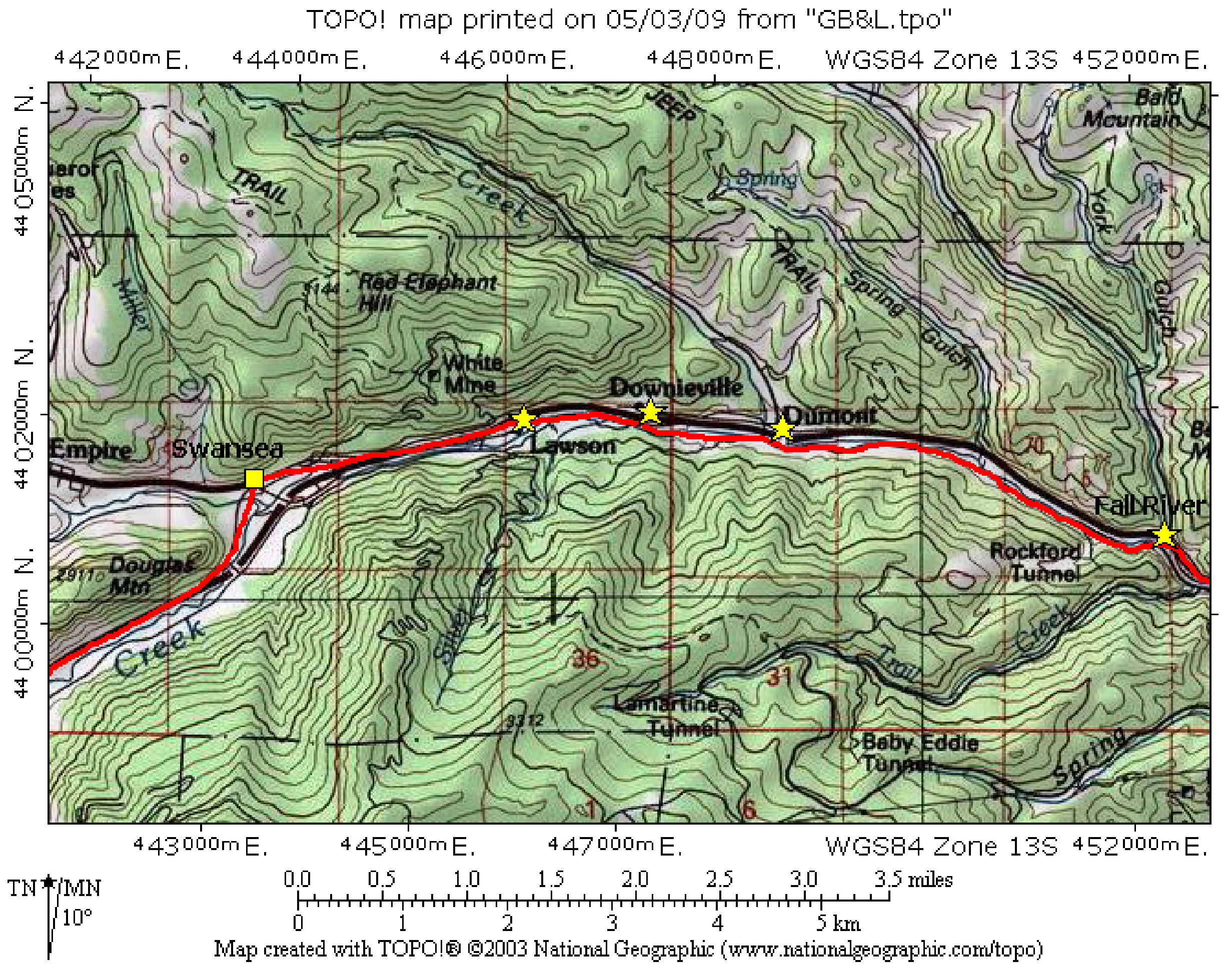
The map illustrates the Colorado Central Railroad segment between Floyd Hill, at far right, and the hamlet of Fall River, at left. Except for the portion on both sides of Idaho Springs, the route follows the south side of Clear Creek valley. The dark line represents I-70.

As can be expected, the CCRR had a dramatic impact on Clear Creek valley, its mining industry, and its settlements. Whatever improvements the Floyd Hill railhead brought in 1873 were amplified in 1877. The price of domestic goods and mining supplies decreased farther, and mining companies shipped higher tonnages of ore than any time before to Black Hawk for treatment. In addition to providing economic benefits, the CCRR was also a conduit by which culture and sophistication made their way into the county.

The CCRR brought a new type of traveler that became an important economic institution. Specifically, the railroad put the Rocky Mountains, legendary in the East, within reach of tourists, and businesses in the county now had the resources to entertain them. To this end, Frank Fossett observed in his 1879 travel guide to Colorado:

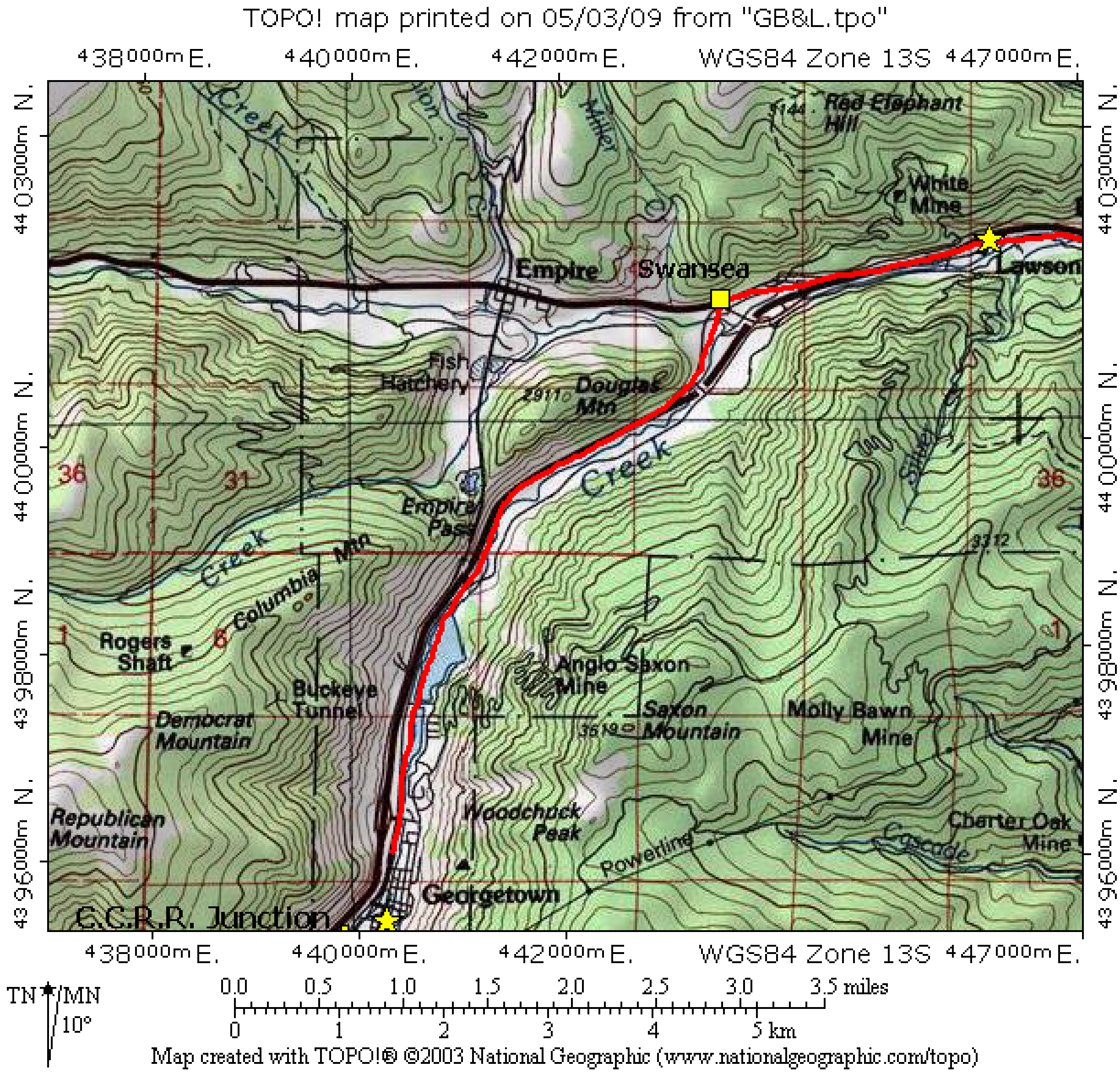
> "At present, the most entertaining trip that can be made, and the quickest and cheapest, is that by way of the Colorado Central railway from Denver to the mining cities of Central, Black Hawk, Idaho, and Georgetown. In this the tourist gets the greatest variety for the least expenditure of money that any single excursion affords that actually enters the mountains any distance. While this canyon may not compare with the Royal Gorge in massive grandeur, the tourist can derive infinite pleasure from the many and varied sights that continually offer themselves *en route* and at adjacent points on either hand. There is no finer prospect than that offered from Gray's lofty

summit, no more beautiful lakes than those near Georgetown, and nowhere in Colorado are mines so deep or mills so numerous as on the headwaters of Clear Creek. There are excellent hotels at all of the towns named, and one of the most noted pleasure resorts, with fine drives and livery turnouts, can be found on this line at Idaho Springs."



The map illustrates the Colorado Central Railroad segment between Fall River, at right, and the hamlet of Swansea, at left. At Lawson, the route crosses from the south side of Clear Creek valley to the north. The dark line represents I-70.

With the CCRR nearly finished in the mountains and on the plains, Loveland and partners relaxed slightly and enjoyed the railroad's meteoric rise to prosperity. In 1878, they added an important extension that cemented the railroad as an institution of the mining industry. In particular, the CCRR added stubs and sidings at the new Argo Smelter north of Denver. Nathaniel Hill erected the Argo to replace his Black Hawk Smelter, which was overwhelmed with business and had no room for enlargements. Hill chose the site north of Denver because fuel coal and water were readily available, it was centrally located, and it was adjacent to the CCRR's tracks. The fact that Hill had long been a part of the mountain community and knew Loveland and Teller probably influenced his decision to build the Argo adjacent to their railroad. As a result, the CCRR had a monopoly on Clear Creek County smelter traffic. Further, when the Denver & Rio Grande (D&RG) or Denver, South Park & Pacific (DSP&P) railroads brought ore from areas they served, they had to use CCRR tracks and pay trackage fees. Clear Creek County was one of the greatest beneficiaries of the Argo arrangement. Not only did the new smelter reduce the fees that mining companies paid, but it also treated low-grade ores more efficiently than any other facility. Because the CCRR provided direct service from the county, the mining companies enjoyed a decrease in freight rates.[15]



The map illustrates the Colorado Central Railroad segment between Swansea, at upper right, and the yard at Georgetown, lower left. The route extends along the north side of Clear Creek valley.

Loveland and associates were unable to rest for long because the Leadville boom stirred a new wave of railroad company agitation, which impacted the CCRR. Discoveries of silver at Leadville stimulated a major rush in 1877, a mining industry took shape during 1878, and companies began producing silver in astounding volumes. Railroad investors and officials correctly forecasted that Leadville was destined for greatness and plotted how to capture growing freight and passenger business.

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[15] Hauck, 1979:60.

Within the year, the UPRR, the DSP&P, and the D&RG began an expensive and difficult race for Leadville. The Arkansas River valley, ascending from the south, was the only natural gateway to Leadville, landlocked in a high mountain valley. The D&RG was in the lead because it possessed the Arkansas River route and already owned a section of track in Royal Gorge. The DSP&P, slightly behind, was busy grading the second-best route up the South Platte River, across South Park, and down into the Arkansas River valley.

This left the UPRR with the least desirable route over the Divide in Clear Creek County. The only reason that the UPRR entertained the idea was that the CCRR's end-of-the-line in Georgetown could serve as a starting point. However, crossing the Divide would be extremely costly, time-consuming, and present special engineering problems, if a railroad could be built at all. When Jay Gould weighed the options, he outlined a twofold plan for reaching Leadville. He both initiated crossing the Divide in Clear Creek County and attempted to acquire either of the other railroads in hopes that one these actions would succeed.

In 1878, Gould began buying stock in the D&RG and DSP&P when it came up for sale and also secured the services of CCRR official and engineer E.L. Berthoud for the Clear Creek crossing. UPRR directors then organized the Georgetown, Leadville & San Juan Railroad to provide Berthoud with resources, and he led a survey party into the field. Berthoud determined that the best route ascended Clear Creek to Silver Plume, continued up Clear Creek to Loveland Pass, crossed under the Divide through a tunnel. From there, the route descended the Snake River into Summit County. As expected, Berthoud reported that the cost would be immense and the project would take time, especially because the tunnel would be thousands of feet long.[16]

Furthering the plan, the UPRR leased the CCRR from Loveland and associates in 1879. Gould overtly did so on the premise that the CCRR was a crucial feeder for the UPRR, although he tacitly wanted control of the railroad as a key link in his Leadville push. The UPRR then replaced Loveland and associates with S.H.H. Clark, a UPRR director, as president; C.C. Welch as vice-president; and Berthoud as secretary. UPRR engineer Jacob Blickensderfer assumed Berthoud's duties and spent much of the year formally surveying a grade all the way to Leadville. The short but tight gulch between Georgetown and Silver Plume was the only section of the proposed grade as difficult as Loveland Pass. The gulch, which carried Clear Creek down 640 feet in elevation from Silver Plume, was too steep for conventional railroad equipment and also too narrow for the meandering route often designed to overcome such obstacles. Blickensderfer confronted the problem with a feat of engineering that is still celebrated today. Specifically, he planned a serpentine grade with hairpin curves equivalent to three full circles, and a complete loop where the track crossed over itself. While the distance from Georgetown to Silver Plume was around one and one-half miles via a steep mountain road, Blickensderfer's numerous curves extended the proposed grade an additional three miles. At this distance, the ascent would be five percent, the maximum for locomotives.[17]

Gould made better progress toward Leadville through an influence over the existing railroads than by building a new one from scratch. He began negotiating with John Evans and syndicate for the DSP&P in 1879, had control over that railroad the next year, and then coordinated it with his UPRR. With his Leadville objective now realized, Gould shelved his plan to extend the CCRR but wisely kept it as an option should trouble arise in the future. Problems did arise within a short time, forcing Gould to reexamine his plan to cross the Divide in Clear Creek County.

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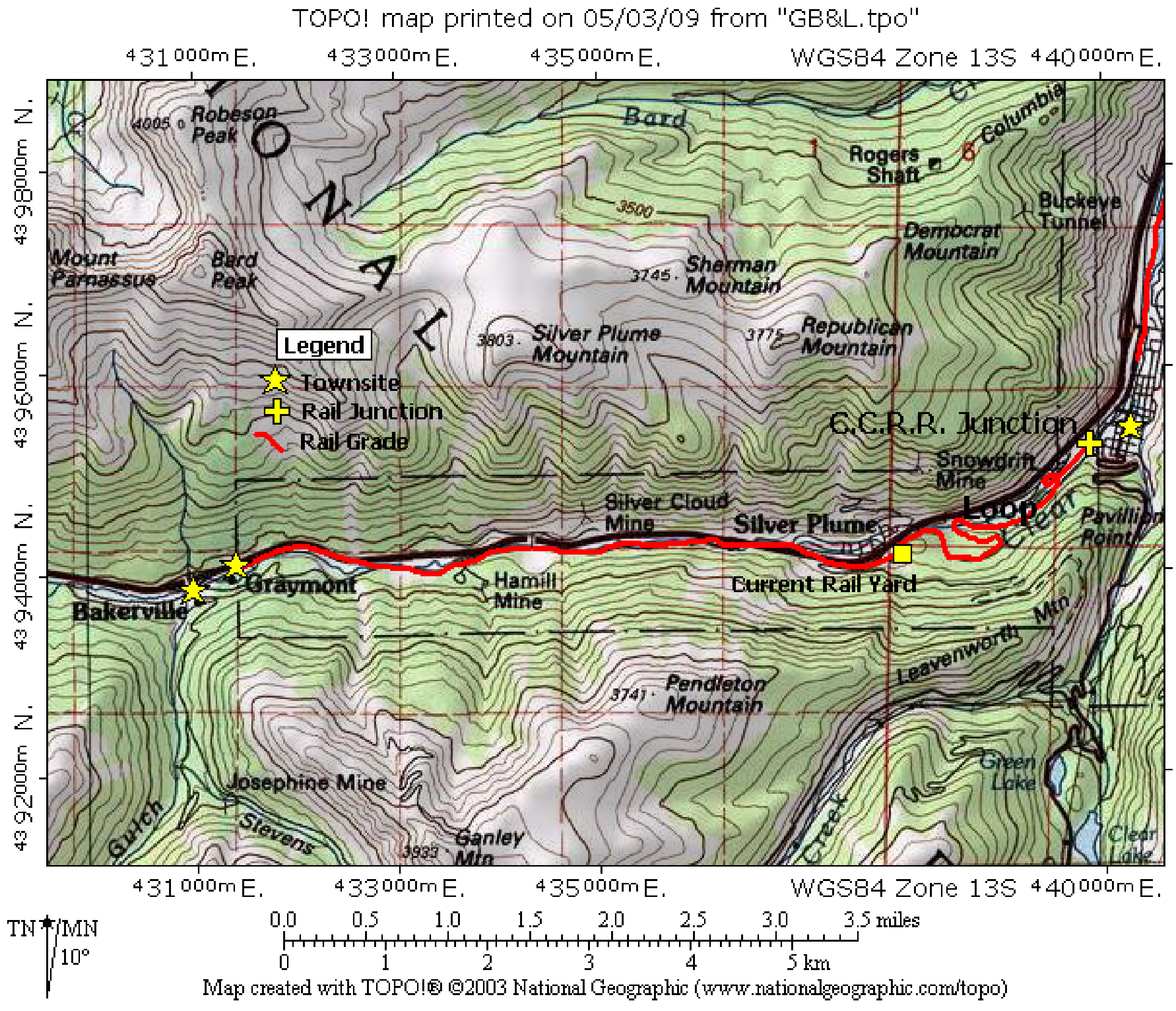
16 Abbott, et al., 2007:; Griswold, et al., 1988:15.

17 Abbott, et al., 2007:319, 380; Griswold, et al., 1988:15, 18, 33; Harrison, 1964:278; Hauck, 1979:61, 74; Morgan, 1976:12, 18; Poor, 1976:75, 86.

Georgetown, Breckenridge & Leadville Railroad: Built, 1881-1884

When Gould began DSP&P service to Leadville in 1880, the DSP&P did not possess its own track up the Arkansas River Valley. Instead, the DSP&P saved capital by tying into the existing D&RG line near Buena Vista and paying a trackage fee for joint use to Leadville. In exchange, the DSP&P allowed the D&RG joint use of another track into the Collegiate Mountains. As long as the DSP&P and D&RG cooperated, the agreement benefited both railroads, but they were competitors and the working relationship lasted only a brief time. (A detailed history of the joint agreement and its disintegration are discussed in detail below under the DSP&P). UPRR directors came into conflict with the D&RG over the Leadville line use fees, and they realized that the D&RG could shut the DSP&P out of Leadville altogether if the disagreement became too heated.



The Georgetown, Breckenridge & Leadville Railroad extended along Clear Creek valley between the Colorado Central yard at Georgetown, right, and a terminal at Graymont, at left. The curves west of Georgetown represent the Georgetown Loop, and the heavy and dark line denotes I-70.

The sinuous series of curves and crossover on the Georgetown, Breckenridge & Leadville Railroad were collectively known as the Georgetown Loop. The crossover, made possible by the steel High Bridge, was an engineering feat recognized in the railroad industry. Enhanced by an impressive alpine setting, the Loop drew tourists from across the nation. Courtesy of Denver Public Library, CHS.J2201.

In response, Gould renewed his interest in building a line to Leadville, and three options seemed apparent. One was a new track paralleling the shared D&RG line up the Arkansas River. This required the least amount of new construction, but it was longest in distance from Denver. The second was to push a new line from the DSP&P terminal at Como in South Park northwest to Breckenridge in Summit County. From there, the line went north to Ten Mile Creek, south up the creek to Fremont Pass, and down to Leadville. The third option was the CCRR extension that Blickensderfer surveyed in 1880. Curiously, Gould eliminated the first choice and simultaneously pursued the last two. Both would be extremely expensive, require a considerable amount of time, and engender high operating costs when finished. The advantage, however, was that both extensions could meet in Summit County and the UPRR would dominate the mining trade there, which was becoming significant.

In 1881, UPRR officials organized the Georgetown, Breckenridge & Leadville Railway (GB&L) to build the CCRR extension. Blickensderfer, UPRR chief engineer, appointed Robert B. Stanton as GB&L chief engineer and Frank A. Maxwell as field engineer. In the mountains, outdoor construction was usually a seasonal endeavor, but not according to the UPRR. In January 1882, Blickensderfer and Stanton gathered a huge workforce and began constructing the GB&L. The workers were so numerous that they filled nearly all available housing in Silver

Plume and crowded into Georgetown's boardinghouses. Many came from elsewhere, and some were local miners hired to drill and blast in the rocky sections. Even though the UPRR offered a wage of $5.00 per day, which was much higher than the regional average, Stanton found that the workers were difficult to retain. The reason was that once their immediate needs were met, the workers left without notice in response to gold and silver strikes elsewhere.[18]

The crews started in Georgetown, pushed their way up the gulch, and ran into immediate trouble. A Mr. McLain owned a toll road up Leavenworth Gulch, which the railroad had to cross with fill. The engineers tried to secure a crossing from McLain, but he refused because he desired quiet and did not want the road severed and toll income lost. When the UPRR bullied McLain, he blockaded the route, took up arms, and kept vigilance. The sheriff demanded that McLain provide access, he still refused to cooperate, and then went to jail. The standoff caused a significant delay, and to avoid wasting time, Stanton directed his crews to move west to other sections of the grade.[19]

By September 1882, workers finished the bed as far as the temporary terminus Bakerville. The GB&L, however, was far from completion as the rockwork, bridges, and fills in the gulch slowed progress. The loop was the greatest impediment because it incorporated a steel trestle known as the High Bridge built to exacting specifications. In April 1883, track gangs finished the grade and prepared the masonry abutments for the bridge. The UPRR contracted with the Phoenixville Bridge Company to prefabricate the structure, ship it in pieces to Georgetown, and assemble them across a constriction in the gulch known as Devil's Gate.

Phoenixville began assembly in October and encountered a number of problems. First, the bridge abutments proved to be eight inches too high for the preformed ironwork and had to be reduced. Second, the height of the bridge scared off experienced riveters, who were in short supply, and they were replaced with general labor. According to railroad historian Gary Morgan, "The Georgetown *Courier* reported that, despite the offer of good wages, a number of workers simply refused to set foot on the 'Devil's Gate' construction site once they saw it."[20] Because the general laborers had little knowledge of riveting, their work ranged in quality from substandard to defective.

The third and most significant problem was that some of the bridge components were assembled backwards! In particular, the support piers were erected slightly off their planned locations and the north pier was accidentally transposed with the south one. As a result of the errors, Stanton refused to accept the bridge as built and ordered Phoenixville to rectify the problems. In December, despite the region's high winds and freezing conditions, Phoenixville workers reassembled the bridge according to specifications. As built, the bridge was 300 feet long, had an 18½ degree curve, and led to a massive peninsula of rock known as the Big Fill, which featured a 30 degree curve. The High Bridge was finished at the end of January 1884, and workers finished the GB&L shortly after.[21]

The first commercial train rolled into Silver Plume in March, inciting a celebration on par with the one held in Georgetown in 1877. The loop, bridge, and fill were recognized as an engineering marvel, and nothing like this assembly had yet been built for a railroad. Further, the line became known worldwide as the "far famed Georgetown Loop" and elevated the GB&L, and CCRR by association, to a special status both among railroads and tourist attractions. All this came at the price of $254,700, which was high for only around eight miles of track.[22]

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[18] Ellis and Ellis, 1983:192; Poor, 1976:79.

[19] Abbott, et al., 2007:374; Griswold, et al., 1988:34.

[20] Morgan, 1976:16.

[21] Abbott, et al., 2007:378, 380; Griswold, et al., 1988:35, 38; Hauck, 1979:77; Morgan, 1976:14, 18.

[22] Abbott, et al., 2007:380; Ellis and Ellis, 1983:193; Griswold, et al., 1988:37; Hauck, 1979:78, 80; Morgan, 1976:15; Poor, 1976:75.

The GB&L impacted Silver Plume and Bakerville the same way that the CCRR affected Georgetown. The decrease in freight rates and direct smelter service made lower grades of ore economical to produce in Silver Plume's mines and allowed the mining companies to install better equipment. The cost of living in town fell, and a wave of tourists swarmed the area during the summer and spent freely.

The GB&L also opened the upper reaches of Clear Creek Valley for economic development. Bakerville, with a stage station, concentration mill for the Baker Mine, and several small sawmills, was originally designated GB&L terminus. To compete for business that the GB&L was sure to bring, railroad officials established the adjacent townsite of Graymont, named for Gray's Peak, in 1883. Graymont grew quickly and attracted service establishments catering to tourists who came to rough it amid Gray's and Torrey's peaks. Mr. and Mrs. J.D. Jennings opened the Jennings Hotel, other individuals ran the Fox and Hounds tavern, the GB&L maintained a ticket office in a box car, the Stevens Mining Company erected ore bins along the railroad track, and the Postal Service established a post office. When the CCRR began running trains to Graymont in 1884, it cemented the hamlet's role as a destination for mountaineers by providing guides and horses for daytrips up to the peaks.[23]

Almost from its beginning, Bakerville was a principal source of lumber for Clear Creek Valley, and the arrival of the GB&L allowed the industry there to boom. Not only did the GB&L carry lumber to the principal towns and mining districts in the county, but it also facilitated direct access to the Denver market, which preferred fir and spruce to the pine brought in from elsewhere. By 1887, the amount of logging in the upper portion of the valley reached unprecedented levels.[24]

In addition to logging and tourism, the railroad fostered one other industry. In particular, two separate groups became aware of the UPRR's plan to tunnel through Loveland Pass, and they started their own bores with the intent of selling them to the GB&L at high prices. Marcus M. "Brick" Pomeroy, an adept speculator, organized the first and longest lived scheme. He, Albert S. Whitaker, and L.C. McKenzie established the Atlantic-Pacific Tunnel Company in 1880, and they promoted a five mile tunnel under the Continental Divide. The company started the bore at the north base of Kelso Mountain, mostly for show, and planned a southwest course to Peru Creek in Summit County. To pique investors, Pomeroy claimed that the tunnel would be not only for the railroad, but also would penetrate ore veins concealed underneath the Gray's and Torrey's peaks area.[25]

Loveland and associates organized their own venture with the same intent as Pomeroy. They organized the Loveland Pass Mining & Railroad Tunnel Company in 1881 and drove the tunnel for around a year while the UPRR considered what to do with the GB&L. When the DSP&P reached Leadville in 1882, Loveland suspended work on suspicions that the GB&L would not be extended into Summit County.[26]

Loveland was correct about the GB&L proceeding no further, but Pomeroy continued with his project anyway. When his first company ran out of funds, Pomeroy secured eastern capitalists who reorganized the project as the Atlantic-Pacific Tunnel & Gray's Peak Railway Company in 1882. After two years of empty promises in exchange for stock assessments, the investors recalled their loans in 1884 and forced the company into bankruptcy. The property was sold at foreclosure to Whitaker and Clear Creek County mining investors D. Washburn and Diamond Joe Reynolds. They organized the Atlantic-Pacific Railway Tunnel Company not for

[23] Ellis and Ellis, 1983:192, 215, 218.
[24] Ellis and Ellis, 1983:150, 153.
[25] "An Important Mining Tunnel" *MSP* 10/14/82, p241; *Colorado Mining Directory*, 1883:118; Ellis and Ellis, 1983:178.
[26] Hauck, 1979:77.

the railroad aspect, but because Diamond Joe saw the tunnel as a means of undercutting his mining claims on Kelso Mountain. Pomeroy, however, did not give up on his scheme because the project provided his salary. In 1887, Pomeroy found British investors who were ideal for his needs because of their great distance from Clear Creek County. He leased the existing tunnel from Reynolds and partners and resumed work at the heading, now thousands of feet from the portal. By this time, local individuals suspected that the project was a scam, and yet, Pomeroy's financiers provided him with enough money to continue operations for five more years.[27]

Originally, the UPRR directors hoped that Graymont would become an important fuel and water stop for trains climbing over the Divide and into Summit County. This was not to be, however. The UPRR finished the DSP&P High Line into Summit County and around to Leadville in 1883. The directors formally announced that the GB&L would not be extended over the Divide and that the Clear Creek County system would be left as it was.[28]

Clear Creek Railroad System: Peak Years, 1885-1904

After the UPRR finished the GB&L in 1884, the entire Clear Creek County railroad system entered a quiet time of prosperity. The UPRR operated the CCRR and GB&L as a single system, sharing locomotives, rolling stock, and schedules. Regular freight trains hauled domestic goods, fuel coal, and industrial supplies up from plains cities and carried ore and mill concentrates down to the smelters. Tourists came from all over the nation to stay in the region's many resorts, ride the GB&L Loop, and hike among the high peaks. Tourist demand grew so high during the late 1880s that the CCRR scheduled six to seven passenger trains per day from Denver to Silver Plume.

The principal changes after 1884 occurred in offices far from Clear Creek County. In 1890, the UPRR began to sag under a backlog of debt, feuds with other transcontinental railroads, internal struggles, and deferred maintenance. Company officials decided to divorce the UPRR from its subsidiaries to improve efficiency of management, keep railroads in serious trouble off its books, and protect the profitable lines. UPRR president Charles F. Adams created the Union Pacific, Denver & Gulf Railway in 1890 as an umbrella for its Colorado carriers. This separate holding company now managed the CCRR, GB&L, DSP&P, and Denver, Texas & Gulf Railroad as one system, but allowed them to maintain their separate identities. As before, the CCRR and GB&L were recognized together as the Colorado Central, and the UPRR was wise to keep this identity because it was popular among tourists. The UPRR conveyed its Denver and Golden yards to the Union Pacific, Denver & Gulf Railway, and consolidated its own support facilities into the extensive UPRR center at Cheyenne. This division became important in a few years because it allowed the Colorado system to function independently.[29]

The Union Pacific, Denver & Gulf Railway was still tied to the UPRR in management and finances, allowing the UPRR to use it in a twofold strategy practiced by many parent railroad companies. First, the UPRR cut operating costs, deferred maintenance, and kept the savings for itself. Second, the UPRR also siphoned general income to service its own debts. The entire UPRR assemblage, including the CCRR and GB&L, suffered financially and deteriorated as a result. The principal casualty in Clear Creek County was Graymont. The UPRR ended service to the hamlet in 1890, claiming that tourist and lumber traffic were insufficient to offset

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[27] Griswold, et al., 1988:29, 182; Hauck, 1979:79; "Latest Mining News" *RMMR* 10/16/84 p9.
[28] Hauck, 1979:79; Poor, 1976:77.
[29] Abbott, et al., 2007:400; Digerness, 1978:50; Hauck, 1979:103, 107; Jessen, 1982:165; Osterwald, 1991:83; Poor, 1976:81.

the line's operating costs. Graymont withered afterward, and the Jennings Hotel only did business during the summer.[30]

A synergy of forces pushed the mighty UPRR into bankruptcy in 1893. Obligations on stocks and debts totaling $450 million undermined the railroad's foundation during the early 1890s. Then, the Silver Crash of 1893 and the resultant economic depression pushed the giant over the edge as creditors and stockholders recalled their loans and dividends. The UPRR and its subsidiaries were assumed by receivers, who were also the same company directors that ruined the railroad. The stockholders of the Colorado subsidiaries howled in protest, claiming that the UPRR would bilk the system and degrade its worth. Thus, the courts appointed Frank Trumbull of Denver as receiver, and the stockholders welcomed him because of his reputation as an able manager. Trumbull accomplished the task that responsible railroad receivers were supposed to complete: returning troubled carriers to profitability. He reversed the UPRR's policies of diverting revenue and deferring maintenance, and instituted improvements instead. During the latter half of the 1890s, he ordered new locomotives and rolling stock, aggressively solicited traffic, promoted tourism, and affected repairs to the Clear Creek system.[31]

Once the Union Pacific, Denver & Gulf was in a condition to operate independently, it was auctioned at a foreclosure sale. In 1898, a group of investors bought the railroad, organized the Colorado & Southern Railway Company (C&S), and appointed Trumbull president because of his excellent record and familiarity with the system.

Trumbull continued to reinvest some of the profits in efficiency and improvements. In 1900, he replaced worn rolling stock with a fleet of freight cars and passenger coaches. He also built new shops, roundhouse, and yard west of Denver to replace those at Golden. High in the mountains, at the far end of the CCRR system, workers erected a waiting pavilion and restaurant at Silver Plume for tourists. In 1902, Edwin T. Hawley, who controlled the Minneapolis & St. Louis and Iowa Central railroads, acquired a controlling interest in the C&S, and he did little to change Trumbull's management style.[32]

Tourist traffic on the Clear Creek system was high enough during summer to warrant several daily express trains. However, overall revenue for the system declined despite Trumbull's improvement campaign. The Clear Creek system shared the same problem suffered by many mining-dependent railroads: when the mining industry ebbed, so did the income of the railroad. After around 40 years of continuous gold and silver production, the output of Clear Creek County's mines began a downward slide, affecting the CCRR. In 1896, the county's companies yielded around $800,000 in gold and $1.6 million in silver, and these figures gradually dropped to $600,000 in gold and $500,000 in silver eight years later.[33] The decrease in ore production translated into lower tonnages of freight hauled by the railroad, and hence a reduction in income. Given this, Trumbull was wise to promote tourism during the early 1900s because it was both a sustainable source of traffic and one that became increasingly important.

Argentine Central Railroad: Added to System, 1905-1911

In 1905, the Clear Creek system received its last significant addition, which temporarily addressed the problem of declining revenues. The Argentine Central Railroad, built to the Argentine Mining District, both funneled ore to the CCRR and made the system more attractive than ever to tourists. The Argentine Mining District, on the Continental Divide southwest of

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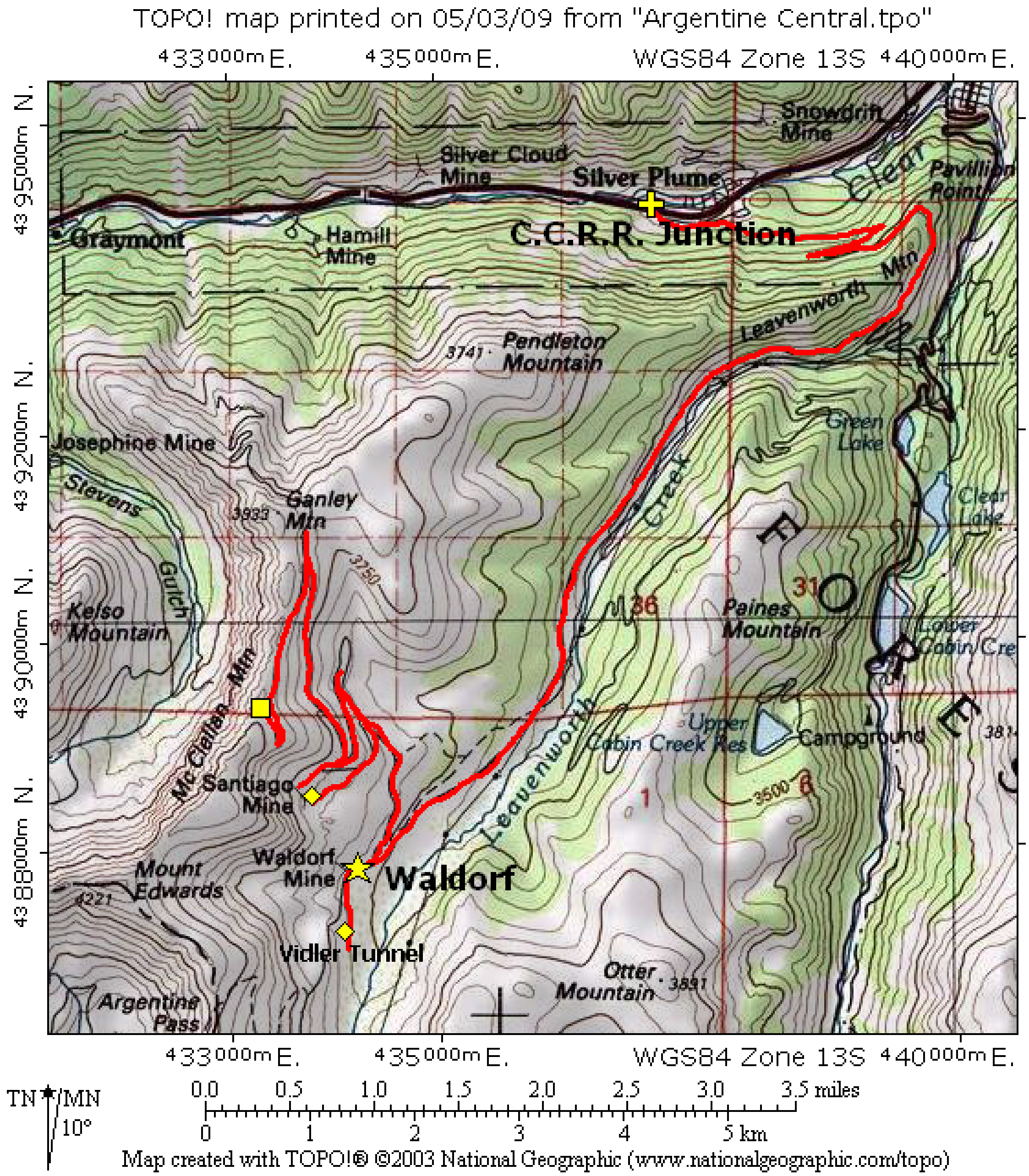
[30] Abbott, et al., 2007:400; Ellis and Ellis, 1983:223; Hauck, 1979:80; Poor, 1976:81.
[31] Abbott, et al., 2007:402; Digerness, 1978:53; Hauck, 1979:103; Jessen, 1982:166.
[32] Abbott, 1977:15; Chappell, 1974:73; Digerness, 1978:61; ; Hauck, 1979:107; Morgan, 1976:21; Osterwald, 1991:93.
[33] Henderson, 1926:109.

Georgetown, hosted one of Colorado's early silver rushes. During the late 1860s and 1870s, mining companies extracted ore from the upper reaches of the district's veins until the shallow payrock was gone. The district then remained relatively quiet until the late 1890s, when several rich discoveries renewed interest in the deeper portions of the veins there. Gradually, investors local to Clear Creek County reopened the largest mines and brought several new properties into production.



The Argentine Central Railroad ascended from the Colorado Central yard at Silver Plume, top, to a terminal at Waldorf, lower left. The switchbacks ascended past the principal mines in the Argentine Mining District to an observation post on McClellan Mountain. Waldorf featured a tourist hotel and mining facilities.

Edward J. Wilcox, among the local investors, owned several mines in Silver Plume and Idaho Springs. When Argentine showed signs of a revival, Wilcox took an interest in the district and acquired some of the important properties including the Stevens, Huckleberry, Independence, and Wheeling. He also purchased shares of the Paymaster and Santiago mines, the most promising and greatest producers. In 1901, he organized the Waldorf Mining & Milling Company to consolidate and operate the mines, and to drive the Wilcox Tunnel to the Santiago ore system.[34]

At the same time, R.C. Vidler, another local investor, began developing one of the district's new mines near the Wilcox Tunnel. His was the Vidler Tunnel, which, depending on the source, was either a deep tunnel projected to undercut an ore system or another railroad bore intended to penetrate the Divide. Vidler began his tunnel in 1902, and the project contributed to the area's boom atmosphere.

A group of Colorado investors, some interested in Argentine's mines, felt that the revival could support a new railroad, despite exorbitant construction costs. Argentine was above treeline, difficult to reach even by road, and offered no routes favorable by conventional standards. In 1904, they organized the Silver Plume & Gray's Peak Railway & Reduction Company anyway, completed a mile of rail bed from Bakerville, and then stopped when reality set in. Wilcox shared the sentiments of the would-be railroad builders and picked up where they left off. He had a direct interest because a railroad would lower high freight costs for his mining company and increase its worth among investors.[35]

The side-geared locomotive, known as a Shay design, made the Argentine Central Railroad possible. The Shay was the only type capable of pulling cars up the tortuous and steep grades from Silver Plume into the Argentine Mining District. Courtesy of Denver Public Library, X-17687.

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[34] *Colorado Mining Directory,* 1901:49; Griswold, et al., 1988:147; "Mining News" *Mining Reporter* 5/16/01 p325.
[35] Abbott, 1977:22.

In 1905, Wilcox began the daunting project with capital from James McGee, Jacob Fillius, S.E. Wirt, and George Richardson, all successful mining investors. Adamant that the railroad had to be finished in 1905, Wilcox put crews to work on Leavenworth Mountain weeks before the Argentine Central Railroad was formally organized. Grading proved to be slower than expected, and the approaching winter threatened Wilcox with more delay. In response, he increased the workforce and sent teams to simultaneously grade different segments along the route and join them when finished. When winter began, Wilcox did not relent and kept the crews at work into January 1906, when they completed the track to the Wilcox Tunnel.[36]

Wilcox celebrated with a golden spike ceremony at the tunnel and appointed W.H. Stillwell as manager. Stillwell came with experience, formerly superintendent of the Rock Island Railroad followed by manager of the Uintah Railroad in Utah. Wilcox then returned to his mining interests but maintained a strong influence over the railroad's operations. Suspending service on Sunday was one of Wilcox's odd decisions, based on his values as a reverend. Wilcox ordered the railroad to respect the traditional day of rest, even though Sunday was one of the most popular travel days for tourists. In so doing, Wilcox lost the railroad a considerable amount of business.[37]

Despite the restrictive policy, freight and tourist traffic was high during the railroad's first years. All the freight consisted of mining supplies and machinery hauled up from Silver Plume and ore and mill concentrates sent down to smelters. As conceived, Wilcox used the railroad as a collection system for the district's principal mines, with the Wilcox Tunnel and Waldorf Mill serving as a focal point for traffic. The strategy maximized the railroad's income and increased the importance of the settlement at the tunnel, which Wilcox named after himself. To fulfill this role, engineer Arthur H. Osborne dispatched construction gangs to grade feeder spurs to the principal mines. As the winter of 1906 permitted, the workers built a spur south to the Vidler Tunnel and a separate set of switchbacks up McClellan Mountain to the Alaska, Bonham, Mammoth, Kitty Owsley, and Manhattan mines. The owners of the Santiago contributed to Wilcox's ore handling system by building an aerial tramway down to the mill.[38]

Wilcox was aware that the railroad had enormous potential for tourism because of the grandeur of its destination and proximity to Gray's and Torrey's peaks. He and Osborne then prepared before the tourist season of 1906 opened. Wilcox changed the name of his settlement to Waldorf, secured a post office, and built a hotel with enough amenities to satisfy tourists. Osborne extended the McClellan Mountain zigzag past the Santiago Mine to the summit, where tourists could enjoy excursions from a pavilion. Wilcox also placed orders for special observation cars.[39]

The Argentine Central finally opened for regular service when enough snow cleared, although the spur to the top of McClellan Mountain was not yet finished. Immediately, the railroad became noted for two significant achievements. First, the industry recognized the unusually rapid progress through some of the worst topographic and weather conditions faced during railroad construction. Second, the line was the highest in North America, which increased its tourist draw.[40]

Simultaneously, the railroad benefitted the Argentine district, increased traffic on the CCRR system, and boosted the county's economy. Out of self interest, CCRR management encouraged the Argentine Central by providing labor for the last construction tasks, loaning

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[36] Abbott, 1977:22, 26, 33; Griswold, et al., 1988:61; Hauck, 1979:106.
[37] Abbott, 1977:35, 44; Griswold, et al., 1988:61.
[38] Abbott, 1977:36, 49, 57; Griswold, et al., 1988:62; Hauck, 1979:106; "Mining News" *Mining Reporter* 11/15/06 p501.
[39] Abbott, 1977:40, 47; Bauer, et al., 1990:148.
[40] Abbott, 1977:35, 54.

rolling stock, and switching passenger cars directly onto the Argentine Central track. Both railroads cooperated in terms of tourism promotion. The Argentine Central advertised the CCRR and The Loop in its publications, and the CCRR advertised the Argentine Central and McClellan Mountain excursion. By August 1906, the Argentine Central reached the mountaintop and was officially complete. Tourists could board a CCRR train in Denver at 8:00 A.M., transfer to the Argentine Central, enjoy McClellan Mountain, and return to Denver by 7:00 P.M.[41]

The Argentine Central was the highest railroad in North America and neatly complimented the Georgetown Loop as a national tourist attraction. The railroad was as important as an industrial carrier for mining companies in the Argentine Mining District, right and out of view. In the late 1900s view, an excursion train parked at the top of McClellan Mountain. Courtesy of Denver Public Library, MCC-682.

The Argentine Central returned favors to the CCRR by sending high volumes of ore down from Waldorf and onto the CCRR line. As Wilcox planned, short trains collected ore from most of the district's mines and shunted it to the Waldorf Mill, where it was reduced to concentrates. During the summer of 1906, the railroad carried down as much as 50 tons of concentrates per day, forwarded by the CCRR to the smelters north of Denver. Not all the

[41] Abbott, 1977:53, 70; Griswold, et al., 1988:147.

district's mines sent their ore to the Waldorf Mill, and instead some, such as the Santiago, relied on the Argentine Central to transfer the material to mills in Silver Plume for concentration.[42]

Like many of Colorado's mountain railroads, the Argentine Central began experiencing financial problems shortly after completion. The railroad turned a profit in 1906 but went into deficit the following year. Wilcox's Sunday suspension and a complete shutdown during the winter reduced the railroad's annual income. Wilcox was willing to accept a slight loss, however, because the railroad played a central role in his small mining empire. Curiously, British investors offered Wilcox a handsome $3.5 million for his entire assemblage of mines, mills, and the railroad in 1907, but Wilcox proudly refused. He came to regret this decision in 1909 when his empire began to crumble. Wilcox's mines were not as productive as hoped, most of the other operations ran out of ore, and the mill then ran intermittently instead of constantly.[43]

To make matters worse, the relationship between Wilcox and the C&S turned hostile and further eroded the earning power of the Argentine Central. In 1908, the Burlington & Quincy Railroad Company purchased the C&S, including the CCRR and GB&L, and wanted ownership over the Argentine Central, as well. Wilcox refused to sell, even though the Argentine district was in decline and began a rate war with Burlington & Quincy. Wilcox was no match for Burlington & Quincy and its deep pockets. In 1909, the Burlington & Quincy raised its transfer and freight rates on Wilcox, who increased his passenger fares to discourage tourist traffic. This move cost Wilcox dearly because his railroad was isolated and unable to outlast Burlington & Quincy. When the economic drain became too much, Wilcox sold the Argentine Central at a heavy loss, but not to Burlington & Quincy out of spite.[44]

In 1909, Denver mayor Robert W. Speer, Governor John F. Shafroth, Richard H. Malone, and A.J. Woodruff bought the Argentine Central under the Gray's Peak Scenic Development Company. With the railroad came assets such as a sound tourist and mining business, but also significant debt. The Denver investors understood the importance of tourism and planned improvements such as a spur track, observation structure, and hotel near the top of Gray's Peak.[45]

The venture was doomed from the start because the investors knew little about the realities of running a mountain railroad. The year 1909 was almost a complete loss because Speer and associates started service too late in the season, and the following year was not much better due to a lack of promotion. At the same time, creditors demanded payment on overdue loans, filed lawsuits, and convinced the Colorado Supreme Court to place the railroad in the hands of receiver John Q. Newton in 1911. He resumed meager service while bond holders attempted to buy the railroad.[46]

The rest of Wilcox's mining empire collapsed at the same time that the Argentine Central went bankrupt. Suspension of the railroad impacted most of his mines in the district, which were failing anyway. Without rail service to Waldorf or a stream of ore for the mill, the settlement saw no tourists, the hotel closed, and the Postal Service revoked the post office in 1912. A year later, the Central Bank & Trust Company foreclosed on the Waldorf Company and assumed its assets. Wilcox regretted his decision to ignore the offer made by the British investors in 1907.[47]

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[42] Abbott, 1977:50.
[43] Abbott, 1977:73.
[44] Abbott, 1977:76; Abbott, et al., 2007:403; Digerness, 1978:72; Osterwald, 1991:94.
[45] Abbott, 1977:79, 83; *Georgetown Courier* 6/12/09; Griswold, et al., 1988:63.
[46] Abbott, 1977:90; Griswold, et al., 1988:63.
[47] Bauer, et al., 1990:148; Ellis and Ellis, 1983:114.

Clear Creek Railroad System: Gradual Decline, 1912-1920

Clear Creek County's railroad system depended on mining, and so when ore production slowed during the 1910s, so did its business. The Argentine Central, the system bellwether, suffered the most. When the railroad went bankrupt in 1911, Santiago Mine owner William Rogers realized that his operation might fail without its service. To save his mine, Rogers organized the Georgetown & Gray's Peak Railway Company, drew in Denver investors William Barth and W.S. Iliff, and bought the defunct carrier at the fire sale price of $20,000.[48]

Rogers and partners operated the Argentine Central during the working season of 1912 mostly hauling ore, and then leased it to another party confident in the mining district's freight and tourist business. The individuals began service in 1913 as the Argentine & Gray's Peak Railway Company, which revived activity at a few of the largest mines such as the Vidler Tunnel. These operations yielded ore intermittently for several years, but the ore quickly ran out. All the mines were idle again by 1916, Waldorf was abandoned, and Rogers scaled back operations at the Santiago. With little demand for service, Rogers and associates applied to the Interstate Commerce Commission (ICC) to abandon the railroad, but the U.S. Railroad Administration seized control in 1917. The Administration did so with all the other railroads in the nation, as well, as part of the federal government's World War I mobilization effort. When the Administration confirmed that no demand existed for the railroad, the ICC granted the application in 1918, and the line was dismantled the next year.[49]

While the Argentine Central was struggling, the C&S held steady. Prices for silver, lead, and copper spiked during World War I and stimulated a wave of mining activity. An increase in freight traffic promised greater revenue for the C&S, but the railroad did not realize the income. The U.S. Railroad Administration took control of the C&S as well in 1917, reduced service, neglected maintenance, and was inefficient overall. The Administration paid the C&S a royalty, but the amount did not offset lost income or operating expenses. When the Administration restored the railroad to C&S management in 1920, it left the system with a set of compounded difficulties. The C&S inherited a backlog of maintenance and unhappy customers and faced little hope of recouping its losses because the nation's economy began to slip into a recession. What the management and other business interests in Clear Creek County did not realize was that conditions would only grow worse the following year.[50]

Clear Creek Railroad System: Major Decline, 1921-1929

The Clear Creek County railroad system entered an irreversible decline in 1921 along with most of Colorado's other carriers. A conspiracy of factors eroded the financial condition for the C&S and sent the railroad into a downward spiral from which it never recovered. First, the nation descended into a postwar economic depression that stifled business, reduced the consumption of goods, made loans difficult to secure, and of special concern for the C&S, greatly reduced tourism among the middle class. Second, those local tourists with disposable income preferred to travel by automobile instead of rail. Last and most important, Clear Creek County's mining industry collapsed. Exhaustion of all but the lowest grades of ore placed the industry in a precarious position, and the economic depression pushed the industry over the edge. In 1919, the industry produced $91,000 in gold, already greatly reduced from the previous year, and $400,000 in silver, which was still in demand due to World War I. Both figures were almost

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[48] Abbott, 1977:99, 100; Griswold, et al., 1988:63, 70.
[49] Abbott, 1977:100, 111, 113; Griswold, et al., 1988:63, 70; Hauck, 1979:106.
[50] Hauck, 1979:108; Osterwald, 1991:99.

halved to $49,000 in gold and $240,000 in silver in 1920, and silver was halved again the following year.[51] The decline was abrupt and ruined the region as dozens of mines suspended, workers left to find jobs elsewhere, and dependent businesses closed.

The outcome was catastrophic for the C&S in Clear Creek County. Passenger and freight demand fell to an all-time low with little hope of restoration. Management assessed the situation for a year and then pursued the only available course, which was a reduction in service followed by divestment of assets. In 1920, the C&S stopped running tourist express trains from Denver to Silver Plume, leaving those tourists willing to travel by rail only with the morning local. This further discouraged ridership, and as a result, the C&S cut all service to Silver Plume except for one train per day. Reflecting the decline, passenger revenue dropped precipitously from around $63,000 in 1923, an already low figure, down to $35,000 by 1926.[52]

In terms of assets, the C&S began culling its oldest and most worn locomotives, scrapping some and selling others. The carrier started with 50 locomotives during the 1900s, dispatched 12 during the late 1910s, and rid itself of another 13 by 1924. Of the 25 remaining, the C&S dedicated only 3 for passenger service and 2 for freight in Clear Creek County. Rolling stock was disposed of as well, and the C&S retired many cars when they came into the repair shops instead of refurbishing them.[53]

The entire Clear Creek County system operated at a loss, and by the mid-1920s, it became apparent to C&S management that this was unlikely to change. Management sought additional cuts in an effort to save the system, finding little room except complete elimination of passenger service. In 1926, the C&S then applied to the Colorado Public Utilities Commission (PUC) to stop passenger service, which sent up howls of protest from Clear Creek, Gilpin, and Jefferson counties. The PUC then held a series of open hearings from December 1926 through January 1927. The C&S explained how freight and passenger revenues declined to a meager 10 percent in years when the economy was sound, primarily because of buses, trucks, and automobiles. Gilpin and Clear Creek county residents countered that suspension of freight service was next, and this was vital to the little mining that was left.[54]

In 1927, the PUC rendered a ruling that sought a compromise for both sides. On one hand, the PUC allowed the C&S to discontinue passenger-specific trains, and the last ran to Georgetown on June 4, 1927. On the other hand, the PUC required mixed trains of freight cars with one or two passenger coaches. As business continued to decline during the late 1920s, the C&S reduced its Clear Creek schedule to three trains per week. Within a short time, a collapse of the nation's economy rendered even this abbreviated service a major drain for the C&S, but the railroad became more important to the county than ever.

End of the Clear Creek Railroad System, 1930-1940

In 1929, the nation plunged into its worst economic depression. Financial institutions collapsed, commerce nearly ceased, capital necessary for business evaporated, and thousands were thrown out of work. Prices for metals tumbled, and with them, the remainder of Clear Creek County's mining industry. As the depression deepened during the early 1930s, the demand for freight and passenger service in the county decreased to the point where management considered abandoning the entire system. Regardless, the C&S continued running its mixed trains but was forced to find yet more ways in which to cut costs. In response, management

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[51] Henderson, 1926:109.
[52] Hauck, 1979:108; Morgan, 1976:26.
[53] Hauck, 1979:154.
[54] Griswold, et al., 1988:111; Hauck, 1979:109.

reduced weekly trains from three to two, and designated Georgetown as end-of-line. Regular traffic to Silver Plume was suspended, although when the handful of productive mines there stockpiled enough ore, the C&S sent up a freight train to fetch the material. Silver Plume might have considered itself fortunate, because the C&S abandoned its line from Black Hawk to Central City altogether in 1931.[55]

Then, in 1933, President Roosevelt provided the county, its mining industry, and the C&S a glimmer of hope. At that time, he instructed the treasury to buy gold at inflated prices in an experiment to stimulate gold mining. It did. The following year, Roosevelt signed into law the Gold Reserve and Silver Purchase acts, which increased the prices of gold and silver to new levels. As expected, gold and silver mining across the West at first began to rebound and then experienced a measurable revival.

Clear Creek County joined in the movement and saw local interests reopen many of its former producers, which fostered a renewed demand for C&S freight service. The railroad restored thrice weekly trains in 1935, which directly supported an improvement in the regional economy during a time of great need. The amount of traffic, however, was still inadequate to offset the system's operating costs, and C&S management applied to the ICC in 1936 to abandon the entire Clear Creek system. Business interests responded with a loud voice, correctly claiming that mining, and hence the economy, was completely dependent on the railroad for viability. The mining industry was especially convincing and presented a sound argument that it was undergoing a measurable revival. The ICC held hearings and considered evidence for a year, and it finally granted the C&S permission to abandon the track from Idaho Springs to Silver Plume in 1937. Clear Creek County residents and businesses, however, were well organized and continued their protests, but a two-year extension was all they could secure.[56]

In January 1939, the C&S suspended traffic beyond the Idaho Springs and dismantled the line, including the trestles and the High Bridge once considered an engineering marvel. The ICC required the C&S to provide service to Idaho Springs, now the end-of-line, on presumption that the station could handle the county's freight. As a result, the mining industry increasingly shipped ore and supplies by truck, strengthening the C&S case for abandonment. In 1936, mining companies shipped 6,539 tons of ore and concentrates by rail and only 164 tons by truck to the smelters at Leadville. By comparison, they sent only 303 tons by rail and 9,810 by truck in 1940. With these numbers and internal figures, the C&S had a relatively easy time convincing the ICC in 1940 to allow the abandonment of the last section of the original CCRR track from Golden to Idaho Springs. The ICC granted permission, and the last train ran on May 4, 1940.[57]

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[55] Hauck, 1979:174.
[56] Hauck, 1979:177.
[57] Griswold, et al., 1988:39, 112; Harrison, 1964:453; Hauck, 1979:177, 179; Morgan, 1976:26; Osterwald, 1991:106.

TEN MILE CANYON AND BLUE RIVER DRAINAGE RAILROAD SYSTEM

Ten Mile Creek and the Blue River valley were served by two mountain railroads that graded competing routes into Summit County. The Denver & Rio Grande Railroad arrived first in 1881 when it completed a line known as the Dillon Branch from Leadville to the hamlet of Dillon. The Denver & Rio Grande (D&RG) strategically planned the dead-end branch to at least capture the mining and logging traffic in Summit County, if not as a platform for expansion into northwestern Colorado. While the D&RG did reap plenty of business in Summit County, it never pursued the latter goal. The Dillon Branch began in Leadville, ascended the Arkansas River headwaters, crossed north over Fremont Pass, and dropped into the Robinson Mining District and towns of Kokomo, Recen, and Robinson. From there, the branch descended Ten Mile Creek to Frisco, primarily on the valley's west side, although the bed crossed to the east side for several short segments. The branch passed easterly through Frisco and followed the northwest side of Ten Mile Creek to Dillon, on the Blue River.

The Denver, South Park & Pacific Railroad graded a second line through the area in 1883. Rather than a dead-end branch, the Denver, South Park & Pacific (DSP&P) built its track as a component of a larger system aptly known as the High Line, with Dillon as an important hub. The DSP&P built the High Line not only to compete with the D&RG in Summit County, which it did very well, but also to serve as a main route from its yard in Como, South Park, to Leadville. The route crossed from South Park into Summit County over Boreas Pass, winding its way down into Breckenridge on the floor of Blue River valley. From there, the High Line traveled north along the Blue River to a station originally known as Placer Junction, and Dickey's Junction by around 1901. At the station, one branch went west, passed through Frisco, and wrapped around Mount Royal into Ten Mile Creek valley. The line ascended the east side of Ten Mile Creek into the Robinson district, crossed Fremont Pass, and continued south to Leadville. At Dickey Junction, another track continued north to a station in Dillon, veered southeast, and ascended the Snake River to the important logging camp of Keystone.

Today, more evidence of the DSP&P line remains in Summit County than of the D&RG. The High Line railbed from Dickey Junction through Ten Mile valley is now a bike path, and segments from the junction south to Breckenridge are intact, but the junction, the site of Dillon, and the connecting grade are underneath Dillon Reservoir. In terms of the D&RG's Dillon Branch, I-70 was built over most of the grade along Ten Mile Creek, residential construction obscured the segment in Frisco, and Dillon reservoir drowned the extension to Dillon.

Both railroad lines were historically important during their years of use. Specific reasons vary by era and railroad, and understanding these aspects is necessary to assess the significance of the historic resources that are left today. Because much of the early history of both railroads is not germane to the historic resources in Summit County, the early history is covered briefly.

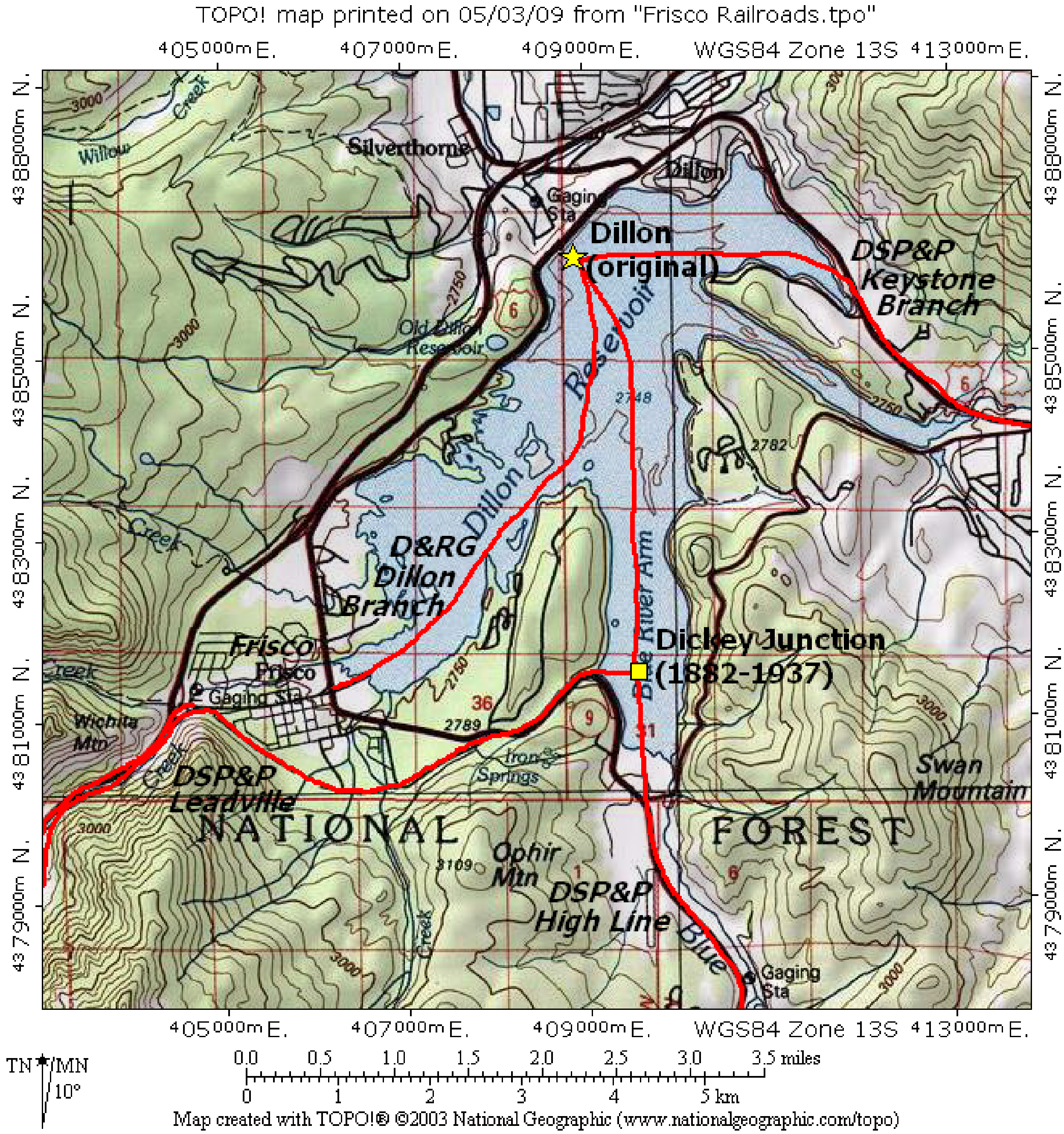

Figure E 8.6: The map depicts the Denver & Rio Grande and Denver, South Park & Pacific railroad lines to Dillon. The DSP&P High Line originated in Breckenridge, south and off the map, and followed the Blue River north to Dickey Junction. There, the High Line branched. One line went west through Frisco and wrapped around to the east side of Ten Mile canyon, and the other line went north to Dillon and then southeast to Keystone. The D&RG Dillon Branch descended the west side of Ten Mile canyon, went east through Frisco, and followed Ten Mile creek down to a terminal at Dillon.

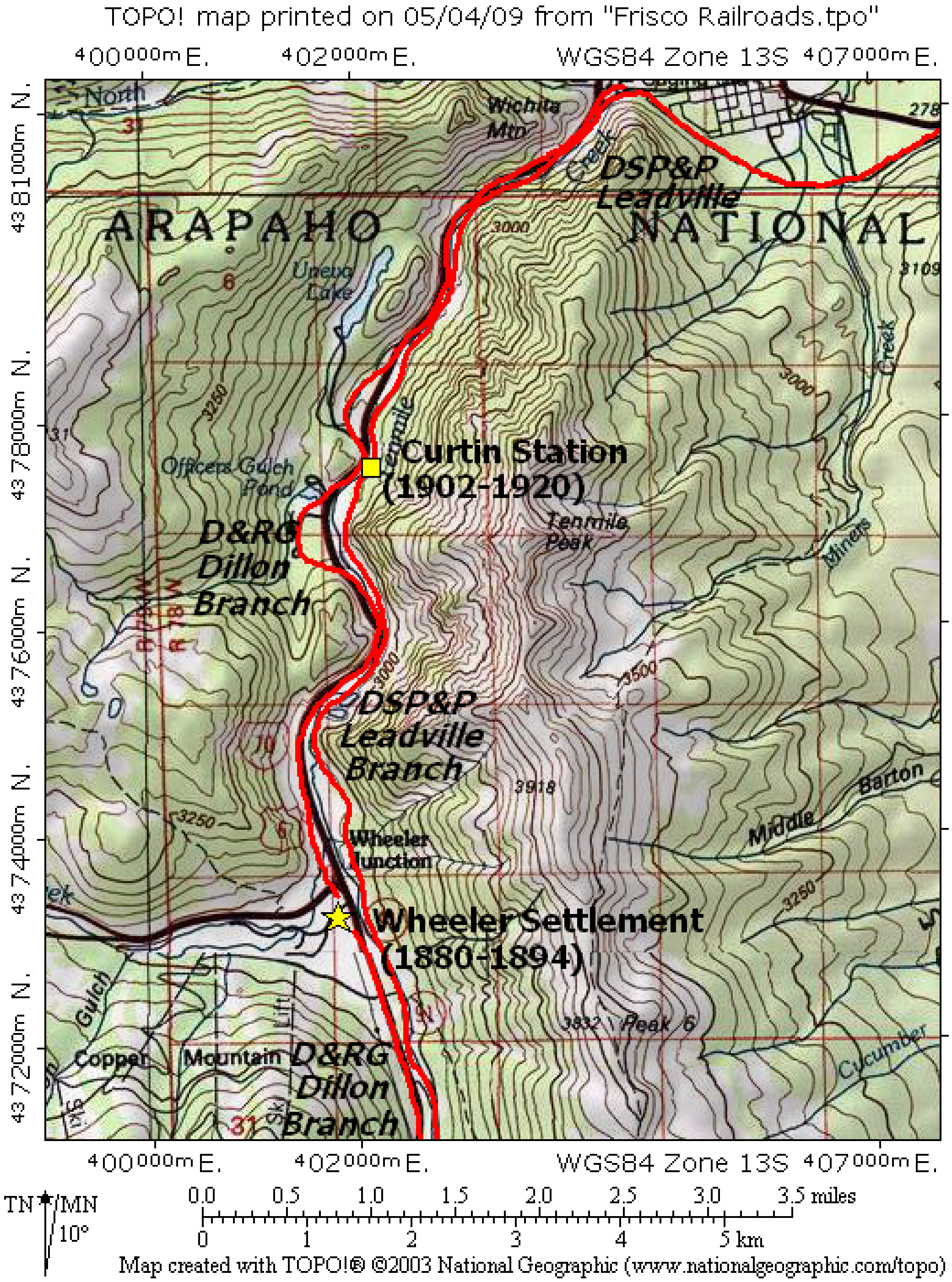

Figure E 8.7: The map depicts the southern continuation of the Denver & Rio Grande Dillon Branch and the Denver, South Park & Pacific High Line. The D&RG Dillon Branch followed the west side of Ten Mile canyon through Wheeler and into downtown Frisco, at top. The DSP&P followed the east side of Ten Mile canyon, past several mines at Curtin, and east through Frisco. The dark line marks I-70.

Denver & Rio Grande Railroad (D&RG)

Organized:	1870
Construction, System-Wide:	1870-1934
Construction of Dillon Branch:	1881 (Leadville to Wheeler), 1882 (Wheeler to Dillon)
Construction of Glenwood Extension:	1887 (Red Cliff to Glenwood Springs)
Construction of Dotsero Cutoff:	1933-1934

Operating Timeframe:	1870-Present
Operation of Dillon Branch:	1882-1911 (track dismantled in 1924)
Operation of Glenwood Extension:	1887-Present (Minturn to Dotsero closed in 1996)
Operation of Dotsero Extension:	1934-Present
Predecessors:	None
Headquarters:	Denver
Traffic/Service:	Common carrier with transcontinental connections
Disposition:	1920, merged into Denver & Rio Grande Western 1988, purchased by Southern Pacific Railroad 1996, merged into Union Pacific Railroad

Denver, South Park & Pacific Railroad (DSP&P)

Organized:	1872
Construction, System-Wide:	1873-1884
Construction of High Line:	1882-1883 (Como to Dillon 1882), (Dillon to Leadville 1883)
Operating Timeframe:	1873-1937
Operation of High Line:	1882-1937
Predecessors:	None
Headquarters:	Denver
Traffic/Service:	Common carrier emphasizing mining
Disposition:	1889, reorganized as Denver, Leadville & Gunnison Railroad (DL&G) 1890, consolidated into Union Pacific, Denver & Gulf Railroad 1898, consolidated into Colorado & Southern Railroad (C&S)

Denver & Rio Grande Railroad: Organized, 1870-1876

William Jackson Palmer was among a handful of entrepreneurs who envisioned railroad systems in Colorado long before the territory could support even a single line. While surveying a route for the Kansas Pacific Railroad during the late 1860s, Palmer became acquainted with the terrain south of Denver and surmised that the area was ripe for a railroad. He correctly forecasted agriculture along the mountain front where water was available and mining deeper in the range. Further, Palmer understood that these industries would constitute a sound market for an appropriately planned railroad system. His interpretation of best design was a main line running up and down the piedmont area with branches extending west up the principal drainages and into the mountains.

In 1870, Palmer discussed the potential with friends William P. Mellen of New York, William A. Bell, W.H. Greenwood of the Kansas Pacific, and attorney Samuel E. Brown. They agreed that such a railroad would be highly successful in the long term but difficult to fund and construct at the time. Palmer's advisors recommended narrow-gauge instead of standard-gauge because it cost less and could negotiate mountain terrain. Within a short time, the capitalists formalized the venture as the Denver & Rio Grande Railroad (D&RG) and obtained a charter to grade lines along most of the natural transportation corridors in southern Colorado. One main line went south from Denver to Texas, another crossed over La Veta Pass into the San Luis Valley, and a third ascended into the central mountains along the Arkansas River. Feeder branches radiated off these trunks to areas with high potential for mining. The new board of directors consisted of Palmer, Mellen, Alexander C. Hunt, and Captain Howard Schuyler of Denver, and Robert H. Lamborn who served in the Civil War with Palmer. All aggressively sold stock to fund construction, which began within the year.[58]

[58] Athearn, 1962:15; LeMassena, 1984:121; Stone, 1918, V.1:349.

The first segment of Palmer's piedmont artery, from Denver south to Colorado Springs, was finished in 1871, and the second, south to Pueblo, the next year. In what became standard D&RG practice, he secured financial incentives and free land in exchange for a commitment to provide service. Palmer next turned his attention toward the first westward mountain extension, which was to ascend from Pueblo to Canon City and up the Arkansas River. In 1872, Palmer contracted with the Central Colorado Improvement Company which graded a 30 mile spur from Pueblo to the Labran coal mines near Florence. The D&RG, however, lacked the funds to pay, so the firm retained the line as the Canon Coal Railway Company but relied on the D&RG to provide service. Due to financial difficulties, the D&RG was unable to push the line farther to Canon City despite promises otherwise. Repeating the Pueblo strategy, the D&RG requested bonds, some construction labor, and land as incentive to finish the line. The townsfolk balked at first but relented when the D&RG suggested bypassing Canon City on its way up the river. Central Colorado Improvement then finished the line to Canon City in 1874, and the D&RG paid its outstanding debts and assumed all trackage built to date. With its piedmont and Canon City lines finished, the D&RG was now positioned to pursue its master plan.[59]

Denver & Rio Grande Railroad: the Push to Leadville, 1877-1880

In 1876, placer mine operators William H. Stevens and Alvinus B. Wood discovered rich deposits of silver in California Gulch, high in the upper Arkansas River valley, and began development. During the next year, word of the find spread and incited a rush to what became Leadville. Palmer paid close attention because it occurred in the D&RG's area of interest and confirmed his predictions of mining in the mountains. Through reports and a personal visit, Palmer realized that the silver deposits were more extensive than initially suspected and would ultimately support a significant mining industry. Palmer wanted the D&RG to be the first railroad into the mining district because the D&RG would gain a competitive advantage. The Atchison, Topeka & Santa Fe Railroad (AT&SF) was also aware of Leadville's potential, already present in southern Colorado, and shared the same desires. Thus, both railroads converged on Canon City in 1877 and began a battle for Royal Gorge, the narrow and rock-walled gateway into the upper valley.

Physical conditions presented by the gorge brought the struggle into open conflict. The gorge was barely wide enough for one rail grade and two were impossible. At first, the rivals tried to sabotage each other, took strategic ground by force, and harassed track gangs. Construction then stalled as AT&SF and D&RG lawyers did battle in court. The AT&SF claimed that its subsidiary, the Canon City & San Juan Railroad, had rights to the gorge, but Palmer countered that his original 1870 charter gave him senior rights. In 1878, the Colorado Supreme Court decided the case, allowing both railroads to build at the same time without obstructing each other. The AT&SF had primary right where there was enough room for only one track, but had to allow D&RG its use. Palmer was unsatisfied because the decision meant that the AT&SF could still grade to Leadville, and so sued for an injunction on other grounds.[60]

The D&RG was unable to devote full attention to the battle because of major problems on other fronts. In his zeal to expand the D&RG, Palmer financially overextended the railroad and was now unable to pay interest on its debts. At the same time, the AT&SF was unrelenting not only in its push for Leadville, but also domination over all of southern Colorado. As the Union Pacific Railroad did in northern Colorado, the AT&SF attempted to wrest control over mountain railroads as feeders for its transcontinental system, and when this was unsuccessful, to

[59] Athearn, 1962:23; LeMassena, 1974:15; LeMassena, 1984:121; Stone, 1918, V.1:350.
[60] Athearn, 1962:61.

build its own lines into the mountains. The AT&SF wanted, in particular, the high volume of Leadville traffic and demanded acquiescence from the D&RG.

When Palmer balked, the AT&SF directors got their way by might. The AT&SF threatened to draw off D&RG traffic by building tracks parallel to most of its existing lines. Squeezed between mounting debt and a permanent loss of traffic, Palmer agreed to lease the D&RG to the AT&SF for 30 years, but only upon certain conditions. The AT&SF could not build lines that competed with existing D&RG routes, and both railroads had to drop their raft of lawsuits. Secretly, Palmer was already seeking a way out of the lease, and he maintained a personal lawsuit against the AT&SF right through the gorge, which was pending in the United States Supreme Court.[61]

In 1879, Palmer was rewarded for his patience and political acumen. The AT&SF resumed construction in the gorge and laid rails as far as Texas Creek when it received news that the Supreme Court found in favor of Palmer and upheld the D&RG's senior right. The AT&SF directors were unhappy but took solace in the fact that they still controlled the D&RG. Then, Palmer found the indiscretion that he needed to dissolve the lease. Palmer discovered that the AT&SF was quietly directing funds through the eastern banking house of Kidder, Peabody & Company to the Denver, South Park & Pacific Railroad (DSP&P), which was pushing to Leadville from Denver. Palmer immediately filed a lawsuit claiming that the DSP&P was a competing line, and by providing funds, the AT&SF violated the terms of the lease. Further, Palmer established that the violation was willful because an AT&SF vice-president was on the board of Kidder and knew his position was a conflict of interest. The court found in favor of Palmer and cancelled the lease, and in case the AT&SF proved recalcitrant, Palmer rallied together sheriffs and loyal employees and took the railroad back by force of arms.[62]

Palmer and associates were back in command of the D&RG by the end of 1879 and had primary rights to Leadville but still faced a financial crisis. They were also squeezed by the hostile AT&SF to the south, and Jay Gould's growing Union Pacific and Kansas Pacific empire to the north. Then, Jay Gould approached Palmer and associates with an offer that solved their principal problems. Gould considered the AT&SF a bitter foe and saw the D&RG as an ally against his greatest competitor. As with the Colorado Central in Clear Creek County, he also perceived the D&RG as a feeder railroad for his Union Pacific and Kansas Pacific systems. Unlike the Colorado Central, Gould thought that gaining control over the D&RG was unlikely and so enticed its cooperation instead. Gould provided emergency funds in exchange for a small interest in the railroad and a trade agreement to the complete exclusion of the AT&SF. When the AT&SF protested, Gould gave the directors a sample of their own strategy and threatened to build a system that paralleled theirs. Palmer and partners readily accepted and enjoyed the political support, which lasted only a short time.[63]

Gould felt that the political dealings and machinations between the railroads needed to be formalized for lasting peace. In 1880, officials from the Union Pacific, Kansas Pacific, D&RG, and AT&SF met in Boston and hammered out the Tripartite Agreement, also known as the Treaty of Boston. The agreement partitioned the Rocky Mountain chain into market shares. The AT&SF agreed to stay south and east of the Rio Grande River and could not venture north and west. The D&RG could not build into New Mexico, reserved for the AT&SF, nor into northern Colorado, which the Union Pacific claimed. This left the central mountains for the D&RG.[64]

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[61] Athearn, 1962:69; LeMassena, 1984:123; Stone, 1918, V.1:356.
[62] Athearn, 1962:72, 75, 80; LeMassena, 1984:125; Osterwald, 1991:71; Poor, 1976:162; Stone, 1918, V.1:356.
[63] Athearn, 1962:85; LeMassena, 1984:125; Poor, 1976:163; Stone, 1918, V.1:358.
[64] Chappell, 1974:44; Osterwald, 1991:72; Poor, 1976:189.

With fresh investment from eastern capitalists and Colorado now divided into market territories, Palmer and partners resumed their master plan to dominate the mountains. The D&RG purchased, at cost, the unfinished grade that the AT&SF built in the Arkansas River valley. In August 1880, the D&RG finally reached Leadville well in advance of the DSP&P, giving the railroad the competitive edge it sought and a platform for important extensions.[65]

In 1880, less than a year after the Treaty of Boston was signed, the first significant crack appeared in the agreement. During the struggle between the railroads, Gould was quietly buying stock in both the D&RG and DSP&P in hopes of controlling whichever one actually completed a track to Leadville. When Gould realized that control over the D&RG was unlikely, he focused on the DSP&P and acquired both a majority interest and an agreement from founder John Evans. When Palmer learned of this, he and partners grew furious because Gould openly supported a competing system, which went against the Treaty of Boston. Palmer responded with a schizophrenic strategy. He continued to uphold the exclusive trade agreement with the Union Pacific and Kansas Pacific, but entered into an aggressive battle against Gould's DSP&P in the mountains. The D&RG ultimately proved victorious through a period of unprecedented expansion, but not without significant repercussions. At this point, we leave the D&RG's general history to focus on its track in Summit County. The remainder of the railroad's history is continued in the section below on the Eagle River and Colorado River Drainage.

Denver & Rio Grande Railroad: Builds the Dillon Branch, 1881

When the D&RG reached Leadville, Palmer and associates celebrated only briefly. They correctly feared that Gould would develop the DSP&P into a formidable mountain system and usurp their territory. Thus, Palmer initiated a period of rapid expansion to weave the D&RG throughout the mountains advance of the DSP&P. The Leadville terminus and the Arkansas River valley trunk line served as platforms for three strategic extensions started in 1881. One, built in a winning race against the DSP&P, crossed over the Collegiate Mountains to Gunnison. The other was a line from Leadville over Tennessee Pass and down the Eagle River to the new mining district of Red Cliff. The last went north from Leadville, up Fremont Pass, down into Ten Mile Valley, and northeast to Dillon on the Blue River in Summit County.

The last extension, known as the Dillon Branch, served several strategic purposes. The first was to capture the Robinson Mining District, which boomed shortly after Leadville. The district, at the head of Ten Mile Creek on the north side of Fremont Pass, featured mines scattered around the towns of Robinson, Kokomo, and Recen. The Branch's second purpose was to establish a station on the Blue River and test that area's market, including Frisco, Breckenridge, and satellite mining camps. The last function was as a railhead for expansion into northern Colorado, which was Gould's territory.

Although construction on the Dillon Branch began in 1881, Palmer and associates already secured the route through a subsidiary company. Palmer, adept at railroad strategy, repeatedly used this railroad charter loophole to avoid lawsuits. The D&RG's original charter limited that railroad to routes outlined at its time of organization, leaving routes defined afterward open to legal contest. Thus, Palmer claimed desirable routes through paper railroads and sold them to the D&RG. The Leadville, Ten Mile & Breckenridge Railway was one such subsidiary, and it was both organized and sold to the D&RG in 1880 with the Dillon Branch in its charter.[66]

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[65] Athearn, 1962:98, 100; Beebe and Clegg, 1962:149; Osterwald, 1991:74; Poor, 1976:184; Stone, 1918, V.1:359.

[66] Digerness, 1978:35; Poor, 1976:242.

During 1881, construction crews completed track over the pass, through the Robinson district, to Wheeler, presently Copper Mountain Ski Resort. Wheeler, a small settlement on the valley floor, grew in response to several mines, sawmills, and road traffic to Leadville. When the D&RG began surveying the Dillon Branch, the residents realized that the line would pass through their hamlet and increase its importance. They applied for and were granted a post office in 1880, in advance of the railroad. When the D&RG arrived in 1881, it designated Wheeler as a coal and water stop, provided a station, and erected a construction camp.[67]

When the working season of 1882 opened, the D&RG finished the branch down the west side of Ten Mile Canyon to Frisco and along the creek to Dillon. The D&RG stopped at Dillon and did not grade north or south up the Blue to Breckenridge as initially planned. Although Breckenridge was the most important town in the area, the DSP&P was already on the way over from South Park, and once the DSP&P established service, it would be able to offer lower freight and passenger rates and shorter travel time than the D&RG. Breckenridge was one of the few areas of contest where the D&RG was unable to compete against the DSP&P. Until the DSP&P reached Breckenridge, however, the D&RG enjoyed a monopoly in Summit County.[68]

This lasted briefly. In 1882, the DSP&P arrived and outmatched the D&RG. The DSP&P graded a track from Breckenridge to Dillon, a spur to the sawmills at Keystone, and a main line up Ten Mile Canyon to Leadville. Because the DSP&P had direct access to Denver, shorter travel times, and stations in Breckenridge and along the Blue River, it quickly dominated Summit County. The D&RG quietly conceded defeat and understood that beyond the Robinson district, the Dillon Branch was secondary preference among businesses and riders. Regardless, the Dillon Branch was still important to the development of the Blue River drainage. By competing for freight and passengers, the D&RG and DSP&P kept their rates low, which changed the course of industry and settlement in the area. The two railroads provided an all-season link with the outside world, reduced previously high freight rates, and facilitated rapid movement of people and goods. The costs of mining and logging fell, stimulating a countywide boom among these two industries. Lumber companies were now able to ship their products to markets in Denver and Leadville. Mining companies profitably extracted lower grades of ore in higher tonnages from deep workings and sent their ore to smelters also in Denver and Leadville. The railroad also made the region accessible to capitalists, who were more likely to invest after personal examination. The reduced freight rates benefited the county's residents by lowering the cost of living and improving the quality of daily life. By providing regular contact with the outside world, the railroads also served as a conduit for culture. Overall, Summit County, its towns, and mining and logging industries grew quickly during the early 1880s.

Denver & Rio Grande Railroad: Operates the Dillon Branch, 1883-1911

The D&RG maintained its important relationship with the Ten Mile and Blue River area for around 25 years, although the Dillon Branch was profitable only intermittently. The Ten Mile Mining District boomed during the early 1880s but slowed significantly by the middle of the decade with no industry to take its place. The latter half of the 1880s then became a difficult time for the Dillon Branch. This changed during the early 1890s when logging and mining revived, and the branch was unprofitable again following the Silver Crash of 1893. Logging and mining revived again in the late 1890s, peaked by the early 1900s, and then permanently declined. The ore underground and old-growth trees in the gulches were nearly gone and unable

[67] Bauer, et al., 1990:151; Digerness, 1978:38; Osterwald, 1991:74.

[68] Digerness, 1978:38; LeMassena, 1974:41; LeMassena, 1984:127; Osterwald, 1991:74; Poor, 1976:242; Stone, 1918, V.1:360.

to sustain mining and logging on meaningful levels. As a result, the general economy contracted to the point where it could not support two railroads.

Because the DSP&P's (now the C&S) Summit County line continued a higher volume of traffic, it remained the dominant railroad. The D&RG reduced traffic to Dillon and found that, by the late 1900s, the cost of clearing snow and providing service exceeded income. Thus, the D&RG directors determined to abandon the branch, but not without extracting a tribute from the DSP&P. Officials from the two railroads met and agreed to exchange territories. The D&RG maintained a strong presence in Gunnison County and coveted a particular dead-end line owned by the C&S. At the same time, the C&S was eager for the D&RG to relinquish Dillon. Thus, the two railroads exchanged lines, the Gunnison County spur for the Dillon Branch, benefiting both organizations. The D&RG still owned the Dillon Branch but cancelled its service, leaving the C&S as the only carrier between Breckenridge and Leadville. Few residents or businesses missed the infrequent D&RG trains, and the track was dismantled in 1924.[69]

Denver, South Park & Pacific Railroad: Organized, 1872-1877

During the late 1860s, Denver's elite struggled with W.A.H. Loveland and mining capitalists over which city would become Colorado's railroad hub. John Evans and associates fought for Denver, and Loveland and associates promoted Golden. Both parties succeeded to a degree. Evans and associates connected their Denver Pacific Railroad with the UPRR transcontinental line in Wyoming, and Loveland established the Colorado Central Railroad. The advantage that Loveland possessed was access to valuable mining traffic in Clear Creek and Gilpin counties. Because Golden was gateway to these counties, it was poised to become a hub of both commerce and a railroad network. The Denver Pacific, by contrast, served no industries of significance, leaving Denver merely as a freight exchange center.

Evans and associates understood that to make Denver an important hub, they too had to build a railroad into the mountains, where natural resources lay. They took action in 1872 and organized the Denver, South Park & Pacific Railway. The principals were a who's who of Denver and included Governor Evans, Joseph E. Bates, Walter Cheesman, Henry Crow, Bela M. Hughes, Charles B. Kountz, David Moffat, and F.Z. Solomon. Evans and associates planned a route up the South Platte River to South Park, down into the Arkansas River Valley, and southwest to the San Juan Mountains. When Loveland's Colorado Central began grading to Georgetown, Evans chartered the Denver, Georgetown & Utah Railroad as competition. The paper railroad never broke ground, but Evans wanted to include its route and capital in the other company. Thus, the investors combined assets as the Denver, South Park & Pacific Railroad (DSP&P) in 1873.[70]

After obtaining bonds, the Evans group established the contracting firm Denver Railway Association in 1873 and began construction. The company laid rails as far as Morrison and then stopped due to the financial panic of 1873. For several years, the fledgling railroad sustained itself on passengers, building stone, fence posts, lime, and lumber. In 1876, public outcry over the stalled DSP&P and the public funds it received moved Evans and partners into action. They pushed the railroad well up the South Platte canyon but ran out of capital, established a railhead, and stopped again.[71]

[69] Athearn, 1962:214; Klinger and Klinger, 2004:141; LeMassena, 1974:125, 139; LeMassena, 1984:163.
[70] Beebe and Clegg, 1958:124; Chappell, 1974:11; LeMassena, 1984:213; Osterwald, 1991:66; Poor, 1976:113, 117; Stone, 1918, V.1:365.
[71] Chappell, 1974:13, 20, 25; LeMassena, 1984:213; Osterwald, 1991:66; Poor, 1976:124, 127, 131, 144.

Denver, South Park & Pacific Railroad, Builds to Leadville, 1877-1880

Although the DSP&P had net yet reached South Park, ridership and one-way freight rose suddenly in 1877, and most of this traffic disembarked for the new mining camp of Leadville. Like William Jackson Palmer of the D&RG, Evans and associates forecasted that Leadville was in the early stages of a sustained boom and would eventually generate high volumes of traffic. He and partners worked quickly to resume construction and modified their South Park objective. Originally, the DSP&P planned a hub in South Park with extensions radiating outward to Fairplay, surrounding ranches, and mining districts in the Mosquito Mountains. With Leadville now demanding attention, South Park itself became a secondary priority and Evans opted for the shortest route across the broad valley. Evans was well aware that Palmer's D&RG was racing toward Leadville, commanded the best avenue up the river valley, and was slightly in the lead.

Construction resumed in 1878, and even though the DSP&P had a long way to go, the constantly moving railhead saw high volumes of traffic bound for the new camp. During 1879, construction crews pushed across South Park and down Trout Creek to the Arkansas River. They also established a yard at Como, primarily because its coal beds provided locomotive fuel.

Around this time, the DSP&P became caught up in the political intrigue that surrounded the D&RG, UPRR, Kansas Pacific, and AT&SF (discussed in detail above with D&RG). Jay Gould owned the UPRR and the Kansas Pacific, fought bitter competitor AT&SF for domination of Colorado, and he cooperated with the D&RG to do so. Gould's ultimate goal was to acquire control over the mountain railroads and use them as feeders for his UPRR and Kansas Pacific transcontinental system. Above all, Gould wanted to capture the Leadville market and any railroad that served the mining city. Gould knew that the D&RG's Arkansas Valley route to Leadville, while unfinished, was as good as built, but was unable to acquire the D&RG. The best he could do was secure an operating agreement with the carrier, and such agreements were temporary. Thus, Gould turned to the DSP&P as his next best option in 1879 and groomed Evans and partners for their cooperation, while quietly buying stock in the railroad.[72]

When the DSP&P reached the Arkansas River valley, Evans assessed how best to carry out the railroad's long-term plans. He simultaneously wanted access to Leadville and to continue southwest over the Collegiate Range to Gunnison. The D&RG already possessed the best route up the Arkansas River to Leadville, and Evans saw a second line as a costly waste of capital. Thus, he and Gould approached the D&RG with a deal. If the D&RG shared its track from Buena Vista to Leadville, then the DSP&P would allow the D&RG to use its line from Buena Vista to Gunnison, with the income from both lines equally divided. Evans was relieved from building a second track to Leadville, the D&RG could access the Gunnison area, and Gould would shut out the AT&SF through the alliance. Although no joint rails had been laid yet, both railroads signed the Joint Operating Agreement of 1879. In 1880, the DSP&P graded north from Trout Creek to Buena Vista and turned west into the Collegiate Mountains, and the D&RG finished its line to Leadville. Both railroads then immediately instituted service and enjoyed heavy traffic.[73]

In 1880, Gould, the D&RG, and the AT&SF negotiated the Treaty of Boston and divided Colorado into market shares. The AT&SF was largely shut out of Colorado, the D&RG was allotted the state's central portion, and Gould's UPRR agreed to Clear Creek County and points north. When the treaty was not even one year old, Gould destabilized the relationship by purchasing the DSP&P from Evans and immediately selling it to the UPRR. In so doing, the UPRR established a direct presence in the territory specifically allotted to the D&RG, which

[72] Osterwald, 1991:71; Poor, 1976:163, 190.

[73] Chappell, 1974:40-41; Digerness, 1978:29; Osterwald, 1991:71; Poor, 1976:173; Stone, 1918, V.1:366.

violated the treaty and enraged Palmer. Evans and associates profited handsomely from Gould, and Gould received a high price from the UPRR, which then operated the DSP&P as the South Park Division.[74]

With the treaty violated and the relationship between the UPRR and D&RG damaged, the Joint Operating Agreement began to fall apart as neither railroad wanted to depend on each other's tracks. Palmer was the first to move away from the agreement by announcing plans to race the DSP&P for Gunnison and usurp the territory. The UPRR then withheld its payments for the shared track to Leadville. When the UPRR assumed control over the DSP&P in 1881, it appointed E.P. Vining as manager, and he knew little of the railroad's specific needs, did not listen to the advice of Evans and partners, and generally mismanaged the railroad. Worst of all, Vining raised freight rates so high that business went to the D&RG. Thus, the UPRR felt that it owed the D&RG proportionately less for the shared track, and the D&RG responded with a lawsuit. The UPRR realized that it was dependent on the D&RG through the Joint Operating Agreement for access to Leadville, and it was only a matter of time before the agreement was not renewed.[75]

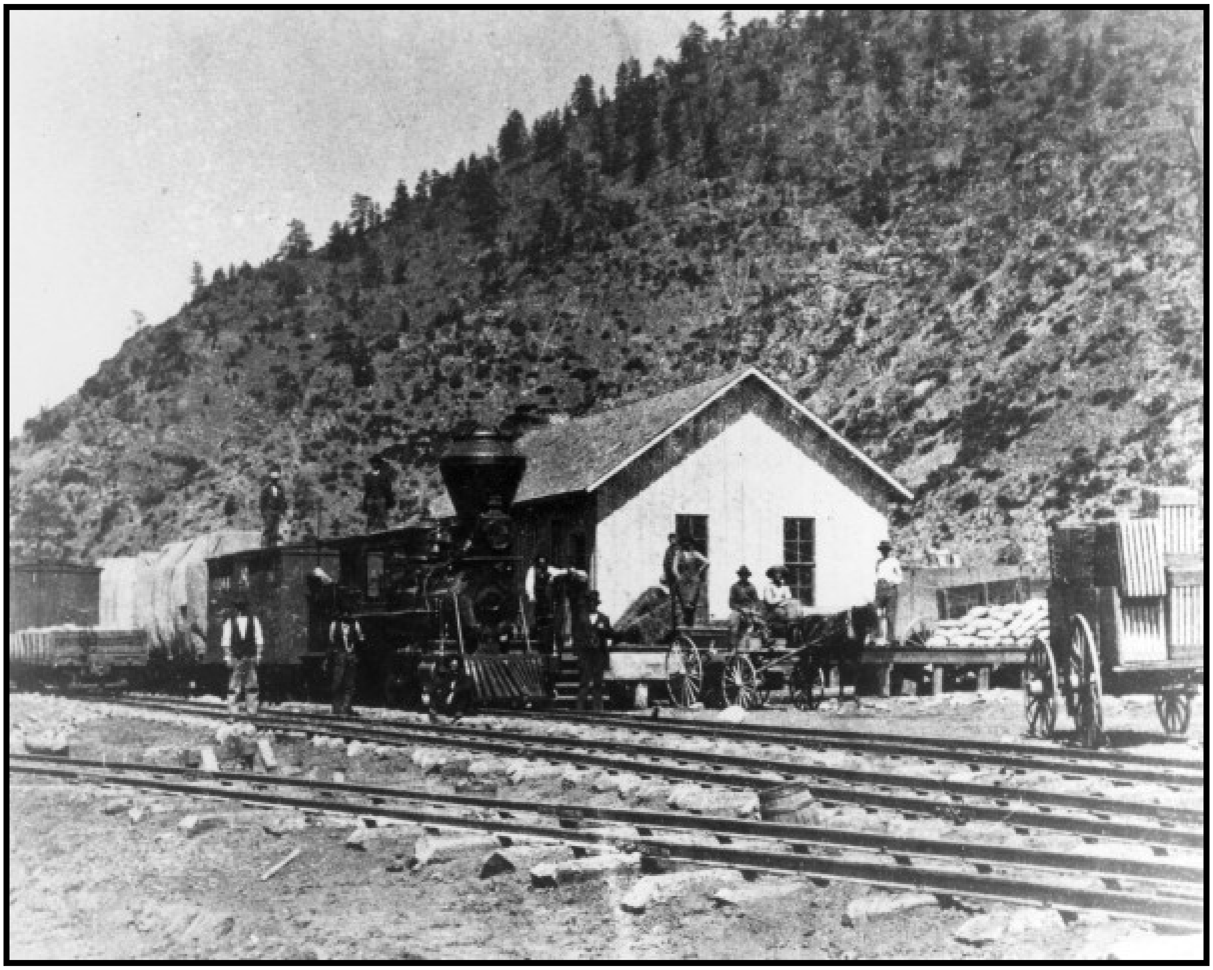
Denver, South Park & Pacific Railroad: Builds the High Line, 1881-1884

John Evans and DSP&P engineers Leonard Eicholtz and James A. Evans offered a solution to the problem of Leadville access. During the initial push for Leadville in 1878, they established the Denver, South Park & Ten Mile Railroad Company and claimed an alternate route through Summit County. The proposed line went from South Park to Breckenridge, Dillon, Ten Mile canyon, Fremont Pass, and Leadville. Evans intended to grade to Summit County at some point, but he shelved the route for the future when he reached the D&RG agreement. Now that the DSP&P required its own line to Leadville, the proposed route was revived. In 1881, Eicholtz and James Evans began construction on what was known as the High Line. Track crews spiked rails to Boreas Pass by spring while workers pushed the bed to Breckenridge and Dillon. In 1882, trains finally reached Breckenridge first and Dillon second, while the DSP&P built an extension from Dillon southeast up the Snake River to the large sawmills at Keystone. At Dillon, the DSP&P established a station and joined its rails with those of the D&RG in the unlikely event that cars would be switched between the carriers.[76]

After the DSP&P established its railhead at Dillon in 1882, it hesitated. As long as the D&RG continued sharing its Arkansas Valley line, DSP&P directors saw no need to saddle their railroad with the high cost of finishing the High Line to Leadville. However, the D&RG sued when the UPRR withheld payment again for the shared track, threatening Leadville access. DSP&P directors resumed construction in response. In 1883, James Evans and P.F. Barr surveyed a right-of-way from the Dillon track through the south side of Frisco, up Ten Mile Canyon, and into the Robinson district. The junction where the Leadville extension branched off the Dillon track was named Placer Junction after local placer mines, and it received a station, water tank, and living quarters for train crews. Evans and Barr had great difficulty finding a viable path for the grade because the D&RG already built its Dillon Branch on the canyon floor. They were limited to the canyon's east side, which offered little room and presented obstacles. C.W. Collins & Company and Carlisle & Corregan were awarded contracts to build the line, and they paid trackmen $2.25 per day and rockmen $2.50 per day. Labor was difficult to find, and so the UPRR advertised out of state and drew twice as many workers as were actually needed. The

[74] Beebe and Clegg, 1958:125; Chappell, 1974:48; Osterwald, 1991:74; Poor, 1976:198.
[75] Osterwald, 1991:11 Poor, 1976:238.
[76] Chappell, 1974:54; Digerness, 1978:38; LeMassena, 1984:213; Osterwald, 1991:77; Poor, 1976:242, 248.

contractors hired only half of those who arrived and turned the rest away, and they had to find work in the dead of winter.[77]



A Denver, South Park & Pacific train stops at the Dillon Station during the late 1880s. Although the Denver & Rio Grande already served Dillon, the DSP&P further reduced transportation costs and time. Also, the DSP&P was the only railroad passing completely through Summit County. Courtesy of Denver Public Library, X-7704.

A constant precession of problems delayed construction of the High Line in Ten Mile canyon. Not only did the DSP&P contend with difficult weather and physical conditions, but also the D&RG did everything in its power to stymie progress. The D&RG applied for injunctions against the DSP&P over right-of-way infringements and the impacts of construction, and when the DSP&P arrived at Kokomo, it became entangled with the D&RG over a need to cross hostile tracks. Ultimately, the courts favored the DSP&P in most cases, which allowed the railroad to enter Leadville in 1884. The High Line was now finished and for the substantial cost of $1,134,399, or $18,000 per mile. And yet, an unusually heavy snowpack on Boreas Pass prevented the DSP&P from inaugurating service until September 1884, which required the UPRR to continue the Joint Operating Agreement and mollify the D&RG with back-payments to keep the Arkansas Valley line open.[78]

[77] Chappell, 1974:56, 60; LeMassena, 1984:213; Osterwald, 1991:12; Poor, 1976:249, 252.
[78] Beebe and Clegg, 1958:125; Chappell, 1974:61; Digerness, 1978:129; Osterwald, 1991:79; Poor, 1976:257, 259, 265.

Denver, South Park & Pacific Railroad: Operates the High Line, 1885-1893

The DSP&P operated the High Line regularly through the latter 1880s, but at a loss. While Leadville provided the DSP&P with consistent traffic, customers awarded much of their business to the D&RG because of high freight rates imposed by the UPRR. In addition, the route traversed one of the most rugged portions of the Rocky Mountains and crossed two passes with elevations above treeline, which consumed an alarming 51 percent of total revenues to keep open. Ten Mile canyon, the worst section, was regularly blocked by avalanches. And yet, the UPRR accepted the losses because the amount of traffic that the DSP&P shunted over to the UPRR transcontinental line exceeded the deficit. Some of the traffic was ore shipped to the Omaha & Grant Smelter near Denver, in which UPRR president Charles F. Adams owned a significant share [79]

By 1889, the DSP&P began defaulting on its loans and bond payments, and when creditors grew impatient, the UPRR allowed the DSP&P to go bankrupt, which wiped free the minor debt. The bondholders forced the DSP&P to be sold at auction to recover their loans, and the UPRR bought it back and reorganized the railroad as the Denver, Leadville & Gunnison (DL&G), named after the principal points of service.[80]

As discussed above with the Colorado Central Railroad, UPRR officials consolidated their Colorado subsidiaries under the Union Pacific, Denver & Gulf Railway in 1890 to improve efficiency, keep troubled railroads off UPRR books, and protect the profitable lines. The separate UPRR holding company now managed the Clear Creek County railroads, the DL&G, and Denver, Texas & Gulf Railroad as one system, but allowed each its separate identity.

From this point in time until the High Line was closed, the DL&G shares a parallel history with the Colorado Central in ownership because they belonged to the same parent railroad. The specifics are covered above with the Colorado Central. An important generality was the financial failure of the UPRR due to the economic depression that followed the Silver Crash of 1893. Shortly after, receiver Frank Trumbull was given charge of the Union Pacific, Denver & Gulf because he was impartial and sensitive to the needs of Colorado railroads. The transfer ended UPRR control over the DL&G, and Trumbull began the complicated task of restoring the DL&G back to profitability. This proved to be exceedingly difficult because Colorado's mining industry, which the DL&G depended on for income, completely collapsed due to the Silver Crash and offered relatively little business.

Denver, Leadville & Gunnison Railroad: Operates the High Line, 1894-1897

During the mid-1890s, the financial panic caused by the Silver Crash of 1893 pushed the nation into a deep economic depression. Colorado suffered because it relied largely on mining, which was nearly at a standstill, and with this economic cornerstone in ruins, dependent businesses and industries also failed. The financial outlook for the DL&G and other mountain railroads was bleak, and Trumbull knew that a buyer would be long in coming in such a climate. And yet, the DL&G derived some benefit from its receivership and delay in acquisition.

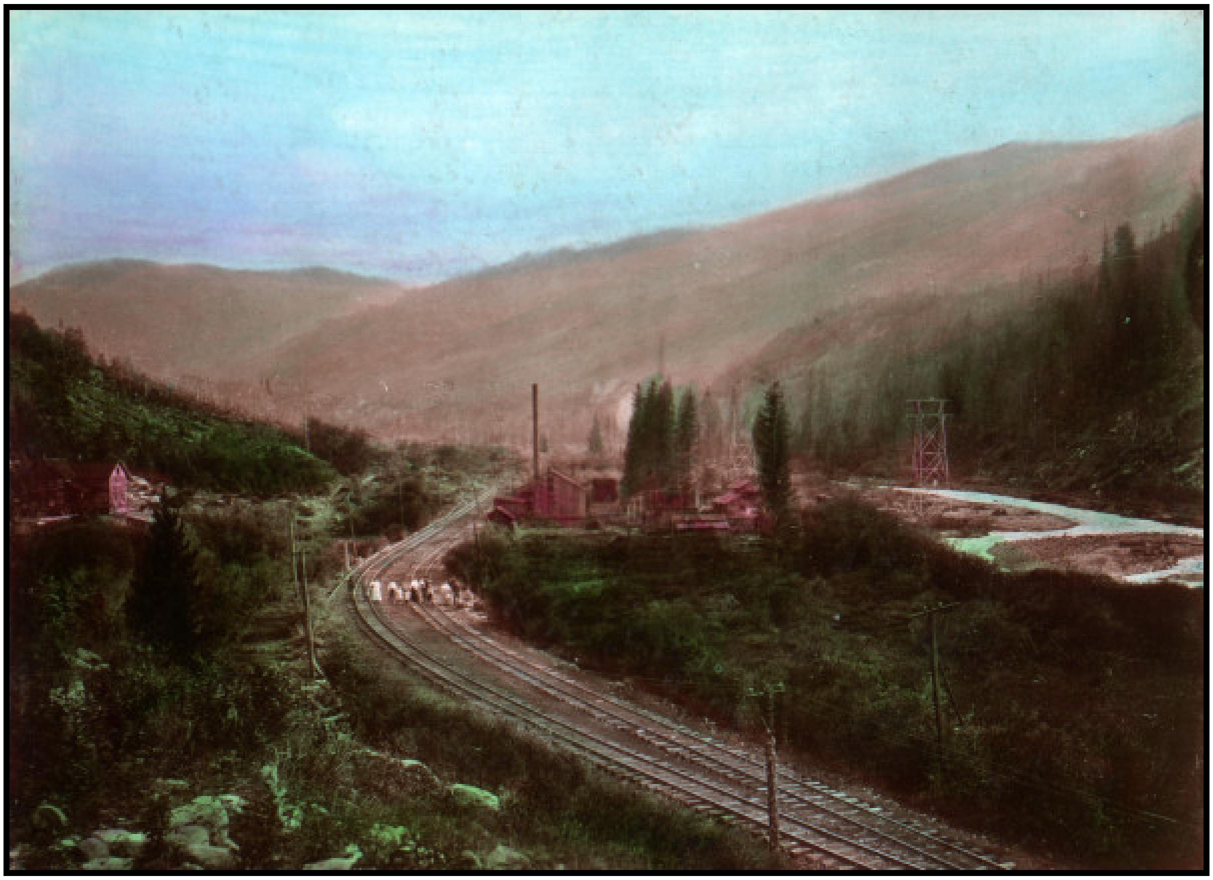
Trumbull was an ideal manager for the DL&G because he was aggressive, practical, fiscally conservative, and understood the business of running a railroad in the mountains. To this end, he reduced wasteful operating costs, carried out long-deferred maintenance, improved service, added new locomotives and rolling stock, and solicited traffic. He replaced lost freight from metal mining with hay, ice, and coal from Crested Butte. Summit County continued to

[79] Chappell, 1974:71; Klinger and Klinger, 2004:155; Poor, 1976:278, 312.

[80] Chappell, 1974:68, 71; Digerness, 1978:50; LeMassena, 1984:215; Osterwald, 1991:81; Poor, 1976:280; Stone, 1918, V.1:366.

serve as an important market because most of the mines around Breckenridge produced gold, which was in demand as a stabile investment during economic depressions. Thus, the High Line remained one of the railroad's most important assets. Overall, Trumbull's program boosted the DL&G's image and helped increase income, difficult to achieve in the climate of the depression.[81]

By the late 1890s, conditions were right for the DL&G's return to private ownership. Trumbull successfully reversed the railroad from loss to profit, and the national economy recovered enough to foster confidence among wealthy investors. Thus, Trumbull put the DL&G and the other railroads under the Union Pacific, Denver & Gulf up for auction, and they were immediately purchased.



The Colorado & Southern Railroad assumed the High Line from Dillon to Leadville in 1898 and continued service through Summit County. The route was instrumental in the region's late 1890s and early 1900s mining boom. The southwest view up Ten Mile Canyon shows the Mary Verna Powerhouse and siding at Curtin around 1906. I-70 was graded later on the canyon's far right side. Courtesy of Denver Public Library, X-62731.

Colorado & Southern Railroad: Operates the High Line, 1898-1920

In 1898, Henry Budge and other Union Pacific, Denver & Gulf bondholders bought the collection of Colorado railroads, including the DL&G and reorganized them as the Colorado & Southern (C&S). Frank Trumbull was president and manager and Grenville M. Dodge and

[81] Chappell, 1974:73; Digerness, 1978:56; Hauck, 1979:103.

Oliver Ames, formerly of the UPRR, were on the board of directors. At first, Budge and associates wanted to sever and dispose of the DL&G because of its extreme operating costs. Dodge, however, convinced them otherwise, and Trumbull continued his policies of keeping the railroad in a profitable state.

During the late 1890s, Colorado's mining industry entered a period of revival, and Leadville and Summit County in particular boomed. Trumbull knew that the DL&G had to compete against the D&RG, which was well entrenched, and this meant providing excellent service while operating efficiently. Thus, he began improving the High Line in 1901, especially in Summit County, to keep up with the significant increase in traffic. Placer Junction, renamed Dickey Junction, received a coal dock in 1902, engine house the following year, and rotary snowplow to keep the tracks clear in winter. In Ten Mile canyon, sidings were built for the King Solomon and other mines, and the station of Curtin was established at the Mary Verna and North American mines.[82]

In 1908, the C&S underwent significant changes. The Burlington & Quincy Railroad purchased the C&S, Trumbull left, and without him, the entire system declined. The new directors were unappreciative of the DL&G because of its high maintenance costs and limited business and attempted to close the branch. Summit County residents and businesses then began a struggle with C&S. When traffic on the High Line became light in 1908 due to the effects of the 1907 financial panic, C&S suspended service on grounds that the line incurred significant deficits. Trains resumed running in 1909, but the directors tried to permanently close the track in 1910, forcing the Breckenridge Chamber of Commerce to obtain a court order reinstating operations. The C&S, however, drastically cut the schedule. In 1911, the D&RG forfeited its Dillon Branch to C&S, which now held a monopoly on all trains between Breckenridge and Leadville. Despite an increase in traffic, the High Line still was a financial liability, and C&S filed an application with the ICC in 1915 to end service. The application was denied, which required C&S to subsidize operations with revenue from other portions of its Colorado system.[83]

In 1917, C&S received temporary relief from the drain imposed by the entire DL&G system, and the residents and businesses in Summit County were granted a break from the struggle to keep the High Line open. At that time, the U.S. Railroad Administration assumed control over the nation's railroads, including C&S, as part of its World War I mobilization policy. The Administration operated C&S for three years, during which the mining industries in Leadville and Summit County enjoyed a major revival and provided the railroad with business. When the Administration returned the DL&G to the C&S in 1920, however, the revival and the associated traffic ended, leaving the High Line in debt again. The C&S desperately wanted to abandon the branch, but because it was Summit County's only railroad, the ICC would not support the closure. As mining in Leadville and Summit County abruptly declined, the economic equation of the High Line grew more imbalanced.

End of the DSP&P High Line, 1921-1938

The entire DL&G system struggled and demand for service on the High Line was minimal during the 1920s. Almost no mining or logging on a commercial scale occurred in Summit County, and the few mining companies in Leadville shipped much of their ore via the D&RGW. In addition, automobiles and trucks diverted increasing amounts of business away from C&S. However, C&S was mandated to operate the High Line because it was Summit County's all-season link with the outside world and the only track in operation between

[82] Digerness, 1978:119; Klinger and Klinger, 2004:141; Poor, 1976:297.
[83] Chappell, 1974:73; Osterwald, 1991:98; Poor, 1976:394.

Leadville and Breckenridge. The C&S patiently bided its time until traffic was so light that even the ICC had to admit that the High Line had outlived its usefulness.

In 1928, an opportunity to abandon the entire DL&G system materialized for C&S. Denver proposed damming the South Platte River in Waterton Canyon, which would have submerged the DL&G's only line between the Denver hub and the rest of the system in the mountains. The C&S immediately embraced the dam because severing the main line gave justification to abandon the rest of the system. In reciprocation, Denver supported the C&S desire to close the DL&G because the city could not build the dam as long as the track along the South Platte was viable. Thus, C&S applied to the ICC to abandon the entire system, with the backing of Denver, and met with strong protests from business interests in Park and Summit counties. As with the Colorado Central, the C&S was entrapped in a position where local interests insisted on service, but were unwilling to discourage the use of trucks and provide enough business.[84]

The ICC entertained hearings for almost two years and then rendered its decision in 1930. The panel understood the importance of the dam and the high losses sustained by C&S and agreed to abandonment on one condition. The C&S had to wait a three year period while finding another entity to run the DL&G. The C&S was not adamant about scrapping the railroad, and instead merely wanted to dispose of the financial liability. As the Great Depression deepened during the early 1930s, C&S grew desperate to be rid of the system and tried giving it, complete with locomotives and rolling stock, away. The offer attracted two parties. Victor A. Miller, receiver of Rio Grande Southern Railroad, thought the system could be kept open if rail buses were substituted for all traffic except for occasional freight trains. Miller and C&S began negotiations, and Miller then organized Denver, Leadville & Alma Railroad in 1932 to take over the system. Shortly after, W.C. Johnstone appeared and made his own proposal to run the railroad under the Denver Intermountain & Summit Railway Company. Sadly, C&S turned down both Miller and Johnstone because the directors felt neither party had the resources to operate the line through the winter as required by the ICC. If Miller or Johnstone failed, C&S would have to repossess the railroad and endure its financial drain again.[85]

When the three year waiting period expired at the end of 1933, C&S was no longer as eager to give up the DL&G. The reason was that the economy, and gold mining in particular, showed signs of a minor recovery due to the Gold Reserve and Silver Purchase acts, which increased the values of both metals and caused a mining revival in Colorado. For two years, the C&S watched the effect that the revival had on the demand for its service, which was not as substantial as forecasted. Trucks and automobiles were largely to blame, and C&S gathered enough information to demonstrate that trucks hauled 50 percent of the ore, 80 percent of the general goods, and 75 percent of the hay in the DL&G region. With these statistics, the C&S filed an application with the ICC in 1935 to suspend service. The ICC approved. The C&S operated the entire DL&G railroad system for one more full year, ran the last train between Leadville and Breckenridge in 1937, and ended service between Breckenridge and Como in 1938. The High Line segment between Leadville and the Climax molybdenum mine on Fremont Pass was conveyed to the D&RGW, the rest of the track was dismantled, and Dickey Junction and the track north to Dillon were flooded in 1963 by Dillon Reservoir.[86]

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[84] Chappell, 1974:192.

[85] Chappell, 1974:192; Poor, 1976:395.

[86] Chappell, 1974:194; Digerness, 1978:215; Klinger and Klinger, 2004:141, 142; Osterwald, 1991:98; Poor, 1976:399.

EAGLE RIVER AND COLORADO RIVER VALLEY RAILROAD SYSTEM

D&RG Builds the Leadville to Glenwood Branch, 1881-1887

After the D&RG finished its highly profitable and strategic trunk line up the Arkansas River valley to Leadville, the railroad enjoyed an expansion binge during the early 1880s. At first, a race for supremacy in the mountains over rival DSP&P drove the expansion, and as the D&RG successfully graded lines deep into Gunnison County and northwest down the Eagle River from Leadville, Palmer and partners realized that Utah was within reach. Palmer's aspirations did not end at the Colorado-Utah border. If the D&RG could connect with a friendly railroad in Utah, then the D&RG could serve as a link on the only transcontinental route to cross the Rockies. Palmer planned to connect his interstate system with the UPRR in Ogden, Utah, and with the same railroad in Denver.

Because no friendly railroad existed in the eastern portion of Utah, Palmer established one. In 1881, he and Utah investors organized the Sevier Valley Railway Company to lay claim to a route to Colorado, and when this was done, they sold the subsidiary to the Denver & Rio Grande Western Railroad (D&RGW), which the party formed at the same time.[87]

The D&RG and D&RGW began building toward each other in 1881 and enjoyed rapid progress across the flat deserts of canyon land country. During 1882, the D&RG pushed from Gunnison through the important cattle center of Cimmeron to Montrose and then followed the San Miguel River down to Grand Junction. With the project almost complete, the D&RG leased the D&RGW for 30 years to ally the two railroads. In 1883, the D&RG turned its construction crews west at Grand Junction and they completed tracks to Green River, Utah, where the railroads joined and became one system. The D&RG increased its value as a transcontinental link, although the route across the Rockies was elaborate and circuitous, and therefore painfully slow. This fact will figure prominently later.[88]

During the period of extreme expansion, Palmer accrued far too much debt, outpaced actual demand for service, and neglected existing lines. The D&RG was in poor condition physically and fiscally, and it was again unable to pay even basic debts such as interest on construction bonds. Tired of the constant financial drain, lack of returns, and rampant expansion, the principal investors forced Palmer to resign in 1883, and he left to focus on his D&RGW. Palmer's replacement proved to be worse for the D&RG.[89]

The board of directors secured Frederick Lovejoy as president because he had 30 years with the Adams Express Company but no experience running a railroad. In an attempt to stem the constant drain of capital, Lovejoy put an immediate end to expansion but lost the savings to mismanagement. He fired long-term employees sympathetic to Palmer, tried to cancel the D&RGW lease, entered into legal squabbles with Palmer, and deferred maintenance on the D&RG. The result was a loss in productivity, decline in service, and further deterioration of the railroad's physical state. Lovejoy also regularly missed payments on debts and failed to pay employees. Within a year, Lovejoy ran the D&RG into bankruptcy, and in 1884, William S. Jackson was appointed receiver.[90]

Because the D&RG was in a poor state and subject to suits by creditors, Jackson had difficulty and made little progress restoring the carrier to profitability. The bondholders were

[87] Athearn, 1962:115.
[88] Athearn, 1962:115, 121; LeMassena, 1974:41; Osterwald, 1991:78; Stone, 1918, V.1:360.
[89] Athearn, 1962:135; LeMassena, 1974:41; LeMassena, 1984:136.
[90] Athearn, 1962:146; LeMassena, 1974:43; LeMassena, 1984:137; Osterwald, 1991:79; Stone, 1918, V.1:361.

unwilling to wait longer for payment and foreclosed on their loans, which forced the sale of the D&RG at auction in 1886. They bought the railroad back, reorganized the company for a fresh start, and appointed Jackson president. Jackson and some of the board members then secured new investors in Europe. As receiver, Jackson pursued one principal improvement intended to increase the railroad's ability to draw transcontinental traffic and hence increase its revenue. Specifically, he began laying a third rail along the main lines to accommodate standard-gauge rolling stock. Up to this point, the D&RG was strictly a narrow-gauge system, which was incompatible with the standard-gauge equipment used by transcontinental railroads.[91]

In 1885, a series of events unfolded that brought the Red Cliff extension into prominence. Several years earlier, a group of Colorado Springs investors organized the Colorado Midland Railroad to build a third route from Colorado Springs to Leadville, and west over the Sawatch Range to Aspen, which they correctly forecasted would become significant. They chose 1883 to begin because under conservative Lovejoy, the D&RG was unlikely to build its own extension to Aspen and threaten their project. The Colorado Midland directors underestimated the time required to reach the new mining city, which presented Jackson with a narrow window of time in which to compete.

The Denver & Rio Grande was hesitant about grading a line from Leadville to Glenwood Springs because Glenwood Canyon, confined by sheer cliffs, was an obstacle. President William Jackson wanted to capture the Aspen market and pushed through anyway, despite objections. The line not only paid for itself, but also became a vital link in the only transcontinental route over the Rockies. Courtesy of Denver Public Library, CHS.J2424.

[91] Athearn, 1962:153; LeMassena, 1974:46; LeMassena, 1984:139.

Jackson was aware that loss of the lucrative Aspen market was only part of a larger problem that the Colorado Midland posed to the D&RG. He assumed that the Colorado Midland would not stop at Aspen and was likely to continue down the Roaring Fork River valley to Glenwood Springs. From there, it would be natural for the Colorado Midland to send branches east and west along the Colorado River, thereby securing the entire river drainage for itself. Further, the Colorado Midland might even form an agreement with the Union Pacific and draw the railroad giant deeper into D&RG territory. This was unacceptable to Jackson, and he knew that the D&RG had to push into the Colorado River valley first.

Jackson presented his case to the board of directors and insisted on funds, but they were unmoved. The board was hesitant because of the financial catastrophe caused by Palmer's aggressive expansion, and they wanted to incur no more debt. Risking the wrath of the board and the security of his own job, Jackson took action anyway in 1886. He ordered construction crews to begin building a line to Aspen from the dead-end Red Cliff extension. The route, surveyed earlier, descended the Eagle River to its confluence with the Colorado River, followed the latter waterway to Glenwood Springs, and ascended the Roaring Fork to Aspen. Jackson planned the track to be standard-gauge to accommodate the same equipment used elsewhere.[92]

When the Denver & Rio Grande began grading the Leadville to Glenwood Springs line in 1886, company surveyors platted Minturn as a service town. Minturn then developed its own local economy that included logging and ranching. The business district was compact and featured architecture characteristic of 1880s industrial towns, including a mix of false-fronts and gabled façades. Courtesy of Denver Public Library, X-12337.

[92] Athearn, 1962:159.

In 1887, David H. Moffat succeeded Jackson as president. Moffat came with great experience, was one of the organizers of the DSP&P, and reaped a fortune from Leadville and other mining districts. Moffat fully agreed with Jackson's policy both toward Aspen and converting the D&RG main lines to standard-gauge. Under Moffat, the D&RG entered into a heated race with the Colorado Midland and poured its resources into completing a track down the Colorado River. In 1887, the D&RG reached Glenwood Springs and turned south up the Roaring Fork to Aspen. Special incentives were offered to the construction workers, and this proved to be an effective investment, because the D&RG finished its Aspen line in October, months ahead of the Colorado Midland. As with the expansions under Palmer, by arriving first, the D&RG captured the most lucrative freight contracts.

The Leadville to Glenwood Springs and Aspen segments were immediate successes. Aspen provided the D&RG with plenty of freight and passenger traffic, and railroad access allowed Glenwood Springs to grow into a thriving tourist resort, which drew additional passengers. All trains went through Leadville to Red Cliff and down the new extension along the Eagle River to Minturn. The D&RG established Minturn as a construction camp in 1887, and when the tracks were finished, the village was designated a coal and water stop. Community organizers secured a post office in 1889 under the name of Minturn in honor of Robert B. Minturn, a D&RG director. From Minturn, the Glenwood extension went through another coal and water stop known as Dotsero at the confluence of the Eagle and Colorado rivers. The name was a modification of Dot Zero, which was the starting point for a D&RG survey along the Colorado River. Local residents convinced the Postal Service to grant them a post office in 1883, well in advance of the settlement's role as a railroad stop.[93]

D&RG: Builds the Grand Junction Extension, 1888-1890

Like Palmer, Moffat had aspirations of making the D&RG an attractive link for transcontinental traffic, and he pushed several long-term projects in 1888. First, he continued to widen the main lines from narrow- to standard-gauge so trains belonging to other railroads could roll through Colorado without the cumbersome transfer of people and freight from one car to another. Second, Moffat negotiated with several transcontinental railroads for joint operations on D&RG lines in exchange for trackage fees. Last, Moffat succumbed to the same allure for a direct and dedicated line to Salt Lake City as did Palmer. The Leadville to Glenwood segment figured prominently in these plans.[94]

Even though Moffat tacitly agreed with Palmer's policies, Moffat did not like nor trust his predecessor. As a general rule, Moffat trusted no other railroad or their signed agreements, and included Palmer's D&RGW in this sentiment. Moffat felt that the D&RGW was unreliable, open to hostile partnerships, and capable of destabilizing the D&RG's western territory. He then attempted to distance the D&RG from the D&RGW and compete directly, suggesting to the board of directors a new line to Salt Lake.[95]

Moffat knew the stockholders would not front all the costs for the entire line at once, so he broke the project into strategic segments that would still benefit the D&RG even if the Salt Lake idea was abandoned. Overall, the strategic segments would follow the Colorado River from Glenwood Springs to Grand Junction and become the D&RG's main transcontinental link. The new route would replace the existing main line over the Collegiate Mountains through

[93] Bauer, et al., 1990:46; 98; Benson, 1994:58.
[94] Athearn, 1962:167; Osterwald, 1991:81.
[95] Athearn, 1962:170.

Montrose. In 1888, the D&RG directors organized the Rio Grande & Pacific Railroad Company to build the first segment from Glenwood Springs to Rifle. The following year, Moffat sought capital to continue grading toward Grand Junction. For unknown reasons, Moffat contacted rival James J. Hagerman of the Colorado Midland and inquired whether he would jointly fund the project, and Hagerman agreed. The two boards of directors established the Rio Grande Junction Railway Company to build a standard-gauge track and voted Charles H. Toll director, brother-in-law to Edward Wolcott. As competitors, Moffat and Hagerman disliked each other, and their wary relationship kept the venture in an unstable state.[96]

Moffat and Hagerman each engaged in backroom decisions that ruined the joint venture's chances of success. The Missouri Pacific & Rock Island Railroad announced it would use the new Colorado River line to run trains through Colorado to Utah, but all the traffic would go to the Colorado Midland. The D&RG had not yet converted the Leadville to Glenwood segment to standard-gauge, which the Missouri Pacific required. The Colorado Midland, however, was standard-gauge for its entire length, and the Missouri Pacific could route its trains over the Colorado Midland, through Aspen to Glenwood Springs, and onto the joint Colorado River line. Moffat was jealous and came up with a plan to capture the lost traffic. He simultaneously slowed construction of the joint Colorado River section while speeding the standard-gauge conversion between Leadville and Glenwood so that both would be finished at the same time and ready for business as a continuous thread. Hagerman figured out Moffat's strategy and was outraged. The D&RG finished the standard-gauge conversion in 1889, completed the Colorado River segment the following year, and then opened the entire line to transcontinental traffic.[97]

While Moffat was quietly manipulating construction timing to favor the D&RG, Hagerman sold the Colorado Midland to the AT&SF. The D&RG had long wanted to buy the Colorado Midland, but Hagerman purposefully worked with bitter D&RG rival AT&SF out of spite for Moffat. By purchasing the Colorado Midland, the AT&SF violated the Treaty of Boston that Jay Gould drafted nine years earlier. The treaty required the AT&SF to remain south and east of the Rio Grande River and not operate lines competitive with the D&RG. Moffat was then forced to cooperate with the AT&SF and panged over the fact that his rival finally established a firm presence in D&RG territory.[98]

D&RG Operations Stabilize, 1891-1899

When the AT&SF purchased the Colorado Midland in 1889, the AT&SF secured a right-of-way from Colorado Springs through Leadville to Aspen, down the Roaring Fork Valley to Glenwood Springs, and west to Grand Junction. Moffat probably gained new insight into Palmer's motivation for the early 1880s expansion campaign, because the presence of the AT&SF compelled Moffat to pursue the same policy. Moffat reasoned that if the D&RG did not hasten into new mining areas such as Creede, the AT&SF would capture these markets instead.

When Moffat approached the board of directors for expansion funds and explained his rationale, they refused. The board not only wanted to avoid more debt, but also it accused Moffat of planning new lines to serve mining districts in which he and fellow D&RG officers held interests. This was slightly unfair because Moffat and associates owned mines in most of Colorado's principal districts. In 1891, Moffat resigned in anger and took officers such as Sylvester T. Smith, who were also members of his mining investment syndicate, with him. The D&RG's British investors replaced Moffat with their associate Edward T. Jeffery, who cancelled

[96] Athearn, 1962:170; Beebe and Clegg, 1962:276; LeMassena, 1984:361.
[97] Athearn, 1962:173.
[98] Athearn, 1962:173; LeMassena, 1974:57; LeMassena, 1984:144.

all expansion projects, trimmed operating costs, and deferred maintenance to save money. Jeffery was highly effective, and in two years, he not only paid off all the D&RG's debt, but also began producing dividends. The stockholders and board were impressed and intended to retain Jeffery, even if he allowed the D&RG to deteriorate physically.[99]

During the mid-1890s, Jeffery's policies and management style allowed the D&RG to weather one of its greatest challenges to date. At the end of 1893, the Silver Crash caused mining throughout Colorado and West to collapse, and the impact ushered in a deep, nationwide depression. The resultant financial panic ruined many railroads and sent them into bankruptcy, but the D&RG survived. As metal mining declined, Jeffery turned to coal, coke, lumber, and agriculture for bulk freight, much of which went out of state. As the depression deepened in 1894, the Colorado Midland and Denver, Leadville & Gunnison Railroad (formerly the DSP&P) went under, leaving the D&RG as the only solvent system in Colorado. But all was not well as the carrier lost a weighty 40 percent of its income and still faced competition from the other railroads, which continued to operate even though bankrupt. Despite the heavy loss in income, Jeffery was still able to meet financial obligations and guide the railroad into better times.[100]

Those times arrived during the late 1890s. The nation ascended out of the depression, business recovered, and Colorado enjoyed a revival of its mining industry. The net result was an increase of traffic, and hence income, for the D&RG. Jeffery continued to avoid debt, reduce expenses, and refrain from costly expansion, which allowed the railroad to resume paying dividends to stockholders. During this time, Jeffery began active tourism promotion to enhance passenger business, and especially to the major resort community Glenwood Springs. Maintenance was an area where Jeffery sought savings, which resulted in poor service and a wave of accidents that tarnished the railroad's reputation. Ridership was not as high as it could have otherwise been, and when ownership of the railroad changed in 1900, these matters only grew worse.

D&RG Operated by George Gould, 1900-1915

During the late 1890s, George Gould, son of Jay Gould, sought to fulfill his father's grand plan of assembling a coast-to-coast transcontinental railroad. He owned the Missouri Pacific and a chain of other railroads linking Denver with the east coast. Gould sought western links to complete his system and realized he would have to buy them because building a new line from Denver all the way to the Pacific Ocean was too costly. He targeted the D&RG and D&RGW, since they provided a connection between the Missouri Pacific in Denver and the Central Pacific at Ogden, Utah. Gould began buying D&RG stock during the 1890s, was elected to the board of directors, and gained control as chair in 1900. Gould next purchased the D&RGW in 1901 from Palmer, who had been discussing its sale to the D&RG for several years. Gould operated the two railroads as one, but allowed them to keep their separate identities. The Leadville to Glenwood segment was important here because it became part of Gould's transcontinental route.[101]

Securing the last piece of the system, from Ogden to the west coast, stymied Gould and became the ruin of the D&RG and D&RGW. Gould surveyed the existing railroads and found them in the hands of hostile transcontinental interests unwilling to cooperate with his competing venture. Thus, Gould realized that he would have to build his own line west out of Utah and organized the Western Pacific Railroad to do so. Financing was a problem, in part because his

[99] Athearn, 1962:175; LeMassena, 1974:67; LeMassena, 1984:144; Stone, 1918, V.1:362.
[100] Athearn, 1962:181, 184; LeMassena, 1974:67; LeMassena, 1984:145.
[101] Athearn, 1962:191, 195; Beebe and Clegg, 1962:276; LeMassena, 1974:74; LeMassena, 1984:147.

rivals influenced the banking houses and their loans. In response, Gould arranged a shaky scheme to fund the Western Pacific on the backs of the D&RG and D&RGW. He used the two railroads as collateral for bonds and other loans, and made them responsible for not only paying interest, but also any operating deficits that the Western Pacific incurred once finished. The only way that the D&RG and D&RGW could remotely hope to meet these onerous obligations was to completely divert of all their income and reduce operating expenses even more than Jeffery had done to date, leaving nothing for maintenance or repairs. The only exception to the revenue reallocation was the payment of dividends to keep the stockholders content.[102]

For four years the D&RG and D&RGW operated under the weight of the Western Pacific, which Gould began building in 1905. As planned, all income generated by the two railroads was diverted and almost nothing reinvested in their upkeep. As a result, the wave of accidents that began during the late 1890s under Jeffery grew worse and service declined even more. Mechanical unreliability, dirty and worn equipment, wrecks, and slow speeds due to inadequate locomotives and poor tracks discouraged both passenger and freight traffic. Some people even referred to the D&RG as the Dirty & Rough Going Railroad. As business dropped off, so did the revenues that Gould based his financial equations on.

In 1910, Gould completed the Western Pacific, and the next year, he had his coast-to-coast railroad assemblage in full operation. Gould enjoyed his dream for a short time before it unraveled. The trouble started after the organization of the Western Pacific. Directors of the UPRR and the banking house of Kuhn, Loeb & Company merged to form the Equitable Trust Company, which held some of the Western Pacific bonds. To harass Gould, the UPRR friendly Equitable Company insisted on regular payments, which the officials knew was impossible because of the D&RG's poor earnings. Around the same time, UPRR and Equitable directors bought large blocks of stock in the D&RG and Missouri Pacific, links in Gould's system, and appointed hostile members to the boards of directors. The new directors quietly undermined Gould's financial equation by prioritizing dividends, some loans, and maintenance over bond payments, which caused the D&RG to repeatedly default on its obligations to Equitable.[103]

Gould unknowingly helped UPRR forces by making his own errors. One of the most important was overestimating the amount of business that his system could develop. The Western Pacific realized much less freight traffic than projected, in part because the railroad had to convince customers to switch from existing transcontinental carriers. As a result, the Western Pacific operated at a large deficit, which the D&RG was obligated to make up by contract. This the D&RG was unable to do because it was already loaded with debt, and the poor physical state created by Gould's scheme and Jeffery's fiscal conservatism discouraged business.

Gould's empire had not yet collapsed, but Gould grew deeply anxious over the viability and stability of his transcontinental system and knew he was losing control. In 1912, Gould attempted to consolidate several of his western railroads by replacing Jeffery as president of the D&RG with Benjamin F. Bush, who was also president of the Missouri Pacific. Bush began a campaign of improvement but made little headway because the obligations to support the Western Pacific left him with no funding.[104]

By 1914, it was obvious to the directors of the D&RG and Missouri Pacific that the Western Pacific drain threatened the solvency of all three railroads. Missouri Pacific officials owned most of the preferred stock in the D&RG, and if the D&RG went bankrupt due to the Western Pacific, they would lose their stock interests. The board then recommended restructure of Western Pacific finances, and a meeting with the Equitable Company, which held the bonds.

[102] Athearn, 1962:207; LeMassena, 1974:78; LeMassena, 1984:151.

[103] Athearn, 1962:195, 214; LeMassena, 1974:117, 125; LeMassena, 1984:157, 163; Osterwald, 1991:95.

[104] Athearn, 1962:218; LeMassena, 1974:125; LeMassena, 1984:163; Stone, 1918, V.1:363.

As can be predicted, the UPRR forces used this opportunity to strike. The Equitable directors refused to restructure the debt, knowing this would wreck the D&RG and Western Pacific, and instead recalled the outstanding bonds. They did so on the grounds that too many payments had been missed, and that the ramshackle state of the D&RG made full repayment unlikely. The bond recall then forced Gould to sell the Western Pacific to hostile interests. Gould now had to rely on the junction between the UPRR and his D&RGW at Ogden to continue transcontinental service. The UPRR, however, struck again in 1915 by closing its Ogden connection with the D&RGW, severing Gould's system and eliminating it as a transcontinental carrier.[105]

D&RG Reorganized, 1916-1920

When Gould lost the Western Pacific in 1915, he seized control over his other railroads and wrested the D&RG back from UPRR. In an attempt to redeem and promote the D&RG, he packed the board of directors with cronies, appointed Henry U. Mudge as president, and personally inspected the system. Gould pledged to Colorado residents that he would repair long-deferred problems and restore the railroad to its former glory, and his train then ironically derailed and toppled over due to faulty tracks. The wreck symbolized the trend followed by the rest of Gould's empire.[106]

After plucking the Western Pacific from Gould's system, the Equitable Company next set its sights on the D&RG. When the Equitable company recalled its Western Pacific bonds in 1915, that railroad was sold at auction to repay as much of the total as possible. The purchase price of the railroad was substantially less, however, leaving a large unpaid balance that the Equitable Company sought to fill. Equitable next trained its sights on the D&RG, obligated by contract for Western Pacific's debts, and began bankruptcy proceedings in 1917. Behind the scenes, the UPRR directors hoped not only to recover the outstanding balance, but also to buy the railroad at auction, gain control, and further dismantle Gould.[107]

This was unacceptable to the directors of the Missouri Pacific because they faced heavy financial losses if Equitable foreclosed. Equitable's bonds had primary rights and would be repaid first when the D&RG was auctioned, leaving little to cover their loans to the D&RG. Further, the directors owned 30 percent of preferred stock and still had control over the railroad. Equitable and Missouri Pacific directors raced each other to foreclose on the D&RG. But before either party was successful, the U.S. Railroad Administration assumed control of the D&RG, as it did with all the nation's carriers, in its World War I mobilization campaign. The Administration kept the D&RG in stasis and operated the railroad as was until 1920, when the Administration released the rail carriers. Ready to pounce, Equitable instituted foreclosure proceedings but met no resistance. The Missouri Pacific directors dumped their stock in the meantime and were no longer interested in secondary foreclosure.[108]

In 1920, J.F. Bowie and associates, who purchased the Western Pacific when it was bankrupted, bought the D&RG at auction for $5 million, leaving worthless the $88 million in common stock held by average investors. Bowie then combined the D&RG and D&RGW into a new company with the old name of D&RGW. Bowie and partners now owned all the western links in Gould's former transcontinental system, and because the D&RGW was again physically

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[105] Athearn, 1962:230; LeMassena, 1984:169; Stone, 1918, V.1:363.
[106] Athearn, 1962:231; LeMassena, 1974:129; LeMassena, 1984:169.
[107] Athearn, 1962:237; LeMassena, 1974:129.
[108] Athearn, 1962:236, 239; LeMassena, 1984:172.

connected with the Western Pacific, the D&RG saw a return of transcontinental traffic to its tracks, including the Leadville to Glenwood segment.[109]

D&RG and Transcontinental Service, 1921-1929

J.F. Bowie and partners possessed the D&RG only a short time before financial problems threatened their tenure. In 1921, one of the worst winters on record washed out the central Pueblo yard, miles of tracks elsewhere, and interfered with traffic. Repair costs were high and a significant amount of revenue was lost due to the inconsistent service that resulted. In addition, residue left from Gould's complex financial scheme continued to shadow the D&RG. The Bankers Trust Company of New York, and the New York Trust Company held significant unpaid mortgages that Bowie inherited from the D&RG, and they were overdue. In 1922, the two financial firms initiated a new round of foreclosure proceedings to recover their loans, forcing the D&RGW (now including D&RG) assemblage into receivership again.[110]

The court took charge of the D&RGW and appointed Joseph H. Young as receiver. Young's duties were to operate the railroad while the court assessed the state of the carrier and examined acquisition proposals. Young reported that the entire D&RGW system was in such an advanced state of decline that it was dangerous and required immediate repairs if the railroad was to remain viable. The court then ordered Young to address the maintenance backlog, and he invested $8 million in the most pressing issues. The main line from Pueblo to Grand Junction, including the Leadville to Glenwood segment, received the most attention. Steep grades were reduced, sharp curves realigned, and wooden bridges replaced. These were the first improvements the railroad had seen in decades, which impressed Colorado businesses and riders. They asserted that the bankruptcy and appointment of a receiver was the best thing that happened to the D&RGW in the memorable past. Regardless, the D&RGW was a long way from being in sound condition.[111]

The ICC and the bankruptcy court began hearings to examine proposals for a reorganization of the D&RGW. The directors of Missouri Pacific and Western Pacific expressed their desire to buy D&RGW. In response, Denver and Colorado businesses loudly protested that these two owners would continue to rob the D&RGW of its funds at the cost of service and safety. Government railroad experts suggested the Chicago, Burlington & Quincy (CB&Q) acquire the D&RGW, which would restore transcontinental traffic through Colorado. As a testament to the poor state of the D&RGW, the CB&Q declined on grounds that the purchase and rehabilitation costs were too high. ICC experts recommended the AT&SF absorb the D&RGW. Colorado interests claimed that this would give the AT&SF a monopoly over Colorado, prevent transcontinental traffic, draw business out of the state, and discourage expansion into northwestern Colorado.[112]

In 1924, after lengthy arguments, the ICC allowed the directors of the Missouri Pacific and Western Pacific to buy the D&RGW for around $18 million. Howls of protest went up from the press, governor, attorney general, and business interests. J.S. Pyeatt, former director of Gulf Coast Lines, was appointed president. He stated, for public relations, that the D&RGW would be operated as an independent system with itself as the main consumer of funds. As Colorado parties suspected, Pyeatt did divert a considerable amount of funds to the Missouri Pacific and Western Pacific, but these two railroads also used the D&RGW as a transcontinental link, which

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109 Athearn, 1962:241; LeMassena, 1974:131; LeMassena, 1984:172.

110 Athearn, 1962:244; LeMassena, 1974:135; LeMassena, 1984:172; Osterwald, 1991:101.

111 Athearn, 1962:246, 254,

112 Athearn, 1962:254.

provided substantial revenue between 1926 and 1928. Even though the D&RGW continued to be bilked by its owners, the railroad was finally profitable and out of shadow of Gould, almost ten years after he lost control of the carrier.[113]

Shortly after the ownership disputes had been settled, the D&RGW became entangled in another set of debates. In 1921, the Colorado State Legislature passed a bond to fund the Moffat Tunnel, a railroad bore projected to pass underneath the Continental Divide at Rollins Pass. The Denver area and northwestern Colorado supported the measure because it would improve the existing Denver & Salt Lake Railroad (D&SL) route and divert water to the Front Range. The D&SL was a reorganization of David Moffat's Denver, Northwestern & Pacific Railroad, established in 1902 as a transcontinental link between Denver and Salt Lake City. Denver long aspired to have its own transcontinental link directly west over the Divide, and Moffat provided them hope in the form of his railroad. The proposed route went west from Denver over the Divide into Winter Park and through the northwestern quarter of the state, which lacked rail service. Tracks went as far as Steamboat Springs, where the project stalled due to funding issues. The Divide was the railroad's undoing. As much as 41 percent of all operating costs went to clearing the tracks of snow and doubleheading engines to pull trains, and because of this, the railroad struggled. In 1911, Moffat died, his railroad went bankrupt, and Newman Erb reorganized it in 1913 as the D&SL. At this time, Erb proposed solving the Divide problem with a tunnel but was unable to secure enough money. As long as the new railroad languished, the transcontinental carriers and the D&RGW in particular were content. If finished, the DS&L would bypass them as the shortest and quickest route through Colorado.[114]

When William Evans and David C. Dodge began the tunnel in 1922, the D&RGW mobilized. The directors proposed a connection between the D&SL and Dotsero on the Leadville to Glenwood segment, known as the Dotsero Cutoff. The connection would ascend the Colorado River from a junction at Dotsero and tie into the D&SL line at Orestod, which was Dotsero spelled backward. The D&RGW directors reasoned that the Cutoff would provide Denver with its transcontinental link and negate the need to push the D&SL all the way to Utah. The outstanding question was: who would build the Cutoff and absorb the extremely high construction costs? Whichever railroad graded the line wanted assurances of enough traffic to repay the necessary loans.

D&SL director Gerald Hughes suggested that he would build the Cutoff, but only under several conditions. First, the D&RGW must divert its transcontinental traffic to the Cutoff and pay the D&SL trackage fees for its use. Second, the D&SL would carry the freight between Orestod and Denver with its own locomotives for a transfer fee. Hughes then threatened that if the D&GRW did not agree to these terms, the D&SL would finish the original line to Salt Lake City and provide serious competition. In response, D&RGW counsel Henry McAllister offered several alternatives. First, his railroad would allow its connection with the Cutoff only if the D&RGW could build and own it. Second, the D&SL could build the Cutoff if the D&RGW could then lease the entire D&SL system. Third, the D&SL had to grant a track sharing agreement from Dotsero to Denver and allow D&RGW trains full-length runs. William H. Williams, chair of D&RGW board, added that if an agreement could not be reached, the D&RGW would build its own direct connection to Denver and cut D&SL out altogether.[115]

The negotiations consumed several years and reached no conclusion by 1927, when the tunnel was complete. Denver residents were furious over the deadlock, because without a connection to Salt Lake City, they perceived the tunnel as a costly waste of funds that accrued

[113] Athearn, 1962:255; LeMassena, 1974:139, 145; LeMassena, 1984:172.
[114] Athearn, 1962:261; LeMassena, 1984:115, 205.
[115] Athearn, 1962:277.

unpaid interest as long as it was unused. In 1929, D&RGW officials quietly attempted to resolve the dispute by acquiring D&SL stock to stage a takeover. The D&RGW, however, found that it needed 80 percent of the railroad's common stock to win control, which could not be purchased in a short amount of time. A resolution to the dispute, and the willingness of any party to build the Cutoff, were suddenly cast into doubt when the Great Depression began in 1929. The various railroads had other matters to worry about, and loans for large projects such as the Cutoff became impossible to secure.[116]

D&RGW Builds the Dotsero Cutoff, 1930-1933

The Great Depression, which began in 1929, wrecked the nation's economy and spared no industry. Consumer demand for all goods and services fell, and the credit that businesses relied on disappeared. Manufacturing and commerce then ground to a halt, and because of this, the movement of freight and people slowed significantly. Colorado also suffered a collapse of its already weakened mining industry, which exacerbated the national trends and economic impact of the depression.

On a nationwide level, the railroad industry was hit hard because it relied on movement of people and goods for income. Colorado carriers in particular, such as the D&RGW, faced a crisis because mining accounted for a significant volume of their mountain traffic. At least the D&RGW received some revenue from transcontinental freight, while other carriers were not as fortunate. However, the D&RGW's income fell by around one-half during the Great Depression, forcing the railroad to apply to the Reconstruction Finance Corporation (RFC), a federal support agency, for a loan to remain solvent. The RFC provided the loan, but this only postponed inevitable problems.[117]

The D&SL was in even worse condition than the D&RGW because its line was short, extremely costly to operate, and depended largely on logging in Winter Park and agriculture to the northwest, both of which barely survived. With the D&SL on the brink of shutting down, its directors realized that the Cutoff would bring D&RGW transcontinental traffic onto their line and increase earnings. In this condition, the D&SL directors grew more amiable to reaching an agreement with the D&RGW, which wanted the Cutoff as well. Thus, the parties consulted the ICC in 1931, which recommended a cooperation similar in structure to the proposals discussed years earlier. All parties agreed that the D&RGW could buy the remaining stock in the D&SL and the Denver & Salt Lake Western Railroad, a paper company that D&SL directors organized to secure the Cutoff right-of-way. The D&RGW had to allow the D&SL to remain independent and not controlled in any way. The D&RGW would then build and own the Cutoff, and the D&SL must grant passage for D&RGW trains to Denver for a trackage fee. The ICC stipulated that the D&RGW had to begin building the Cutoff in six months, open it to traffic in two years, and make improvements to the Moffat Tunnel handle the increase in traffic.[118]

[116] Athearn, 1962:284; LeMassena, 1984:182.
[117] LeMassena, 1974:147.
[118] Athearn, 1962:291; LeMassena, 1974:147.

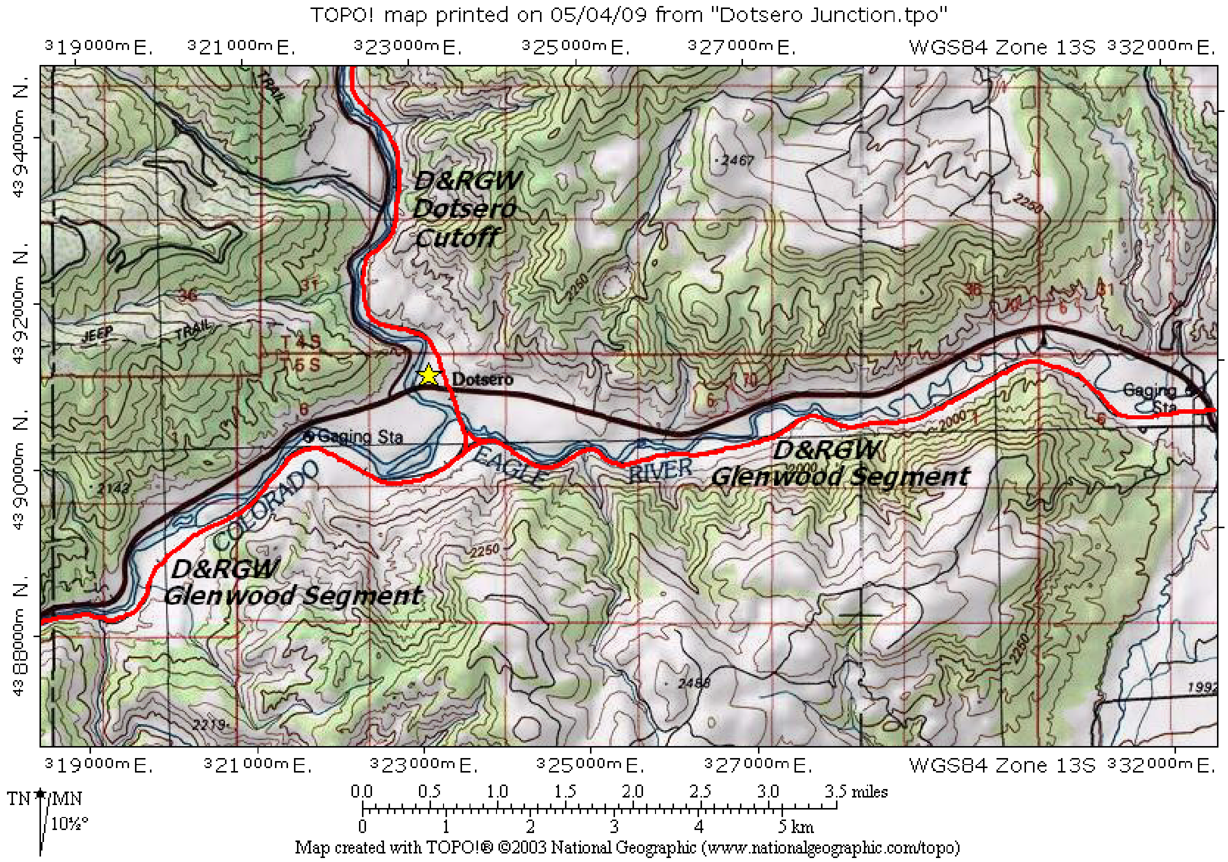
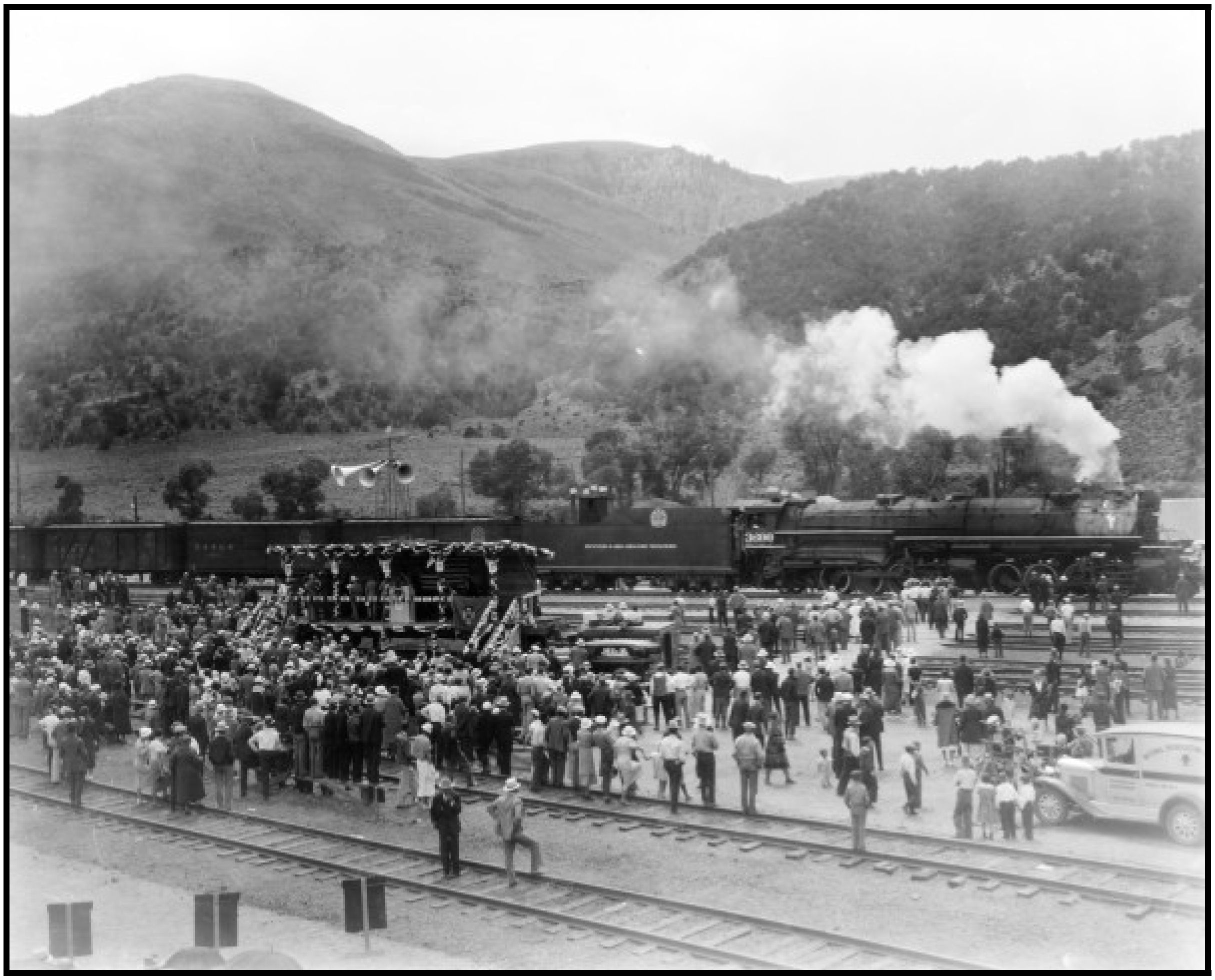


Figure E 8.8: The map illustrates the junction of the Denver & Rio Grande Glenwood line and the Dotsero Cutoff, which intersected the Denver & Salt Lake Railroad far northwest and off the map. The dark line represents I-70.

The collapsing economy caused by the Depression threw a wrench into the plan. Because of falling revenue, the D&RGW was unable to buy the D&SL stock, pay for Cutoff construction, and make necessary improvements to the Moffat Tunnel. D&RGW officials applied to the ICC for an extension and to the RFC for a $3,850,000 loan, and once these were provided, the railroad began grading. Dotsero and Orestod assumed importance in the project because they were railhead settlements, hosted construction camps, and were conduits for materials flowing along the Colorado River to points of work. Dotsero became the most important of the two settlements because it was largest, had already been in existence for 50 years, and lay at the junction of the Cutoff and the D&RGW's Leadville to Glenwood segment. Because of the project, Dotsero drew a permanent population sizeable enough to justify a post office, granted in 1933. As a combination water and fuel stop, regional station, rail junction, and agricultural community, Dotsero retained its post office until 1948. Orestod, however, reverted to its vacant state when the Cutoff was complete in 1934.[119]

[119] Athearn, 1962:296-297; Bauer, et al., 1990:46; LeMassena, 1974:147; LeMassena, 1984:182.



The Dotsero Cutoff was completed in 1934 and opened with a formal celebration at the service hamlet of Dotsero. In connecting the Denver & Rio Grande and Denver & Salt Lake systems, the cutoff shortened the only transcontinental route over the Rocky Mountains and improved Denver's strategic importance as a rail center. Courtesy of Denver Public Library, GB-7796.

D&RGW Operates during the Great Depression, 1934-1941

While the D&SL and D&RGW managed to come together during the early 1930s and build the Dotsero Cutoff, their relationship was not harmonious. Until the Cutoff was complete and D&RGW trains rolled into Denver, the D&SL had to pay Moffat Tunnel usage fees. Once D&RGW traffic passed through the tunnel, the D&RGW had to share the costs. Thus, when the D&RGW directors brought the Cutoff close to completion during the winter, they laid rails to within only 200 feet of the D&SL junction at Orestod and stopped. The directors offered feckless excuses for the delay, when they actually attempted to postpone sharing the tunnel usage fees until the D&RGW generated enough freight business to offset the costs. The D&SL directors knew why the D&RGW was stalling and decided to force the matter by filling the gap themselves, even though it was the D&RGW's responsibility. Once this was done, the D&SL claimed that the Cutoff was open to traffic in May 1934.[120]

[120] Athearn, 1962:297.

Instead of helping the two railroads improve their financial condition as expected, the Cutoff and associated deal pushed them over the edge. The D&RGW was unable to simultaneously meet its new obligation to buy the D&SL stock, pay its own corporate taxes, and continue channeling funds to its old bonds and other debts. In 1934, the D&RGW applied to the RFC for yet another loan, which was granted under pretenses that were radical for a federal agency. The RFC agreed to provide the money in exchange for all the D&RGW stock and control of the railroad, which constituted a government takeover of a private company. Such conditions were not preferred but were necessary because failure of the D&RGW could trigger a domino effect. The D&SL, the Silverton narrow-gauge, and other dependent railroads would go bankrupt and ruin already weakened economies in their areas. When the RFC assumed the D&RGW, it forced out the existing management and appointed Wilson McCarthy as director.[121]

Including the RFC loans, the D&RGW was in debt for $122 million and had little hope of repaying its creditors. In a worn pattern, the bondholders recalled their primary loans in 1935 and forced the railroad into bankruptcy again. Judge J. Foster Symes represented the court and chose Wilson McCarthy and Henry Swan as receivers. They were local to Colorado, and their appointment ended 60 years of absentee control and financial machinations.[122]

Symes, McCarthy, and the RFC coordinated a plan to put the D&RGW back on a paying basis. Such a task was difficult in ordinary times and seemed impossible in the climate of the Great Depression, and yet, they achieved success. To run the D&RGW, the trio selected local businessmen with loyalty to Colorado instead of relying on absentee directors of other railroads. Symes then instructed McCarthy to invest $18 million rehabilitating the entire system. Between 1935 and 1939, the railroad built or repaired 400 bridges and eliminated 114 more, replaced 2 million rotten ties and 240 miles of worn rails, and improved miles of old roadbeds. The D&RGW also purchased a fleet of new rolling stock and 15 locomotives, extended key sidings to accommodate longer trains, and built more yard facilities. In 1940, McCarthy introduced diesel engines to improve efficiency. Steam locomotives had to stop during ascents for fuel and water and on descents so their brakes could cool, all of which jammed traffic. Although the diesels proved inadequate for passenger service, they were excellent for freight, which was most of the business. McCarthy also replaced maintenance trains, which blocked traffic, with off-track heavy equipment and trucks. Last, the system of signal lights known as Centralized Traffic Control was expanded to improve the movement of trains. Because the Leadville to Glenwood segment was the main transcontinental line, it received many improvements.[123]

Of the unprecedented reinvestment campaign, D&RG historian Robert G. Athearn noted: “Rising from what was described as ‘almost a pile of junk’ four years before, the road was said now to be one of the most efficient in the nation.” McCarthy and Symes hoped this would draw transcontinental traffic and redeem the railroad’s reputation. The partners were amply rewarded, because the D&RG was ready to receive its biggest increase in traffic.[124]

D&RGW Booms during World War II, 1942-1946

When the nation formally entered World War II at the end of 1941, nearly every facet of industry in the United States scrambled to meet new production demands. The railroads shouldered a triple duty during the wartime mobilization, and most rose to the occasion. First, the rail carriers had to recover from the Great Depression and improve their operating states to

[121] Athearn, 1962:303; LeMassena, 1974:149; LeMassena, 1984:182.
[122] Athearn, 1962:305, 306; LeMassena, 1974:149; LeMassena, 1984:182.
[123] Athearn, 1962:308, 312, 314; LeMassena, 1974:149; LeMassena, 1984:185.
[124] Athearn, 1962:318.

accommodate a huge swell in traffic. That meant, as the D&RGW had done, rebuilding their decayed physical infrastructures and improving efficiency. Second, the railroads had to move an unprecedented amount of freight in record time from point of generation to place of need. Most of this were resources needed for the manufacture of weapons, support infrastructure, and food. Last, the railroads conveyed both the materials of war and military personnel from inland to the coasts for shipment to battlefields overseas.

Between 1942 and 1946, the D&RGW carried out all these duties. Colorado mines, sawmills, farms, and ranches turned out the raw materials needed to support the war effort, and new businesses produced some finished goods. Shunting the local products over to the transcontinental rail carriers for long-distance distribution increased the D&RGW's business. The transcontinental freight that moved across the D&RGW's tracks rose sharply, as well. The Dotsero Cutoff accommodated heavy traffic to Denver, and the Leadville to Glenwood segment saw numerous trains east to Pueblo. The D&RGW was a conduit for long trains that traveled west, as well. In particular, the system hosted a mass movement of military personnel, weapons, and supplies bound for the Pacific Theater.

The net result for the D&RGW was a quick ascent into solvency. Revenue for 1942 increased an astounding 900 percent over that for 1941 and kept climbing. In 1945, income reached an all-time high of $75 million, up from $17 million during the mid-1930s. The war ended in 1945, but the traffic did not. International reconstruction and consumer demand, released after 15 years of restraint due to the depression and the war, perpetuated local and transcontinental traffic throughout the D&RGW system. The income for 1946 dropped to $51 million, which was still higher than any time in the past. The ICC and RFC determined that the D&RGW was again ready to be conveyed back into private ownership. The railroad's business was sufficient, its financial state was sound, and the system was among the best in the nation.

D&RGW Absorbed, 1947-1988

In 1947, the D&RGW was consolidated with the D&SL and restored to private ownership. McCarthy remained president, Henry Swan was head of the finance committee, and Denver capitalist John Evans chaired a board of Colorado businessmen. The previous absentee bondholders were the new owners, and conditions specified in the sale blocked them from the past privations that ruined the railroad.

The Colorado management maintained progressive policies that kept the D&RGW in sound physical and financial condition. During the 1930s improvement campaign, McCarthy and Swan built a laboratory for studying wear on rail equipment in hopes of reducing failures and saving costs. They developed methods for inspecting boilers, scanning metal parts for minute fatigue, testing improved rails, and developing alloys suited for specific functions. This proved so successful that the American Railway Engineering Association adopted some D&RG standards for rails. Laboratory work continued under the new organization and kept the D&RGW on the edge of railroad engineering. The D&RGW and Atomic Energy Commission even went so far as to test nuclear-powered locomotives.[125]

McCarthy and staff paid special attention to practical matters on the railroad system. One was a decline in passenger business during the late 1940s. After the war ended, gasoline was no longer rationed and auto makers returned to automobile production, which made travel by car attractive. To retain as much of the declining passenger business as possible, McCarthy entered a joint project with the CB&Q and the Western Pacific, in which they bought comfortable passenger cars and sleek locomotives for rapid transcontinental service from Chicago to San

[125] Athearn, 1962:335, 348.

Francisco. In 1949, they commissioned the line as the California Zephyr, and its route through the Rocky Mountains caused a stir among riders. One particular addition set the service apart from competing railroads. In 1944, Cyrus Osborn, head of Electromotive Division of General Motors, rode in the fireman's seat of a freight locomotive through Glenwood Canyon and realized that passengers would pay well to view the fabulous scenery. Osborn then came up with the idea of a special passenger car with an elevated observation platform enclosed in a cupola, with seats sold at premium prices. The D&RGW formalized the design, contracted with General Motors in 1949 to produce the cars, and introduced them on the California Zephyr line. The D&RGW was the first railroad to use observation cars, and they made the Rocky Mountain route famous and popular. Other railroads then attempted to imitate the experience.[126]

The scenery of Glenwood Canyon inspired the Denver & Rio Grande to develop platform observation cars for its transcontinental passenger trains. The cars made the California Zephyr a household name among travellers during the 1950s, and increased the railroad's revenues. Courtesy of Denver Public Library, Z-6349.

[126] Athearn, 1962:331, 335; Beebe and Clegg, 1962:283.

Despite the success of the Zephyr, D&RGW staff was not idealistic about the future of passenger service and understood that freight was the railroad's most important revenue. Given this, McCarthy took several measures during the late 1940s and early 1950s to increase both regional and transcontinental business. For regional business, he groomed United States Steel, owner of the Geneva steel mill in Provo, Utah, and the Colorado Fuel & Iron Company, operator of another steel plant at Pueblo. Both firms consumed enormous volumes of iron ore, fuel, and other materials, and distributed finished products, all hauled by the D&RGW. McCarthy also provided reliable and prompt service to agriculture, and organized the Rio Grande Land Company to develop industrial sites and attract business into the D&RGW's rail corridors.[127]

In 1956, McCarthy died and Gale B. Aydelott replaced him as president. His father, James Aydelott, was an official with the Burlington Railroad, and Gale joined the D&RGW in 1936. Once he was president, Aydelott maintained McCarthy's vision, management style, and policies, including his interest in increasing transcontinental traffic.

For the next several decades, the D&RGW settled into a comfortable niche established by McCarthy. The railroad was Colorado's principal carrier, enjoyed a predictable amount of transcontinental traffic, and provided limited passenger service. The 1960s and 1970s were relatively quiet, although the D&RGW experienced several changes, mostly beneficial. In 1965, the D&RGW and the CB&Q reached an agreement over through-traffic, improving the efficiency of transcontinental service. The CB&Q allowed D&RGW trains to traverse its tracks as far east as Chicago, and the D&RGW permitted CB&Q trains to cross its lines to Salt Lake City. Both railroads then paid each other trackage fees in exchange. The D&RGW also appealed an ICC decision allowing the UPRR and Southern Pacific to charge prohibitive transfer fees at their Ogden, Utah, connection points. The anticompetitive fees intentionally discouraged the transfer of certain types of freight onto the D&RGW system. The D&RGW was victorious in 1968 as the ICC required the hostile carriers to drop their fees. Also in 1968, friendly investors organized Rio Grande Industries to buy the D&RGW and further expand the railroad's business opportunities and real estate development. The following year, the new firm acquired the D&RGW. Energy consumption increased during the 1970s, and the railroad hauled higher tonnages of coal from mines in Utah and Colorado then ever before. The increase in interstate traffic that resulted from the above events and trends traveled across both the Leadville to Glenwood segment, and over the Dotsero Cutoff.[128]

After around 30 years of progressive management, the D&RGW achieved a status realized by few other railroads. The D&RGW retired the last of its bonds and mortgages in 1982, leaving loans for equipment as its only debt. The railroad was now a particularly valuable asset, and the D&RGW entertained buyout offers from larger competitors, who applied pressure from all sides of its territory. In 1988, the directors succumbed and sold the railroad to the Southern Pacific. The UPRR in turn acquired the Southern Pacific in 1996, assumed ownership of the D&RGW system, and closed the main line between Dotsero and Pueblo shortly afterward. The track from Glenwood Springs to Dotsero and through the Moffat Tunnel to Denver remains in use today.

[127] Athearn, 1962:332, 335.
[128] LeMassena, 1974:195, 202; LeMassena, 1984:201.

Section E 9: History of Road Transportation, 1859-Present

Introduction

This section provides an overview of the historic road and trail network that evolved in the I-70 Mountain Corridor. Native American trails, wagon roads, and pack trails were formative in the development of today's highway and road systems because they pioneered presently used routes. The roads in the corridor, when built, fostered Colorado's economic development and settlement patterns relative to their period of historic significance. Additionally, these routes represent the evolution of transportation modes and engineering, from footpath to professionally constructed highway. Colorado's road building evolved substantially over the past two centuries. Today's design and construction techniques produce road networks bearing little resemblance to the roads of yesteryear. The Rocky Mountains, until engineering and technological breakthroughs in transportation, served as a substantial barrier to east/west connectivity. For nearly a century, the transportation solution was to travel north through Wyoming or south through New Mexico until relief from the steep mountain grades allowed easy travel west. The historic context provided in this section will aid in the identification of remaining historic resources in order to determine eligibility for the National Register of Historic Places (NRHP).

Period of Significance, 1859-Present

In overview, roads and trails were important during the Period of Significance 1859 through Present. The Period began in 1859 when prospectors and placer miners inadvertently created pack trails beginning in Golden and extending into Clear Creek drainage. During the 1860s, most of these routes were improved into wagon roads to meet the demands of a growing mining industry. Trails and roads extended farther west as mining boomed in Summit County around the same time, but the Eagle and Colorado river valley saw little development until the mid-1880s. Eventually, the roads in each of these regions became linked in a system spanning much of the I-70 Mountain Corridor. Mining, lumber, and toll companies constructed most of the roads, which were unpaved, poorly built, and yet expected to accommodate wagons. These roads transferred from private to public ownership beginning in the 1890s, making them available for needed improvements. The Good Roads Movement took hold across the United States, including Colorado, as automobile owners encouraged better road engineering and surfacing practices. From this movement, roadway construction gradually matured into engineered highways and bridges. The federal government had a significant impact and completed engineering feats such as the Eisenhower and Johnson Tunnels and the Glenwood Canyon section of I-70 in recent decades. Roads followed settlement patterns and locations of economic growth throughout Clear Creek drainage, Blue River valley and Ten Mile Canyon, and the Eagle and Colorado river valleys. A road networks developed more slowly in some of these regions than others, owing mostly to topographic constraints. As a result, roads in each region were important during narrower timeframes within the overall Period of Significance. The Period continues today, as the I-70 Mountain Corridor provides the only east-west interstate connection through Colorado and serves tourism and commerce industries.

Each of the corridor's drainages has its own history of roads, though it should be noted that most principal roads are trans-drainage and share larger historic trends. Road builders chose to follow the drainages not only for ease of surveying or construction, but also because that was where most of the settlements and industry, and hence demand, were located. Initially, road builders invested little effort or capital in quality routes, and their intent was instead to grade avenues passable by wagon. Although roads were improved as mountain communities became permanent, they were still primitive by today's standards. The early routes followed mountain topography, while later road builders manipulated the topography to better suit the road.

Although the Period of Significance applies to the corridor as a whole, narrower timeframes of importance may be more relevant for the individual drainages. The timeframes, summarized below by drainage, are based on when roads actually operated and influenced the course of history. The importance of the roads and their historic resources can be generalized under four NRHP areas of significance. The areas of significance in order of relevance are: Transportation, Engineering, Commerce and Economics, and Community Planning.

Clear Creek Drainage, 1859-Present

Roads and pack trails were significant in Clear Creek drainage from 1859 to present. Roads first emerged from Denver and Golden and routed westward through Clear Creek Canyon, Mount Vernon Canyon, or Bear Creek Canyon, among others, to mining settlements in Idaho Springs, Blackhawk, and Central City following the gold rush of 1859. They expanded farther west to Georgetown by 1861.

Pack trails led the way to the gold fields, and almost as quickly privately-owned wagon road companies incorporated and began constructing wagon roads over the pack trails. Until the railroad arrived in Clear Creek, wagon roads provided the only overland route to the mountains, and stage and freight outfits supported commerce by transporting goods, passengers, and mail. Even after the railroad arrived in Georgetown in 1877, towns away from the tracks still relied on roads for supplies and passenger service.

County governments began purchasing privately-owned and operated toll roads as their financial resources grew. Between the 1890s and 1900s, Clear Creek purchased many toll roads when their charters expired or acquired roads that were abandoned. These two decades marked a shift from private to publicly owned and maintained roads. Additionally, the 1890s also signaled a change in road building efforts. The Good Roads Movement placed greater emphasis on grading, paving, and drainage, which led to higher quality roads. The demands of auto tourism further propelled road building practices during the 1910s. Automobile owners demanded better roads negotiable by auto to scenic areas. The Denver Mountain Parks system was established in 1910 in part to fulfill those requests, and several scenic routes were thoughtfully designed and constructed to appease auto owners. Federal dollars helped pave and widen U.S. 6 and U.S. 40 through Clear Creek drainage during the New Deal programs of the 1930s. Segments of U.S. 6 and U.S. 40 became Interstate 70 through Clear Creek County when the Federal Highway Act of 1956 established an interstate system. The original plan for I-70 was to begin in Washington D.C. and terminate in Denver, but with convincing from western legislators, I-70 continued west through Denver to Utah.

Blue River Valley, 1859-Present

Gold was discovered in 1859 along the Blue River at Breckenridge, and in 1860 in California Gulch near present Leadville. Each discovery was center to a local rush that drew large numbers of prospectors and miners, who created several well-beaten pack trail routes.

Silver was discovered at Leadville in 1877 and near Frisco in 1878, fostering second rushes to these areas. Wagon roads were hastily constructed to connect the fledgling towns with points of commerce. One of the most popular roads crossed over the Continental Divide from Georgetown to the Blue River, and south up Ten Mile Canyon to Leadville. The town of Dillon grew at the intersection of this road with feeders extending to Kremling and Breckenridge. Once the railroad arrived in Leadville in 1880, stage service from Georgetown to Leadville ceased. However, those areas not serviced by the railroad still supported local stage and freight service, which relied on wagon roads.[1] Given that the basic road network was developed during the 1860s and 1870s, later road construction involved feeders to new communities and areas of industry, as well as improvements to existing routes. During the 1910s and 1920s, the principal wagon roads were improved for automobiles. In Great Depression-era New Deal projects, sections of U.S. 6 were graded over Loveland and Vail passes, but not completely paved. Just as paving and widening of Loveland Pass from Clear Creek County to Summit County was finished during the late 1940s, officials in the transportation department decided that Loveland Pass would not be suitable as an interstate route during winter months. Instead, the Eisenhower-Johnson Memorial Tunnels were commissioned. Construction on the Eisenhower bore began in 1968, and the Johnson bore was completed in 1979. The Eisenhower-Johnson Memorial Tunnels provided mobility and connectivity between the Denver metro area and Summit County, which fostered the growth of tourism on a significant scale.

<u>Eagle and Colorado River Valley, 1811-Present</u>

Trappers and explorers first journeyed through the continuous Eagle and Colorado river valley in search of natural resources, to chart the geography of the Rocky Mountains, and to survey for efficient east-west routes across the country. Settlement in the Eagle and Colorado River valley began with ranching during the 1870s, but permanent communities were not established until a treaty with the Ute tribe opened the western slope in 1881. Few inter-drainage roads traversed this area because freight and stage traffic was insufficient to interest road builders, which the Denver & Rio Grande Railroad ensured when it began service in 1887. Small, local roads, however, fanned out from the existing communities to access outlying ranches and sawmills. As auto tourism grew, highway associations improved roads in the region in support of their interests. In 1912, the Taylor State Road through Glenwood Canyon was designated a segment of the Pike's Peak Ocean-to-Ocean highway.[2] During the Great Depression, the Works Progress Administration (WPA) graded and paved U.S. 24 between Leadville and Glenwood Springs, linking the towns of Minturn, Avon, Edwards, Wolcott, Eagle, Gypsum, and Dotsero. As important, the Progress Works Administration (PWA) constructed U.S. 6 over Vail Pass, which opened the valley between Minturn in Eagle County and Wheeler Junction in Summit County. In providing a direct route from the Denver metro area, Vail Pass made possible the development skiing in Eagle County. Vail and Beaver Creek, among the most popular ski resorts in Colorado, then followed. I-70 was pushed from the Eisenhower-Johnson Tunnels over Vail Pass during the 1960s but stopped at Glenwood Canyon due to extreme topography. Construction on this last segment of I-70 began in 1981 and was finished in 1992.

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[1] Leadville Quadrangle, 29.

[2] Frontier Historical Society, 2011: www.glenwoodhistory.com/timeline1910.htm.

Table E 9.1: Wagon Roads in I-70 Mountain Corridor

Builder/Company	Date Organized	Route	Drainage	Date declared public
Bakerville & Leadville Toll Road Company (also known as the High Line Wagon Road)	1879	Bakerville up the Middle Fork of S. Clear Creek over Loveland Pass, down Snake River to Blue River. Up Ten Mile Creek to Carbonateville to Leadville	Clear Creek, Blue River, Ten Mile Creek	
Central & Georgetown Road Company	1864	Central City up Eureka Gulch, down York Gulch, to Fall River. Up S. Clear Creek to Georgetown	Clear Creek	
Clear Creek Wagon Road	1864	South Clear Creek to Empire City, with branches to Georgetown and Central City	Clear Creek	
Clear Creek Wagon Road Company	1862	Idaho Springs along S. Clear Creek to Floyd's Ranch. One branch extended three miles to Bergen's ranch and intersected with Denver and Tarryall road. Another branch extended one mile to Central City and Mount Vernon road.	Clear Creek	
Denver, Auraria, Colorado Wagon Road Company	1859	Denver to Mount Vernon. One branch to Tarryall in South Park. Another branch to Hot Sulphur Springs on Blue Fork of the Colorado River	Clear Creek, South Park, Middle Park	--
Denver, Bradford, & Blue River Wagon Road Company	1861	Denver via Bradford (Confier), to Hamilton, to Breckenridge	Blue River, South Park	--
Dotsero Toll Road	1883	Eagle River and Gypsum Creek to Dotsero	Eagle River	--
Eagle City & Leadville Toll Road	1879	Eagle City to Piney on Tennessee Creek to Leadville	Eagle River	--
Eagle City & White River Toll Road Co.	1879	Eagle City to base of Baxter Mountain, down Eagle River to junction with Colorado River	Eagle River, Colorado River	--
Eagle River Toll Road	1879	Eagle City and Red Cliff, down Eagle River through Battle Mountain, to the Colorado River	Eagle River, Colorado River	--
Evans, Leadville, & Green River Toll Road Company	1879	From Leadville over Tennessee Pass to head of Eagle River. Down to Colorado River, north to Egeria Park to Hot Springs	Eagle River, Colorado River Middle Park	--

Table E 9.1, continued

Builder/Company	**Date Organized**	**Route**	**Drainage**	**Date declared public**
Fall River & Georgetown Road	1884	Central City down York Gulch to Fall River. S. Clear Creek to Georgetown	Clear Creek	--
Genesee Wagon Road Company	1859	Cold Spring Ranch near Apex to Apex Town. Mount Vernon Town, up Mount Vernon Gulch to Genesee Ranch, to Bergen Park	Clear Creek	--
Georgetown & Breckenridge Wagon Road	1867	Georgetown over Irwin Pass into Summit County, down the Snake River	Clear Creek, Blue River	May 1, 1890
Georgetown & Empire Wagon Road	1874	Georgetown to Empire via Union Pass	Clear Creek	--
Georgetown & Middle Park Wagon Road	1878	From Empire to foot of Berthoud Pass, to Fraser Creek and Vasquez Fork. Northwest to Hot Sulphur Springs	Clear Creek, Middle Park	--
Georgetown & Silver Plume Wagon Road Co.	1873	Georgetown to Silver Plume	Clear Creek	September 9, 1893
Georgetown & Ten Mile Road Company	1879	Georgetown, over the Divide, down the Snake River to Montezuma. Snake River to Frisco, up Ten Mile Creek to Recen and Kokomo. Over Fremont Pass to Leadville	Clear Creek, Blue River, Ten Mile Creek	--
Glenwood Springs, Carbonate, & Eagle River Wagon Toll Road, Telegraph, & Telephone Company	1885	Glenwood Springs up Colorado River to mouth of Grizzly Creek. Up to Carbonate and Colorado River to Dotsero	Eagle River, Colorado River	--
Idaho & Beaver Creek Wagon Road Company	1872	Purchased route from Clear Creek Wagon Road	Clear Creek	April 29, 1896
Idaho & Floyd Hill Wagon Road		Idaho Springs to Floyd Hill	Clear Creek	April 29, 1896
Idaho Springs & Fall River Wagon Road		Idaho Springs to Fall River	Clear Creek	April 29, 1896
Kelly's Toll Road	--	Bighorn to Vail to Dowd's Junction, Minturn, Two Elks Pass	Eagle River	--
Kokomo Toll Road	1881	Georgetown to Silver Plume, over Loveland Pass to Montezuma, Frisco, and Leadville	Clear Creek, Blue River, Ten Mile Creek	--

Table E 9.1, continued

Builder/Company	**Date Organized**	**Route**	**Drainage**	**Date declared public**
Leadville Free Road	--	Turn off Mount Vernon Road at New York Ranch, south side of Genesee Mountain, ending at Bergen Park	Clear Creek	--
Leadville, Eagle River, & White River Toll Road Company	1880	Leadville to Evans Creek, up the Arkansas River, and over Tennessee Pass. Down White Pine Creek to Little Piney Creek, to Eagle River. Down Eagle River to Red Cliff. Down Eagle River to Colorado River. Cross near the Ute Trail to the White River Indian Agency	Eagle River, Colorado River Middle Park	--
Mount Vernon Toll Road	1859	Town of Auraria to Mount Vernon. Bergen's Ranch to Bradford Junction (Conifer) through Jefferson to Tarryall	Clear Creek. South Park	1880
South Park, Blue River, & Middle Park Wagon Road Company	1866	Tarryall to Breckenridge, down Blue River to Dillon, then to Middle Park	Blue River, Middle Park	--
Sweetwater & White River Toll Road Company	1885	Dotsero to the mouth of South Fork of the White River, with branches to Carbonate and Defiance Mining Camp	Eagle River, Colorado River	--
Ten Mile & Eagle River Toll Road Company	1880	Ten Mile Creek to Black Lakes, down south fork of Piney to Eagle	Ten Mile Creek, Eagle River	--
Tennessee Pass & Red Cliff Wagon Road Co.	1885	From Tennessee Pass down Little Piney Creek to Eagle City	Eagle River	--

OVERVIEW OF ROADS

Ute Indian tribes inhabited the central mountains long before Anglo-Americans arrived, and they foraged in the high country during the summer and at lower elevations in winter. When migrating between elevations and favored settlement sites, the Native American followed the same general routes. Eventually, the tribes created a network of trails primarily through valleys and over the lowest and gentlest mountain passes. This network became the earliest version of an overland transportation system, later used by Anglo explorers, fur trappers, and finally prospectors and miners. Some of the principal trails were so well planned that they were ultimately converted into wagon roads.[3]

[3] Norman, 2002: 15.

But before this, road builders and even Anglo trailblazers avoided the Rocky Mountains. During the westward migration of the 1840s and 1850s, wagon trails of pioneers crossed the plains to the base of the mountains, but turned north and went around. They realized that the canyons were too narrow, slopes too steep, and passes too high for wagons.[4] Instead of attempting the central Rocky Mountains, nearly all early east-west routes crossed the Continental Divide at South Pass, Wyoming, the low point of the Rocky Mountains.

It was the lure of financial gain that brought road networks into Colorado's mountains. Discovery of gold on Cherry Creek in 1858, and the resultant Pikes Peak gold rush, drew prospectors to Colorado's piedmont region, where they platted Denver, Golden, Apex, and similar small settlements. Prospectors rushed west into the mountains in 1859 and 1860 in pursuit of more gold discoveries, establishing mining camps near the centers of activity. At the time, it was difficult for miners to obtain supplies because the region lacked professionally built roads.[5] Although editorial in nature, the following description is apt: "there were no roads into the mountains worthy of the name until the toll companies began to construct them after 1860."[6]

Until roads were completed, prospectors and miners hauled goods and equipment in wagons as far as they could, and finished their journeys by pack animal. Such traffic generally followed Native American trails and other sensible routes into Clear Creek drainage and beyond to the Blue River valley. A rudimentary system of pack trails grew organically from the constant flow of men and animals over the same routes. When trails were purposefully built, an effort was made to choose routes with the gentlest slopes, shallowest water crossings, and fewest obstacles. Where trails were forced to climb over landforms, they often ascended canyons and gulches, traversed slopes on graded tracks, and crossed over the lowest points.

The use of pack trails to travel from Denver or Golden to the gold fields was brief. As mining camps grew into established towns during the 1860s, the existing system of pack trails proved inadequate for the greater amounts of supplies transported from plains settlements. Wagons were an answer because they could carry more than a pack animal, but the lack of roads prevented their use. In response, community activists began a road-building movement.

Although cooperatives of miners helped construct some roads, entrepreneurs saw the need for roads as a source of profit and formed toll companies. In pooling capital, they were able to complete a number of routes to the principal centers of mining. Colorado's territorial legislature also understood the problem and passed several bills between 1860 and 1862 authorizing toll roads and bridges. But the territorial government was not in the business of road-building itself, and instead deferred to private toll road companies. Between the 1860s and 1890s, forty-three toll roads were chartered and constructed.[7] Even more were in the planning stages but failed for various reasons.[8]

Early wagon roads were primitive at best. Most were little more than avenues of wagon wheel ruts "from which the largest rocks had been removed."[9] The roads preferred gentle gradients when available, but when crossing landforms, they ascended winding canyons to a summit and then descended equally narrow, winding canyons to the base. The roadbeds were narrow, poorly graded, slanted, rough, and rocky. Because construction, maintenance, and

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[4] King, 1984: 89

[5] Ubbelohde, et al, 2006: 75

[6] Ubbelohde, et al, 2006: 75

[7] Autobee, 2003: E-17

[8] Sprague, 1964: 181

[9] Norman, 2002: 15.

returns on investment consumed toll income, companies invested little in improvements for the comfort of passengers. Thus, travel was treacherous and tiring. In response, the territorial legislature required, in 1862, that toll companies maintain their roads in good condition and attached a penalty for negligence.

Wealthy entrepreneurs and mining companies invested more capital and man-power in their roads. Builders used hand- tools and pack animals to construct cut-and-fill areas, to properly grade roadbeds, and move large rocks out of the way. "Road building in the mountains required expensive rock work to go over, around, and through the mountains. In some cases, shelves were blasted on mountainsides and cliff faces to carry the roads."[10] Pavement, however, was far off in the future.

While wagons hauled most of the bulk freight into Clear Creek drainage, stagecoaches were the principle carriers of parcels, mail, and passengers. Travelling at relatively high and constant speeds, stages exhausted their horses, which had to be changed every 10 to 15 miles. Thus, stage companies established swing stations where passengers could eat a quick meal and the driver deliver and pick up mail.[11] Home stations were spaced every 40 to 50 miles, and there, stages stopped for the night. In general, "such places normally contained lodging and eating facilities, a ticket and postal office, store, barn with stable, and of course, staging equipment and livestock. Some home stations were located within towns, even within cities, and when this was the case the offices were housed in hotels, the horses and vehicles in livery stations."[12] The stations were "square, one storied structures with walls built of hewn cedar logs; roofs were sod. Most of the home stations contained three rooms, but some were limited to one room divided by muslin draperies into a kitchen, dining room, and sleeping quarters."[13]

In 1865, the territorial legislature began regulating the toll road business to further improve quality and foster the development of transportation. A bill authorized county commissions to fix toll rates and defined the distance between tolling stations a minimum of ten miles.[14] Typical tolls in the 1870s were:

> Each vehicle with one span of horses, mules or cattle: $1.00
> Each additional pair of draft animals attached: $0.25
> Each horse or mule with rider: $0.25
> Horses, mules, cattle or jackasses driven loose, per head: $0.05
> Sheep, hogs, or goats, per head: $0.05
> Travel for attendance at funerals: Free."[15]

The road network continued to grow through the 1860s and 1870s in parallel with mining, the timber industry, and associated settlement. Wagons hauled more freight than ever into the central mountains along improved arteries, and distributed goods to remote towns and camps on primitive feeder roads. Stages followed a similar trend in passenger travel. Toll companies completed the basic road network in Clear Creek County by the early 1870s, and later in the decade in Summit County, and most, but not all, the later road projects extended or

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[10] Mehls, 1984: 59.
[11] Ubbelohde, et al, 2006: 66.
[12] Winther, 1964: 67.
[13] Winther, 1964: 67.
[14] Stone, 1918: 576.
[15] Autobee, 2003: 15.

improved this basic system. Pack trails were by no means obsolete, however, and although not mentioned in archival sources, their total mileage increased. Remote mines and logging operations depended on freight service as much as those in transportation corridors, but many were unable to justify the cost of building wagon roads. Thus, they relied on trains of pack animals instead, and graded trails for the traffic. Nearly all mining and logging communities featured systems of pack trails fanning to remote and otherwise difficult to reach properties. Pack trails remained in use through the 1930s.

Continued growth of industry and settlement in the mountains, and the associated demand for freight and passenger service, became great enough to support railroads. For example, estimates suggest that, in 1865, wagons hauled approximately 100 million pounds of freight to Colorado.[16] Targeting Clear Creek drainage and its mining industry, the Colorado Central Railroad established a railhead near Idaho Springs in 1873 and completed a line to Georgetown in 1877. The Georgetown, Breckenridge & Leadville Railroad then pushed farther up the drainage to Graymont in 1884. The Denver & Rio Grande and Denver, South Park & Pacific graded lines through Summit County between 1881 and 1883. The Denver & Rio Grande also completed a track from Leadville down the Eagle and Colorado rivers to Glenwood Springs in 1887. Although these railroads carried most freight and passengers into and out of these regions, they did not negate the need for roads. Instead, the role of roads changed, now being used primarily for traffic between railroad stations and points of industry and population.

With the demand for roads as great as ever, toll companies and local government turned their attention to improvements and extensions. Better construction methods became a consideration in their efforts starting in 1893, when Congress created the federal Office of Road Inquiry to provide engineering information. In association, roadway engineers promoted hard and smooth road surfaces, grading methods, and use of road-building material and machinery.[17] Most important, the Office recommended drainage systems and roadway surfacing materials such as oil and bitumen. By the early twentieth century, surfacing scrapers, haul vehicles, steam rollers, and rock crushers were used for construction in urban areas. But the mountains were slow to benefit, and most construction was still done by hand and draft animal.[18] Some road builders, however, started using crushed rock for roadbeds in a technique known as macadam.

Local and trans-drainage roads came into public ownership in a wave spanning the 1890s through 1910s. Some toll companies mortgaged their roads, others abandoned them when the loan payments became too burdensome, and original charters expired in many cases. As the most important roads came available, state and county governments took them over, often with support from residents and county commissioners. Once under public ownership, the counties assumed responsibility for repairs, maintenance, and upgrades, paid for with taxes.

The movement toward better roads and conveyance from private to public occurred during an important transition. Mining, logging, and other natural resource industries began waning in the mountains, and tourism gradually replaced them as an economic base. Originally, railroads brought tourists to the mountains, but during the early 1900s, the tourists increasingly turned to automobiles in the interest of autonomy and greater mobility. Most of those auto tourists were wealthy activists, and they organized a number of special-interest groups to promote further road improvements. The Colorado Good Roads movement, which began in 1905, and the Denver Motor Club, established in 1908, were particularly influential. These

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[16] Ubbelohde, at al, 2006: 114.
[17] Winther, 1964: 157.
[18] Winther, 1964: 157.

groups, with independent automobile owners, convinced the Colorado General Assembly to establish the Colorado State Highway Commission to further their cause. But because the Commission's original budget was a meager $56,000 at first, it was only able to survey existing roads and plan improvements. After driving the state's roads, the commissioners commented that: "We found bridges we did not dare to cross in a car, encountered mud that stuck us, found grades we managed to crawl up at a speed a snail could beat, and roads that were never meant for anything but a horse-drawn vehicle." These descriptions made it quite clear that the modern engineering techniques still had not been broadly employed.[19]

The federal government assumed a greater role in developing an automobile-based transportation system during the 1910s, to Colorado's benefit. Congress issued the Federal Aid Highway Act of 1916, which guaranteed matching federal funds for state highway construction. This was partly because the postal service found difficulty in delivering to rural areas due to unimproved roads. The Colorado Highway Commission took advantage of the grant program and organized its first six federal aid projects in 1917. The results were as many auto-worthy roads: Denver-Littleton, Pueblo-Trinidad, Granite-Twin Lakes, Rifle-Meeker, Placerville-Norwood, Lamar-Springfield, none within the I-70 Mountain Corridor.[20]

The Colorado State Highway Commission continually sought best practices in road construction methods and materials. The agency increasingly used gravel, stone, or shale for well-drained pavement during the early 1920s, and concrete later in the decade.[21] In road footprint, the agency not only provided ample width for on-coming vehicles to pass, but also construction of additional lanes in the future. "For graded and paved roads, the state demanded a 60-foot-wide right-of- way to accommodate a 24-foot wide road."[22] Important in the mountains, the federal Bureau of Public Roads established regulations regarding grade limits and road curvature. Grades could be to no more than six percent and curve radii no less than 100 feet. But this was not viable in narrow canyons, so the Bureau recommended radii of no less than 40 feet in such conditions.[23]

Building on the Act of 1916, the Federal Highway Act of 1921 required that each state highway commission designate seven percent of total road mileage as primary roads and the remainder as a secondary network. The intent was to select strategic primary roads and tie them together as a new national highway system. Highway commissions in each state were responsible for construction and maintenance, and with federal funding to do so. The Victory Highway, completed in 1921 between New York and San Francisco, was the first national road to come of the program. Nine others were under construction at the same time, and were designated transcontinental highways the next year. Included were: the Lincoln Highway, Roosevelt International Highway, Yellowstone Trail, Bankhead Highway, National Old Trail, Old Spanish Trail, Pikes Peak Ocean to Ocean Highway, and Midland Trail. To coordinate these and future highways into a national system, the U.S. Bureau of Public Roads designed a nationwide numbering system. Standardized highway markers then replaced locally or regionally recognized highway shields.[24]

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19 Clayton, 2000: E-25, Associated Cultural Resource Experts, 2002: 5-18.

20 Autobee, 2003: E-29.

21 Autobee, 2003: E-55.

22 Autobee, 2003: E-53.

23 Autobee, 2003: E-54.

24 Autobee, 2003: E-71; Koucherik, 2009: www.museumwco.org; The Lincoln Highway, 2009: http://lincolnhighway.jameslin.name.

In the early history of automobile roads and highways in Colorado, the New Deal programs of the Great Depression brought some of the most lasting changes. The Public Works Administration (PWA) and Works Progress Administration (WPA) improved key arteries and built several thousand miles of new roads and bridges. Between 1933 and 1942, the WPA alone constructed or improved over 9,400 miles of highways, roads, and streets; 3,400 bridges or viaducts; and 21,000 culverts. Most this work was supervised by professional, trained engineers who considered drainage, safety, retaining structures, and surfacing materials as necessary elements in roadway construction and design.[25]

More federal legislation affected Colorado's highway network during the 1950s, and especially in the I-70 Mountain Corridor. In particular, President Dwight D. Eisenhower understood that a well-planned system of professionally built highways was an important factor in Germany's successful mobilization during World War II. His administration envisioned a similar but better system in the United States, and passed the Federal Highway Act of 1956. But instead of the types of highways built up to that time, the Act commissioned a system of high-speed, multilane interstate roads designed for high volumes of traffic and long-term use. Colorado was designated the destination of east-west Interstate-70, originally intended to link Washington D.C. and Denver. But with convincing from western legislators, I-70 continued west through Denver to Utah. Construction took years, and crossing through the mountains slowed progress. Eventually, I-70 was built up Clear Creek drainage, under the Continental Divide through the Eisenhower-Johnson Memorial Tunnels, and through Glenwood Canyon on an elevated, award-winning double-deck structure. Today, the interstate continues its original function with no major changes.

Clear Creek Drainage

Road Development in Clear Creek Drainage, 1859-1893

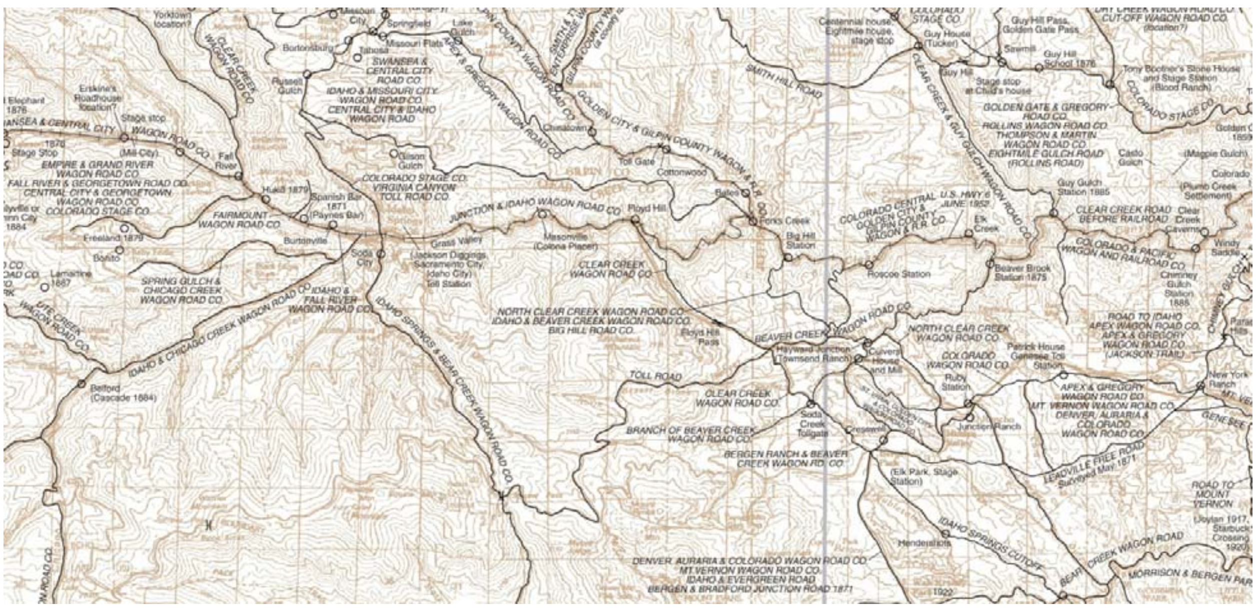
The early history of road development in Clear Creek drainage parallels, and provided some material for, the overview discussed above. Large numbers of prospectors made their way into the drainage during the spring of 1859, shortly after George Jackson discovered placer gold at Idaho Springs. They followed several natural routes from Denver and Golden over the Front Range foothills into Clear Creek valley, on both the north and south sides of Clear Creek. Most routes were pack trails that received little if any documentation at the time, but one known as the Prospector's Trail was among the most heavily travelled. The route meandered southwest from Golden up Lookout Mountain, through Mount Vernon Canyon and Kerr Gulch, to Idaho Springs. The trail, later converted into a wagon road, then followed Clear Creek to Georgetown.

The growth of placer mining, its transition to hardrock industry, and associated settlement fostered a network of pack trails and then wagon roads throughout Clear Creek drainage. Table 9.1 lists many of the known routes, builders, or operators. Also, as mentioned in Section E 2, the Griffith family was instrumental in grading the earliest road to upper Clear Creek drainage. They developed several mines near the head of South Clear Creek, claimed portions of the valley floor as homesteads, and platted a townsite known as George's Town. To haul supplies, equipment for an ore treatment plant, and sawmill, they were forced to build their own road from Central City. Their road, completed by 1861, opened the western drainage for settlement and

[25] Office of Historic Preservation, 2008: 24.

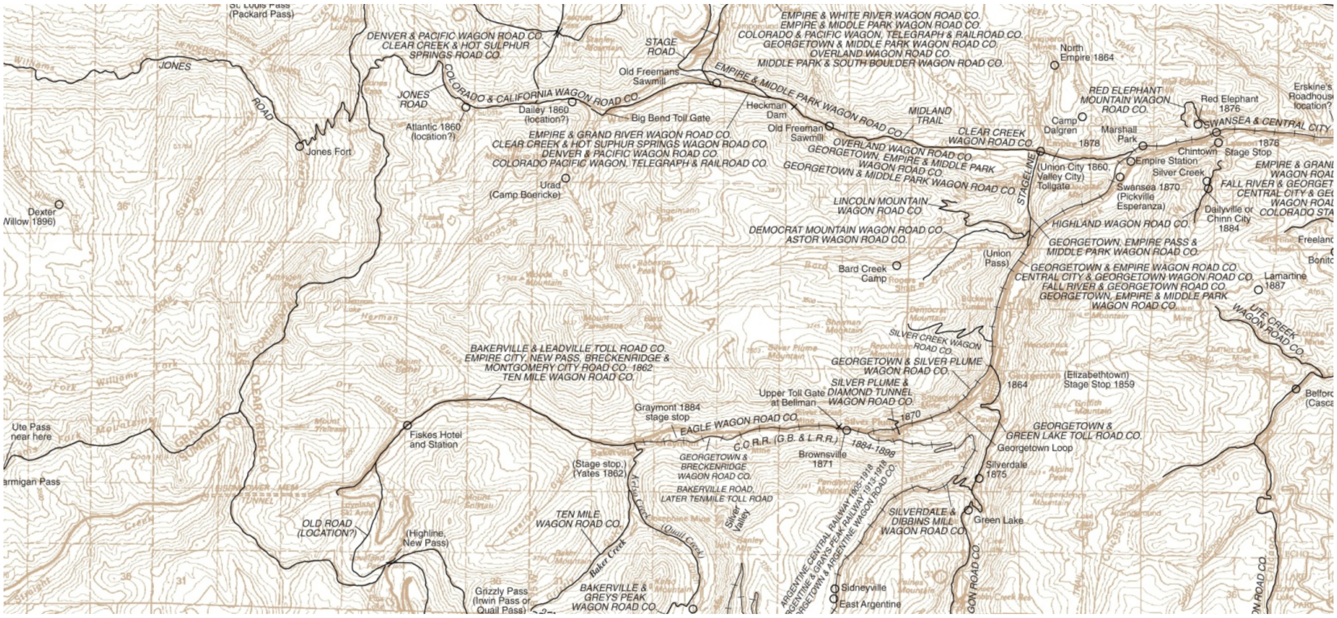
further development. This included their townsite, which then became a supply point and gateway to rich goldfields west and over the continental divide in Summit County.

The period-drawn map illustrates Prospector's Trail, among the most popular gold rush routes into Clear Creek drainage. Courtesy of Denver Public Library, CG4312.P25 192 D3.



Wagon Roads through Denver Quadrangle, Golden to Lawson. Source: Glenn Scott's 1999 Historic Trails Map of the Denver Quadrangle.

Stagecoach companies thrived during the 1860s, due in large part to a growing system of roads. Wells, Fargo & Company controlled a great deal of the market because it strategically bought competitors and expanded its routes. By consolidating various stage companies, Wells, Fargo & Company provided freight, mail, and passenger service to Denver and Central City. In 1867, the outfit announced that it would extend service from Central City to Georgetown, competing with several other outfits. Expressing confidence in its service, the company claimed that its coaches would arrive from Denver in Georgetown "in time for afternoon tea."



Wagon Roads through Denver Quadrangle, Lawson to Straight Creek. Source: Glenn Scott's 1999 Historic Trails Map of the Denver Quadrangle.

The discovery of Berthoud Pass was an important event for the expansion of roads in Clear Creek drainage. When the Civil War began in 1861, the Oregon Trail was one of the nation's principal east-west travel arteries and it crossed over the Rocky Mountains at South Pass in Wyoming. Several organized stage and mail companies relied on the route to move important parcels and money between eastern states and western territories, including the Central Overland California & Pike's Peak Express Company (COC&PP). Army units were necessary to keep the pass open and guard wagon trains against hostile tribes, and when they were withdrawn and sent to fight Confederates, some Native American bands temporarily closed the route. In response, the COC&PP Express searched for alternate mountain passes and heeded William Byers, a Denver supporter, when he suggested that a mountain pass west of Denver could provide an east-west link. The COC&PP then hired Captain Edward Berthoud, intrepid frontiersman Jim Bridger, and an exploration party, which began their search in Clear Creek drainage. They were successful in a short time, locating today's Berthoud Pass as a key portal on a route into Middle Park and then west to Salt Lake City. Ultimately, the COC&PP decided against the route in favor of Bridger Pass, just south of South Pass, because of flatter ground, fewer climbs, and open terrain. However, a wagon road was graded over Berthoud Pass within a short time, and it became one of the principal routes to Winter and Middle parks. The road added to the importance of the Clear Creek system and was eventually developed into U.S. 40.

Local stagecoach companies, more important in the I-70 Mountain Corridor than the large outfits, developed heavily used the road network to shuttle people, freight, and mail between towns. A few of the stagecoach lines that operated in Clear Creek drainage are named below:

- W.L. Smith serviced Caribou, Nederland, Boulder and Central City/Blackhawk.

- Colorado Stage Company operated between Blackhawk, Central City, Denver, Georgetown, Golden, and Idaho Springs.
- Kehler & Montgomery Express ran from Denver to Golden, up Golden Gate Canyon, to Central City.
- The Denver, Mt. Vernon, & Mountain City Express route provided service to Central City.
- Ben Holladay purchased the COC&PP in 1862 and changed the name to the Overland Stage Company. He staged between Denver and Central City, among other routes. He purchased the Butterfield Overland Dispatch in 1866, eliminating his most important competition on the Denver to Central City route.[26]
- The Middle Park Mail & Transportation Company Stageline passed through Empire on its way over Berthoud Pass from Georgetown to Middle Park.
- The Tovey Stageline ran from Georgetown to Middle Park.
- D.B. Castro (1859) express service between Denver and Central City.[27]
- Hinckley Express: service between Denver and Central City.
- Sowers & Company Mountain Express & Stage Company carried Hinkley and Company Express messengers to the mining camps.
- Western Stage Company provided mail service from Denver to Clear Creek mining towns, Boulder, and South Park.[28]

The Good Roads Movement in Clear Creek Drainage, 1893-1933

Clear Creek drainage roads carried at least as much traffic during the 1890s and 1900s as when originally constructed. Traffic in the eastern drainage in particular boomed between 1895 and 1915, mostly due to mining. As the charters for privately-owned roads began expiring in the 1890s, residents petitioned their county commissioners to bring those roads into county jurisdiction. Once under public ownership, the counties assumed responsibility for repairs, maintenance, and upgrades, paid for with taxes.

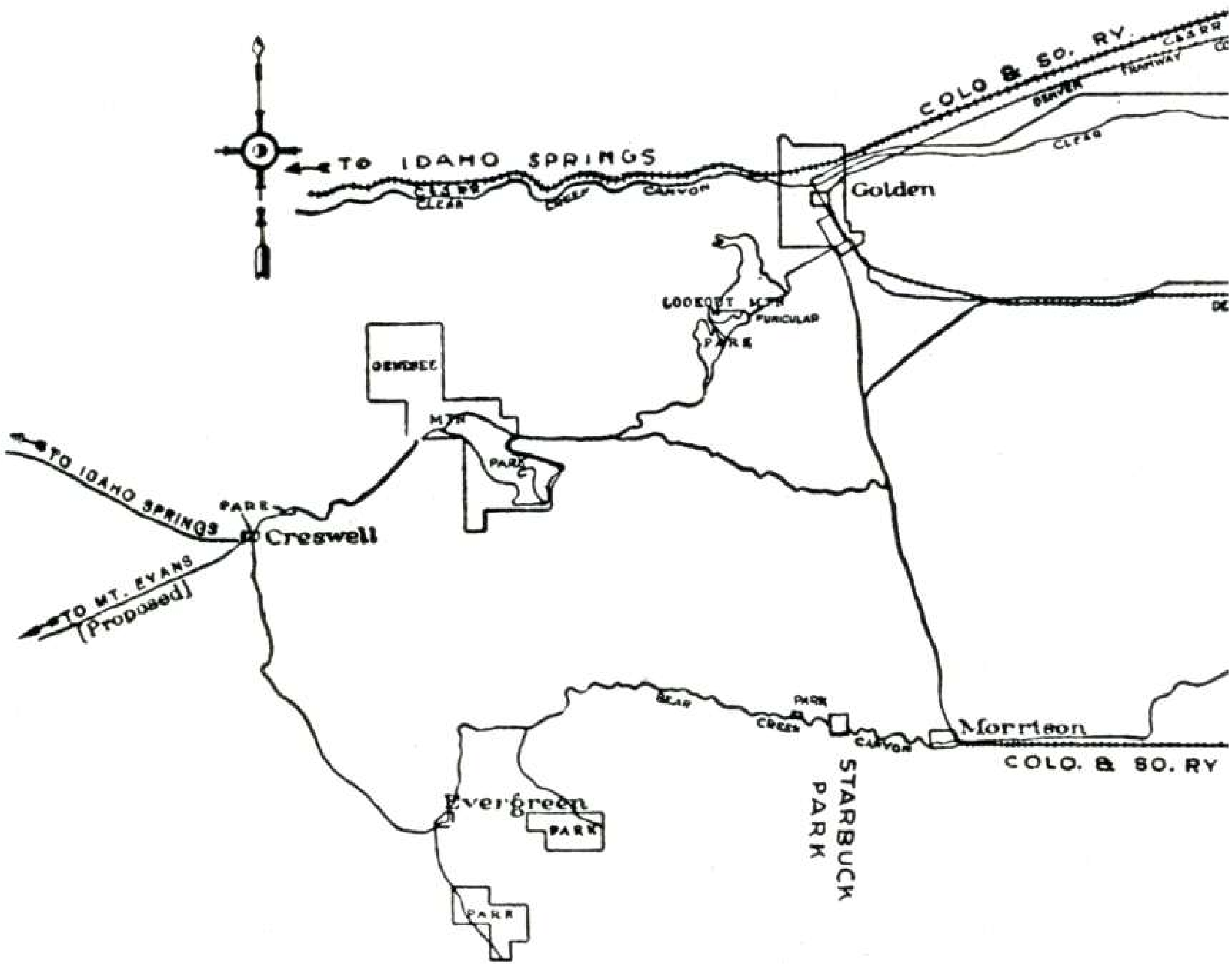
Many of the now-public roads were improved for automobile traffic during the 1900s and 1910s. As mentioned in the overview above, the Office of Road Inquiry and state highway engineers invested the latest methods and materials in road improvements, straightening tight curves, flattening steep grades, widening narrow roadbeds, and resurfacing. For example, Clear Creek County assumed the Idaho & Floyd Hill Wagon Road in 1896 and incrementally completed projects over the next 20 years. Engineers reconstructed the road in 1907 to climb an eleven percent grade, with a short thirteen percent segment near the hill base. In 1916, the surface was widened, and in 1917 the county added guard rails where necessary. The original route remained the same, but newer road building techniques and design standards were implemented for safety and traffic efficiency.

A road over Loveland Pass was first constructed in 1869 for traffic into the mining districts of Summit County. Although heavily used, the road remained unimproved and featured a segment over the pass that could not be traveled by auto. By 1920, automobile owners and

[26] Scott, 1999: 28.
[27] Norman, 2002: 21.
[28] Scott, 1999, 29.

Clear Creek County convinced the State Highway Commission to contribute, and the agency improved the eastern portion up to the pass, leaving the western side in original condition.

Denver Mountain Parks, a department of Denver city government, played a role in the expansion of Clear Creek drainage's growing network of auto roads. Denver officials valued the natural environment, its watersheds, and income from tourism, and began purchasing land in Jefferson and Clear Creek counties to secure all three. Playing on Colorado's natural beauty, Denver Mountain Parks defined a system of alpine parks and scenic points linked by auto roads. A charted route naturally began in Denver and led motorists into the high country and to Denver's mountain parklands.[29] Genesee Park was the first destination established under this system in 1913, accessed via the Lariat Trail up Lookout Mountain and Mount Vernon Canyon (today's U.S. 40), which continued to Bergen Park, Floyd Hill, and Idaho Springs.



The historic map illustrates Denver Mountain Parks auto roads. Courtesy of Denver Mountain Parks.

[29] Norman, 2002: 37.

In 1915, Denver Mountain Parks announced even loftier goals in its auto tourism program and planned a road to the summit of Mt. Evans. But construction of the tortuous, 6½ percent, gravel road was delayed until 1924, and it finally opened in 1927 as the highest auto route in the United States.

In addition to roads for auto tourists, Clear Creek drainage also became an important link in one of the earliest auto-worthy roads to cross the central mountains. In 1922, the State Highway Commission announced that it planned on improving roads that were heavily used and of strategic value. Included was today's U.S. 40, from Denver to Idaho Springs, up Clear Creek to Empire, and over Berthoud Pass to Granby, Steamboat Springs, and Craig. The highway then extended to Utah. The road must have been in poor condition much of its way, because the Bureau of Public Roads director criticized Colorado in 1928 for lacking a well-built east-west road through the mountains. He noted that trans-mountain traffic went through Wyoming and New Mexico, as a result.[30]

The New Deal and Engineering in Clear Creek Drainage, 1933-1956

Ironically, Clear Creek County and greater Colorado underwent one its greatest periods of road development during the Great Depression of the 1930s. State highway engineer Charles Vail began a prolonged improvement campaign in 1931 by surfacing gravel roads. Although concrete and asphalt were used for important arteries, the agency coated most roads with oil because it was plentiful, a Colorado product, and inexpensive. There were only 533 miles of paved roads in Colorado in 1930, but by 1941, the total was 4,200 miles. Between 1933 and 1942, WPA workers constructed or improved over 9,400 miles of highway, secondary roads, and streets, 3,400 bridges and viaducts, and 21,000 culverts. The campaign employed hundreds and funneled money into local economies, but consumed 35 percent of the WPA's Colorado budget.[31] Clear Creek drainage directly benefitted because U.S. 40 was improved between Denver and Idaho Springs.[32] In 1938, the Colorado State Highway Department took ownership over abandoned railroad alignments with the intent of adding them to the 4,440 miles of state highways.[33] This included the Colorado Central Railroad grade between Clear Creek and Georgetown, which was converted into State Highway 103.

Road construction temporarily stopped during World War II when labor and materials were diverted, but resumed when the war ended. The unimproved west side of the old Loveland Pass wagon road was widened and paved in 1950, opening Summit County to more tourism than before. Another project completed after the war was improving the road up Clear Creek Canyon (U.S. 6), which provided greater access to the mountains for Denverites. The section, with numerous cuts, fills, and tunnels, was opened from Golden and Idaho Springs in 1952.[34]

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30 Autobee, 2003: E-32; Colorado Highways, 1922: 8.

31 Office of Archaeology and Historic Preservation, 2008: 23; Autobee, 2003: E-34.

32 Norman, 2002: 39, Autobee, 2003: E-67.

33 Autobee et al, 2003: E-16.

34 Associated Cultural Resource Experts, 2002: 7-3, 7; Norman, 2002: 40.

The Interstate Era in Clear Creek Drainage: 1956-Present

The Federal Highway Act of 1956 played a pivotal role in the development of roads in Clear Creek drainage. As noted above, the Act supported the construction of a national system of high-speed, multilane highways known as interstates. The federal government planned to grade Interstate-70 from Washington D.C. to Denver, but no farther on the assumption that the Rocky Mountains presented too great of an obstacle for such a highway. Western legislators, however, convinced the government to extend I-70 to Interstate-15 at Cove Fort, Utah.[35] The Colorado Division of Highways received a recommendation to engineer the highway from U.S. 6 at Golden, ascend the east side of the Front Range, pass beneath the Continental Divide through a tunnel, and follow the Eagle River valley down to Dotsero.[36] Eventually, the section to the tunnel was completed as planned.[37]

Blue River Valley and Ten Mile Creek

Road Development in Blue River Valley and Ten Mile Creek, 1859-1893

The development of pack trails and roads in the Blue River valley and Ten Mile Canyon followed the same general patterns and chronology as Clear Creek. Prospectors found gold near Breckenridge in 1859, leading to a substantial rush the next year. Prospectors and miners crossed over the Divide from South Park and Clear Creek, creating well-beaten pack trails into the hills on the east side of the Blue River. Loveland and Argentine passes in particular were heavily traveled. At the same time, California Gulch, near present Leadville, became the focus of yet another rush, and prospectors established several more trails south up Ten Mile Canyon to Fremont Pass. By 1861, activity along the Blue River was intense enough to justify several wagon roads, and one of the earliest routed from Denver to Bergen Park, south to Tarryall in South Park, and over Breckenridge Pass.[38]

Stage companies began service to Breckenridge and neighboring Parkville in 1860 or 1861. Many approached from South Park to the south, but the quickest crossed over the Divide from Georgetown, nearest commercial center. This basic template remained largely the same and was in place when mining in Summit County matured from placer to hardrock, and when Leadville boomed during the late 1870s.

The S.W. Nott Company operated from Bakerville and Georgetown over Loveland Pass to Dillon, Frisco, Kokomo, and Leadville. In 1879, Nott constructed a stage-worthy road over Loveland Pass, down the Snake River, to Dillon. Nott's stages then followed the existing road up Ten Mile Canyon to Wheeler, and over Fremont Pass to Leadville. The trip between Georgetown and Leadville was 60 miles and took 12 hours, but it was 70 miles shorter than the route between Denver and Leadville via South Park. After the railroads rendered Nott's stages obsolete by 1883, he abandoned the Loveland Pass Toll Road. Summit and Clear Creek counties

[35] Associated Cultural Resource Experts, 2002: 11-66.
[36] Associated Cultural Resource Experts, 2002: 11-66.
[37] Associated Cultural Resource Experts, 2002: 7-9.
[38] Stone, 1918: 576.

bought the road as a public highway, and although Clear Creek maintained its side, Summit County did not, and the road was soon was impassable for wagons.[39]

The Ten Mile Express & Stage Company, owned by Ed Cooke and Perley Wason, provided service to Ten Mile City, Carbonateville, and Kokomo in Summit County. The company was reorganized as the Leadville & Georgetown Stage Line and operated stages between those two cities. Six stage companies, including the Spottswood & McClelland and Dave Braddock, operated routes through the Blue River valley in the early 1880s. Their routes linked local communities with Georgetown, Hot Sulphur Springs to the north, Kokomo and Recen in Ten Mile Canyon, and Como and Hamilton in South Park.[40] Other stage lines operating through Summit County include:

- Denver & Steamboat Springs stage company connecting Denver, Granby, Hot Sulphur Springs, Kremmling, Steamboat Springs, and Craig.
- Denver & South Park Stage Company operated from Denver to Fairplay, Breckenridge, and California Gulch.[41]
- Leadville & Ten Mile Express Company, serving Frisco, Wheeler, Kokomo, and Recen.
- Dan McLaughlin Stage Line, operated stages from Red Hill to Leadville beginning in 1880. A terminal station was built at Breckenridge, and the company carried passengers, freight, and gold shipments from there to Denver in 1862.
- The Colorado Stage Company, operated from Denver to Colorado Springs and Breckenridge three times a week.

The Good Roads Movement in Blue River Valley and Ten Mile Creek, 1893-1933

The history of roads and pack trails in the Blue River valley and Ten Mile Canyon was somewhat static between 1893 and 1933. As discussed in Section E 3, the Silver Crash of 1893 forced nearly all silver mining and logging in Summit County into suspension. Few if any roads were built anew or extended during the 1890s, and traffic was light overall as a result. But gold mining continued at Breckenridge and silver at Leadville, fostering regular use of the roads along the Blue River and up Ten Mile Creek. Traffic increased during the early 1900s with a revival of mining throughout the region, and although no major arteries were constructed, feeder roads were graded to mines and logged areas in Ten Mile Canyon and near Dillon.

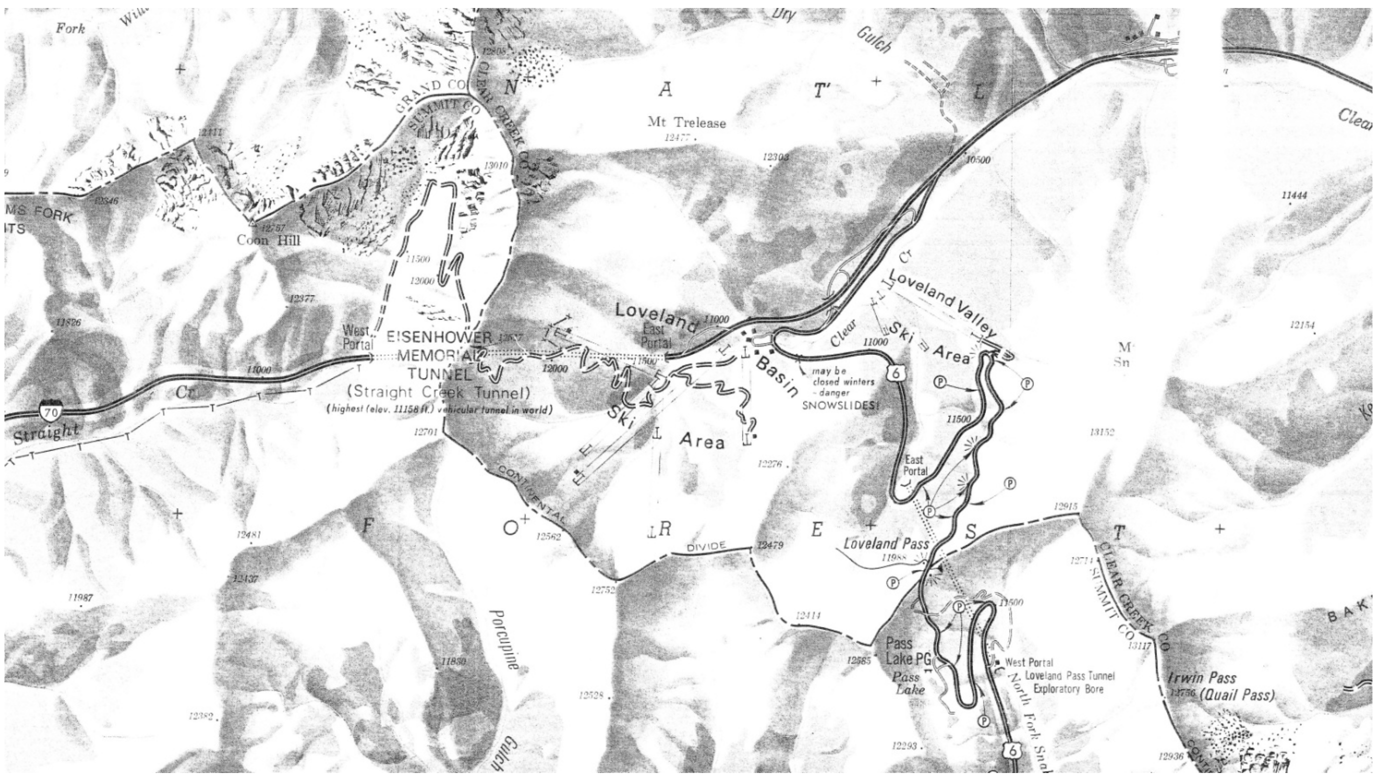
Similar to Clear Creek drainage, privately-owned wagon roads in Summit County were conveyed into the public domain during the 1890s and 1900s. These roads were improved following the Bureau of Public Roads design standards, including drainage and surfacing practices. Now negotiable by auto, the roads saw increased use by tourists into the 1920s.

The Interstate Era in Blue River Valley and Ten Mile Creek: 1956-Present

The road over Loveland Pass was the focus of the first significant improvement project in the Blue River area in decades. As noted above, Clear Creek County owned and diligently maintained the eastern side, and Summit County owned but neglected the western portion. An effort was made to render the road passable by auto during the 1930s, but it remained in poor

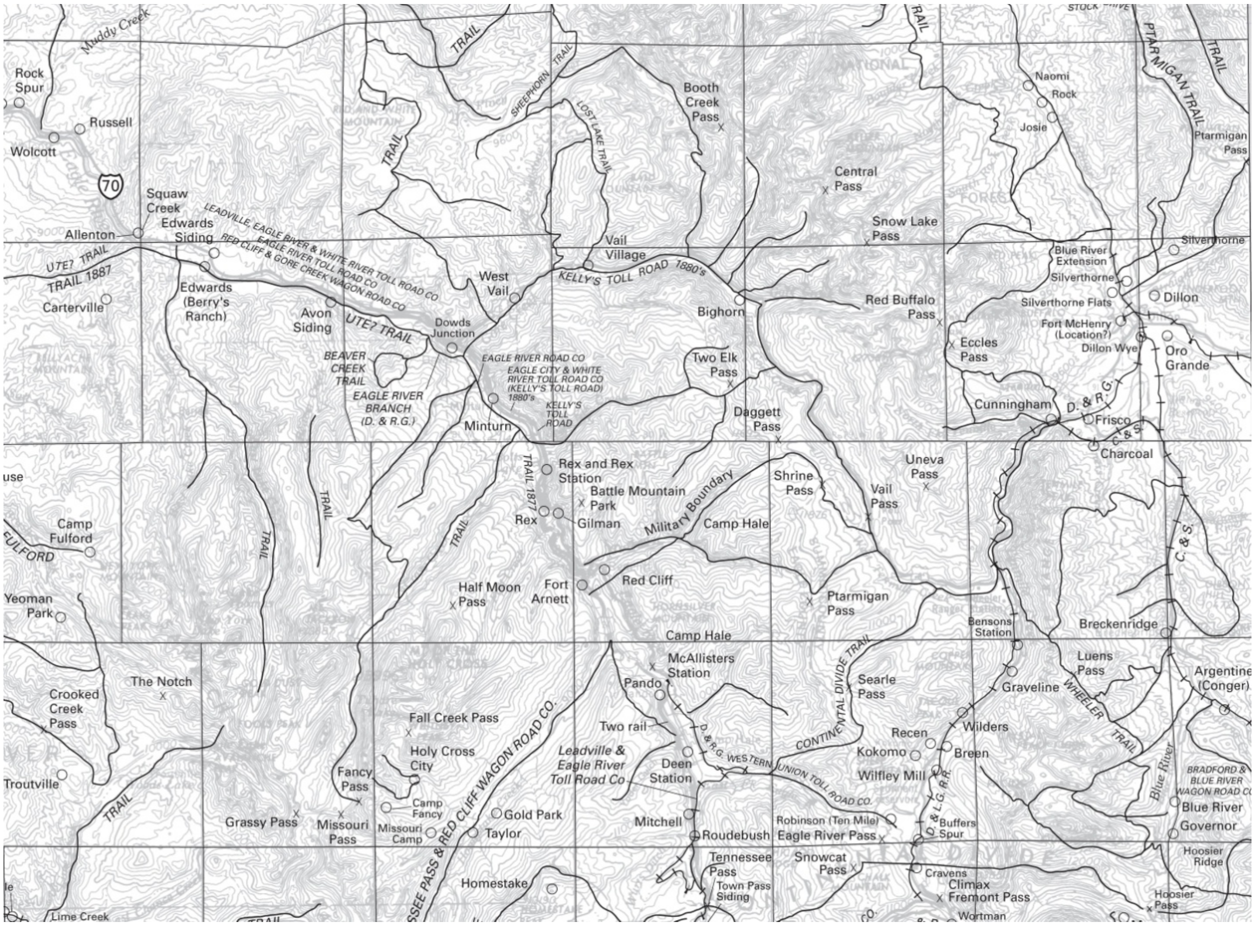
[39] Scott, 2004: 31.
[40] Burke, 2007: 139; Scott, 2004: 30.
[41] Norman, 2002: 21.

condition and relatively unimproved. In 1950, the Federal Highway Administration, the state highway department, and Summit County widened and paved the route as a segment of U.S. 6 over the Divide. When the Federal Highway Administration charted I-70, it planned the interstate parallel to, and on top U.S. 6 in some places. But due to extreme altitude and elevation, the pass was not a reliable crossing in winter. Here, I-70 left U.S. 6 in favor of continuing due west and crossing under the Divide through two tunnels. Construction of the Eisenhower bore commenced in 1968, and despite landslides, rock fall, and cave-ins, the tunnel opened to two-way traffic in 1973. Construction of the Johnson bore began in 1975 and finished in 1979. The Johnson bore was designated for eastbound traffic and the Eisenhower bore for westbound. Completion was of enormous benefit to mountain communities west of the Divide, because they were more accessible for recreation than ever before.[42]



The map illustrates I-70 and the tunnels crossing under the Divide. The original Loveland Pass wagon road, now U.S., crosses Loveland Pass to the south. The dashed line is an early and unknown wagon road. Courtesy of Denver Public Library, CG4312.L66 1973.R6.

42 Autobee, 2003: 7-12.



The map depicts the network of wagon roads and trails around the upper Eagle River valley. Source: Glenn Scott's 2004 Historic Trails in the Leadville Quadrangle.

Eagle and Colorado River Valley

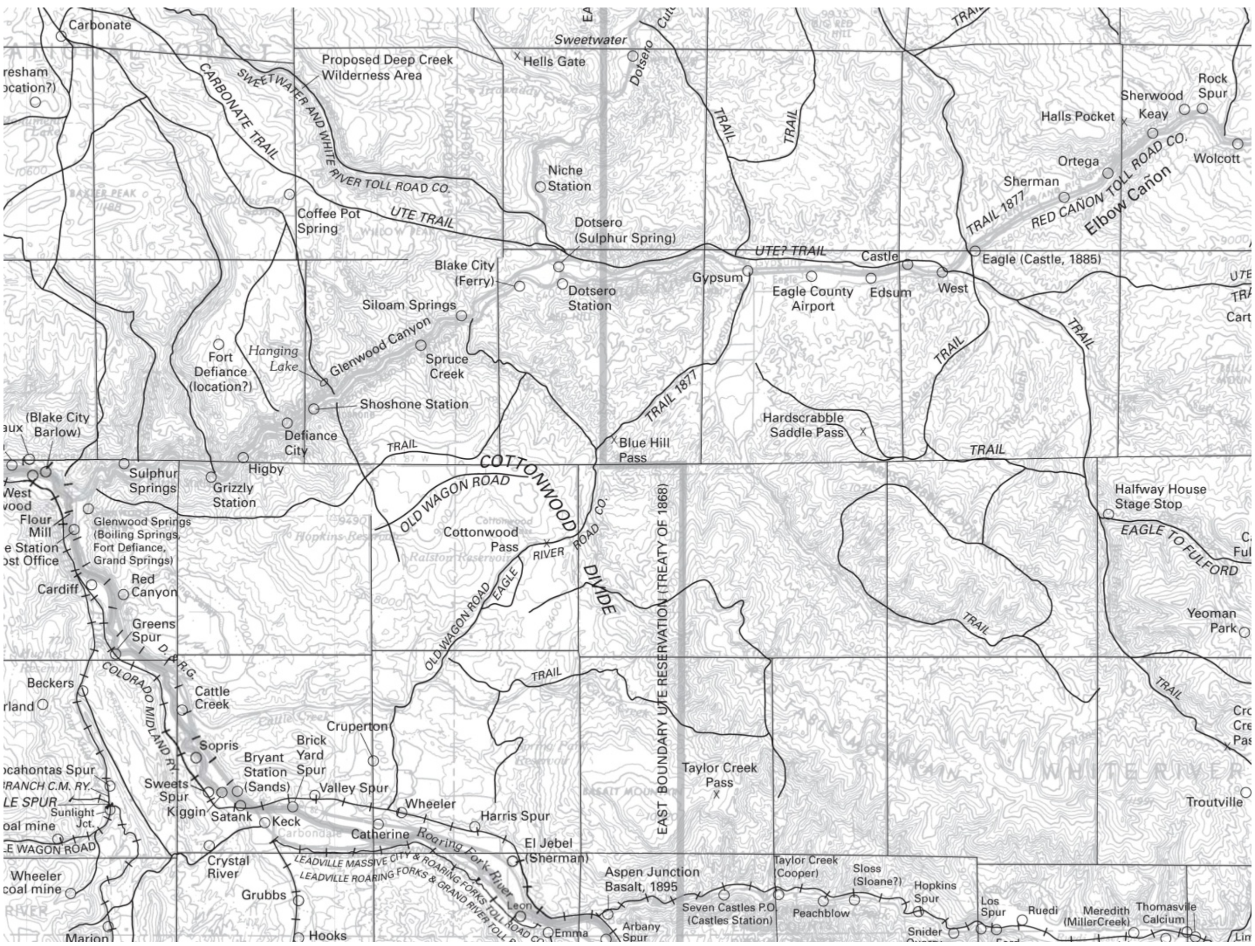
Trappers and Explorers in Eagle and Colorado River Drainages, 1811-1859

Native Americans, trappers, and exploration parties were the earliest to travel through the Eagle and Colorado river valley, and they primarily used the types of Native American trails described at the section's beginning. As trapping declined, the federal government began dispatching exploration parties in hopes of locating new east-west routes through the Rocky Mountains, and to understand their geography. Some of these expeditions ultimately blazed routes later followed by wagon roads and ultimately I-70. John C. Fremont's first expedition, in 1842, examined the South Pass region in Wyoming for potential military posts. The return trip of his second expedition in 1844 brought him into the central Colorado mountains. He entered from the northwest, traveled down Middle Park, followed the Blue River through Summit County to Hoosier Pass, and traversed South Park.[43] Fremont's was the first U.S.-commissioned expedition to cross this section of the state.

[43] Stone, 1918: 59.

On his third expedition in 1845, Fremont returned to the central Rocky Mountains en route to the Great Basin. He followed the Arkansas River to its head waters, crossed Tennessee Pass to the head of the Eagle River, and descended down to present Minturn. This route later became part of U.S 24 between Leadville and Minturn. Fremont continued west along the Eagle to the Colorado River, followed it north, and then paralleled the White River into Utah. The trip was the first recorded Anglo expedition through the Eagle and Colorado river valley.

John Wesley Powell led the next and last federal expedition to venture through the I-70 Mountain Corridor. In 1867, the Powell expedition, also the U.S. Geological Survey's first, began in Bergen Park, traveled to Central City, and went west to Middle Park. The group then followed the Colorado River to the junction of the Colorado and Green Rivers, roughly paralleling present I-70. The expedition was an important step in quantifying central Colorado's natural resources, natural environment, and river network.[44]



The map depicts the network of wagon roads and trails around the Colorado River valley. Source: Glenn Scott's 2004 Historic Trails in the Leadville Quadrangle.

44 Mehls, 1984: 27.

Road Development in the Eagle and Colorado River Valley, 1881-1893

The Eagle and Colorado river valley, and surrounding area, lagged behind Clear Creek and Summit counties in road development by nearly twenty years. Several factors discouraged permanent settlement, growth of industry, and development of associated roads. First, the region remained in Ute possession, and second, it lacked gold and silver.

Facing pressures by ranchers, timber companies, and settlers, Colorado and the federal government forcibly relocated the Utes and made available the Colorado River drainage in 1881. Ranchers and homesteaders immediately moved into the Eagle and Colorado river valley, forming an economic base for the small hamlets of Dotsero, Eagle, and Gypsum, organized during the early 1880s. As elsewhere, pack trails were the initial transportation arteries, and most followed older Native American trails. The region lacked enough traffic to interest entrepreneurs in building toll roads, until local farmers and ranchers perceived Aspen, Red Cliff, and Leadville as markets for their produce. Several organizations then graded a few rough roads out of the river valley toward these cities. A network within the valley, however, was long in coming because little freight moved between the communities. The Denver & Rio Grande Railroad reduced the traffic that the main roads carried when it completed its Leadville to Glenwood Springs line in 1887. The traffic that did travel the roads afterward included a few stages and freight wagons providing service from the railroad to remote communities, and lumber wagons hauling materials from the forests down to the railroad.

The Good Roads Movement in the Eagle and Colorado River Valley, 1893-1933

As of 1890s, western Colorado, and the Eagle and Colorado river valley in particular, still lagged far behind the Front Range and central mountains in its road system. Because the region was primarily agricultural, it was lightly settled. The rural population and its light traffic were unable to finance regularly maintained roads, and found minimal assistance from state government. And yet, the poor roads retarded economic development and discouraged tourism, which exacerbated the problem.

In an attempt to remedy this, State Senator Edward Taylor of Glenwood Springs petitioned the State Legislature in 1899 to fund a continuous road from Denver to Grand Junction via his district. Taylor was successful, and the state linked existing roads where it could, and built new segments where necessary. The route started in Denver, traveled southwest to Buena Vista, followed the Arkansas River to Leadville, and crossed Tennessee Pass to the Eagle River. The road passed through Red Cliff and continued along the Eagle to the Colorado River, following present U.S. 24. The road was supposed to parallel the Colorado to Glenwood Springs, but stopped at the mouth of Glenwood Canyon, the first major obstacle. The project temporarily stalled as engineers pondered how to grade a road through the cliff-locked chasm. At this point, however, the road was partially successful because it provided a direct route linking the Colorado River communities with Leadville and ultimately Denver. The only viable solution to complete the road was imitating the Denver & Rio Grande and blast the roadbed from the canyon walls. The final segment through the canyon was finished within several years, bringing the total project cost to around $60,000.[45]

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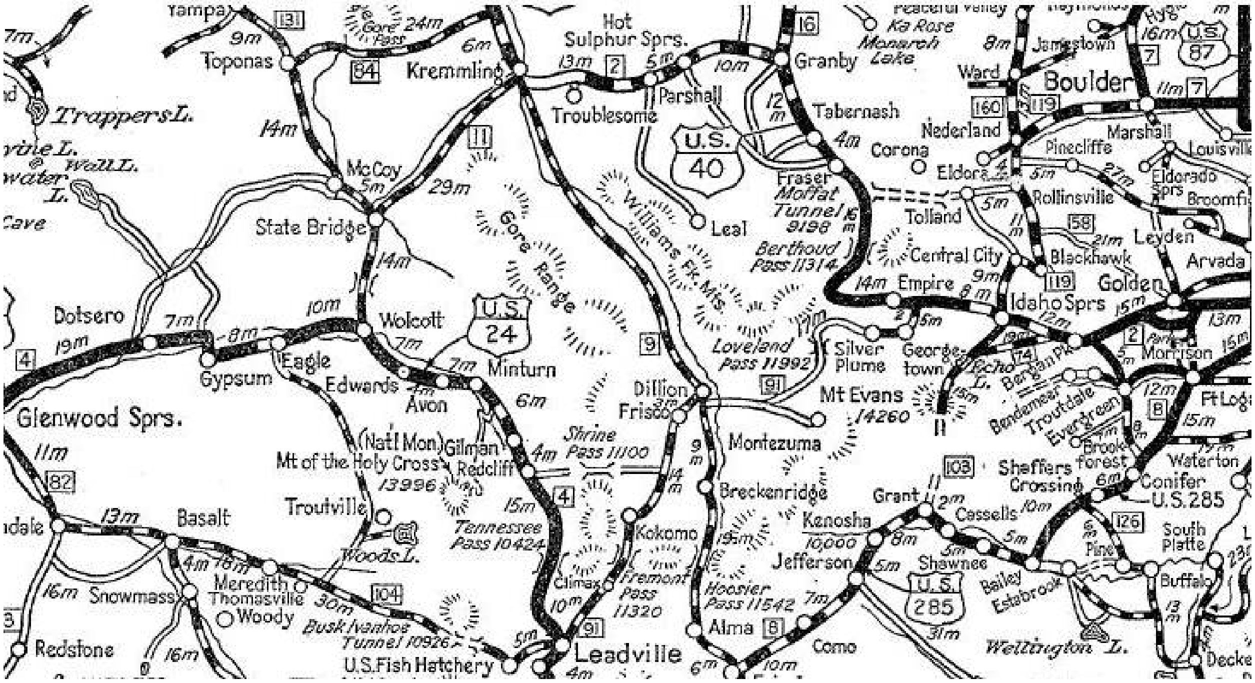
[45] Schader, 1996: 124.

Taylor State Road through Glenwood Canyon. Courtesy of Denver Public Library, RH-280.

The route, named Taylor State Road, was the only alternative route to Glenwood Springs from Denver via auto, other than over Berthoud Pass to Hot Sulphur Springs (now U.S. 40). Because the road was narrow, rough in places, and slow even when finished, it was subject to improvements as money became available. When the Colorado Highway Commission was organized in 1909, it designated the route State Primary Road 10, making it eligible for improvement grants. Additional work was then completed along the Eagle River at first, making the road attractive to auto tourists. To encourage tourism and recognize the road as the most direct highway through the central mountains, the federal government designated it as part of the Pike's Peak Ocean to Ocean highway in 1914. Various sections were widened afterward, and the entire highway surfaced with gravel and oil in 1923.

The New Deal and Engineering in the Eagle and Colorado River Valley, 1933-1956

Taylor State Road, now recognized by the federal government as U.S. 24, was the focus of most of the highway work in the Eagle and Colorado river valley during the Great Depression. The WPA began by paving sections between Leadville and Eagle, and then turned its attention to Glenwood Canyon. There, the road was still a narrow and winding shelf along the base of sheer cliffs. The highway was often closed for periods of time while workers widened and paved it. They finished in 1938 after investing $1.5 million, and western Colorado was now easily accessible to trucks, buses, and auto tourists.[46]



Road map of central Colorado in 1936. Courtesy of Colorado School of Mines, G4311.P2 1936.R6.

Although U.S. 24 greatly improved travel from Denver into the Colorado River valley and Glenwood Springs, the route was still tortuous and slow. The federal and state government sought a more direct alternative and planned to extend U.S. 6 from Summit County west to Minturn. There, the new road would join U.S. 24. In 1939, the PWA began grading the shortcut at Wheeler in Ten Mile Canyon and pushed west up and over Vail Pass, named after State Highway Engineer Charles Vail.[47] In 1940, construction crews joined the new highway with U.S. 24, further contracting travel time from Denver. Eagle County then saw greater numbers of tourists than in the past, and the highway opened the region for the development of the ski industry.

<u>The Interstate Era in Eagle and Colorado River Valley: 1956-Present</u>

When the Federal Highway Administration planned I-70 west from Summit County, it originally had difficulty finding a suitable, cost-effective route due to the tight canyons, steep grades, and high passes of the central mountains. One option was to curve north around the highest peaks and follow Gore Creek, and the other was to parallel U.S. 6 as in Clear Creek and

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[46] Schader, 1996: 133-134.
[47] Autobee, 2003: E-36.

Summit counties. The administration ultimately chose U.S. 6 because the Secretary of Agriculture denied an easement through national forest at Gore Creek and construction costs were three times higher. Thus, the administration routed I-70 over Vail Pass and down the Eagle and Colorado rivers, and then encountered the same impediment that stalled the Taylor State Road. Glenwood Canyon was simply not large enough for a four-lane interstate with median, and blasting and fills were infeasible. Thus, CDOT and the Federal Highway Administration used the project as an opportunity to employ best practice in construction and design. Construction began in 1981 and was finished in 1992, an engineering and environmental success in a canyon that historically vexed road builders. The highway, built directly on Taylor State Road, was double-decked with each set of lanes its own distinct concrete structure. In the design, the roadway was intended to be slender and visually prominent instead of trying to blend in with the canyon. The contrast defined the interstate as separate while highlighting the beauty of the canyon. In so doing, the Glenwood Canyon section contributed to the development of context sensitive highway engineering.[48]

[48] Associated Cultural Resource Experts, 2002: 11-71.

Section E 10: History of Tourism and Recreation, 1860-Present

Introduction

The I-70 Mountain Corridor is a well-known destination for outdoor recreation and has been since the early 1860s when miners first opened the region. Tourists ascended from Colorado's plains cities, elsewhere in the nation, and other countries to experience the Rocky Mountains through outdoor recreation. This section discusses the most important outdoor activities that left a prevalent imprint on the land, primarily in the form of historic resources. In order of discussion, the activities are skiing, resort tourism, fishing, hunting, hiking, and camping.

All the activities except for skiing were related in history, season, general timeframe, and demography. Skiing was separate because it began as practical winter transportation and evolved into one of the most popular but heavily mechanized forms of outdoor recreation. As skiing became dependent on capital for designed resorts and their equipment, an influential industry secured control over the sport for its high profit. The other recreational activities, in contrast, were enjoyed by resort tourists and campers during snow-free months. Although destination resorts required money, the other activities were inexpensive, simple, and provided an intimate experience with nature. Usually, tourists combined several of the activities in a single excursion, such as camping and hiking in the same trip.

Period of Significance, 1860-Present

As a theme, outdoor recreation was important in the I-70 Mountain Corridor during the Period of Significance 1860 to present. The Period began in 1860 when gold miners in western Clear Creek drainage began skiing as transportation. Miners, loggers, and other settlers carried the practice west into the I-70 Mountain Corridor during the 1880s, where it evolved into a recreational activity. Resort tourism started in Clear Creek drainage in the mid-1860s and became closely associated with camping, hiking, fishing, and hunting. Outdoor recreation migrated into the western corridor during the 1880s, and although resort tourism declined by World War II, the other activities became increasingly popular and are still practiced.

Because outdoor recreation followed a westward progression through the corridor, narrower timeframes apply to specific regions. The timeframes are summarized separately below. The six forms of outdoor recreation were also significant under specific NRHP areas, which are Architecture, Commerce and Economics, Conservation, Landscape Architecture, Politics/Government, and Entertainment/Recreation. The significance is likely to be on local and statewide levels. Recreation was not, however, important on a national level.

Clear Creek Drainage

Outdoor recreation in Clear Creek drainage began in 1860 when miners skied as winter transportation. From the 1880s through the 1910s, the activity gradually evolved into a form of recreation and completed the transition by the 1930s. Afterward, people came into the western portion of the drainage specifically to ski at several developed areas. Although the small operations went out of business quickly, Loveland persevered and is presently one of the most popular areas in the Front Range.

Resort tourism, based on destination resorts, lagged behind skiing by around five years. Tourists began coming to Idaho Springs for the hot springs as early as 1865 and to resorts in the western drainage by 1870. From this time until World War II, resort tourism was an important business, and vacationers combined resort trips with fishing, hunting, hiking, and camping. These four activities increased in popularity after resort tourism declined and are still vital contributors to the drainage's identity and economy.

Blue River Valley

Skiing was the first outdoor activity in the area around Frisco and Dillon, in Summit County. Miners and prospectors used skis for transportation as early as 1878, the beginning of the region's mining and logging boom, and continued into the 1910s. The overlapping transition from transportation to recreation started in the 1890s, came to completion during the 1930s, and recreational skiing is presently the region's economic foundation.

Resort tourism began around 1882 when vacationers used new hotels in the boomtowns of Dillon and Frisco as bases for outdoor excursions. Although the hotels were basic, tourism thrived for decades because the region had outstanding natural character and numerous destinations for outdoor activities. Resort tourism declined at the same time as the mining industry and ended around 1920. Tourists returned for hunting, fishing, hiking, and camping after World War II.

Eagle and Colorado River Valley

Completion of the Denver & Rio Grande Railroad Glenwood Springs line opened the Eagle and Colorado River valley for tourism and recreation. Local residents and tourists practiced all forms of outdoor activities starting in 1887. Resort tourism, never popular in the valley, ended in 1893 when the Silver Crash financially wrecked the handful of substantial destination resorts. Hunting, fishing, camping, and hiking continued to present, with the former two among the region's most popular activities.

HISTORY OF SKIING

Skiing as Transportation: 1860-1900

Miners who arrived during the early 1860s with the Pikes Peak gold rush can be credited with introducing skiing to Colorado on a meaningful level. Many migrated from Scandinavia and northern Europe, where skiing was widely practiced winter transportation on heavy snowpacks. When the Rocky Mountains presented the immigrants with familiar winter conditions, they implemented this important cultural tradition. Other mountain settlers then imitated, such as minister and mail carrier John Dyer, who wore what were referred to at the time as Norwegian snowshoes. Early skis were eight to twelve feet long, five inches wide, an inch thick, with tips steamed and curled upwards. The skier was attached via a strap and manipulated a single long pole for balance and stopping. Dyer was not alone as miners, doctors, postal carriers, and other residents in early mountain towns learned to ski out of necessity.[1]

Skiing began a transition from transportation to recreation during the 1880s due to changes in regional development and demography. The mountain towns were finally connected

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[1] Baker 2004:12; Coleman 2004:19, 21, 26; Fay 2000:7, 9, 15, 19.

with the outside world by road networks and railroads, and residents no longer had to rely on skiing for mobility. But the tradition of skiing persisted because it was now part of mountain town culture. With free time and an interest in leisure during winters, residents turned to skiing for recreation. Communities organized ski clubs and hosted related events such as dances, parties, and outings. Ski racing, primarily among the working class, also became popular. Races were both entertainment for participants and spectators and competition for cash prizes between neighboring communities. The result was closer ties within and between communities, which was important in difficult Rocky Mountain winters.[2]

Skiing as Sport and Recreation: 1901-1930

Whereas Northern European immigrants introduced skiing to Colorado, they also fostered its evolution as a recreational activity around the turn of the century. Immigrants brought new types of skis with bindings that attached the heel, providing the user with greater maneuverability. During the same time period, Norwegians promoted ski competitions and winter carnivals. Among them were Fritdjof Nansen and Sondre Nordheim, both avid skiers who emphasized the social aspects, health benefits, and opportunity to temporarily escape indoor life. These developments furthered skiing as a sport by making it easier and more attractive to a greater number of people.

Peter Prestrud, a Norwegian immigrant, was among the earliest to popularize skiing as sport in Summit County. He moved to Frisco to oversee his father-in-law's mining interests in 1910 and found that the winter provided ample snow. Prestrud and friend Eyvind Flood then built a ski jump at the Excelsior Mill in 1911, as well as other jumps around Frisco in subsequent years. Their events were locally important, but celebrations in communities to the north had greater impact. Hot Sulfur Springs set precedent with Colorado's first winter carnival and ski competition in 1912. Norwegian immigrant and skiing circus daredevil Carl Howelson, also known as the Flying Norseman, then started an annual winter carnival tradition at Steamboat Springs in 1914. The carnivals included sledding, skating, ski competitions, and women-only contests, which became popular by the 1930s. Similar carnivals began spreading throughout the central mountains as participants organized events in their communities.[3]

Due in large part to Prestrud and Flood, Frisco began hosting the annual Winter Sports Carnival, one of the most important ski events in the central mountains. In 1919, they built Summit County's largest jump to date at Dillon in preparation for a significant competition. Youths from throughout the county tested their skills, and Norwegian jumper Anders Haugen set a world distance record. Prestrud and Flood continued to promote both traditional cross-county and downhill skiing, new but increasingly popular. They organized children's competitions, youth ski classes, and the Summit Cup ski jump contest.[4]

Interest in skiing expanded down to Colorado plains towns during the 1910s. In 1912, Denver area interests established the Colorado Mountain Club in 1912 for the "preservation of scenery and wilderness, exercise and outdoor recreation, and tourism." The club embraced skiing within three years and made regular winter trips to the Estes Park area. During the 1920s, residents in Colorado Springs, Boulder, and Estes Park organized their own chapters. Carl Howelson and a group of Norwegian immigrants founded the Denver Ski Club in 1913 and the

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[2] Coleman 2004:22, 24-25.
[3] Coleman 2004:27, 28, 32, 36, 65; Fay 2000:23; Gilliland 1984:76.
[4] Gilliland 1984:76, 79, 83.

Rocky Mountain Ski Club the following year. The purpose was to organize spectator events and promote the sport.[5]

Development of Resort Skiing: 1931-1945

In Europe, where skiing began, the sport underwent another transition and approached today's Alpine style. During the 1920s, Europe's elite claimed the sport as their winter leisure activity and stayed in resorts specifically designed for downhill skiing. Equipment improved, skis were shorter, and two easily manipulated poles replaced the long rod previously used. European ski instructors then brought the concept, equipment, and skill to the northeastern United States. The charisma and charm of the European instructors, the sport's strong association with European sophistication, and new destination reports began to interest young people who belonged to middle and upper classes. The movement became a foundation of ski culture, which trickled into Colorado during the 1930s.

Energized, Colorado's recreational organizations promoted the concept of building formal ski areas in the Front Range, within reach of plains cities. Ski organizations, the Civilian Conservation Corps, Works Progress Administration, and Public Works Administration then pooled labor, capital, and planning during the mid-1930s. Their products were four ski areas within or near the I-70 Mountain Corridor, and a few more elsewhere in Colorado. The effort was significant as Colorado's first coordinated movement legitimizing skiing as business, cultural activity, and economic contributor to mountain communities. Even though the state suffered in the dismal economic climate of the Great Depression, popularity of skiing increased as a result.

Echo Lake, first among the four new areas, opened less than ten miles southwest of Idaho Springs in 1935. The destination was among the most primitive, consisting largely of tight ski runs, a parking area, and warming hut. A permanent lodge and other facilities were absent. In 1936, the ski organizations and government agencies completed Berthoud Pass ski area, on Berthoud Pass north of Empire. The consortium cut trails, graded parking areas, and with financing from the May Company department store in Denver, installed one of the state's earliest tow ropes. Also called ski tows, these apparatuses were important to skiing as a growing industry because they made long slopes accessible to more participants. A tow was simple, consisting of a rope loop, a pulley at the slope base, another at top, and an engine, usually salvaged from an automobile. Skiers either held handles or used seats as the rope dragged them, sometimes literally, to the top of a run.[6]

Loveland ski area also opened in 1936 but had difficulty at first due to construction and improvements on Loveland Pass road. Thor C. Groswold and J.C. Blickensderfer set up a portable tow rope on the east side of the pass, and Allen Bennett installed his own tow rope powered by a Model-T engine. When the road was finished in 1938, area use soared. Enthusiasts then established Porcupine Gulch ski area on the west side of the pass, and it may have been the simplest with a portable tow rope and no facilities.[7]

United States entry into World War II at the end of 1941 quickly stopped progress in the nascent ski industry. Young people, the sport's principal demographic group, either went to war or into contributing industries. Gasoline rationing and a moratorium on new automobiles discouraged commuting into the mountains. Ski organizations also had difficulty securing labor, capital, and cooperation from government agencies for more resort development.

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[5] Coleman 2004:30, 34-35; Fay 2000:31.
[6] Coleman 2004:90-91. Fay 2000:36.
[7] Colorado Ski History website, 2010.

World War II was not completely detrimental, however, because it produced the human capital that shaped skiing into its current form. In 1943, the United States Army established the Tenth Mountain Division for specialty work in Europe's rugged terrain and easily attracted young men already versed in skiing and mountaineering. Some began training at Camp Hale, west of Leadville, became intimate with Colorado's central mountains, and determined to settle in the mountains when discharged from the Army. Former Camp Hale soldiers, a group that one former veteran called, "a fraternity. . .a brotherhood of outdoorsmen" gave new life to the industry. Tenth Mountain veterans later opened or managed over a half dozen ski areas in Colorado, including Loveland Basin and Vail in the I-70 Mountain Corridor.[8]

Growth of Ski Tourism: 1946 to Present

After World War II ended, a number of broad factors and conditions specific to the sport helped the industry flourish during the late 1940s and 1950s. People were ready for leisure and had the resources to pursue entertainment, after going without during the Great Depression and World War II. Culture shifted slightly as youth felt less inhibited than previous generations to fully embrace difficult physical recreation. Automobiles were widely available and government agencies improved Colorado's road network, making the mountains easily accessible. When the federal government began its interstate program in 1956 and air travel became affordable, vacationers outside of Colorado found ski areas to be within reach.

Within Colorado, former Tenth Mountain soldiers, ski promoters, and state and federal government developed a common vision and applied their business acumen to develop the industry. During the winter of 1945 and 1946, the Denver Chamber of Commerce's Winter Sports Committee conducted a statewide survey for potential ski areas. The Forest Service also examined terrain that regional staff considered appropriate. As important, industry experts redefined the ski area concept, obtained capital, and built complexes similar to those in Europe. Before the war, ski areas were simple, small, and offered few amenities for people not actively skiing. Lodges, also known as warming huts, were crude, built as needed with available materials, and offered no services. Bathrooms were usually privies. On the mountain, runs were tight and tortuous, tow ropes were uncommon, and skiers walked to the top.[9]

After the war, Tenth Mountain veterans and businessmen organized companies and invested capital on improvements for skiers and their families. The companies built lodges with food service, bathrooms, waiting areas, and parking lots. Experts also adapted existing forms of machinery and even invented new equipment and methods to improve conditions on the mountain. Workers cut wider runs over varied terrain, and distinguished them between beginners and experts. Companies not only replaced existing tow ropes with chair lifts, but also invested in more lifts for new runs. In the 1950s, the largest companies began grooming their slopes with corduroy to eliminate icy areas. These and other improvements made the sport easier and enjoyable to more people, who then skied in and around corridor in increasing numbers.

The sport grew significantly in the corridor from the mid-1950s through the 1970s. As skiing became an attractive source of profit, investors bought and expanded existing areas, built complex resorts from the ground up, and aggressively promoted out of state. The industry began to move away from relaxed, nature-based recreation toward a commercialized, finance-driven culture. Whereas around 7 areas existed during the 1930s, 30 were scattered throughout the state by 1966. Some of the largest and oldest areas operated in the corridor. They included Loveland,

[8] Coleman 2004:8, 97-98, 100, 106-107. Fay 2000:36.
[9] Coleman 2004:92, 96; Hauk 1979(a):1.

opened in 1936; Vail in 1962, Meadow Mountain near Vail in 1966, Keystone in 1970, Copper Mountain in 1972, and Beaver Creek in 1980.[10]

Loveland Ski Area

After opening in 1936, Loveland became one of the most sophisticated areas, partly because the area had several tow ropes and a warming hut. The area remained small until Tenth Mountain veteran Peter Seibert organized a group of stockholders and bought the establishment in 1955. Seibert then acted as general manager and instituted improvements that kept the area on the forefront of Colorado's industry. In 1955, before moving on to pioneer skiing at Vail, Seibert contracted with Heron Engineering for Loveland's first two chairlifts, No.1 and No.2. In the late 1950s and early 1960s, Heron Engineering added chairlifts No.3 and No.4 over the Eisenhower Tunnel, which expanded available terrain. Loveland replaced chairlift No.2 with a Yan triple during the late 1980s and No.3 with a Poma quad in 1990 to accommodate more users. The Valley Lodge was constructed in 1989 and expanded in 1995.[11]

Vail Ski Area

Experienced skiers Earl Eaton and Peter Seibert met during the early 1950s while working at Aspen ski area, and they shared a vision of establishing their own resort. During the warm season, they perused Colorado, New Mexico, and Wyoming for potential ski areas and had luck in the central mountains. Eaton discovered what became Vail's Back Bowls in 1954 while prospecting for uranium, contacted Seibert shortly after, and together they explored the terrain around Vail Valley. In 1957, they secured investors and purchased the Hanson Ranch at the base of Vail Mountain for a destination resort. The investors formalized the project under the Vail Corporation, negotiated with the Forest Service to build ski runs on public land, and began work in 1961. Vail, among the largest destination resorts in the Rocky Mountains at the time, opened ahead of schedule in December of 1962. The resort was ready for elite skiers and their families with two lodges, four restaurants, a filling station, four-person Bell gondola, two double chairlifts, larger Poma lift, ski school, runs on the front side, and the Back Bowls. In 1966, the town of Vail was incorporated.

The Vail Corporation created controversy in 1968 when it proposed significant modifications and additions to its system of runs. In particular, the ski area planners intended to bulldoze the terrain, but the Forest Service determined that the heavy equipment would promote excessive erosion. After careful studies and negotiations, the two parties agreed to selective bulldozing, immediate revegetation, and subsequent monitoring until the disturbed ground stabilized. When the management practice proved to be effective, Vail, and later Keystone and Copper Mountain, adopted it for development. Vail ski area was enormously successful and, with Meadow Mountain, grew large enough to support the town of Vail throughout the year.[12]

Keystone Ski Area

Max Dercum was a snow scientist who moved to Colorado with wife Edna during the late 1930s. They purchased the Black Ranch adjacent to the idle Keystone sawmill on the Snake River, Summit County, in 1941 because of its proximity to an abundance of snow. Within a

[10] Coleman 2004: 118, 124-126; Fay 2000:89; Mather and Summit Historical Society 2008:125.
[11] Colorado Ski History website, ski area history for Loveland web page 2010.
[12] Hauk 1979(e):1-10.

short time, the Dercums joined local ski culture by renaming their property Ski Tip Ranch and opening it to local and vacationing skiers. No formal ski area existed at the time, and users wandered nearby slopes and logging roads. Shortly after Arapaho Basin ski area opened in 1946, Max became a director and learned the basics of area planning. With this knowledge, he determined that Keystone Mountain, rising south of Ski Tip Ranch, was ideal for a resort and began promoting the idea. He interested investors and local land owners who formed Ski Valley USA, Incorporated, in 1965, and negotiated with the Forest Service for a special use permit. The Forest Service approved the area plan in 1967, but lack of funding delayed actions until 1969. At that time, William Bergman and Max reorganized the venture as Keystone International, obtained capital from Ralston Purina, and completed several lodges and four chairlifts on Keystone Mountain. The ski area opened on November 21, 1970.

Keystone International established precedent in environmental planning when designing and building the runs and lift system. While the area was in a formative stage, Summit County enacted a set of environmental protection and compliance laws with strict rules on ski area development. Area design, planning process, and construction were carefully monitored, and the finished terrain and contours were left as natural as possible. But after the first season, it became apparent that modifications were necessary for skier safety. The company used the opportunity to add two more lifts and snow making equipment in 1972. In later years, the company installed several more lifts and opened the Outback south of Keystone Mountain.[13]

Copper Mountain Ski Area

During the late 1940s or early 1950s, the Forest Service surveyed the Ten Mile Canyon region for suitable ski area sites. In a 1954 statement, the agency recommended Copper Mountain because the landform possessed a variety of terrain, natural ski runs, and the valley floor for base facilities. Developers finally became interested in the site during the late 1960s when Denver was awarded the opportunity to host the 1976 winter Olympics. Investors pushed special use permit negotiations during 1969, began construction the next year, and opened the ski area in 1971. For a brief time, the resort had potential for worldwide notoriety when the Olympic committee chose it as a backup for the 1976 games, but Colorado voters rejected a referendum to host the Olympics. Copper Mountain was built as a complete resort with five lifts serving a series of runs and a three-story lodge on the mountain's northeast face. A 34,000-square-foot facility with lodges, restaurants, hotels, and condominiums was built at the base of the mountain, by the abandoned logging and railroad hamlet of Wheeler. In terrain and design, Copper Mountain is largely unchanged, although accommodations and parking areas were added in later years.[14]

Beaver Creek Ski Area

The Forest Service first examined Beaver Creek as a possible resort location in 1956 and concluded that it possessed the necessary qualities. The land drew little interest until 1970, when Vail Associates surveyed it, drew plans for a state-of-the-art resort, and secured a commitment to host the 1976 Olympic Alpine and cross-country ski events. Vail then purchased the private land for the base facilities and began the permit process with the Forest Service, but stalled when Colorado rejected the Olympics. After reassessing the ski area's viability, Vail moved forward but had difficulty convincing the Forest Service to grant the required permit. Land use concerns

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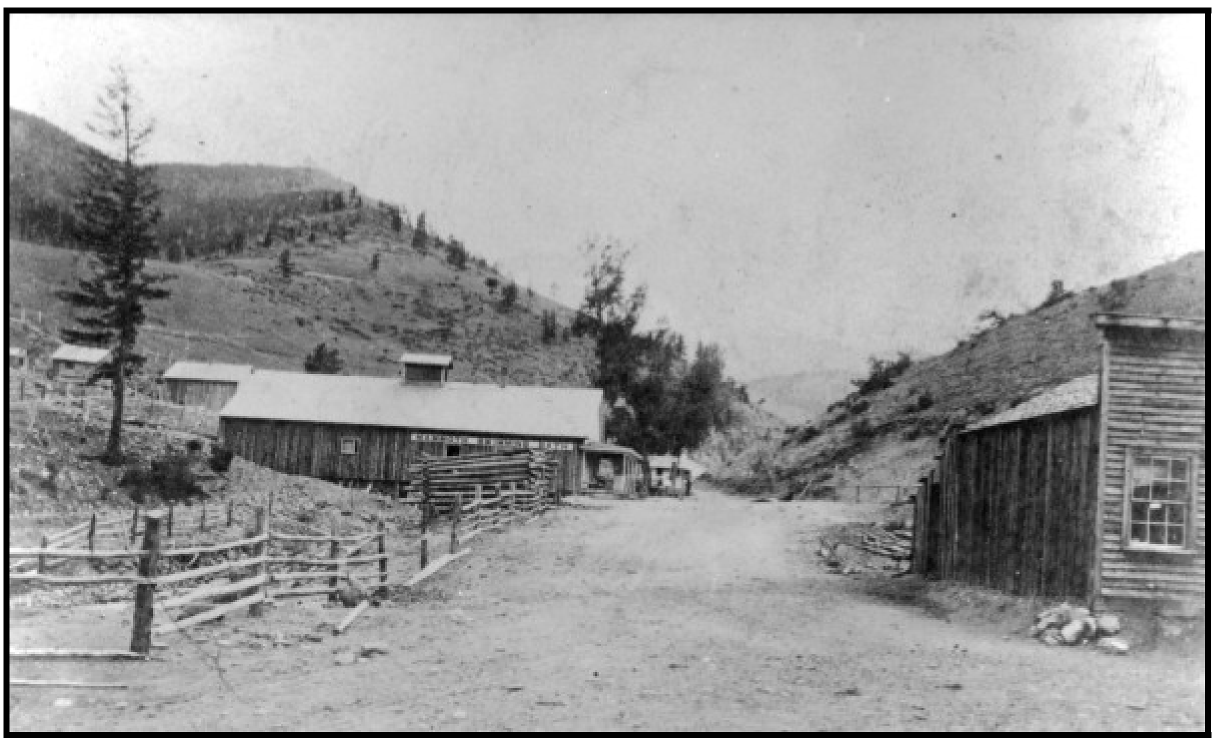
[13] Hauk 1979(a):6-7; Hauk 1979(b):1-11.
[14] Hauk 1979(d):1-9.

and sensitive environmental conditions drew widespread scrutiny and delayed the project for years. After prolonged negotiations, the Forest Service finally granted the needed permit in 1976, allowing Vail to begin work the next year. Beaver Creek Resort finally opened in 1980 after a logical process that Forest Service district ranger and author Paul Hauk referred to as "one of the most intensely analyzed ski area proposals in the United States."[15]

HISTORY OF RESORT TOURISM

Colorado recreation historian Kenneth Helphand accurately described nineteenth century resort hotels as "the most glorious and palatial structures in town." Concentrated in Clear Creek drainage and Glenwood Springs, the resorts and hotels were full-service destinations where tourists vacationed in luxury. Within several decades after initial settlement, tourists came to the I-70 Mountain Corridor for health, grandeur of the Rocky Mountains, and their opportunities for hunting, fishing, and excursions. Completion of railroads in Clear Creek drainage in 1877, Summit County in 1882, and the Colorado River valley in 1887, fostered a tourism boom in these regions. Destination resort tourism declined during World War I and never recovered. After World War II, vacationers returned, but enjoyed the mountains in a new way. They came in automobiles to inhabit the outdoors through camping, hiking, and mountaineering.[16]



Although rough and primitive, the Mammoth Bath House at Idaho Springs may have been the earliest destination resort in the I-70 Mountain Corridor. The early 1860s building was later replaced by several large resorts that catered to wealthy tourists from the Midwest and East. Courtesy of Denver Public Library, X-2237.

Early Resort Tourism, 1860 to 1877

[15] Hauk 1979(c):1-10.

[16] Frost, 1880:296; Gillette 1978: 151; Helpand 1991:206-207; Leyendecker et al. 2005: 185.

Clear Creek County was the principal destination for resort tourists in the I-70 Mountain Corridor, and they arrived in 1866 on the tail end of the gold rush. Idaho hot springs, discovered in 1859 by pioneer prospector George Jackson, was the basis for the first resort, however primitive. The springs initially attracted curiosity rather than development because the local miners were interested in gold and not luxury bathing. Cornish miner James Jack and son thought that the springs may have indicated hardrock gold and sank an 18-foot shaft nearby, but abandoned the project when the shaft disintegrated and filled with hot water. Dr. E.E. Cummings envisioned other possibilities for the springs, acquired ownership of all six in 1863, and constructed a small bathhouse. As simple as the facility was, it allowed miners to bathe in warm water, an activity that was otherwise impossible given the primitive living conditions of the time. Between 1866 and 1871, Harrison Montague purchased the springs and had the water analyzed. According to results, the water had antacid and laxative qualities, and bathing could alleviate rheumatism, skin ailments, and other issues. Although tourists were few, Montague built the Ocean Bath House, the first destination resort in the region, if not the central mountains. The resort featured a 4-foot deep, 24-by-40-foot swimming pool, baths for men and women, hot and cold showers, and a small hotel. Shortly after, the Mammoth Bath Company built another facility with a larger pool and luxury accommodations.[17]

As the 1870s progressed, tourists discovered other towns in Clear Creek valley, where entrepreneurs ran hotels acceptable in quality. Although the hostlers gladly received tourists, they initially appointed their establishments for the comfort of mining investors interested in the valley's booming industry. The tourists found mining as intriguing and worthy of excursion as the natural beauty for which the valley was known. The Bee Bee House hotel in Idaho Springs, the Barton Inn in Georgetown, and the Peck House in Empire all drew vacationers. The Barton House was the most luxurious with men's and women's parlors, a billiard room, dining room, bathroom with hot and cold running water, and toilets for ladies.[18]

The Peck House in Empire began as the Peck family home in the early 1860s, and became an inn when the family began renting rooms to miners. The Pecks enlarged the hotel several times, and by 1880, it included a billiard room, bar, poker room, ladies parlor, library, and numerous guest rooms.[19]

Local entrepreneurs noticed that several mountain basins were popular day excursion destinations among tourists. Chicago Lakes above Idaho Springs and Green Lake southwest of Georgetown were the most heavily used among the destinations, and several individuals concluded that they were good markets for remote resorts. The largest was built at Green Lake in 1871, and initially foot or horseback were the only means of access. The following year, the proprietor completed a wagon road that brought guests who expected luxury and entertainment in addition to a wilderness experience. To meet their needs, the owner expanded the resort to include the main guesthouse, bathhouse, picnic grounds, and a dock on the lake for punts.[20]

Bakerville, west of Silver Plume at the confluence of Grizzly Gulch and Clear Creek, drew a slightly different type of destination tourist. The Baker Silver Mining Company built a smelter, boardinghouse, and other buildings at the site in 1867, but the operation failed two years later. William H. Bowles perceived the vacant settlement as a base camp for mountaineers, who came not for luxury but to test themselves. In 1870, he bought the boardinghouse, converted it

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[17] Bowland 2004:21; Crofutt, 1885:107; Frost, 1880:277, 294; Gillette 1978:5-6, 27, 34-35, 144-145, 151.

[18] Leyendecker et al. 2005: 185-187.

[19] The Peck House website 2010.

[20] Chicago, Rock Island and Pacific Railway, 1890:47-48; *Colorado Miner*, 6/8/71; *Colorado Miner*, 5/12/87; Leyendecker et al. 2005: 90-91. St. Louis, Kansas City and Northern Railway Company 1877:23, 26.

into an austere hotel, and arranged trips to Gray's and Torrey's peaks. The hotel was not only significant as one of the earliest destination resorts in the I-70 Mountain Corridor, but also as one of a few that catered specifically to mountaineers.[21]

[21] Ellis and Ellis, 1983:209

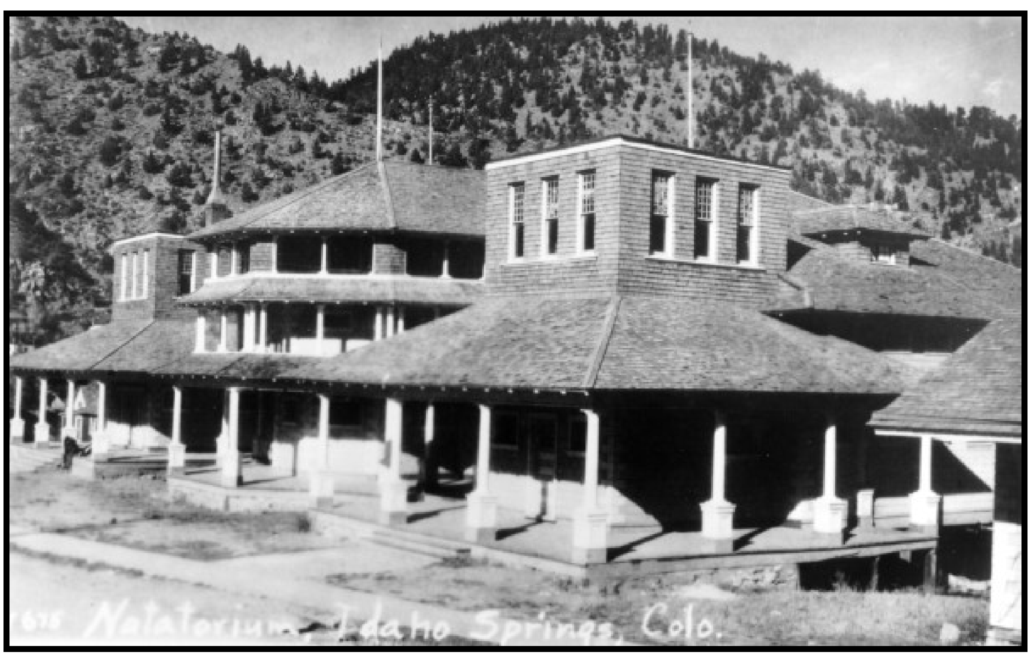
Railroads and Resort Tourism, 1878 to 1915

Railroads changed tourism in the I-70 Mountain Corridor. Previously, stages and omnibuses were the only means of transportation for tourists, but the long trip over rough roads discouraged travelers used to comfort. Railroads not only delivered them directly to corridor communities, but also allowed a nearly unbroken commute from the Midwest and East. The result was both a huge increase in tourism and diversity in traveler fitness level, demography, and gender. Destination resort tourism then peaked and remained high until around 1915 when World War I, decline in corridor accommodations, and preference for auto travel changed traveler patterns.

Clear Creek County

Completion of the Colorado Central Railroad to Georgetown in 1877 provided tourists direct access to the principal communities in Clear Creek valley. Each town saw increased patronage afterward, although Idaho Springs and Georgetown benefitted the most because they offered the widest variety of accommodations for all levels of travel. Tourism became so pronounced during the 1880s that the Colorado Central (CCRR) ran as many as seven trains per day from Denver.

Idaho Springs was the first community where railroad tourists journeying from Denver could disembark. Due to improvements at the prominent hot springs resorts, the town became known as the Saratoga of the West after Saratoga, New York. Although mining continued to be the community's principal industry, tourism was a lucrative business and significant to the economy. Promotional brochures published by various railroads in the Midwest and East touted the town's mild weather, infrequent snow, and proximity to the springs.[22]

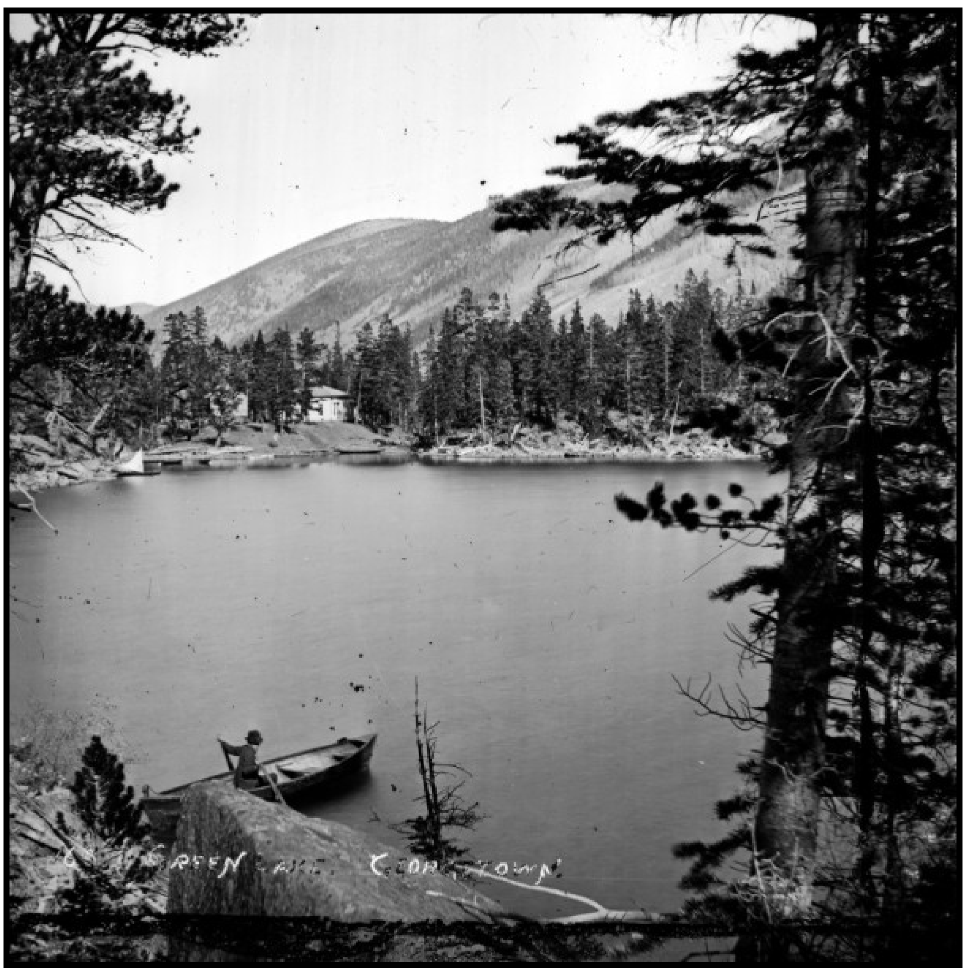


The luxurious Natatorium replaced the old Idaho Hot Springs resort and offered baths, steam rooms, and other amenities. Tourists came from across the nation. Courtesy of Denver Public Library, X-2336.

[22] Brown, 1993:136; Frost, 1880:294; Gillette 1978:44, 55, 143-144.

Tourism was so profitable that William P. Daniels, a regional mining investor, ventured into the resort trade and bought Idaho Hot Springs from Harrison Montague. Daniels expanded the hotel with a wing on each side and converted the original building into a lobby. An elevator lowered guests to the basement level, which featured baths and a spa with masseuses and masseurs. The original Ocean Wave and Mammoth pools had been replaced by a hot cavern and massive 40-by-80-foot natatorium pool with a toboggan and trapeze. The resort complex also included a dining hall, casino, tennis court, and single-occupancy cabins along Soda Creek.[23]

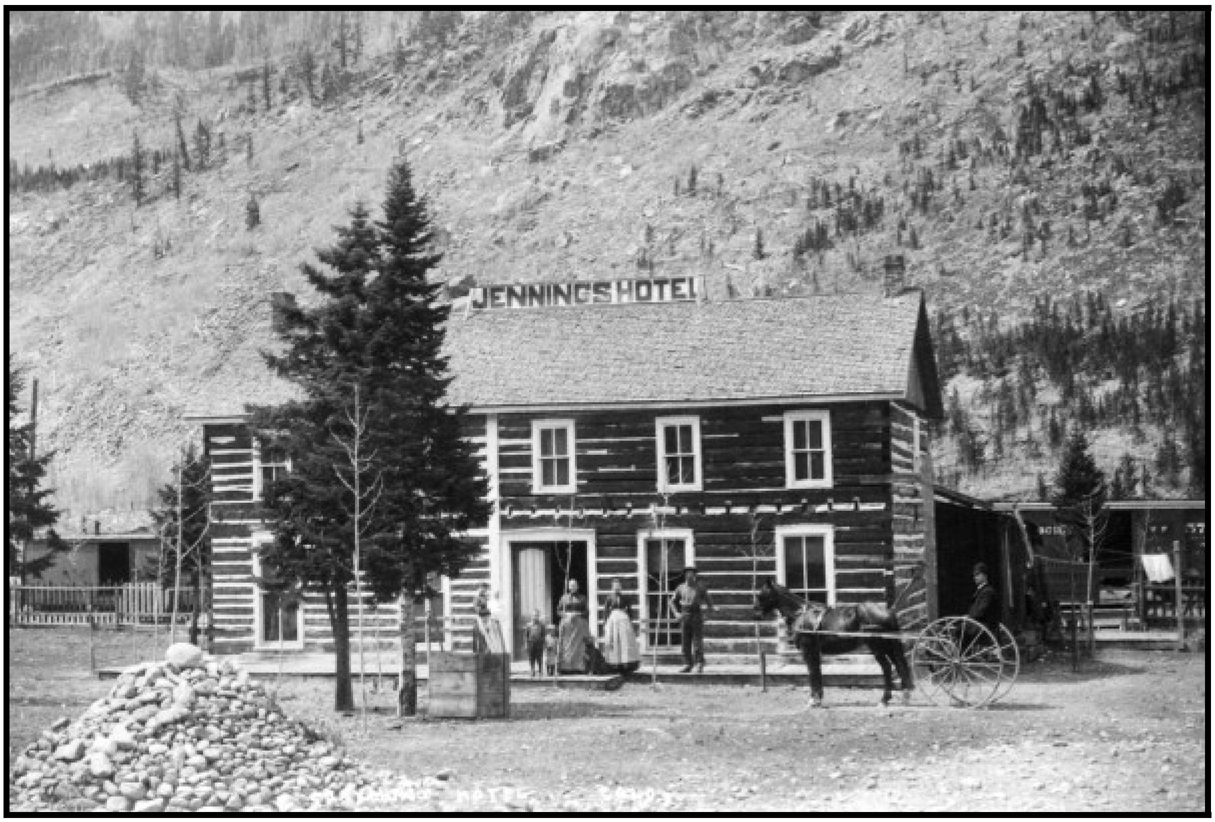
Georgetown, the last stop on the Colorado Central, lacked hot springs but instead offered scenery, culture, and remote mountain destinations. Tourists heavily patronized the resorts at Green and Chicago lakes, and provided enough business to support a number of well-appointed hotels in town including the Yates, Barton, and American houses, and Star and Centennial hotels. Louis Dupuy's Hotel de Paris may have been the most luxurious. Dupuy, French miner turned hostler, brought fine European lodging, dining, and libations to Georgetown, but not for all comers. Reclusive and cantankerous, Dupuy developed a reputation for refusing service to difficult, demanding, and unappreciative guests.



Tourists interested in an intimate experience with the Rocky Mountains stayed at the Green Lake resort above Georgetown. The hotel, pictured in the 1880s, is on the far shore. Courtesy of Denver Public Library, C-13.

[23] Bowland 2004:21; Gillette 1978:158-159.

Georgetown also became starting point for an excursion known to many vacationers elsewhere in the nation and even in Europe. Described in detail in the railroad history section, the Union Pacific Railroad company built the Georgetown, Breckenridge & Leadville Railroad (GB&L) in 1884 as a first stage in crossing the continental divide. The GB&L was a short-line that ascended from Georgetown through Silver Plume to a dead-end railhead at new Graymont. The Union Pacific abandoned its plans to cross the Divide and left the GB&L as a short-line, but with a route recognized as an engineering marvel in a stunning mountain setting. The GB&L looped over itself on a high steel bridge and then wound through a series of tight switchbacks on its ascent from Georgetown. Tourists came by the thousands to ride the Georgetown Loop, and the GB&L earned as much from tourism as mining freight. The Union Pacific platted end-of-line Graymont to capture tourism business from Bakerville, and both communities then served as trailheads for mountaineers.



Mountaineers, few in number during the nineteenth century, stayed in the Jennings Hotel at Graymont before and after testing themselves against Gray's and Torrey's peaks. The hotel gave the mountaineers a taste of frontier accommodations until the railroad ended service in 1893. Courtesy of Denver Public Library, X-8760.

In 1906, Edward J. Wilcox completed another mountain railroad that neatly complimented the GB&L's tourist service. Wilcox's Argentine Central Railroad started in Silver Plume and ascended through switchbacks up to his mining complex in the Argentine Mining district southwest of Georgetown. The Argentine Central combined tourism and mining freight like the GB&L, and its claim to fame was the highest railroad in the continental United States. Until hostile ownership ruined the relationship between two railroads in 1909, they cooperated in promotion and service and provided vacationers with a unique experience.

Summit County

Frisco was the principal tourist destination in Summit County because of its picturesque location as gateway to rugged Ten Mile Canyon. The town began in 1879 as a commercial center for a local mining boom and remained small and primitive until 1883, when the Denver South Park & Pacific Railroad graded its High Line. Although Frisco was only a minor stop on the High Line route between Denver and Leadville, tourists discovered the hamlet and came during the mid-1880s. But their numbers were small because Frisco was a mining and logging community and lacked well-appointed hotels, restaurants, and excursions. The Leyner House and Frisco Hotel initially provided accommodations for mining investors, but when tourists began showing interest, the owners improved their buildings with new rooms, bedding, and décor. The hotels fell into disrepair after the Silver Crash of 1893 and depression that followed. John and Jane Thomas purchased the Leyner in the late 1890s when the economy recovered and tourists returned, made the necessary repairs, and renamed it the Thomas Hotel. Shortly after, C.O. Linquist bought the Frisco and Con Ecklund opened the Southern Hotel, but competition from well-developed resort towns elsewhere in Colorado diverted patronage. Tourism declined permanently around 1910 as result, and only the Southern survived the decade.[24]

Garfield County

Before Glenwood Springs became the premier destination resort in Garfield County, three developers filed a plat for the Siloam Springs Sanitation and Town Company in early 1884. Their proposed townsite and resort was located on both sides of the Colorado River in Glenwood Canyon, east of Glenwood Springs. By the mid-1880s, the operators completed a hotel, hot springs bathhouse, train station, and hospital. The small resort thrived at first when the Denver & Rio Grande Railroad pushed its Glenwood Springs line from Minturn through the resort to Glenwood Springs in 1887. When the Silver Crash of 1893 ruined Colorado's economy, the tourist trade contracted and was unable to support all the resorts in the area. Siloam Springs could not complete against Glenwood Springs, well known in the Midwest and East, and closed. The resort buildings were sold or became part of the Bair Ranch.[25]

Automobiles and Resort Tourism, 1916 to 1941

The 1910s and 1920s were a time of transition for tourism in the I-70 Mountain Corridor. During these decades, tourists increasingly vacationed in automobiles at the expense of rail travel. The popularity of autos increased for several reasons. The vehicles were perceived as status symbols because their high purchase cost initially limited them to the wealthy. People also felt that autos were fun for excursions, provided independence, and an intimate experience with the road. Thus, as prices fell during the 1910s, a greater number of people than before purchased autos for commuting and recreation. At the same time, Colorado's railroad companies encouraged the trend by incrementally reducing quality and frequency of service in the mountains. The railroads had little choice as mining declined, and with this, their economic foundation.

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[24] Gilliland 1984:15, 24, 26, 35.
[25] Schader 1996: 93-94.

The transition from rail to auto tourism was nearly complete by the mid-1920s. Autos were now common among middle-class families, who drove to destination resorts and camps in the mountains. But they did not patronize the established resorts in the same pattern as before. Roads were a limiting factor, and those resorts near quality roads drew the auto tourists while those with poor wagon roads lost business and closed. The character of corridor towns was another limiting factor. Historically, many of the towns with prominent resorts originally depended on mining, such as Empire, Georgetown, Silver Plume, and Frisco. As their industries collapsed around 1920, the towns lost population, fell into disrepair, and lost quality in service and accommodations. These communities no longer provided tourists with pleasant experiences. Thus, auto tourists tended to vacation at resorts that were well run, near roads, and in populated towns.

The Great Depression narrowed the resort field and forced more to shut their doors as tourists had less income to spend on travel. World War II put an end to resort tourism as a viable business because much of the customer base disappeared, rationing made supplies difficult to secure, and few people could afford the time and money for vacations. The business never recovered after the war ended.

Idaho Springs was the only corridor town whose tourist business survived the auto transition. And even then, tourism was minor compared to past patronage. The Rocky Mountain Motors Company acquired a 99-year lease on the Idaho Springs Hot Springs Hotel and spa during the 1900s and invested $300,000 remodeling the facilities to increase attendance. Patronage declined anyway, and the company subleased the property to the Idaho Springs Sanatorium Company in 1911. Business was slow but steady for next several decades. In 1928, the N.C. Merrill family took over the property through their Surety Investment Company, which ran fine hotels in other cities. The family operated the enterprise on a limited scale into World War II.[26]

HISTORY OF OUTDOOR RECREATION

The subtopic of Outdoor Recreation covers activities other than skiing that left distinct historic resources in the I-70 Mountain Corridor. These activities were primarily fishing, hunting, picnicking and camping, and hiking. In all types, participants sought an outdoor experience in the natural environment, but with the aid of activity-specific additions or constructs such as picnic grounds, trails, and campsites. Coverage of the subtopic is broad and general because outdoor recreation was not well documented for the relevant timeframe of 1860 to 1960.

Outdoor Recreation Overview: 1860 to 1960

People in corridor communities enjoyed outdoor recreation from time of settlement in the 1860s throughout the nineteenth century. In a broad sense, urban intellectual activities such as social events, the arts, lectures, and performances were preferred recreation of the era. But corridor communities had difficulty fully participating because isolation and slow communications limited contact with cultural centers in the Midwest and East. Further, the communities lacked the necessary critical mass of people and urban environment. Corridor residents thus adapted then-current recreational activities to their surroundings, the natural environment itself.

[26] Gillette 1978:59, 160-161; Historical Society of Idaho Springs 2004:21.

The result was a recreation pattern where outdoor activities became a premise for social events, lectures, and performances by local individuals. Picnicking and camping at favored locations such as lakes, stream cascades, and meadows were common in warm months. Often, these outings also included fishing, short hikes, and mountaineering for adventurous men and women. Ice skating and sledding were popular during winter, although practiced close to home.

The above forms of outdoor recreation became increasingly common as the nineteenth century progressed. The dominant culture adopted outdoor recreation as life became increasingly complex, rapid communications and transportation shrank time and distance, and Frederick Jackson Turner declared that the United States was settled and its frontier closed. Development of a nationwide railroad network made Colorado accessible to the middle and upper classes, who were eager to see the region for themselves. Railroad companies both in Colorado and the East acknowledged that profit lay in the mass movement of tourists, and began promoting the concept to increase business. An 1890 tourist brochure published by Chicago, Rock Island & Pacific Railway encouraged all Americans to get away:

> "Once a year, at least, men and women of every class and condition are forcibly reminded that the monotony of daily toil or the merciless exactions of fashionable and social life must be interrupted by a season of welcome rest, including a hygienic change of diet, water, soil and climate, under favoring circumstances and amid congenial surroundings, before the health and capacity for enjoyment are irretrievably wrecked."[27]

The Denver & Rio Grande, Colorado Central, and Denver, South Park & Pacific, built primarily for mining, were part of this movement and forwarded Colorado as a tourist destination. Vacationers came by rail from the Midwest and East to enjoy the Rocky Mountains. Although the tourists primarily stayed in destination resorts, they also engaged in the same outdoor activities that corridor community residents practiced for decades. Packing outfits local to corridor communities brought tourist groups to favored picnic and campgrounds, many of which offered shelters, outhouses, fire pits, and cooking stations. The outfits also carried parties of men on fishing and hunting trips to regularly used camps deep in the mountains and away from towns. Outdoor recreation increased during the 1900s and into the 1910s, when conditions created by World War I interrupted tourism.

The war marked a turning point in tourist behavior and outdoor recreation patterns. After the war ended in 1918, tourist demography shifted and, as discussed with skiing and destination resorts above, automobiles increasingly became popular Younger generations with greater mobility based their travel plans and activities around their automobiles. They were more willing to camp, hike, and hunt in smaller groups, and in remote areas, than previous generations. Thus, outdoor recreation destinations became primitive and located away from established towns, but had to be auto-accessible. Newly created National Forests contributed to the trend, and although the acreage was immense, the region in entirety was a major destination in itself. For those tourists unwilling to rough it in the forest, entrepreneurs in principal towns constructed auto courts and urban campgrounds with cabins, tents, and bathrooms.[28]

The Great Depression was another important period of time for outdoor recreation. A poor economic climate and limited personal income encouraged people to enjoy leisure in the outdoors. Camping, picnicking, and hiking were an inexpensive alternative to resorts and many urban activities. Also, hunting and fishing were a means of supplementing groceries.

At the same time, federal and state agencies provided tourists with decent places to go. The PWA, CCC, WPA, and National Youth Administration built camp and picnic grounds near

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[27] Chicago, Rock Island and Pacific Railway, 1890:3.

[28] Draper 1934:20; Wyckoff 1999:97.

most of the corridor communities. Historian Ethel Morrow Gillette noted in her history of Idaho Springs that CCC camps were scattered throughout Clear Creek County. The camps typically consisted of small parking areas, running water, picnic tables, bathrooms, and shelters, usually well built with local materials. The facilities and their embrace by the public became a lasting foundation for recreational patterns that persist today.[29]

Fishing Camps and Hatcheries

Fishing was, and still is, favored recreation among both tourists and corridor residents. They fished for sport, camaraderie, household consumption, and income through sales. It seemed like mountain streams and lakes offered enough fish for all in Colorado's early years, but constantly increasing tourism and a permanent population threatened the waterways with over-fishing. Colorado then struggled to maintain fish stocks throughout the nineteenth century and into the twentieth. The territorial and later state government followed two approaches to prevent the collapse of fish populations and the riparian habitat.

Regulation was the first and earliest. Pikes Peak gold rushers caught so many fish for food in 1860 that the Territorial Assembly passed a law the next year banning nets, baskets, and traps. Colorado appointed the first Fish Commissioner in 1877 to control fishing and the fish population as best as he and small staff could. When this became insufficient, the state established the Fish and Game Department, which forced fisherman to limit their catches to 20 pounds per day beginning in 1898, and obtain licenses by 1909.[30]

Restocking waterways was the state government's other approach in avoiding over-fishing. Private entities began restocking some Front Range lakes with bass and trout during the late 1870s. One of these was the Green Lakes resort above Georgetown, which built its own hatchery in 1876. The facility included two fish reservoirs on the lakeshore and a 25-by-60 foot fish-house with 15,000 trout and 35,000 California salmon, and 200,000 hatchlings. The Fish Commissioner continued the state restock policy and opened a fish hatchery north of Denver in 1881. During the next two decades, the Fish and Game Department established eight satellite hatcheries in the principal mountain drainages, and private interests ran others. The hatcheries were important to the mountain economy because they provided the fish that drew tourists.[31]

A strong interest in fishing among local and out-of-state vacationers stimulated a small hatchery boom in the 1890s and early 1900s. At the same time, private fishing camps became popular recreation destinations, and corridor communities organized fishing clubs. Even women began participating. Through their hatchery, the Green Lakes resort owners were among the earliest in the corridor's tourist business to reach out to fishermen. But by the 1890s, activists in other communities made the connection between fishing and tourism and promoted opportunities in their areas. Eagle County interests published a booklet in 1899 claiming that: "every stream in the county is full of fish. . . .[and] the lakes of the county are. . .great summer resorts for camping parties, who spend several weeks or months on their cool banks."[32] An early twentieth century booklet suggested that the streams and rivers near Avon were unsurpassed and that Lake Creek in Edwards was famous for its large catches.[33]

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[29] Brockman and Merriam Jr. 1979:73; Gillette 1978:137.
[30] Carrington 1990:21; Colorado Midland Railway ca. 1908: 23, 25; Page 1975:89-91.
[31] Colorado Miner, January 1876:3; Colorado Miner, July 1876:3.
[32] McCabe 1899:47.
[33] Cocks-Clark Engraving Company, 13-14, 16; Grabau 1999:7, 87.

Fishing continued to be among the most popular forms of recreation through the twentieth century. The activity maintained a steady flow of tourists through corridor communities well after other forms of recreation such as destination resorts fell out of favor. Fishing and the money that tourists spent supported local economies, the need for recreational facilities such as campgrounds, and even dependent businesses including guided excursions.

Hunting

In broad overview, hunting in the corridor followed a pattern similar to fishing. At first, miners hunted game to supplement their meager diets with fresh meat. This changed with the development of industry, settlement, transportation links with the outside, and the rise of tourism. Many in the corridor continued to hunt as time allowed for their own consumption, and a few made a business of supplying local communities. This pattern occurred throughout the corridor, but primarily within five years when any specific portion was settled. Afterward, game became harder to find, and food could be alternatively purchased in stores.

Large-scale mining booms in Clear Creek drainage, Leadville, and Aspen created a substantial demand for meat during the late 1870s and 1880s, and entrepreneurs responded by organizing commercial hunting parties. Within a short time, the professional hunters depleted most of the game near these communities, and industry frightened off the rest. This drove hunting parties deeper into the surrounding mountains, and west into Garfield and Eagle counties, where they worked out of hunting camps. The typical hunting camp featured several pads for wall tents, a fire ring, dining area, privy, and racks for hanging game.

Mass slaughter, common in the absence of game laws, also impacted game populations. Professional hunter Jack Burns killed 47 elk in one day and butchered only the hindquarters, and Will Nederson and Ike Jones shot 200 grouse in several days for delivery to Aspen. The region's last moose was downed in 1880, the last native bull elk was killed in Garfield County in 1895, and a species of mountain buffalo was hunted to extinction in the 1890s.[34]

Concerned over these and other natural resource abuses, the federal government established the forest reserve system during the early 1890s (discussed in timber industry section). The Department of the Interior established the White River Plateau Timberland Reserve in 1891 to protect forests in Eagle and Garfield counties, and extended it into Summit County in 1902 as the White River National Forest. New forest regulations exacerbated what had been a gradual shift in hunting away from business and toward recreation. In a westward progression, sport hunters replaced the meat suppliers in Summit, Eagle, and then Garfield counties during the 1890s. An end to wholesale killing, lack of invasive industry, and responsible hunting practices allowed some game populations to recover in these counties, which improved hunter experiences. Hunting parties, now consisting of middle- and upper-class men, increasingly came to the corridor to get away from home, to socialize, and enjoy nature. Some stayed in destination resorts, others in hunting lodges, and many in remote camps attended by packing outfits.[35]

Eagle and Garfield counties became the most popular sport hunting region in the corridor during the 1890s. Local business interests heavily promoted the region to attract business, and with little exaggeration. Tourism booklets published during the 1900s praised Eagle County for its hunting opportunities, and recommended the town of Wolcott as a strategic center for expeditions. The publication specifically advertised the Wolcott Hotel for its comfortable rooms, furnished cabins, and family style meals. This level of promotion hit its mark and helped the

[34] Gulliford 1983:35; Knight and Hammock 1965:7.

[35] Gulliford 1983:34-36, 38; Leyendecker et al. 2005:251; McCabe 1899:46.

region draw a steady stream of hunters varying in age, skills, and game interests. Most hunters developed favorable impressions of the region because a quality environment supported substantial game populations, which increased chances of success. For these reasons, the western portion of the corridor has been, and still is, an important hunting destination.[36]

Hiking

Hiking was among the earliest and most popular outdoor recreation activities in the I-70 Mountain Corridor. It satisfied an almost timeless desire to move slowly through the landscape and experience nature intimately. Hiking was also inexpensive, required little infrastructure, and could be enjoyed individually, in groups, or with guides in the case of mountaineering. For these reasons, hiking was an activity shared by a variety of demographic groups throughout the corridor from the beginning of recreation to present.

In the first decades of corridor recreation, hiking was primarily an activity among resort tourists. Because recreational trails did not yet exist, their journeys were short and tended to follow mining roads, packtrails, and natural clearings on valley and canyon floors. In Clear Creek County, the corridor's most important resort center, business interests set precedent by grading recreational trails. Acknowledging that hiking was an important tourist activity, local businessmen invested capital in several routes around Georgetown to improve patron experience and increase visitation to the region. During the 1870s, the operators focused on a trail to the summit of Gray's Peak, one of the most popular hiking destinations. The trail was the last segment in a journey advertised in 1873 by the Kansas Pacific Railway. A booklet recommended hiking or taking a carriage from Georgetown to the Baker Silver Mine, overnighting at the mine boardinghouse, and then a dawn ascent the remaining three miles to the summit. For women and children, the publication suggested horses. The Gray's Peak journey set an example that other resort operators and tourism promoters later followed elsewhere.[37]

Hiking became a common activity around the corridor's resort communities, and as tourism increased, so did the popularity of hiking. Although operators and promoters graded few new hiking-specific trails, they based pedestrian routes on old roads and packtrails, and where these ended, beaten paths to attractive destinations. The awareness of hiking as recreation increased during the 1890s, and corridor communities attempted to draw tourists by advertising the potential for hiking in their regions. Promoters in Eagle County invited tourists to explore the high mountain lakes and claimed that a hike to these "basins is well repaid and not difficult." In Garfield County, resort operators improved an old Ute Indian trail for tourists staying in Glenwood Springs. The trail provided breathtaking views of both Glenwood Springs and the Colorado River.[38]

Hiking as recreation changed during the 1920s due to a younger, physically active tourist demography and their embrace of automobiles. Tourists were able to travel greater distances from resorts to notable hiking routes than before, and could hike from remote camps. The most popular routes evolved into hiking trails through repeated use, and the parking areas where tourists began grew into trailheads.

Hiking and camping, usually enjoyed together, became a minor cultural movement among mountain tourists during the 1920s. A Civil Works Administration (CWA) report noted that hikers of the era wore distinguishing apparel of hobnail boots and khaki, and enjoyed long hikes over boulder strewn hillsides and down pine covered gulches. The Colorado Mountain

[36] Cocks-Clark Engraving Company, 17.
[37] Kansas Pacific Railway Company 1873:18.
[38] Frost, Aaron, 1880:285;;McCabe 1899:23; Nelson 1999:143.

Club recognized hiking as a core member activity and organized multiday outings, mountaineering expeditions, and promotional events.

As the interest in hiking crept into popular culture, local, state, and federal agencies began building recreational trails. Denver Mountain Parks and the Forest Service graded hundreds of miles of trails in in the eastern portion of the corridor during the 1920s, allowing a greater number of people to experience the outdoors on a personal and direct level.[39]

In the corridor's western portion, the town of Glenwood Springs purchased recreational land and built trails in support of tourism there. The town acquired Hanging Lake in Glenwood Canyon in 1924 as a centerpiece, graded a trail from a parking area, and stocked the lake with brook trout. The CCC improved the trail in 1933 with a well-constructed and lasting route still in use today.[40]

As with other forms of outdoor recreation, World War II marked a turning point in hiking. The principal change was greater acceptance of the activity by the dominant culture. More people than ever enjoyed the outdoors, and many spent a day hiking while a daring and physically fit few backpacked. All were motivated by a desire for a relationship with the mountains and escape from technology and urban life. As participation increased and offered tangible economic benefits to mountain communities, state and federal agencies made greater efforts to accommodate hiking, picnicking, and camping. State agencies and the Forest Service built more trails, formally designated trailheads, improved signage, and invested in designed picnic and campgrounds.

The improvements only encouraged further recreational use, forcing the agencies to revise their policies toward public lands. Previously, the agencies managed land for natural resource extraction, particularly logging and mining in the corridor, and gave little thought to recreation. But as recreation increased heavily and resource extraction nearly ended during the 1960s and 1970s, the agencies began to consider recreation equally important. The valuation of hiking, other outdoor activities, and the natural environment among the population and government shifted the culture of land management agencies from industry to recreation.

Camping

Like most outdoor activities in the I-70 Mountain Corridor, camping as recreation developed from tourism at a relatively early time. Although prospectors regularly camped and often enjoyed the experience, they did so for practical reasons. People from other backgrounds began camping for recreation during the 1870s when the dominant culture considered the activity an eccentric way to vacation. They continued the practice largely unchanged through the 1910s, and it became generally accepted in the Rocky Mountain States. Although a variety of people camped, their numbers were few at first and most were tourists from outside of the corridor. They tended to be young, middle or upper class, and accustomed to taking comfort in the outdoors. The reasons for camping were similar to those for related outdoor activities: health, camaraderie, appreciation of the natural environment, and escape from the urban atmosphere.

Camping at the time was not as simple as now, and involved heavy and cumbersome equipment. Tourists needed changes of rugged clothing, preferably wool, as well as hats, rain slickers, heavy boots, and items for entertainment. Because synthetic materials did not yet exist, most camp equipment was wooden, iron, brass, leather, and canvas. Food was canned or dried, and beverages came in bottles. When pitched, the typical camp featured wall tents on earthen pads, a large fire ring surrounded by seating logs, a cooking area with masonry hearth or sheet-

[39] Draper 1934:40, 63; Wyckoff 1999:87.
[40] Nelson 1999: 163-164.

iron stove, and portable tables. Frequently used campsites may have included an outhouse, food hutch, and even a roofed shelter.

Tourists rarely arrived in the mountains with their own camping outfits because the heavy and bulky equipment was too difficult to lug en route. Instead, they hired local packers and guides who knew where to go, had the equipment, and could set it up. Because the process of trekking to a site and helping with setup was lengthy, the tourists usually stayed for days to make the time investment worthwhile.

The automobile revolutionized camping. It allowed tourists to run their own expeditions by carrying equipment from home to destination and providing autonomy of travel. The popularity of camping thus increased during the 1920s when automobiles became common among middle and upper classes. Because automobiles were restricted to roads, property owners along the principal routes of travel in the mountains perceived opportunity to profit from the outdoorsy tourists. The entrepreneurs organized auto-friendly campgrounds that followed a general template in physical content. The campgrounds were usually sited off but near a main road, on flat land, and amid open forest. The operators dedicated one portion for primitive camping, and provided earthen tent platforms, a table, fire pit, and food locker. Forecasting that crude lodging would increase business, operators added rustic cabins, a masonry fireplace, roofed shelter, and toilets usually lining a pull-through drive.

In those regions lacking campgrounds, auto tourists simply camped in forests accessible by road. This family vacationing in Eagle or Summit County in 1917 was on the forefront of a growing recreational movement. Auto camping is presently one of the most important economic supporters in the I-70 Mountain Corridor. Courtesy of Denver Public Library, Z-7801.

As camping increased throughout the corridor, private interests and state and federal agencies built a number of campgrounds according to the general template. During the 1910s and 1920s, the City of Denver established eight campgrounds in its Mount Evans park area with shelters, stone fireplaces, springs and pump houses, and tables and benches. The Forest Service added two more campgrounds in the area.[41] Some municipalities saw economic value in attracting auto tourists and built their own campgrounds, exemplified by a project in Georgetown in 1927.

> "A new tourist camp is being prepared on Brownell Street almost directly below the turn on the Silver Plume road. A small building which stands will be fixed up so that visitors can get under cover in rainy weather. The grounds contain a number of fine large trees for shade and plenty of dry ground for camps. Running water from the city mains and comfort stations will also be supplied and when finished the new tourist camp will be equal in attractiveness to any in the state."[42]

In 1922 the federal government set aside $10,000 for recreational development, primarily campground improvements in National Forests. Although the sum was modest, it was one of the government's earliest efforts to support recreation in the forests. The investment also reflected the growing importance of camping.[43]

As with other forms of outdoor recreation, the Great Depression and World War II were important transition points. Camping increased yet again in popularity during the Great Depression because it was inexpensive and close to Front Range cities, and federal and state agencies built additional campgrounds through New Deal programs. The general template in campground design and content remained nearly unchanged from the past several decades.

The new campgrounds and their regular use during the 1930s were important for several reasons. First, camping as recreation became a widely practiced cultural movement in the Rocky Mountains, which families and their children later perpetuated. Second, the campgrounds were lasting public assets that provided several generations of tourists with designated places to recreate. Well built, many of those campgrounds are still in service today. Last, in building numerous campgrounds, state agencies and the Forest Service began a policy of providing the public with outdoor recreational facilities. When that policy became part of agency culture, the agencies managed their land for recreation and added more facilities.

From the end of World War II to present, the trends and patterns established during previous decades flowered. Camping and related activities became part of a Rocky Mountain cultural identity as more people than ever roughed it in the mountains. For many, camping became a regular weekend event. In response, private interests, state agencies, and the Forest Service completed additional campgrounds in the corridor and adjacent mountains. The economic benefits were significant and widespread. Tourists funneled money into mountain towns, depressed after their natural resource industries collapsed, and some began to recover. Tourist demand for camping equipment eventually fostered an outdoor retail sector large enough to interest department stores and support independent sellers and a number of specialty manufacturers in Colorado and other western states.

Camping, part of a larger outdoor movement, grew constantly both in number of participants and in frequency of their trips. At present, camping is one of the most important recreational activities, economic contributors, and cultural and political influences in the corridor.

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[41] Draper 1934:13, 60.
[42] Georgetown Courier 1927: p1 c2.
[43] Brockman and Merriam 1979:56; Wyckoff 1999:87.

Section F 1: Mining Industry Property Types and Registration Requirements

INTRODUCTION

The I-70 Mountain Corridor passes through dense concentrations of historic mining resources in Clear Creek and Summit Counties. Section F describes the most common categories of resources, known as Property Types, and defines their registration requirements. Nearly all the mines and mills are abandoned, most have been partially or completely dismantled, and now manifest as archaeological sites. It should be noted that, individually, archaeological sites have as much potential for significance as intact complexes, and collectively may form National Register-eligible rural historic mining landscapes. Itemized descriptions of mining-related archaeological, structural, and architectural features are offered at the section's end to refine resource interpretation. The researcher should review descriptions of mining methods and equipment in Section E 4 for context.

The following Property Types and Subtypes are developed in this section:

- Placer Mine
  - Stream Placer
  - Gulch Placer
  - River Bar Placer
  - Hydraulic Placer
- Hardrock Prospect
  - Prospect Complex
  - Prospect Shaft
  - Prospect Adit
- Hardrock Mine
  - Shaft Mine
  - Tunnel Mine
- Ore Treatment Mill
  - Concentration Mill
  - Amalgamation Stamp Mill
  - Arrastra
- Smelter
- Prospectors' Camp
- Worker Housing
- Isolated Residence
- Mining Settlement
  - Unincorporated Settlement
  - Townsite
- Rural Historic Mining Landscape

Definitions for Resources and Site Features

- *Building:* A building was a construct with a roof and one or more walls, and it sheltered activities within an interior space. For a resource to qualify as a building today, most of its walls should stand intact.
- *Building Ruin:* A building qualifies as a ruin if the walls are no longer complete and the roof is gone. A ruin is a type of archaeological feature.
- *Structure:* A structure is a construct built to serve a specific purpose other than shelter. Structures may have been countersunk into the ground as with cisterns, associated with industrial processes, facilitated a flow of materials like ditches, or a component of land improvement such as a retaining wall.
- *Engineered Structure:* An engineered structure was built according to a design or plan, complex in itself, and a component of a larger system. Some engineered structures were beneath the surface such as buried pipelines and culverts. Underground mine workings are an advanced form of subsurface engineered structures.
- *Structure Ruin:* Structures qualify as ruins when their components are mostly collapsed or missing. Ruins are archaeological features.
- *Archaeological Feature:* Archaeological features are a broad category encompassing most of a site's attributes other than buildings, structures, and objects. The category refers to manifestations above ground, while those below ground are subsurface features (see below). Archaeological features are distinct physical entities that often possess artifacts with interpretive value. Features commonly represent past buildings, structures, and other intentional constructs through material evidence. Examples include earthen platforms, foundations, ruins, depressions, topographic alterations, and debris. Archaeological features also can be the physical result of organic processes, and may not be the remnants of designed constructs. Placer workings, waste rock dumps, refuse scatters, and mine open-cuts are samples of such features. Collections of artifacts that represent activity areas apart from buildings and structures fall within the general category.
- *Subsurface Archaeological Feature:* This group includes features below ground-surface. Subsurface ruins such as collapsed root cellars, intentionally buried artifact deposits like privy pits, and naturally buried artifact deposits exemplified by refuse dumps qualify.
- *Object:* Objects are individual, small-scale constructs that are easily moved. Some objects were designed for mobility, such as vehicles and portable mining equipment. Others were designed to be stationary, but were either self-contained or functioned independently, like some pieces of machinery. When a component of a system, a machine qualifies as a structural or engineering feature.
- *Artifact:* The category includes all man-made items lying around a site. Most artifacts associated with mining resources can be categorized as structural materials, industrial debris, domestic refuse, or household items. Although artifacts are commonly attributable to archaeological features, they also constitute the physical makeup of buildings and structures. Artifacts are extremely important because they can help interpret the timeframe and function of an individual feature and, as well, the history of an entire site and its people.

PROPERTY TYPE: PLACER MINE

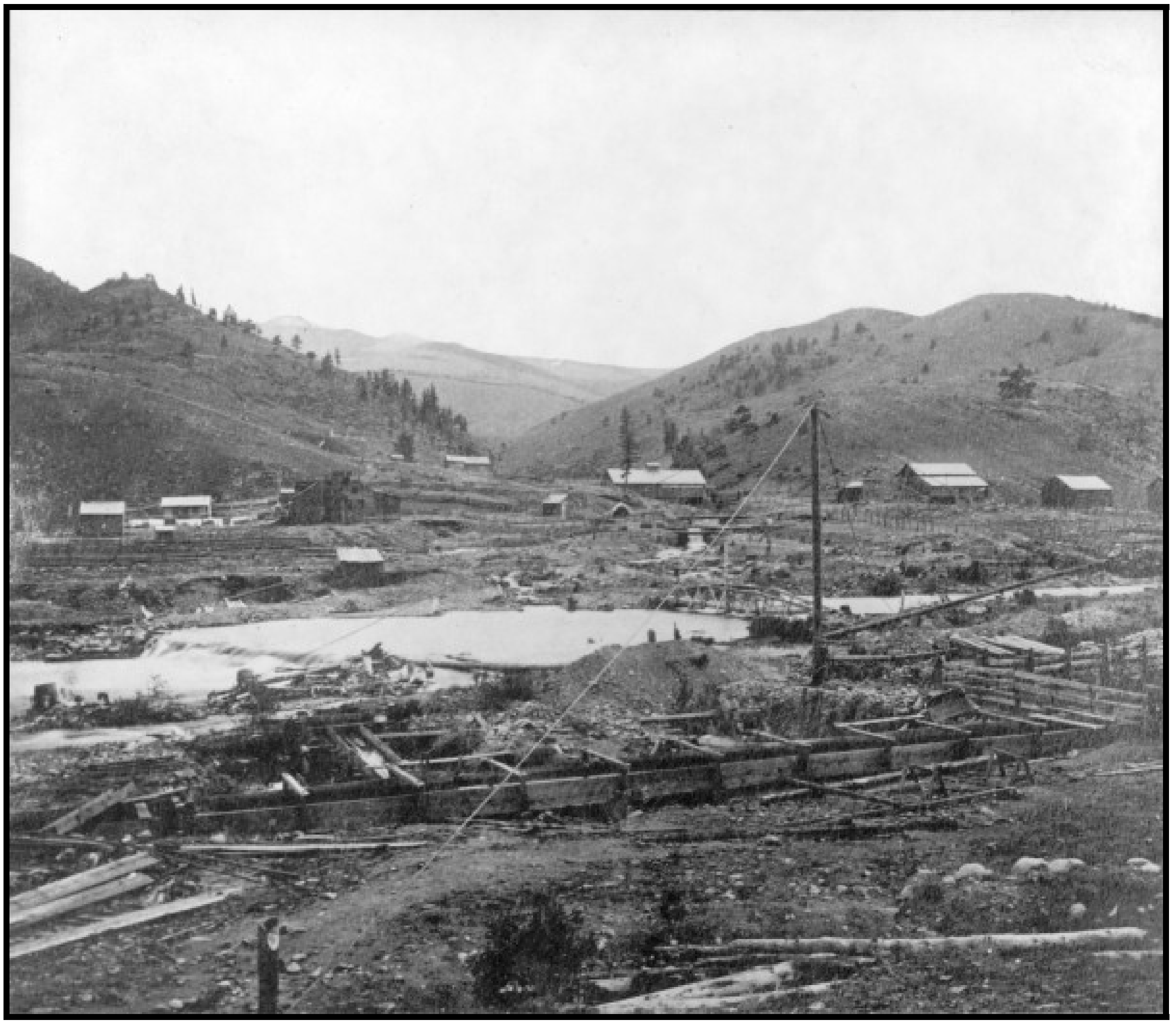
Placer mines were operations where interests ranging from individuals to capitalized companies processed stream gravel and soil for particles of gold. A difference exists between *placer workings* and *placer mines*. At one time, Clear Creek featured miles of unbroken placer workings that manifested as tailings piles, pits, and infrastructure features. Some of these may still be evident. A placer mine, by contrast, was a specific property, usually defined by claim boundaries, which an individual or company worked for gold. Extensive placer workings may include several individual placer mines that blend together, although all may be recorded today as a single historic resource. Archival research and the physical examination of extensive workings may be necessary to identify specific mines in heavily worked areas. For an explanation of placer mining methods and equipment, see Section E 3.

Placer Mine Property Subtypes

Property Subtype: Gulch Placer: Companies and individual miners created gulch placers when they worked a gulch, or narrow drainage, for gold. Because gulches tended to be confined and steep, miners had to pile tailings in a linear fashion along one or both sides, and over time, erosion reduced the piles to short linear segments, isolated mounds, and hummocky deposits. As erosion redeposited the tailings along the gulch floor, the associated stream channel often became braided. Extensive gulch placers operated by organized companies may offer the same infrastructure features as stream placers.

The photo depicts a typical gulch placer mine, featuring a sluice on one side of the drainage floor, tailings on the other, and high-bank excavations on both sides. Although the mine is in La Plata County during the mid-1870s, the general form was universal. Courtesy of Denver Public Library, WHJ-10197.

Property Subtype: Stream Placer: Both organized companies and individual miners created stream placers when they worked streambeds for gold. Streams are small waterways that usually flowed all year across broad, gently sloped drainage floors. Individual miners dug pits down to bedrock in streambeds and used any combination of gold pans, cradles, and small sluices to recover gold from excavated gravel. Organized companies often installed lengthy sluices and created trenches or other large excavations when removing gravel. Pits, trenches, piles of gravel and stream cobbles, and braided stream channels can denote placer mines today. If the stream flowed all year, miners usually piled tailings along the banks to maintain the waterway. Companies with lengthy sluices may have left rock piles and posts that supported the sluices and small, adjacent platforms that served as workstations. At substantial mines, companies often engineered networks of ditches and added other aspects of infrastructure such as residential buildings and blacksmith shops, sometimes represented today by earthen platforms.



The 1867 photo captures a typical stream placer on Chicago Creek near Idaho Springs. The mine is characteristic of company operations with engineered sluices, log cribbing walls that retain pits, a hoisting derrick to remove boulders, and large tailings piles. Courtesy of Denver Public Library, X7604.

Property Subtype: River Bar Placer: River bar placers attracted the same spectrum of mining outfits as stream placers, and they employed like methods of development and production. As a result, river bar placers possess characteristics similar to stream placers. The principal difference is that river bar placers tend to be located along the sides of stream drainages instead of directly on the floors. Placers worked by small outfits usually manifest as excavations, tailings piles, minor gullies, and feed ditches. Large operations include ditch systems, distinct sluice beds, and dams for booming and feeding the sluices.

Property Subtype: Hydraulic Placer: Because hydraulic mining operations used jets of water to mobilize high volumes of gravel in economies of scale, most extant sites tend to be expansive with broad deposits of tailings, deep incisions and gullies, and abrupt, precipitous cut-banks. Hydraulic mining required an infrastructure to deliver water both for the monitors and for washing gravel through sluices. Ditches, pipelines, and flumes often directed water from regional drainages to a reservoir upslope from the site. Pipelines then carried the water under pressure to the monitors, and ditches and flumes directed the runoff through the workings into sluices, where workers recovered gold. To support industrial activity, hydraulic mines also usually included a shop, other buildings, supports for pipelines, and roads. If the mine was more than one mile from the nearest settlement, the mining company often provided residences for the workers. In general, engineering and archaeological features represent most hydraulic mine sites today.

In hydraulic placer mines, the workings usually feature high and precipitous cut-banks, collections of boulders, and a central drain that directed effluent into sluices. The hydraulic monitor, water system, and sluices are out of view. Although the photo is in California Gulch near Leadville, hydraulic placers existed near Idaho Springs and Empire. Courtesy of Denver Public Library, X-19197.

Hydraulic mines followed a common pattern in engineering and workings. Monitors emitted high-pressure jets of water that eroded gold-bearing gravel and washed slurry through a system of sluices. The operation in the photo was the Iowa Hill Mine near Breckenridge, Summit County, during the 1880s. Courtesy of Breckenridge town historian Rebecca Waugh.

Placer Mine Significance

Placer mining was a cornerstone of history in the I-70 Mountain Corridor, drawing the first large numbers of Euro-Americans. They explored the corridor and established a powerful mining industry, permanent settlements, and a transportation network. Over time, these factors heavily influenced other forms of development in the corridor. The important trends and historical patterns attributed to placer mining, and its present placer mine resources, are summarized as the NRHP areas of significance below. The trends and patterns include Commerce and Economics, Community Planning, Engineering, Exploration/Settlement, Industry, Law, and Politics/Government.

When assessing the historical importance of placer mines, Period of Significance must be considered. The Period 1859 to 1942 covers mining as a viable industry across the I-70 Mountain Corridor. But narrower timeframes of importance are more applicable to Clear Creek drainage and the Dillon and Frisco area because these regions had different mining histories.

Placer mining was of great significance in Clear Creek drainage from 1859 to 1864, between 1880 and 1895, and 1930 and 1942. Discovery of placer gold in Clear Creek drainage brought the first large numbers of Euro-Americans to the region. They were also among the earliest Euro-Americans to penetrate the Rocky Mountain Front Range and document their findings. Miners established a baseline understanding of the region's physical attributes and geography and drew attention to the region.

Hydraulic placer mining was locally significant from 1880 to 1895, when companies developed large hydraulic operations on Clear Creek and in the Empire area. These provided jobs, contributed to the economy, and added to the county's overall gold output.

Between 1930 and 1942, during the Great Depression, placer mining was extremely important in Clear Creek drainage because it was a source of income for unemployed workers. Few jobs or other opportunities for income existed in the region, and placer mining allowed some individuals to earn enough for subsistence.

Placer mining was significant in the area around Dillon between 1898 and 1913. Several large, mechanized placer mines were developed and then yielded for more than ten years. These operations contributed heavily to the local economy, provided jobs, and drew publicity in the greater mining industry through innovative engineering.

Areas of Significance: Commerce and Economics: Placer mining was significant in the areas of *Commerce* and *Economics* in several ways, depending on timeframe and location in the I-70 Mountain Corridor. During the first important period, from 1859 through 1864, Clear Creek placer miners participated in a larger movement including Boulder, Gilpin, Park, and Summit counties. In the movement, miners generated the first substantial output of wealth in the Rocky Mountains and established the largest economy to date. That economy became the basic template for the natural resource-based system on which Colorado relied for the next 110 years. Also, placer mining made some individuals wealthy, supported a workforce with few other employment opportunities, and produced gold traded for supplies and equipment. In turn, the supplies and equipment supported further development of industry and permanent settlement.

Hydraulic mining was economically important in Clear Creek drainage from 1880 through 1895 and at Dillon from 1898 through 1913. The gold output, profits to investors, wages paid to labor, and purchases of supplies contributed to local commerce and economies. The consumption of goods and supplies also fostered the development of banking, retail businesses, and other commercial systems.

Placer mines that produced between 1930 and 1942 contributed to local and statewide economies at a time when income was dearly needed. During this period, Clear Creek drainage and greater Colorado suffered due to the Great Depression, the nation's worst economic disaster. When the Great Depression began in 1929, Clear Creek drainage already suffered severe poverty through lack of investment, high unemployment, and few sources of income outside of industry. The Depression worsened these conditions, forcing many people to leave. But those who remained returned to the old placers, previously thought exhausted, in hopes of finding enough gold for a subsistence-level income. The movement began slowly at first, increased in momentum in 1933 when President Franklin Delano Roosevelt increased the value of gold, and became a substantial revival in 1934 when Roosevelt formalized the increase as the Gold Reserve Act. The mines ranged in scale from small, family placers to operations run by organized companies. Although a shadow of previous decades, the resuscitated mining industry provided jobs and income, stabilized the existing communities, and contributed to local economies at an important time of need.

Area of Significance: Community Planning and Development: *Community Planning and Development* was an important Area of Significance primarily in Clear Creek drainage from 1859 through 1864. The region's general settlement pattern began taking form during the first two years, but because it was mostly a function of exploration and prospecting, the pattern was in flux. The development of a placer mining industry during the latter years cemented the pattern, which then changed little afterward. During the period, all the drainage's principal settlements were established around concentrations of mines and grew into permanent administrative, communication, commercial, and social centers.

Area of Significance: Engineering: In terms of placer mining, the *Engineering* Area of Significance refers primarily to designed constructs and systems, and the roles that they played in history. Most company placer operations employed engineering to some degree for sluices, water systems, and methods. At small-scale operations, miners not formally trained in design tended to build vernacular structures and systems. In these cases, individuals adapted familiar design and construction principals to the specific conditions of their mines, available materials or equipment, and the immediate environment. Although functional, vernacular engineered structures and systems tended to be impermanent, inefficient, and simple. They were important, however, for several reasons. First, the structures and systems allowed many mining operations to function. Second, they provided examples followed by other miners. Last, the small mines, in their vernacular engineering, made up the bulk of the placer mining industry.

At large mines, trained engineers designed structures, systems, and placer workings according to principals established by the greater mining industry. Through professional planning, these types of structures, efficient systems, and placer workings allowed the companies to process higher tonnages of lower grade gravel than was otherwise possible. In so doing, professional engineering prolonged placer mining, which then continued to support communities.

Area of Significance: Exploration/Settlement: Placer mines whose physical remains date between 1859 and 1864 participated in the Area of *Exploration/Settlement* as physical anchors for the frontier movement in the central Rocky Mountains. Because the movement included Clear Creek, Boulder, Gilpin, Park, and Summit counties, significance is statewide.

When prospectors and miners arrived in significant numbers in 1859, they brought the mining frontier to the central mountains, previously the domain of Native American tribes. During the period, the prospectors and miners first established a baseline body of knowledge of geography and natural resources and defined the areas with the highest concentrations of placer deposits. This information gave guidance to other miners, as well as investors willing to risk capital in the proven areas. Localized mining industries and settlement patterns quickly followed. Each local industry fostered the growth of settlements, dependent industries, commerce, and infrastructure. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Area of Significance: Industry: The area of *Industry* applies differently by era and location. Placer workings whose remains date from 1859 to 1864 were pioneering elements and building blocks of the mining industry. During this time, prospectors and miners established the basic elements required for mining to assume industrial proportions. At first, prospectors located and then began developing the placer deposits. Outside investors followed and organized companies that purchased and then improved the primitive operations. The profitable ventures in turn inspired confidence among other investors, who felt encouraged to do likewise. Their capital, combined with the increasing numbers of people who journeyed to the region, became a mining industry. Cumulatively, individuals and companies, regardless of size or productivity, improved the transportation networks, reinforced the extant settlement patterns, contributed to local economies, and established commercial and communications systems.

The large placer mines operating in Clear Creek drainage and around Dillon after the early 1860s rush were also important in the area of industry. They were part of the industrial fabric in these regions, contributing to local economies, employing hundreds, drawing trained experts, and supporting businesses and development of infrastructure.

Areas of Significance: Law and Politics/Government: Placer mines were the reason why prospectors and miners were in Clear Creek drainage from 1859 through 1864, and those individuals participated in the development of early law and government. They organized the region's first mining districts, which codified laws, governing bodies, and documentation. The frontier legal system defined claim types, rights, and sizes; water rights; and crime and punishment. The Territorial Legislature then included many of the definitions and rights in its 1861 charter.

Placer Mine Registration Requirements

National Register-eligible placer mines must meet at least one of the NRHP Criteria below and possess related physical integrity.

Criterion A: Placer mines eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important in their host segment of the I-70 Mountain Corridor.

Criterion B: Placer mines may be eligible under Criterion B when they can be directly tied to an important person. Certain circumstances apply. First, the individual must have directly participated in the mining operation and spent time on the property. Second, the site must retain physical integrity relative to the person's productive period of time, and when the importance was achieved. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the operation. At small mines, participation may have been personally working gravel. At company placers, participation could have been as labor, on-site management, or as an engineer. But if the association is expressed through design and engineering attributes, then Criterion C applies. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in or owned placer operations but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, few gulch and stream placers will be eligible under Criterion B because it is extremely difficult to attribute a given property to an important person, and most properties lack sufficient integrity. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: For a placer mine to be eligible under Criterion C, the resource must clearly represent one of the placer mine types. Further, a site's features and artifacts must possess enough physical integrity to permit the virtual reconstruction of the placer operation. At gulch, stream, and river bar placers, character defining features such as excavations, tailings piles, work stations, and infrastructure should be discernable. At hydraulic placers, the systems of water allocation and distribution must be represented. The workings should resemble those developed by hydraulic methods, and the locations of sluices should be evident. Intact structures for all placer mine types are rare and important, and strengthen eligibility.

Placer mines are potentially eligible under Criterion C when they are contributing elements of historic mining landscapes. Even when a site is not completely intact in itself, it may provide visual impact contributing to the setting and feeling of an area. Some sites may be extensive enough to constitute localized landscapes in themselves.

Criterion D: Placer mines may be eligible under Criterion D if they hold a high likelihood of yielding important information upon further study. Studies of infrastructure features, including water allocation and distributions systems, sluice beds, and work areas may enhance the current understanding of engineering adapted to placer mining. If the resource possesses building platforms, testing and excavation of buried archaeological deposits may reveal information regarding workers' lifestyles and social structures of the workforce, as well as the functions of ancillary buildings.

Placer mines must retain physical integrity relative to one of the important timeframes mentioned above. Because buildings and structures were either removed or destroyed after placers were abandoned, integrity will probably be on an archaeological level. To be eligible, the archaeological features and artifacts must clearly embody the type of placer mine; it's operating timeframe; and content including workings, ditches, and sluice beds.

The most applicable NRHP aspects of historic integrity will be *design*, *setting*, *feeling*, and *association*. A resource retains integrity of *design* when the overall feature assemblage and the individual feature systems reflect the layout, content, and directed evolution of the mining operation. Integrity of *setting* requires the ground around the resource, and the resource itself, to appear similar today as when the mine operated. If the placer was isolated, then the natural environment should be preserved. If the site is in a mining landscape, then nearby placer mines and other resources should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of placer mining, both from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where placer workings, structures, and other visible features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic placer operation.

PROPERTY TYPE: HARDROCK PROSPECT

A hardrock prospect is a manifestation of the search for an ore formation in bedrock. Associated historic resources range in scale from shallow pits to underground operations such as prospect shafts and adits. A lack of significant production, absence of ore storage facilities, minimal property development, portable equipment if any, and little capital investment are defining characteristics. Although most prospects tended to be simple, shallow, and lacked machinery and structures, some were fairly advanced with surface plants requiring equipment and some degree of engineering. See Section E 4 for an explanation of prospecting methods, design, and related equipment.

As they exist today, prospect sites may include some original structures and buildings. Usually, however, equipment and structures were removed when a prospect was abandoned, leaving an assemblage of archaeological features and artifacts. While the researcher may be able to cipher out simple sites, interpreting archaeological remnants of substantial operations can be challenging. Substantial operations were usually centered on an adit or a shaft with an associated waste rock dump of some volume, which represents deep workings. Although most prospects were labor-intensive and lacked machinery, deep operations employed some power appliances. Buildings, machinery, and other facilities usually shared the same orientation as the shaft or adit and were clustered together around the opening. Prospect resources can be grouped into three general subtypes:

Hardrock Prospect Subtypes

Property Subtype: Prospect Complex: In attempting to locate mineral formations, prospectors often excavated groups of pits and trenches to expose and examine bedrock in multiple places. If the prospectors uncovered a promising lead, they subsequently drove shallow adits and shafts to explore and sample the formation at depth. Collectively, the groups of excavations from these efforts can be termed prospect complexes. Pits and trenches will be surfacial, shafts and adits are commonly 100 feet long at most, and the sum represents mineral sampling and a search for ore. It should be noted, however, that some prospectors drove shallow adits and shafts as assessment obligations to retain title to their mining claims. Experienced prospectors often implemented an organized, strategic pattern in excavating their workings, which may become apparent when the features of a prospect complex are mapped.

If a prospector invested an appreciable amount of time in a complex, he usually constructed a few infrastructure components in support of work. One of the most common was a field forge where the prospector maintained his tools and fabricated basic hardware. Field forges were usually in the open and made with dry-laid rock masonry or small logs. Vertical workings of depth, such as shafts, required hoists to winch out waste rock. Prospectors favored hand windlasses for their portability and low cost. A hand windlass was a wooden spool with a crank handle set in a frame over the shaft collar. In horizontal excavations like adits and long trenches, prospectors extracted waste rock in wheelbarrows and ore cars. When prospectors suspended work, they usually removed serviceable equipment at the time of abandonment, leaving excavations and assemblages of archaeological features representing property development.

The Thompson Mine near Breckenridge is characteristic of deep prospect shafts. These operations typically had a simple headframe and blacksmith shop enclosed in a shaft house. Additional property development is absent, and the waste rock dump limited in volume. Archaeological features represent the buildings and structures at most sites. Source: Eric Twitty.

Property Subtype: Prospect Shaft: When prospectors discovered a promising mineral formation, they often sank a shaft to explore and sample it at depth. The smallest shafts were 3 by 6 feet to 4 by 8 feet in-the-clear and less than 125 feet deep. Initially, the prospectors installed a hand windlass to winch out waste rock. If they determined to continue sinking, the prospectors installed a mechanical hoist or sold their property to an organized outfit able to do so. A horse whim was simplest and least expensive, providing adequate depth capacity for further underground exploration. However, whims were too slow and limited in performance for many organized outfits, which installed power hoisting systems driven by steam or, by the 1900s, petroleum engines.

When a shaft was deep enough to warrant a power hoist, the outfit usually erected other facilities as well. Blacksmiths maintained tools and fabricated hardware in shops, miners shuttled waste rock away from the shaft in ore cars on mine rail lines, and portable boilers provided steam power. Overall, the surface plant was simple, and its components were clustered around the shaft. If the operation was remote, then the prospectors usually lived in a nearby cabin or wall tent. All structures and equipment met what the greater mining industry recognized as temporary-class criteria, defined by low cost, portability, impermanence, and ease of construction. By definition, prospect shafts produced little if any ore, and lacked evidence of ore storage or processing facilities.

If the shaft failed to encounter ore in profitable volumes, then the outfit abandoned the site and usually removed all items of value. Given this, archaeological features and artifacts tend to represent prospect shaft sites today. The decay of timbering caused most shaft collars to collapse, leaving areas of subsidence that can appear similar to large prospect pits. For a site to be defined as a shaft, the volume of waste rock should exceed the area of subsidence.

Property Subtype: Prospect Adit: An adit was a horizontal entry underground usually 3 by 6 feet or less in-the-clear. Prospectors chose adits instead of shafts for underground exploration because adits required less capital and effort, and were better suited where topography was steep. Prospect adits often featured surface plants equipped with little more than a blacksmith shop and a means of hauling waste rock out of the workings. Wheelbarrows were the simplest and least expensive, and if the prospectors determined to continue driving, they may have used an ore car on a mine rail line. As the adit's length exceeded the penetration of fresh air, the prospectors usually installed a hand-powered blower, a bellows, or a windsock to force air underground through tubing.

The surface plant components were usually clustered around the adit portal, and a residence usually stood nearby if the adit was remote. All structures and equipment met temporary-class criteria, including low cost, portability, impermanence, and ease of construction. By definition, prospect adits produced little if any ore and lacked evidence of ore storage or processing facilities.

If the adit failed to encounter ore in economical volumes, the outfit abandoned the site and usually removed all items of value. Given this, archaeological features and artifacts tend to represent prospect adits today. The decay of timbering caused most adit portals to collapse, leaving areas of subsidence that can appear similar to lengthy trenches. For a resource to be defined as an adit, the volume of waste rock should exceed the area of subsidence.

Hardrock Prospect Significance

Hardrock prospecting was fundamental to I-70 Mountain Corridor history. Prospecting was an essential step in finding and defining the profitable ore formations on which the mining industry was founded. That industry, in turn, was the principal engine for most of the settlement, transportation networks, dependent industries, land use patterns, and other trends throughout the corridor. The important trends and historical patterns specific to prospecting, and its resources, are summarized below as the NRHP areas of significance. The trends and patterns include Community Planning and Development, Engineering, Exploration/Settlement, Industry, and Politics/Government.

When assessing the historical importance of prospects, Period of Significance must be considered. The Period 1859 to 1942 covers mining as a viable industry throughout the I-70 Mountain Corridor, but narrower timeframes of importance are more applicable to prospecting by region. Prospecting, the search for profitable ore generally occurred during the formative years of a mining industry. In Clear Creek drainage and the Dillon and Frisco area, the industries were separate and followed their own chronologies, defined below. There was limited prospecting around Eagle and Gypsum, as well, intermittently between 1880 and 1915.

Timeframes of significance for prospecting in Clear Creek drainage differed for gold and silver. Prospecting for gold was important throughout the entire drainage from 1859 through 1864. The search for gold then contracted to the eastern portion, from Floyd Hill west to Empire, between 1865 and 1910. Silver prospecting was important in the western drainage, from

Empire west to Loveland Pass, between 1864 and 1893. Although some prospecting occurred afterward, it contributed little to the mining industry because the principal ore formations had already been found and developed.

Prospecting was significant in the area around Dillon and Frisco between 1878 and 1885 and again from 1897 until 1905. During the first period, prospectors located the principal silver veins and characterized the region's geology, providing a foundation for the mining industry. Declining silver values ended the period. The second timeframe occurred during the region's mining revival, and prospectors found additional silver veins that supported growth of the industry. The timeframe ended when the region had been thoroughly examined.

Area of Significance: Community Planning and Development: *Community Planning and Development* was an important Area of Significance in Clear Creek drainage from 1859 through 1890 and in the Dillon and Frisco area from 1878 through 1885. During the periods, some settlements were a function largely of prospecting, thriving and then declining in parallel. Settlements such as Bakerville and Silver Creek in Clear Creek drainage, and Wheeler in Ten Mile Canyon, were established near concentrations of prospects and grew into communication, commercial, and social centers. They withered when prospecting ended, reflecting the general evolution of settlement patterns related to the mining industry.

Area of Significance: Engineering: The *Engineering* Area of Significance applies to the planning and organization of prospect complexes, as well as to individual structures and designed systems at shafts and adits. When excavating pits and trenches at prospect complexes, experienced individuals often implemented a methodical sampling and examination strategy. They may have planned grids, rows, or triangular configurations of pits and trenches. Prospectors also employed engineering to some degree when developing shafts and adits. They adapted known technology, shaft or adit design, and development methods to primitive environmental conditions including difficult terrain, inaccessibility, unknown geological conditions, and an undeveloped landscape. Prospect outfits also adapted geological knowledge and technology to make sense of and predict the occurrence of mineral formations and ore in uncharacterized regions. In so doing, they collectively contributed to the understanding of regional economic and structural geology and mineralogy.

Area of Significance: Exploration/Settlement: Prospects participated in the Area of *Exploration/Settlement* as physical anchors for the mining frontier in the central Rocky Mountains. Individual prospectors and prospect outfits were on the forefront of the frontier and laid the groundwork for the establishment of regional mining industries. They were usually the first to conduct extensive physical and mineralogical exploration, and they relayed information critical to subsequent mining interests and settlers. Prospectors and prospect outfits were among the first Euro-Americans to inhabit the I-70 Mountain Corridor, especially when a rush developed, and brought political, economic, and social systems. Localized mining industries and settlement patterns then quickly followed. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Area of Significance: Industry: The initial growth and development of the mining industry was a movement that began with prospecting. At first, prospectors located and began developing hardrock veins. Within a short time, outside investors organized companies that purchased and then improved the primitive operations. Although most failed, some became profitable and in turn inspired confidence among other investors, who felt encouraged to do likewise. Their capital combined with the numerous prospectors, increasing numbers of other people, and regional development became a mining industry. Cumulatively, individuals and the companies, regardless of size, improved the transportation networks, reinforced extant settlement patterns, contributed to local economies, and established commercial and communications systems.

Area of Significance: Politics/Government: The Area of Significance applies to prospects in Clear Creek drainage dating from 1859 through 1864. The prospectors participated in organizing the region's earliest mining districts, which codified laws, governing bodies, and documentation. The frontier legal system defined hardrock claim types, rights, and sizes and also crime and punishment. The Territorial Legislature then included many of the definitions and rights in its 1861 charter.

Hardrock Prospect Registration Requirements

National Register-eligible prospects must meet at least one of the NRHP Criteria below and possess related physical integrity.

Criterion A: Prospects eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important in their host segment of the I-70 Mountain Corridor.

Criterion B: Prospects may be eligible under Criterion B when they can be directly tied to an important person. Certain circumstances apply. First, the individual must have directly participated in claim development and spent time on the property. Second, the site must retain physical integrity relative to the person's productive period of time, and when they achieved importance. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the operation. Participation at some prospects may have been personally excavating ground. At company operations, the individual could have been labor or on-site management. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in prospect operations or owned claims but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, few prospects will be eligible under Criterion B because it is extremely difficult to attribute the workings to an important person. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Prospect complexes may be eligible under Criterion C if they are sound examples of an organized and planned prospect effort. The assemblage of excavations must conform to a systematic pattern, and if support facilities such as a blacksmith shop existed, then evidence should be clear.

Prospect shafts and adits may be eligible under Criterion C if they are outstanding examples of their resource type. Because most equipment and buildings were removed when an operation was abandoned, integrity is usually on an archaeological level. At shafts, the hoisting system, blacksmith shop, and other facilities should be represented by features and artifacts. At adits, the shop and transportation system used from portal to surface must be discernable. Intact structures and equipment, a high degree of integrity, or character-defining engineering or architectural features strengthen a site's eligibility. Important engineering and architectural features include intact buildings, structures, machinery, adit portals, and shaft collars.

Prospects are potentially eligible under Criterion C when they are contributing elements of historic mining landscapes. Even when a site is not completely intact in itself, it may provide visual impact contributing to the setting and feeling of an area. Some sites may be extensive enough to constitute localized landscapes in themselves.

Criterion D: Prospects may be eligible under Criterion D if a site will likely yield important information upon further study. When excavations are mapped in detail, prospect complexes may reveal sampling strategies and patterns employed by experienced individuals. If a shaft or adit site possesses intact structures and buildings, detailed examination may reveal how prospect outfits adapted conventional mining architecture and engineering to Colorado's mining frontier. Few studies within these arenas of inquiry have been completed to date.

If the workers lived on-site, the residential area may offer meaningful buried archaeological deposits such as privy pits. Testing and excavation could exhume artifacts capable of illuminating the currently dim portrait of the types of workers employed at prospect operations, and how they lived.

Prospects must retain physical integrity relative to one of the important timeframes mentioned above. Because buildings and structures either decayed or were removed after prospecting stopped, integrity will probably be on an archaeological level. To be eligible, the archaeological features and artifacts must clearly embody the prospect type, its operating timeframe, and content including workings and support facilities.

The most applicable NRHP aspects of historic integrity will be *location*, *design*, *setting*, *feeling*, and *association*. Intact buildings, structures, and machinery must be in their original places of use to retain integrity of *location*. A resource retains integrity of *design* when the overall feature assemblage and the individual feature systems reflect the layout, content, and directed evolution of the prospect operation. Integrity of *setting* requires the terrain around the prospect, and the resource itself, to appear similar today as when it was developed. If the prospect was isolated, then the natural environment should be preserved. If the resource is in a mining landscape, then nearby mines and other resources should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of mineral exploration, both from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where prospect workings, structures, and other visible features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic operation.

PROPERTY TYPE: HARDROCK MINE

Usually company endeavors, hardrock mines were underground operations that produced ore. They ranged in scale from one underground opening and associated ore bin, to extensive properties with multiple buildings, structures, and underground openings. Small and large mines alike shared a few basic characteristics including ore storage facilities, one or more buildings, substantial waste rock dumps at least 125 by 125 feet in area, and roads for the transportation of materials and ore. Remote mines may have been accessed by well-graded packtrails instead of roads. Profitability of a mine should not be confused with its ore production. Despite yielding ore, some mines were unprofitable due to insufficient reserves, mismanagement, and other reasons.

While small, marginal mines were similar in scale and content to the advanced prospects discussed in Section E 4, many featured substantial surface plants in support of intensive work underground. To facilitate ore extraction, materials handling, and other activities, mining companies often employed machinery and erected buildings larger than those at prospects. Some companies attempted to produce ore in economies of scale while minimizing energy consumption and costly labor and usually relied on advanced machinery and efficient ore handling systems to do so.

Because small mines and deep prospects had the same basic needs, their surface plants consisted of similar components. The actual production of ore, however, required additional structures including those for ore storage or processing. Ore bins permitted mining companies to store ore between shipments, and companies that mined complex ore often erected ore sorting houses where workers manually separated waste and segregated recovered ore according to quality. Some mines that were either highly productive or in remote locations featured mechanized concentration mills, which separated metalliferous material from waste.

Substantial, productive mines differed from small operations in the scale and content of their surface plants. Shaft operations featured power-driven hoisting systems that raised high tonnages of payrock from deep workings. Both tunnel and shaft operations employed compressed air systems, which permitted miners to bore blast-holes with mechanical rockdrills.

The shop was another key facility that differed between large and small operations. In general, the employment of mechanical systems created a heavy demand for advanced metalwork and carpentry. To meet an increased volume and scale of work, substantial mining companies erected spacious shops equipped with power-driven appliances including drill presses, lathes, trip hammers, and pipe cutters. The 1900s saw a number of mining companies employ electric motors to power their shop appliances, while they used upright steam engines in prior years. Most power appliances had to be anchored to foundations, which ranged from timbers to concrete pads. Where possible, companies located the shop adjacent to the mine opening to minimize undue handling of heavy materials.

In many cases, the surface plants erected by advanced, highly productive companies required more than the several structures typical of small outfits. For efficient servicing, plumbing, and engineering, substantial companies generally clustered their mechanical components and shops together in either large tunnel houses or shaft houses. Ancillary facilities, such as separate shops, electrical transformers, explosives magazines, offices, and quarters for draft animals were enclosed in individual buildings. In general, the surface plants for substantial operations featured the primary shaft- or tunnel house surrounded by several smaller structures.

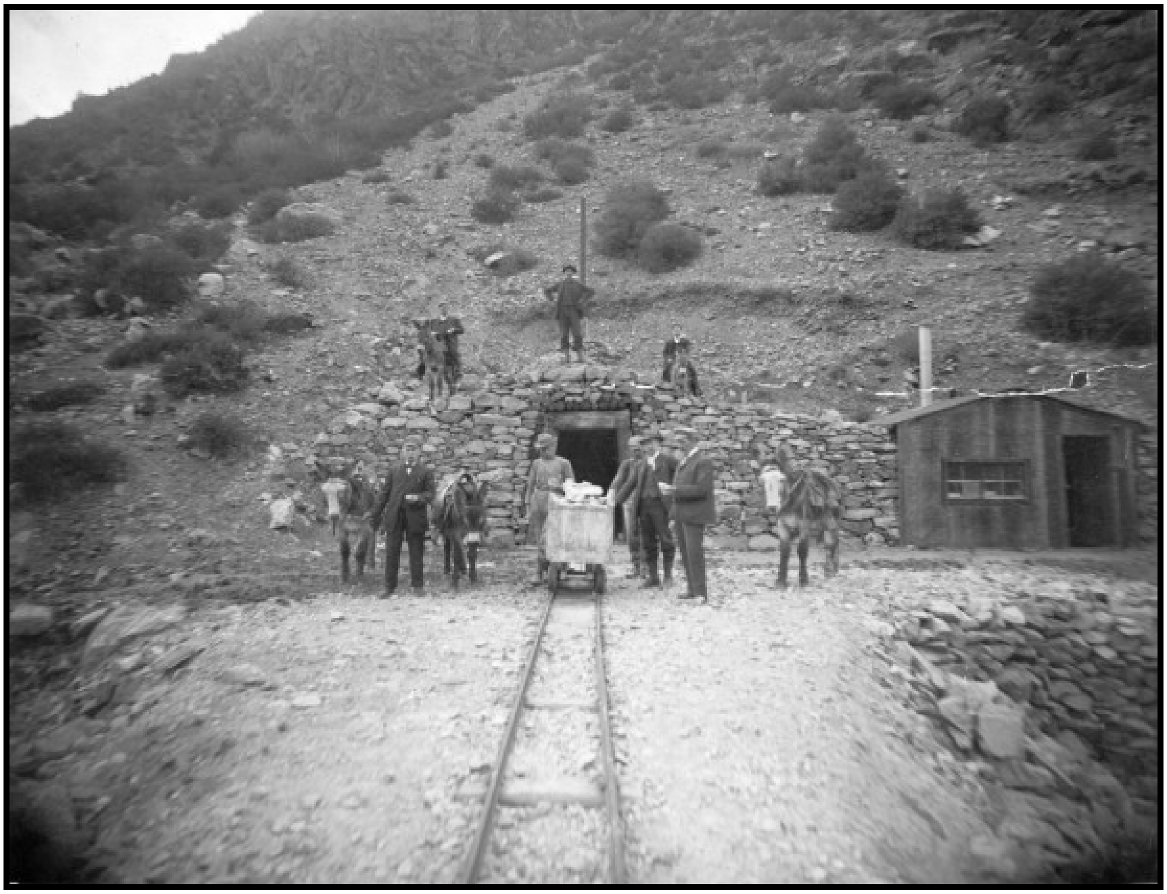
The need for efficient transportation gave rise to another facility characteristic of productive companies. To overcome impediments of weather, snow, and hostile terrain, some companies built aerial tramways descending from the mine to a shipping point or a concentration mill. Small, impoverished operations installed single-rope reversible systems, which were the simplest. Companies with marginal financing strung double-rope reversible systems, consisting of two track cables and a pair of tram buckets linked by a cable loop. The Bleichert double-rope system, with its endless loop of buckets, was the most efficient and costly and was limited to heavily capitalized companies.

The Gem Mine on Seaton Mountain above Idaho Springs around 1910 typifies large, professionally engineered shaft operations. A complex shaft house enclosing the shaft collar, hoisting system, steam boilers, and shop stands at left. A large waste rock dump and series of ore bins extends right. A shaft mine site need not possess its buildings and structures for eligibility, provided that they are clearly represented by archaeological features. Most mines were not as extensive as the Gem but featured similar characteristics. Courtesy of Denver Public Library, X-60758.

<u>Hardrock Mine Subtypes</u>

Property Subtype: Shaft Mine: Shaft mines were operations that produced ore from vertical or inclined underground entries. Companies almost always arranged critical surface plant components around the shaft collar. Large shaft mines possessed complex, mechanized surface plants with multiple structures, and small operations were simple and may have featured facilities like those at deep prospects. The presence of an ore bin or sorting house, or the evidence thereof, can distinguish a mine from a deep prospect. See Section E for a detailed description.

When assessing the significance of a shaft mine as a historic resource, rarity should be considered. A site's content and state of preservation, and sophistication of the historic operation, are influential factors. Small to moderate-sized mines retaining limited integrity are common, while sites retaining high integrity on archaeological, engineering, or architectural levels are uncommon and important. Large, complex shaft mines are uncommon, and those retaining any level of integrity are rare and possibly important.



Most tunnel mines, such as this operation near Georgetown during the 1890s, were small and simple. Surface facilities consisted of a blacksmith shop, tunnel portal, rail line, ore bin, and little else. Even when buildings and structures are gone, tunnel mines may be eligible for the NRHP if the archaeological features and artifacts clearly represent the operation. Courtesy of Denver Public Library, X-61651.

The Doric Mine near Georgetown, pictured around 1890, is typical of mechanized tunnel mines. A tunnel house encloses the tunnel portal, shops, air compressor, and steam boiler. A chute and decayed bin for ore lie on the waste rock dump's flank. Courtesy of Denver Public Library, X-61652.

Property Subtype: Tunnel Mine: Like shaft mines, tunnel mines were usually company operations that produced ore. The principal difference is that the company drove a horizontal tunnel or adit (see Feature Descriptions below for difference between adit and tunnel) to work an ore body. Companies almost always arranged critical surface plant components around the tunnel portal. Large tunnel mines possessed complex, mechanized surface plants with multiple structures, and small operations were simple and may have featured only an ore bin and shop building. The presence of an ore bin or sorting house, or the evidence thereof, can distinguish a mine from a deep prospect. See Section E for a detailed description.

When assessing the significance of a tunnel mine as a historic resource, rarity should be considered. A site's content and state of preservation, and sophistication of the historic operation, are influential factors. Small to moderate-sized mines retaining limited integrity are common, while sites retaining high integrity on archaeological, engineering, or architectural levels are uncommon and important. Large, complex tunnel mines are uncommon, and those retaining any level of integrity are rare and possibly important.

Some mines, such as the Tenth Legion near Empire during the late 1860s, were a complex series of workings on a linear ore vein. Here, miners developed the upper portion through a shaft, marked by a shaft house at center, and the lower portion through a tunnel, with a log shop building at the lower right. Open-cuts exposed the vein in between. Note the ore chutes and log cribbing walls retaining waste rock. Courtesy of Denver Public Library, X-61589.

Hardrock Mine Significance

In the I-70 Mountain Corridor, hardrock mining was limited primarily to Clear Creek drainage and the Dillon and Frisco area. The industries were not only locally important, but also part of a larger, highly influential movement in the central Rocky Mountains. The greater mining industry underwrote most of the settlement, transportation networks, dependent industries, land use patterns, and other trends throughout the I-70 Mountain Corridor. The principal trends and historical patterns are summarized below as the NRHP areas of significance, and include Architecture, Commerce and Economics, Community Planning and Development, Engineering, Exploration/Settlement, Industry, Law, Politics/Government, and Social History.

Period of Significance must be considered when assessing the historical importance of mines. The Period 1859 to 1942 covers mining as a viable industry throughout the I-70 Mountain Corridor, but narrower timeframes of importance are more applicable by region and ore type. The industries in the Dillon and Frisco area and Clear Creek drainage were distinct and followed their own chronologies. Further, in Clear Creek drainage, gold and silver mining experienced different timeframes of significance due to geological conditions, general economic trends, and local events. Thus, the Dillon and Frisco area, silver mining in western Clear Creek drainage, and gold mining in the eastern drainage should be considered separately.

Hardrock gold mining was important throughout Clear Creek drainage from 1859 through 1864. Gold production declined for a time, replaced by silver in the western drainage from Empire west to Loveland Pass. Silver mining was significant on local, statewide, and national levels from 1865 through 1920. Gold production of substance resumed in the eastern portion, from Floyd Hill west to Empire, in 1873. Gold mining then became important on local, statewide, and national levels from 1873 through 1918. The industry was largely quiet and unimportant during the 1920s but returned to local and statewide significance from 1930 through 1942.

Hardrock mining was locally significant in the area around Dillon and Frisco during three time periods. The first spanned 1878 through 1885, the second from 1890 into 1893, and the last 1898 until 1920.

Area of Significance: Architecture: Mines with standing buildings may be important in the area of Architecture for several reasons. At small and early operations, miners adapted familiar building designs and construction methods to meet the needs of work underground in frontier conditions. They responded to topography, natural landscape features, local climate, and impediments in access. Economic constraints and available buildings materials also influenced how miners adapted designs and methods. The buildings tended to be simple, crude, and assembled with logs, lumber, and canvas. In constructing these types of buildings, miners contributed to existing patterns of functional and yet cost-effective frontier mining industry architecture.

At large operations, engineers and experienced miners contributed to the development and evolution of architecture for mining in the mountains. Miners and engineers adapted general industrial architecture practices and concepts to the needs of a mine and its environmental conditions. Some buildings such as shaft houses and tunnel houses were custom-designed but followed a template specific to mining in the mountains. In other buildings, miners and engineers adapted familiar forms and methods but added features to fulfill required functions and duties.

Areas of Significance: Commerce and Economics: The mining industry was significant in the areas of *Commerce* and *Economics* on local and statewide levels. At the local level, the industry converted natural resources into a cash product and diverted a large portion of the money into local economies. Mining companies paid wages to their workers, hired contractors for various services, and purchased small items from sources in nearby towns.

Mining companies were part of and contributed to complex regional and statewide commercial and economic systems. For example, Clear Creek drainage companies shipped crude ore and concentrates to smelters in Black Hawk, Golden, Denver, and even Colorado Springs. The outfits in Summit County sent ore to Leadville, Denver, and also Colorado Springs. The transactions supported a regional economy, and wed the mining industry with railroads and smelting centers.

In another example, mining companies acquired large machinery and other industrial goods from manufacturers mostly in Denver, and to a lesser degree from outside of Colorado. The manufacturers in Denver in turn purchased their materials from sources within and outside of Colorado. In so doing, mining companies supported primarily Colorado's and secondarily other economies. Further, they helped Denver maintain its status as one of the most important mine supply and machinery manufacturers in the western states. It should be noted that large operations had a greater association with these trends than the small ones.

In a third example, the hundreds of workers employed by mining companies consumed food and other domestic goods purchased from a variety of sources. Preserved food was shipped from packing companies in the Midwest and on the West Coast, while fresh foods came from Colorado farms and ranches. By consuming both preserved and fresh foods, mining company employees not only supported a complex food transportation network, but also helped the development of farming and ranching in Colorado. Merchants in the nearby towns handled most of the food and goods, and the acquisition of such therefore contributed to local economies.

As a physical representation of the industry, mine sites share the importance defined above. Large mining companies consumed goods, services, and machinery in volume, and are therefore more closely allied with the above trends than the small operations. Cumulatively, however, the small companies outnumbered the substantial operations and had a significant impact.

Area of Significance: Community Planning and Development: Hardrock mines participated in the area of *Community Planning and Development* as anchors for the towns of Frisco, Curtin, and Wheeler in Summit County and most of the communities in Clear Creek drainage. The settlements were a function of mining and paralleled the industry's rise and decline. Community activists planned growth and instituted important services and infrastructure when nearby mines did well. Conversely, communities contracted and revised services and infrastructure when the industry struggled. In general, large mines are more allied with the trend than small operations because they were substantial employers and economic contributors.

Area of Significance: Engineering: The *Engineering* Area of Significance applies to planning and organization of individual structures and designed systems, as well as entire mines. Most mining operations employed engineering to organize workings and arrange surface plants. Engineering was primitive and vernacular at the small operations but advanced and professional at the large mines. Vernacular engineering refers to structures and systems built by individuals who were not formally trained in design. The individuals adapted familiar design and construction principals to the specific needs of their mines, available materials or equipment, and the immediate environment. Although functional, vernacular engineered structures and systems tended to be impermanent, inefficient, and small in scale. They were important, however, for several reasons. First, the structures and systems allowed many mining operations to function. Second, the small mines, in their informally engineered surface plants and workings, made up the bulk of the mining industry.

At substantial mines, trained engineers designed structures, systems, and underground workings according to principals established in the greater mining industry. With efficiently planned workings and surface plants, the companies produced higher tonnages of lower grade ore from deeper workings than was otherwise possible. In so doing, professional engineering prolonged the lives of many mines and their dependent communities.

On a broad level, Clear Creek drainage was a cradle for important technological and engineering developments in the field of hardrock mining. During the 1870s, engineers at Silver Plume and Georgetown contributed to systematic vein development from the bottom up and blocked out in sections for efficient extraction. The practice culminated in a phase of deep tunneling during the 1890s and 1900s, with the Newhouse Tunnel as one of the nation's longest at the time. Clear Creek drainage became an example to the greater mining industry for successful engineering of deep tunnels, in total design and planning of support facilities. The Newhouse and similar tunnels also were models of a combined engineering and business strategy. The tunnels were designed to undercut independent mines and provide their owners with access at depth. The tunnel companies then leased rights-of-way to those owners, who shared the tunnels for drainage and ore extraction. The lease income then offset the costs of driving the tunnels.

The adaptation of electric power to mining was another important contribution. The Kohinoor & Donaldson Mine at Lawson built one of the earliest electrical plants in Colorado in 1883. The drainage also received an Alternating Current grid during the 1890s when that technology was formative. Mining engineers then applied the empirical knowledge elsewhere.

Engineers at Silver Plume and Georgetown pioneered the use of mechanical rockdrills for boring blast-holes underground. Drills were tested, used, and then modified at the Burleigh Tunnel during the late 1860s and adopted at neighboring mines within a short time. The greater mining industry gradually adopted rockdrills within several decades.

Area of Significance: Exploration/Settlement: The Area of *Exploration/Settlement* applies to mines dating between 1859 and 1880 in Clear Creek drainage and 1878 and 1885 in the Dillon and Frisco area. During these periods, mines were physical anchors for the frontier in the central Rocky Mountains. Miners penetrated most of the region, quantified its general geography, and outlined the economic geology. Through claim examination, sampling, and development, they defined the areas with the highest concentrations of veins and most of the principal ore bodies in those areas. This information guided investors and companies willing to risk capital. Localized mining industries and associated settlement patterns then quickly followed. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Area of Significance: Industry: Mines were important in the Area of *Industry* as elemental building blocks of the mining industry. During the earliest years in Clear Creek drainage and the Dillon and Frisco area, mining companies were on the forefront of the frontier and brought social, economic, governmental, and transportation systems. As the industry grew, it became one of the most important forces shaping history in the central mountains. The industry was the largest employer, supported most of the communities, fostered commerce, drew railroads, and influenced politics and government. By producing an enormous amount of gold, silver, and industrial metals, the industry supported the regional economy and contributed on a statewide level. The industry also was the foundation of Euro-American settlement, which outlived the industry itself.

Areas of Significance: Law and Politics/Government: Mines in Clear Creek drainage dating from 1859 through 1880 are associated with the Areas of Significance in several ways. First, mines were physical anchors for mining districts organized in the drainage. The districts, among the earliest in Colorado, were frontier legal systems defining hardrock claim types, rights, and sizes, and crime and punishment. When the Territorial Legislature established its charter in 1861, it included many of definitions and rights developed in Colorado's mining districts.

Second, a substantial number of mines in the western drainage were materially involved in the development of mining law. Prior to 1872, federal and territorial law had few provisions for addressing legal disputes between mine owners, leaving room for lawyers to interpret the sparse statutes. Passage of the 1872 Mining Law attempted to resolve gaps and standardize law but complicated some types of conflicts. Between 1864 and 1880, the western drainage became a battleground among hostile and competing mine owners, who sued and countersued over a variety of issues. The cases, court decisions, and lawyers set numerous legal precedents in mining property rights, preemption, title to ore formations, and other definitions important to the industry. Also, a high volume of suits and cases gave rise to a wing of the legal profession specializing in mining litigation. Some of Colorado's prominent lawyers and judges gained experience in Clear Creek drainage during the period, influenced application and interpretation of mining law, and later applied their lessons to resolve important cases.

Area of Significance: Social History: As centers for large workforces, mines are associated with the area of *social history*. Mining, ore milling, and logging in the I-70 Mountain Corridor shared the same general pool of labor and investors. Workers tended to migrate between the sectors, and investors often participated in both mining and lumber companies. Given this, mining and logging contributed to the evolution of local and statewide social structures together.

One was the development of classes in Colorado. Local investors owned most of the mines, and the profits made from ore production helped some ascend to upper classes while cementing others in a growing middle class. The laborers, of whom there were many, formed a working class dependent on wages.

The other form of social structure was the workforce that made mining possible. Industrial-scale operations created a strong employment market that provided jobs to hundreds who lacked the skills for other industries. Some of those workers were immigrants, mostly from European countries, and the mining industry provided them with pay, a foothold in the mountains, and opportunity for advancement. Because mining was subject to cycles of boom and bust, the workers had to be mobile, which contrasted sharply with Colorado's sedentary farming and ranching culture. Each boom drew laborers from a variety of backgrounds and the busts propelled them to other regions and economic sectors in Colorado. The result was a mobile, adaptable, and diverse society.

Hardrock Mine Registration Requirements

For eligibility to the NRHP, historic mine sites must meet at least one of the Criteria below and possess related physical integrity.

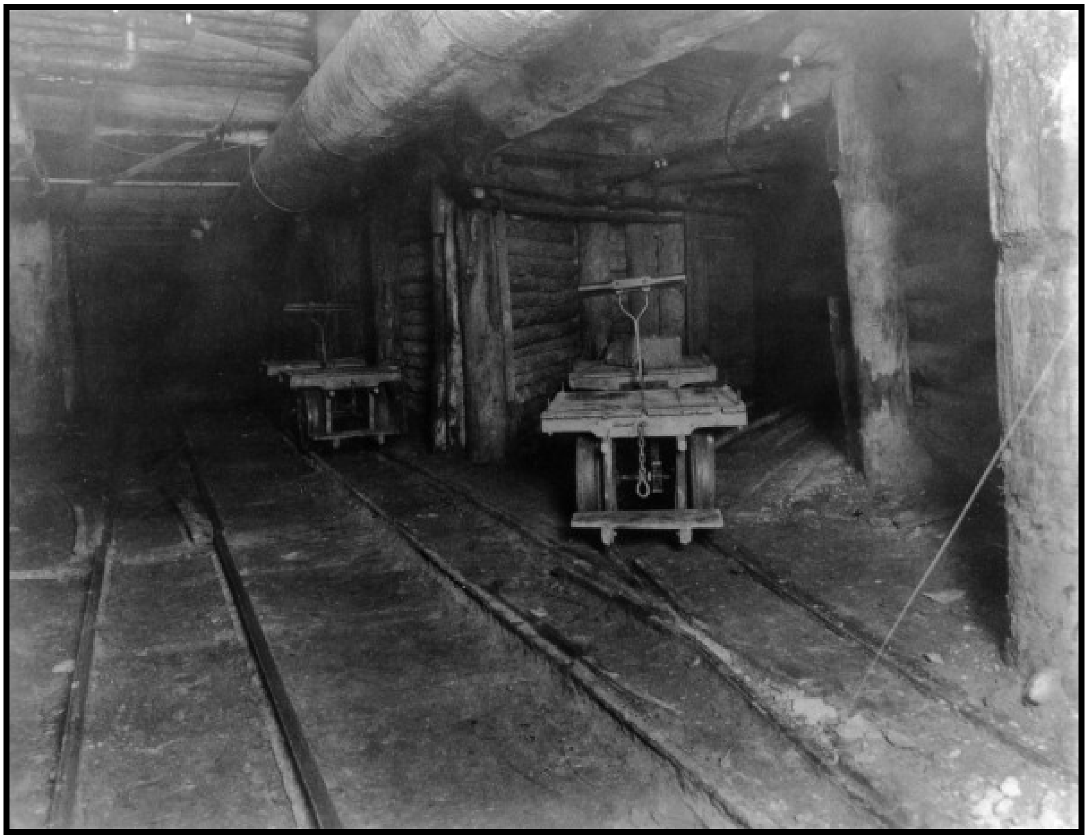
Criterion A: Mines eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important in their host segment of the I-70 Mountain Corridor.

Criterion B: Mines may be eligible under Criterion B when they can be directly tied to an important person. Some mines, especially large complexes, can be traced to important individuals such as engineers and managers. In these cases, they can be eligible under Criterion B if significance is through the person's presence on-site and participation in operations. The site must retain physical integrity relative to the person's productive period of time, and they achieved when importance. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the operation. A brief biography is necessary to explain the individual's significant contributions. Important people commonly invested in mines, directed companies, or owned claims but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, few mines will be eligible because it is extremely difficult to prove the presence of an important person. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Mine sites may be eligible under Criterion C if they are outstanding examples of a shaft or tunnel mine. Because most equipment and buildings were removed when a mine was abandoned, integrity is usually on an archaeological level. The overall organization, design, and content of the mine's surface plant should be evident, and the site must possess features characteristic of its type. At shaft mines, the hoisting system, blacksmith shop, waste rock dump, and ore storage facilities should be discernable. Similarly, the tunnel house and associated facilities should be evident at tunnel mines. Intact structures and equipment, a high degree of integrity, or character-defining engineering or architectural features strengthen a site's eligibility. Important engineering and architectural features include intact buildings, structures, machinery, adit portals, and shaft collars.

Mine sites are potentially eligible under Criterion C when they are contributing elements of historic mining landscapes. Even when a site is not completely intact in itself, it may provide visual impact contributing to the setting and feeling of an area. Preserved waste rock dumps are critical contributing elements. Some sites may be extensive enough to constitute localized landscapes in themselves.

Criterion D: A mine complex may be eligible under Criterion D if it will likely yield important information upon further study. If the site possesses building platforms, privy pits, and boiler-clinker dumps, testing and excavation of these buried archaeological deposits may reveal information regarding miners' lifestyles, social structures, and the workplace, which are important areas of inquiry. Accessible and intact underground workings are important because few formal studies have been carried out regarding the underground work environment, engineering, equipment, and practices of drilling, blasting, and removing rock. Historical documentation is currently the principal body of information that researchers rely on for studying the above aspects of mining. Detailed studies of structures and machinery can contribute information regarding engineering and architectural practices and the application of technology.



Underground mine workings, such as this shaft station in the Newhouse Tunnel around 1910, hold a high potential to yield important information. Few if any formal historical studies of underground workings have been completed, and much can be learned in the fields of mining engineering, practices of drilling and blasting, and the underground work environment. Because of this, underground workings may qualify for the NRHP under Criterion D, when preserved and safely accessible. Courtesy of Denver Public Library, X-61088.

Eligible mines must possess physical integrity relative to one of the important timeframes outlined above. Because most small mines possessed few structures and little machinery, which were usually salvaged when a site was abandoned, integrity will probably be on an archaeological level. Archaeological remains retain sufficient integrity when they permit the virtual reconstruction of the mining operation, its timeframe, and convey the site's significance.

Most of the seven aspects of historic integrity defined by the NRHP apply to mine sites. Some sites may possess standing structures and intact machinery, which must retain the aspect of *location* to contribute to a resource's integrity. To retain integrity of *location*, the structure or machine should have been present when the mine operated. For a resource to retain the aspect of *design*, the resource's material remains, including the archaeological features, must convey the mine's organization, planning, and engineering. In many cases, mines were worked periodically and the surface facilities changed and adapted to new operations, leaving evidence of sequential occupation. In such cases, a resource can retain the aspect of *design* if the material remains reflect the evolution of the surface facilities over time. To retain the aspect of *setting*, the area around the mine, and the resource itself, must appear similar today as when it was developed. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of mining from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where mine structures, machinery, and other visible features remain to convey a strong sense of connectedness between mining properties and a contemporary observer's ability to discern the historic activity that occurred at the location.

Eligible mines must possess physical integrity relative to a timeframe of significance. Mines heavily altered within the recent past, such as Atlantic Tunnel on Seaton Mountain above Idaho Springs, usually lack sufficient integrity. Source: Eric Twitty

Shafts that suffered catastrophic collapse often lack sufficient integrity for eligibility. Massive collapse often impacts the assemblage of archaeological features necessary for site interpretation. Source: Eric Twitty.

PROPERTY TYPE: ORE TREATMENT MILL

One of the main objectives of mining was to reduce ore to its constituent metals. In a multistage process, treatment involved crushing and grinding crude ore to sand and slurry, and separating out metalliferous material from waste. Most of the payrock produced in the first five years of mining was known as free-milling and free-gold ore. The material was simple in form and the gold readily amalgamated with mercury. Because of this, companies were able to erect what were categorically known as *amalgamation mills* to recover the gold. Most mills employed a battery of stamps to crush the crude ore into a slurry, which flowed over slanted amalgamation tables at the battery's toe. The amalgamation tables, coated with mercury, recovered the gold. Because of its simplicity and relatively low cost, the amalgamation mill was within economic reach of many mining companies. Independent operators also provided custom treatment for mining companies unable to afford their own mills.

With depth underground, mining companies found that the ore became increasingly complex, presenting great challenges to mill operators. The gold and the host rock, known as gangue, featured minerals that interfered with amalgamation, and the mills recovered only a small percentage of gold. Such ore had to be treated in a primary smelter, which crushed the ore, separated out as much waste as possible, and melted the material in a furnace, yielding a blend of metals known as matte. For silver and industrial metals, smelting was the only effective treatment method. Advanced smelters at Black Hawk, along Colorado's piedmont, and in the Midwest were able to refine the matte into pure metals.

But few companies were willing to build their own smelters, due in part to the great cost, and also because smelters were difficult to design and had high failure rates. Investors sought a partial answer in *concentration mills*, which completed the preliminary crushing and separation steps ordinarily carried out by smelters. Concentration mills relied on combinations of mechanical and sometimes chemical methods to separate the metalliferous material from gangue. The facilities, also known as *reduction mills*, produced concentrates only and no refined metals, and the concentrates were shipped to a smelter for final treatment. The mills saved mining companies money in two areas. First, the companies did not incur the high transportation costs of shipping waste-laden ore to a distant smelter, and second, they avoided the fees charged by smelters for complete treatment. Concentration mills saw increased use during the mid-1870s, and they replaced most of the simple amalgamation mills by the 1890s.

Both concentration and amalgamation stamp mills operated in the I-70 Mountain Corridor either as independent plants or in conjunction with specific mines. A third type of mill, the arrastra, was used in Clear Creek drainage during the 1860s and the 1870s, and rarely afterward. The three types are described in detail in Section E 4.

Ore Treatment Mill Subtypes

Property Subtype: Concentration Mill: A concentration mill was a facility that employed primarily mechanical and occasionally chemical means to separate metalliferous materials from waste. The recovered material was known as concentrates, and it manifested as mineralized, metalliferous sand and rock dust. Concentration mills ranged in size and complexity and were usually built over stairstep terraces incised into a hillslope. This design used gravity to draw ore through the processing stages. Small mills usually featured only several stages of crushing and concentration while large mills were heavily equipped to process both great volumes of ore and complex material that resisted treatment.

Engineers usually followed a general template when designing concentration mills. An ore bin stood at the mill's head and fed crude ore into a primary crusher, usually located on the mill's top platform. The resultant gravel descended to a secondary crusher located on the platform below and then through a screening system. Oversized material returned for secondary crushing, and material that passed the screen went on for concentration at small mills, or tertiary crushing at large mills. Following another screening, the ore descended to subsequent mill platforms for concentration.

On the concentration platforms, apparatuses such as jigs, vanners, vibrating tables, and settling tanks (discussed in Section E 4) separated waste known as gangue from the metalliferous material. Depending on the size of the mill and the complexity and volume of the ore, the apparatuses could have achieved the separation in numerous steps. The concentration platforms also usually featured the mill's power source and a drier to evaporate moisture from finished concentrates.

When a mill was abandoned, the structures and machinery were usually removed, leaving stairstep platforms, machine foundations, and hardware. Tailings from ore processing were usually flumed to an area downslope from the mill and today can manifest as substantial deposits of finely ground sand and rock flour. Some mills were no more than costly failures, which an absence of tailings from a site often reflects.

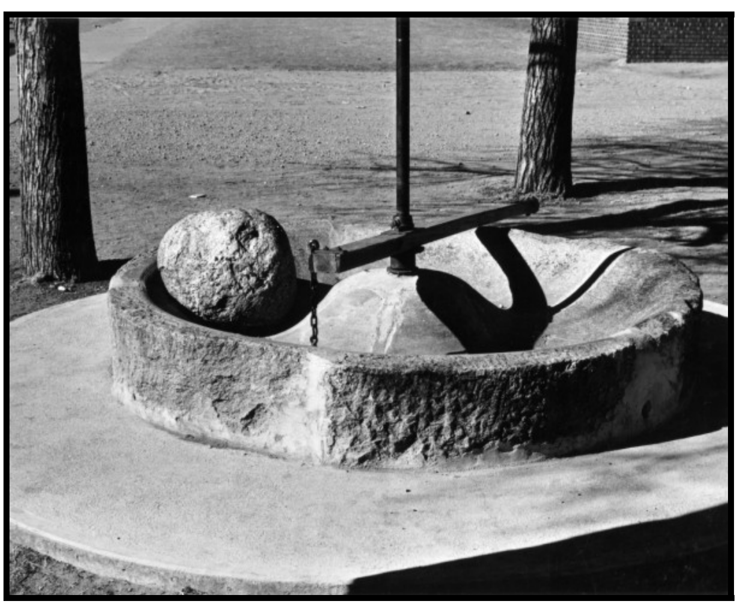
The Pay Rock Mill on the north side of Clear Creek near Silver Plume is a good example of a typical concentration facility. The building descends over a series of stairstep foundations, which are often all that remain at mill sites today. Courtesy of Denver Public Library, X-61593.

Property Subtype: Amalgamation Stamp Mill: The amalgamation stamp mill was an institution in eastern Clear Creek drainage, and it recovered gold bullion from simple ore. Because the plants used gravity to draw ore through only several treatment stages, they tended to be basic in design and flow path. Metallurgists usually erected the facilities over three or four terraces cut out of a slope.

A receiving bin at the mill's head fed crude ore into a primary crusher on a terrace below. The crusher reduced the ore to sand and gravel, which flowed down to a stamp battery on another terrace. A stamp battery consisted of a timber gallows frame with guides for heavy iron rods fitted with cylindrical iron shoes. A camshaft, powered by a large belt, lifted the rods in sequence and let them drop. The shoes pulverized the ore in cast iron battery boxes bolted to timber pedestals. After screening, the slurry washed over amalgamating tables at the battery's toe. A mercury coating on the tables amalgamated with the gold, and the spent tailings flowed into a trough and continued out of the mill. Workers periodically scraped off the amalgam and heated the spongy mass in a retort to volatize the mercury. The end product was impure gold that had to be refined.

The mill's lowest platform featured other facilities and the power source, often a horizontal steam engine and boiler. When the above amalgamation process proved insufficient, metallurgists added other types of apparatuses to recover more gold. As can be expected, the additional machinery required more terraces in the mill building. Usually, each terrace was dedicated to a specific stage of ore treatment and had its own dedicated bank of appliances. The retort, an assay office, and administrative office were often in a separate building.

Because common amalgamation mills traditionally crushed the ore with batteries of stamps, they became popularly known as *stamp mills*. This term is slightly misleading in that some amalgamation mills relied on other apparatuses to crush and amalgamate the ore. Concentration mills, discussed above, also employed batteries of stamps for crushing, but were not stamp mills in themselves. When associated with a concentration mill, the term stamp mill applies only to the stamp battery and not the entire facility.



An arrastra was a circular stone floor with capstan at center, harness beam, and muller stone. The one pictured here in 1939 was moved to Idaho Springs for public viewing. An arrastra must be in place of use for eligibility. Courtesy of Denver Public Library, X-62938.

Property Subtype: Arrastra: An arrastra was a small, simple, and inefficient apparatus for recovering gold from ore. An arrastra consisted of a circular stone floor usually less than 30 feet in diameter with low sidewalls and a capstan at center. A draft animal, tethered to a harness beam fastened to the capstan, walked a path around the stone floor. Drag-stones, chained to the harness beam, ground the ore on the stone floor, where it amalgamated with mercury that a worker introduced. Some outfits substituted waterpower for draft animals.

Ore Treatment Mill Significance

Ore treatment mills played a key role in the long-term success of hardrock mining in the I-70 Mountain Corridor because they reduced crude ore, as extracted from the ground, into an economical commodity. Without a local means for treating ore, mining companies would have been limited only to those grades of payrock that were profitable enough to ship to distant smelters, and such material was in limited supply. The greater mining industry, dependent on treatment mills, underwrote most of the settlement, transportation networks, dependent industries, land use patterns, and other trends throughout the corridor. The trends and historical patterns relevant to treatment mills are summarized below as the NRHP areas of significance. They include Architecture, Commerce and Economics, Community Planning and Development, Engineering, Industry, and Social History.

Period of Significance must be considered when assessing the historical importance of ore treatment mills. The Period 1859 to 1942 covers mining as a viable industry throughout the I-70 Mountain Corridor, but narrower timeframes of importance are more applicable by region and mill type. Those timeframes are reviewed below.

Arrastras were important in eastern Clear Creek drainage from 1859 until around 1870. They were the earliest treatment facilities and fostered hardrock gold production when the industry was nascent. Their simplicity and low cost made them ideal for small, undercapitalized operations, which constituted the bulk of the mining industry at the time. Amalgamation stamp mills were important in eastern Clear Creek drainage from 1860 through 1890. They were the principal ore treatment mills in the drainage for around ten years and later supported numerous small mines, although production of simple, free-milling gold ore declined. Concentration mills were important throughout the drainage from 1875 through 1920. Most of the gold and silver ore produced by 1875 was too complex for amalgamation and yet unprofitable to ship to distant smelters. Through local treatment, concentration mills allowed mining companies to produce this category of ore in volume. Concentration mills were important again from 1930 through 1942 because they supported a Great Depression-era mining revival.

Concentration mills were locally significant in the area around Dillon and Frisco from 1898 until 1920. The Excelsior Mill began service in 1898 and processed ore for the local mining industry until around 1920. The mill may have been the area's only ore treatment plant.

Area of Significance: Architecture: Mills with standing buildings may be important in the area of Architecture for several reasons. At early plants, operators adapted familiar building designs and construction methods to shelter ore treatment processes and machinery. They responded to environmental conditions including topography, natural landscape features, and local climate. Frontier conditions such as economic constraints and available building materials also influenced how mill operators adapted designs and methods. Most early buildings tended to be simple, crude, and assembled with logs and lumber. In constructing these types of buildings, the operators contributed to existing patterns of functional and yet cost-effective frontier mining industry architecture.

At large complexes, engineers and metallurgists contributed to the development and evolution of architecture for mining in the mountains. Metallurgists and engineers adapted general industrial architecture practices and concepts to then-current ore treatment processes and equipment. The building enclosing treatment processes were custom-designed but followed a template characteristic of mining in the mountains. In other buildings, miners and engineers adapted familiar forms and methods but added features to fulfill required functions and duties.

Areas of Significance: Commerce and Economics: Ore treatment mills were significant in the areas of *Commerce* and *Economics* on local and statewide levels through their direct support of mining. At the local level, the mining industry converted natural resources into a cash product and diverted a large portion of the money into local economies. Mining and milling companies paid wages to their workers, hired contractors for various services, and purchased small items from sources in nearby towns.

Companies were part of and contributed to complex regional and statewide commercial and economic systems. For example, Clear Creek drainage mills shipped concentrates to smelters in Black Hawk, Golden, Denver, and even Colorado Springs. The Excelsior Mill in Summit County sent concentrates to Leadville, Denver, and also Colorado Springs. The transactions supported a regional economy, and wed the mining industry with railroads and smelting centers.

In another example, mill operators acquired large machinery and other industrial goods from manufacturers mostly in Denver, and to a lesser degree outside of Colorado. The manufacturers in Denver in turn purchased their materials from sources within and outside of Colorado. In so doing, mining companies supported primarily Colorado's and secondarily other economies. Further, they helped Denver maintain its status as one of the most important mine supply and machinery manufacturers in the western states.

In a third example, the hundreds of millworkers consumed food and other domestic goods purchased from a variety of sources. Preserved food was shipped from packing companies in the Midwest and on the West Coast, while fresh foods came from Colorado farms and ranches. By consuming both preserved and fresh foods, mill employees not only supported a complex food transportation network, but also helped the development of farming and ranching in Colorado. Merchants in nearby towns handled most of the food and goods, and the acquisition of such therefore contributed to local economies.

As a physical representation of the industry, mill sites share the importance defined above. Large plants consumed goods, services, and machinery in volume, and are therefore more closely allied with the above trends than small operations.

Area of Significance: Community Planning and Development: Ore treatment mills participated in the area of *Community Planning and Development* through a presence at Frisco in Summit County, and most of the communities in Clear Creek drainage. On a local level, mill operators sited their plants in these communities to be near a workforce, shipping points, water, and commerce. The mills then reinforced existing community development patterns, and established the communities as local ore treatment centers.

In a broad sense, the settlements were a function of mining, made possible by mills, and paralleled the industry's rise and decline. Community activists planned growth and instituted important services and infrastructure when nearby mines did well. Conversely, communities contracted and revised services and infrastructure when the industry struggled. In general, large mills are more allied with the trend than small operations because they were substantial employers and economic contributors.

Area of Significance: Engineering: The *Engineering* Area of Significance applies to planning and organization of individual structures and designed systems, as well as entire mills. Engineering was primitive and vernacular at the small operations, especially arrastras, but advanced and professional at the large mills. Vernacular engineering refers to structures and systems built by individuals who were not formally trained in metallurgy and mechanics. The individuals adapted familiar designs and construction principals to their interpretation of ore treatment, to available materials or equipment, and the immediate environment. Although functional, vernacular engineered structures and systems tended to be impermanent, inefficient, and small in scale. They were important, however, because they allowed many mills to function, despite difficult environmental conditions and lack of capital.

At medium-sized and large mills, trained engineers and metallurgists adapted standard ore treatment principals to the character of the ore, expected tonnage, and available equipment and materials. Their interpretations were expressed as the mill design, treatment flow path, small-scale structures, and ultimate success. Working capital, environmental conditions, and then-current processes heavily influenced how metallurgists built their mills. When a mill was planned well, it enabled mining companies to produce higher tonnages of lower grade ore from deeper workings than was otherwise possible. In so doing, successful mill engineering prolonged the lives of many mines and their dependent communities.

In solving problems posed by complex gold and silver ore, metallurgical engineering was crucial to long-term success of the mining industry. Without engineering, the industry would have declined at an early time. The complex gold and silver ores defied conventional metallurgical practices and those methods proven to be effective for metals in other regions. In combining experience with calculation, metallurgists devised processes that rendered the complex ores economically viable. When specific processes and mill appliances proved to be inadequate, Clear Creek metallurgists modified existing processes and equipment or invented new apparatuses.

Ore concentration was on the forefront of a movement away from simple and labor-intensive methods to advanced and highly mechanized processes, which permitted the separation of multiple metals in economies of scale. This involved the coordination of testing and treatment methods, complex mechanical systems, and hundreds of workers in massive facilities that featured multiple buildings. The ability to treat large tonnages of low-grade ore was crucial for the mining industry because it rendered previously uneconomical payrock profitable, extending the viability of individual mines as well as entire mining districts.

Area of Significance: Industry: Mills were important in the Area of *Industry* through their direct support of ore production. During the earliest years in Clear Creek drainage, mines and mills were on the forefront of the frontier and encouraged social, economic, governmental, and transportation systems. Arrastras were especially relevant in this trend, helping the industry to gain a foothold during the early years of Euro-American presence in the region. As the industry grew, it became one of the most important forces shaping history in the central mountains. The industry was the largest employer, supported most of the communities, fostered commerce, drew railroads, and influenced politics and government. By producing an enormous amount of gold, silver, and industrial metals, the industry supported the regional economy and contributed on a statewide level. The industry also was the foundation of Euro-American settlement, which outlived the industry itself.

Area of Significance: Social History: As centers for large workforces, mills are associated with the area of *social history*. Mining and milling in the I-70 Mountain Corridor shared the same general pool of labor and investors. Workers tended to migrate between the two sectors, and investors often participated in both mining and milling companies. Given this, mining and milling contributed to the evolution of local and statewide social structures together.

One was the development of classes in Colorado. Local investors backed most of the small mills, and the profits made from ore treatment helped some ascend to upper classes while cementing others in a growing middle class. The laborers, of whom there were many, formed a working class dependent on wages.

The other form of social structure was the workforce that made the mining industry possible. Large-scale operations created a strong employment market that provided jobs to hundreds who lacked the skills for other industries. Some of those workers were immigrants, mostly from European countries, and the mining industry provided them with pay, a foothold in the mountains, and opportunity for advancement. Because milling was a function of mining, it was subject to the same cycles of boom and bust. These cycles required that the workers be mobile, which contrasted sharply with Colorado's sedentary farming and ranching culture. Each boom drew laborers from a variety of backgrounds and the busts propelled them to other regions and economic sectors in Colorado. The result was a mobile, adaptable, and diverse society.

Ore Treatment Mill Registration Requirements

To qualify for the NRHP, ore treatment mills must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important to their immediate area or community, or Colorado.

Criterion B: Mills may be eligible under Criterion B when they can be directly tied to an important person. The operators and managers of most mills can be identified, and metallurgists and engineers attributed to some large complexes. In these cases, they can be eligible under Criterion B provided significance is through the person's presence on-site and participation in operations. The site must retain physical integrity relative to the person's productive period of time, and when they achieved importance. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the operation. A brief biography is necessary to explain the individual's significant contributions. Important people commonly invested in mills or directed companies, but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. Few arrastras will be eligible under Criterion B because it is extremely difficult to prove an association with an important person. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Sites may be eligible under Criterion C if they clearly reflect a type of ore treatment mill. Because most equipment and buildings were removed when a mill was abandoned, integrity is usually on an archaeological level. Distinguishing site characteristics vary for the different mill types. In the case of an arrastra, its circular stone floor must be present and in its place of use. Archaeological features representing the sidewalls, capstan, mechanized power source, or support facilities strengthen a site's potential eligibility.

At concentration and amalgamation stamp mill sites, the building footprint, terraces and foundations, aspects of infrastructure, and support facilities should be represented by features and artifacts. The general ore treatment process should be identifiable, but its specifics can be approximated. Intact structures and equipment, a high degree of integrity, or character-defining engineering or architectural features strengthen a site's potential eligibility. Important engineering and architectural features include intact buildings, structures, and machinery.

Mill sites are potentially eligible under Criterion C when they are contributing elements of historic mining landscapes. Even when a mill is not completely intact in itself, the site's visual impact may contribute to the setting and feeling of an area. Preserved terraces, foundations, and platforms are critical contributing elements. Some sites may be extensive enough to constitute localized landscapes in themselves.

Criterion D: Mill sites may be eligible under Criterion D if they hold a high likelihood of yielding important information upon further study. Arrastras have a high potential for eligibility because few have been documented in the Rocky Mountain states, and little is currently understood about how miners actually constructed and operated the facilities. The surface features and artifacts may enhance the current knowledge, and even when only the floor is visible, arrastras can possess buried archaeological deposits and features that may contribute important details.

Concentration and amalgamation stamp mill sites can contribute in three general ways. The first is buried archaeological deposits such as privy pits, thick boiler clinker dumps, and refuse layers in tailings dumps. The deposits may include artifacts capable of enhancing our current understanding of workplace behavior, diet, and substance abuse. If the workers lived on-site, residential deposits may illuminate the currently dim portrait of mill workers and their lifestyle. Second is a good assemblage of structures, foundations, or machinery for the ore treatment process. Detailed examination may reveal how metallurgists designed concentration processes for Clear Creek or Ten Mile Canyon ore and chose machinery accordingly. The third is a well-represented infrastructure. Documentation may demonstrate how engineers designed water, power, ore input, and tailings disposal systems.

Eligible mills must possess physical integrity relative to one of the important timeframes outlined above. Because most small mills possessed few structures and little machinery, usually salvaged when a site was abandoned, integrity will probably be on an archaeological level. Archaeological remains retain sufficient integrity when they permit the virtual reconstruction of the mill, its timeframe, and convey the site's significance.

Most of the seven aspects of historic integrity defined by the NRHP apply to mills. Some sites may possess standing structures and intact machinery, which must retain the aspect of *location* to contribute to a resource's integrity. For integrity of *location*, the structure or machine should have been present during the mill's operating time period. For a resource to retain the aspect of *design*, the resource's material remains, including the archaeological features, must convey the mill's organization, planning, and engineering. In many cases, mills were worked periodically and the treatment flow path adapted to machinery or processes, leaving evidence of sequential modifications. In such cases, a resource can retain the aspect of *design* if the material remains reflect the evolution of the mill over time. To retain the aspect of *setting*, the area around the mill, and the resource itself, must appear similar today as when it was developed. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of milling from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where structures, machinery, and other visible features remain to convey a strong sense of connectedness between a mill and a contemporary observer's ability to discern the historic activity that occurred at the location.

<u>PROPERTY TYPE: SMELTER</u>

Smelters were among the most important facilities in the mining industry. They were the final recipients for crude ore delivered from mines and the concentrates generated by mills, and converted the material into metals. Smelting in the I-70 Mountain Corridor was limited in timeframe and geographic extent. Metallurgists built a number of small plants in western Clear Creek drainage between 1865 and 1870, and most failed but a few treated ore until around 1875. Several smelters also operated at Idaho Springs during the mid-1880s. Mining around Dillon and Frisco was not productive enough to support a dedicated smelter. Although the western drainage smelters were not completely successful, they were important in several ways. The few effective plants produced the region's first silver, drew investment, and inspired confidence among capitalists. The failed plants were stepping stones in effective smelter design because they exemplified what not to do. Overall, silver mining would have remained static, if not failed altogether, without both successful plants and the failures.

Clear Creek smelters used a combination of mechanical, chemical, roasting, and smelting processes to convert ores and concentrates into metals. See Section E 4 for more detail. Most of the facilities required flat space, a source of abundant water, and well-graded roads, and they tended to be limited in scale and variety of components. The smelters usually featured several large buildings, high-volume coal and coke bins, and several characteristic furnaces. Companies usually planned smelter complexes according to a master surface datum in organization of buildings and infrastructure, and as a result, the various components shared a common orientation. Slag, the waste produced by smelting ore, almost always lies around a smelter site and it manifests as fine-grained or glassy cobbles dark gray to black in hue.

When the Dibben Smelter at Argentine was photographed during the late 1890s, it had already been long abandoned. The facility is typical of the smelters built in Clear Creek drainage during the late 1860s and early 1870s, with local stone chimney and furnace, and small building built over several stairstep foundations. The masonry and foundations are all that remain from most smelters of the vintage. Courtesy of Denver Public Library, X-61397.

No smelters are presently intact in the I-70 Mountain Corridor, and most sites suffered various impacts after the smelter was removed. As a result, most identifiable sites will possess physical integrity on an archaeological level at best. Commonly, stairstep terraces or platforms represent the building and general stages of ore preparation and smelting. Unfired crude ore, bin foundations, and a foundation for a jaw crusher should be evident on the highest terrace. The lowest terrace will offer evidence of the furnaces and blowers. Masonry foundations, brick rubble, and slag flows mark the locations of the furnaces, and machine foundations might remain from the blowers. Features reflecting screening and concentration machinery may lie on intermediate terraces. Smelters almost always had assay shops, and a shop platform should be present on or near the lowest terrace. Aspects of water and power systems are likely, as well. High volumes of slag and clinker from furnace fuel are telltale characteristics of smelter sites.

Smelter Significance

Smelters were important in the development of silver mining in western Clear Creek drainage and helped the industry become Colorado's first significant silver producer. They also were a proving ground where metallurgists tested smelting processes on Colorado's resilient ore, made progress, and applied the experience in successful plants elsewhere. Smelters also supported gold mining in the eastern drainage by providing a local means for treating complex ore. The trends and historical patterns relevant to smelters are summarized below as the NRHP areas of significance. They include Commerce and Economics, Community Planning and Development, Engineering, and Industry.

Period of Significance must be considered when assessing the historical importance of smelters. Although the Period 1859 to 1942 covers mining as a viable industry throughout the I-70 Mountain Corridor, smelting was limited to Clear Creek drainage, and only during two time periods. The first was in the western drainage from 1865 until 1875, where metallurgists pioneered silver smelting. The second was in eastern Clear Creek drainage from 1885 through 1895, where several smelters processed complex gold ore.

Areas of Significance: Commerce and Economics: Smelters were significant in the areas of *Commerce* and *Economics* on local and statewide levels primarily in two ways. At the local level, the facilities in the western drainage converted silver ore into an unrefined blend of silver and industrial metals known as matte. In the eastern drainage, the smelters produced gold matte. Cast as bricks, the matte was a cash product shipped to the Midwest in exchange for income. The smelting companies then diverted some of the money into local economies as wages for workers, pay for contractors, and acquisition of small items from merchants. In so doing, smelting companies supported the development of local economies and commercial systems.

On a statewide level, the smelters in the western drainage produced the earliest silver matte in Colorado. The income was important to the territory because the overall economy was poor and in need of such contributions at the time. Also, the successful production of silver encouraged investment, which provided the capital required for further growth in mining.

Area of Significance: Community Planning and Development: Smelters participated in the area of *Community Planning and Development* through a presence in the communities of Bakerville, Georgetown, Empire, and Silver Plume. Company organizers sited their plants in these communities to be near a workforce, shipping points, water, and commerce. The smelters, operating between 1865 and 1875, were important because they anchored growth patterns when the communities were young, in development, and in flux. Further, the smelters attracted other mills and freighting services, which established the communities as local ore treatment centers. In the eastern drainage, smelters reinforced existing community development patterns at Idaho Springs.

Area of Significance: Engineering: The *Engineering* Area of Significance applies to smelters on local and statewide levels. At the local level, smelter operators employed engineering in designing individual structures and systems, as well as planning entire smelter complexes. Engineering was primitive and vernacular at the smelters in western Clear Creek drainage between 1865 and 1875. Vernacular engineering refers to structures and systems built by individuals who were not formally trained in metallurgy, mechanics, and furnaces. The individuals adapted familiar smelter designs and construction principals primarily from lead districts in Missouri, Wisconsin, and Minnesota. Frontier conditions such as available materials and equipment, and the natural environment were influencing factors in their designs. Although the smelters were highly inefficient and sometimes failures, they were important steps in understanding how to recover silver from ore in the western drainage. Resolution to problems posed by the ore allowed mining to then boom.

At the smelters around Idaho Springs, trained engineers and metallurgists adapted standard smelting principals to the character of the ore, expected tonnage, and available equipment and materials. Their guided interpretations were expressed as the smelter design, treatment flow path, small-scale structures, and ultimate success. Working capital, environmental conditions, and then-current processes heavily influenced how metallurgists built their smelters. When a smelter was planned well, it enabled mining companies to produce higher tonnages of lower grade ore from deeper workings than was otherwise possible. In so doing, successful smelter engineering prolonged the lives of many mines, which contributed to eastern Clear Creek drainage.

On a statewide level, the period adaptations in smelter design and interpretations of ore treatment were critical steps in the ultimate success of silver smelting, and hence silver mining, in Colorado. Beginning in 1865, the western drainage was the first region in Colorado to yield silver ore in meaningful tonnages. The ore was complex, however, defying conventional metallurgical practices and methods effective for metals in other regions. In response, both trained metallurgists and inexperienced smelter operators imitated known smelter designs with limited success. Although metallurgists then adapted the designs, most of the period smelters failed and only a few were successful. But both the failures and successes were important steps that metallurgists built on. Based on lessons learned in the western drainage, metallurgists ultimately developed truly effective smelters for complex ore. The effective designs in turn allowed silver mining to thrive and become one of Colorado's principal industries.

Area of Significance: Industry: Smelters were important to *Industry* in Clear Creek drainage by fostering mining. When silver mining began in 1865, the industry was precarious because no ore treatment facilities existed, and smelters were necessary for profitable ore production. Metallurgists and inexperienced investors quickly responded by building smelters to fill the unmet demand. Although most of the smelters were small and inefficient at best, they were critical in several ways. First, some produced silver matte, demonstrating that the ore could, in fact, be effectively treated. This encouraged mining claim development, ore production, and further efforts to improve smelter designs. Second, the smelters legitimized silver mining and drew needed investment and expertise. The silver industry was then able to gain a foothold in the region and become a major employer, foundation of commerce and communities, and magnet for railroads and other development. By the time smelters were built in Idaho Springs, mining was already one of the most important forces shaping history in the central mountains. The smelters there reinforced this pattern.

Smelter Registration Requirements

To qualify for the NRHP, smelters must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Smelter sites eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important in their immediate area or community, or Colorado.

Criterion B: Smelter sites may be eligible under Criterion B when they can be directly tied to an important person. The operators and managers of most smelters can be identified, with metallurgists and engineers attributable to large complexes. In these cases, they can be eligible under Criterion B provided significance is through the person's presence on-site and participation in operations. The site must retain physical integrity relative to the person's productive period of time, and when the person achieved importance. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the smelter. A brief biography is necessary to explain the individual's significant contributions. Important people commonly invested in smelters or directed companies but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Smelter sites may be eligible under Criterion C if they clearly reflect a type of smelter. Because few if any smelters remain intact, integrity will be on an archaeological level. Distinguishing site characteristics must be present, and may vary for the different smelter types. In the case of early smelters, remnants of the masonry hearth or furnace should be discernable. At later smelters, the base for freestanding furnaces should be identifiable. In general, the smelter footprint, terraces, aspects of infrastructure, and support facilities should be represented by features and artifacts. The general flow path for the ore from input to furnace should be traceable, but the process specifics can be approximated. Intact structures and equipment, a high degree of integrity, or character-defining engineering or architectural features strengthen a site's potential eligibility. Important engineering and architectural features include intact buildings, structures, and machinery.

Smelter sites are potentially eligible under Criterion C when they are contributing elements of historic mining landscapes. Even when a smelter is not completely intact in itself, the site's visual impact may contribute to the setting and feeling of an area. Preserved terraces, foundations, and slag dumps are critical contributing elements.

Criterion D: Smelter sites may be eligible under Criterion D if they hold a high likelihood of yielding important information upon further study. The sites can contribute in three general ways. The first is buried archaeological deposits such as privy pits, thick boiler clinker dumps, and refuse layers in tailings dumps. The deposits may include artifacts capable of enhancing our current understanding of workplace behavior, diet, and substance abuse. If the workers lived on-site, residential deposits may illuminate the currently dim portrait of mill workers and their lifestyle. Second is a good assemblage of structures, foundations, or machinery for the ore treatment process. Detailed examination may reveal how metallurgists designed smelters for complex silver and gold ore and chose machinery and furnaces accordingly. The third is a well-represented infrastructure. Documentation may demonstrate how engineers designed water, power, ore input, and slag disposal systems.

Eligible smelters must possess physical integrity relative to one of the important timeframes outlined above. Because few if any smelters are presently intact in the I-70 Mountain Corridor, integrity will be on an archaeological level. Archaeological remains retain sufficient integrity when they permit the virtual reconstruction of the smelter, its timeframe, and convey the site's significance.

Most of the seven aspects of historic integrity defined by the NRHP apply to smelters. Some sites may possess standing structures and objects, which must retain the aspect of *location* to contribute to a resource's integrity. For integrity of *location*, the structure or object should have been present during the operating time period. For a resource to retain the aspect of *design*, the resource's material remains, including the archaeological features, must convey the smelter's organization, planning, and engineering. In many cases, smelters were converted to ore treatment mills with different machinery and treatment flow path. In such cases, a site can retain the aspect of *design* if the material remains clearly reflect the evolution of the plant over time. To retain the aspect of *setting*, the area around the smelter, and the site itself, must appear similar today as when it was developed. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of smelting from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where structures, machinery, and other visible features remain to convey a strong sense of connectedness between a smelter site and a contemporary observer's ability to discern the historic activity at the location.

MINING SETTLEMENT AND RESIDENCE PROPERTY TYPES

Between 1859 and around 1920, prospectors, miners, and industry participants examined nearly every, if not all, the canyons, gulches, hills, and mountains in the I-70 Mountain Corridor. In those locations where industry participants spent appreciable amounts of time, they usually established residences. Every mining district featured at least isolated prospectors' camps and collections of residences, and where the mines and prospects were numerous and closely spaced, the accumulation of residences formed what can be referred to as settlements. Many settlements such as Wheeler in Ten Mile Canyon or Silver Creek in Clear Creek drainage never progressed beyond an informal status, but when a local mining industry showed signs of permanency and the population grew large enough, some of the settlements matured into formally organized towns.

As places of inhabitation, the residences common to the mining industry fall into several broad categories. In ascending order of complexity and population, related Property Types are prospector's camp, workers' housing, unincorporated settlement, and townsite. Their descriptions and registration requirements are provided below.

PROPERTY TYPE: PROSPECTOR'S CAMP

The prospector's camp photographed on Horse Mountain south of Eagle in 1913 reflects how little field accommodations changed since the 1860s. The camp is typical with several wall tents on a cut-and-fill platform, and few if any other improvements. Courtesy of Denver Public Library, CHS-X5655.

When examining an area or developing a claim, prospectors usually established camps intended to be impermanent. The camps were simple, often lacked formal buildings, and were abandoned after brief occupation. A typical camp included a wall tent or log cabin, a privy for sanitation, an open area for domestic activities, and possibly a fire ring for outdoor cooking. Prospectors also built corrals with stumps, brush, and natural obstacles as fencing. In the camp, the prospectors chopped firewood, may have conducted blacksmithing, prepared and ate food, and threw refuse downslope.

Because the camps were temporary and occupied briefly, only the barest of material evidence remains today. Camps inhabited by individuals and pairs of prospectors tend to be represented by a single tent platform, a sparse scatter of food cans, and little else. In some cases, groups of prospectors established camps of several tents or a log cabin as a more permanent base of operations. For an assemblage of residential features to qualify as a prospector's camp, it must be directly associated with prospect workings or be in an area subjected to prospecting. If a site features evidence of substantial buildings and lengthy occupation, it may be one of the resource types described below such as Workers' Housing. Prospectors' camps often lie within larger complexes such as groups of excavations or placer workings, for example. In such cases, the resource is a component of that larger site and should be recorded as such.

Prospector's Camp Significance

Prospectors' camps were a function of hardrock prospecting, which was fundamental to I-70 Mountain Corridor history. Prospecting was an essential step in finding and defining the profitable ore formations on which the mining industry was founded. That industry, in turn, was the principal engine for most of the settlement, transportation networks, dependent industries, land use patterns, and other trends throughout the corridor. The important trends and historical patterns specific to prospecting and associated camps are summarized below as the NRHP areas of significance. The trends and patterns include Exploration/Settlement, Industry, and Politics/Government.

When assessing the historical importance of prospectors' camps, Period of Significance must be considered. Although the Period 1859 to 1942 covers mining as a viable industry throughout the I-70 Mountain Corridor, narrower timeframes of importance are more applicable to prospecting by region. Prospecting generally occurred during the formative years of a mining industry. In Clear Creek drainage and the Dillon and Frisco area, the industries were separate and followed their own chronologies, defined below. There was limited prospecting around Eagle and Gypsum, as well, intermittently between 1880 and 1915.

Timeframes of significance for prospecting in Clear Creek drainage differed for gold and silver. Prospecting for gold was important throughout the entire drainage from 1859 through 1864. The search for gold then contracted to the eastern portion, from Floyd Hill west to Empire, between 1865 and 1910. Silver prospecting was important in the western drainage, from Empire west to Loveland Pass, between 1864 and 1893. Although some prospecting occurred afterward, it contributed little to the mining industry because the principal ore formations had already been found and developed.

Prospecting was significant in the area around Dillon and Frisco between 1878 and 1885, and again from 1897 until 1905. During the first period, prospectors located the principal silver veins and characterized the region's geology, providing a foundation for the mining industry. Declining silver values ended the period. The second timeframe occurred during the region's mining revival, and prospectors found additional silver veins that supported growth of the industry. The timeframe ended when the region had been thoroughly examined

Area of Significance: Exploration/Settlement: Prospectors' camps participated in the Area of *Exploration/Settlement* as bases of operation and residence on the central Rocky Mountain mining frontier. Individual prospectors and prospect outfits were on the forefront of the frontier and laid the groundwork for the establishment of regional mining industries. Working from their camps, prospectors were usually the first to conduct extensive physical and mineralogical exploration, and they relayed information critical to subsequent mining interests and settlers. Prospectors and prospect outfits were among the first Euro-Americans to inhabit the I-70 Mountain Corridor, especially when a rush developed, and brought political, economic, and social systems. Localized mining industries and settlement patterns then quickly followed. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Area of Significance: Industry: The initial growth and development of the mining industry was a movement that began with prospecting. With support from their camps, prospectors located and then began developing hardrock veins. Within a short time, outside investors organized companies that purchased and then improved the primitive operations. Although most failed, some became profitable and in turn inspired confidence among other investors, who felt encouraged to do likewise. Their capital combined with the numerous prospectors, increasing numbers of other people, and regional development, became a mining industry. Cumulatively, individuals and the companies, regardless of size, improved the transportation networks, reinforced extant settlement patterns, contributed to local economies, and established commercial and communications systems.

Area of Significance: Politics/Government: The Area of Significance applies to prospectors' camps in Clear Creek drainage dating from 1859 through 1864. The prospectors who lived in the camps participated in organizing the region's earliest mining districts, which codified laws, governing bodies, and documentation. The frontier legal system defined hardrock claim types, rights, and sizes as well as crime and punishment. The Territorial Legislature then included many of the definitions and rights in its 1861 charter.

Prospector's Camp Registration Requirements

National Register-eligible prospector's camps must meet at least one of the NRHP Criteria below and possess related physical integrity.

Criterion A: Camps eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends important in their host segment of the I-70 Mountain Corridor.

Criterion B: Camps may be eligible under Criterion B when they can be directly tied to an important person. Certain circumstances apply. First, the individual must have lived in the camp. Second, the site must retain physical integrity relative to the person's productive period of time, and when the person achieved importance. Integrity on an archaeological level is sufficient if the features and artifacts clearly represent the camp.

A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in prospect operations or owned claims but did not occupy the camp. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, few camps will be eligible under Criterion B because it is extremely difficult to attribute the workings to an important person. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Prospectors' camps can be eligible under Criterion C when their features and artifacts clearly represent the resource type. Because tents, buildings, and items of value were usually removed or collapsed, integrity is expected to be on an archaeological level. Character-defining attributes include a tent or cabin platform, refuse scatter, and possibly a corral or blacksmith forge. Such cams represent the typical residences associated with mineral examinations and discoveries, the beginnings of mineral booms, and the general exploration of the region. Intact buildings and facilities necessary for prospecting, such as cabins and field forges, are rare and contribute to eligibility. Clearly definable camps with integrity are uncommon, and few well-preserved examples survive.

Criterion D: Prospectors' camps may be eligible under Criterion D if a site will likely yield important information upon further study. In cases where camp sites possess building platforms, privy pits, and refuse dumps that feature buried archaeological deposits, testing and excavation may reveal information regarding the lifestyles, social structures, and demography of prospectors, as well as the presence of families and women. Such studies are important because these subjects were not extensively documented at the time. In general, however, few resources are likely to be eligible as occupation was brief and archaeological deposits are unlikely.

Prospectors' camps must retain physical integrity relative to one of the timeframes mentioned above. Because buildings and structures either decayed or were removed after the camp was abandoned, integrity will probably be on an archaeological level. To be eligible, the archaeological features and artifacts must clearly reflect the camp, its timeframe, and content.

The most applicable NRHP aspects of historic integrity will be *location*, *design*, *setting*, *feeling*, and *association*. Intact buildings and structures must be in their original places of use to retain integrity of *location*. A resource retains integrity of *design* when the overall feature assemblage reflects the camp's layout and relationship to the environment. Integrity of *setting* requires the terrain around the camp, and the resource itself, to appear similar today as when it was developed. If the camp was isolated, then the natural environment should be preserved. If the resource is in a mining landscape, then nearby mines and other resources should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of mineral exploration, both from a historical perspective and from today's standpoint. Integrity of *association* exists in cases where prospect workings, structures, and other visible features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic operation.

PROPERTY TYPE: WORKERS' HOUSING

By definition, workers' housing is usually associated with, and a residential component of, one of the mining industry Property Types discussed above. When workers' housing can be attributed to a specific industrial or business entity, it does not qualify as a resource in itself and would, instead, be part of the associated complex. Workers' housing may be classified as an independent resource under several conditions:

1. When workers' housing cannot be tied to a specific industrial complex. For example, residences may lie near a cluster of mines, and yet be far enough away so that the residences cannot be attributed to one specific operation.
2. When the residences are within a town dependent on mines or mills, and whose population was dominated by industry workers. In company-dominated towns, most residences are workers' housing.
3. When the residential features are a component of a larger industrial site, but the industrial aspects have been destroyed or have little integrity. The residential features may be the only surviving portion of the site. In this case, the residential features would be a site in themselves, but the lost or damaged industrial complex should be noted.

Boardinghouses, or their archaeological representations, are the most common resources clearly identifiable as workers' housing. This abandoned building once housed Conqueror Mine workers at North Empire. Courtesy of Denver Public Library, X-12513.

As a resource, workers' housing includes all features associated with inhabitation and other domestic activities. The sites were usually complexes centered on at least one residential building, and often several. The buildings may have been cabins or formal houses occupied by a miner and family or shared by two to four unmarried workers. Boardinghouses provided accommodations for four or more unmarried workers, who dined and spent leisure time in a communal setting. Isolated mines and mills commonly had boardinghouses for the workers and separate cabins or houses for the superintendent and family. Typically, archaeological features such as building platforms, foundations, and ruins represent the residential buildings today.

Workers' housing complexes almost always possess additional features, primarily archaeological in nature. Privy pits and refuse dumps reflect primitive waste disposal practices. The dumps usually extend downslope from the residence doorway and consist of domestic refuse, primarily materials generated by food preparation. Residents usually cleared an area by the building for chopping firewood, cleaning laundry, and other outdoor activities. Complexes for numerous workers often included root cellars for the storage of perishable food such as meat and vegetables.

Workers' Housing Significance

By providing accommodations for labor, workers' housing was a function of hardrock and company placer mining. The industry was not only locally important in Clear Creek drainage and the Dillon and Frisco area, but also part of a larger, highly influential movement in the central Rocky Mountains. The greater mining industry underwrote most of the communities, transportation networks, dependent industries, land use patterns, and other trends throughout the I-70 Mountain Corridor. The principal trends and historical patterns relevant to Workers' Housing are summarized below as the NRHP areas of significance, and include Architecture, Community Planning and Development, Exploration/Settlement, Industry, and Social History.

Period of Significance must be considered when assessing the historical importance of workers' housing. The Period 1859 to 1942 covers mining throughout the I-70 Mountain Corridor, but narrower timeframes of importance are more applicable by region. The industry in the Dillon and Frisco area was distinct from Clear Creek drainage, and each followed its own chronology. Mining was important throughout Clear Creek drainage from 1859 through 1864. Gold production declined for a time, replaced by silver in the western drainage from Empire west to Loveland Pass. Silver mining was significant on local, statewide, and national levels from 1865 through 1920. Gold production of substance resumed in the eastern portion, from Floyd Hill west to Empire, in 1873. Gold mining then became important on local, statewide, and national levels from 1873 through 1918. The industry was largely quiet and unimportant during the 1920s but returned to local and statewide significance from 1930 through 1942. Hardrock mining was locally significant in the area around Dillon and Frisco during three time periods. The first spanned 1878 through 1885, the second from 1890 into 1893, and the last 1898 until 1920.

> *Area of Significance: Architecture:* The area of *Architecture* applies to intact Workers' Housing buildings, and specifically cabins, houses, and boardinghouses. Historically, small houses and cabins tended not to be involved with major engineering or architectural contributions. However, they represent the simple and austere architecture typical of wage workers in mountain mining communities. Boardinghouses reflect residential engineering and architecture built to accommodate mine workers in mountain communities. Further, those at mines were company housing. In constructing the above residence types, workers and companies adapted familiar building designs and

construction methods to Rocky Mountain mining conditions. Influencing factors included local climate, community, and natural and industrial landscape features. In many cases, economic constraints, traditions in construction, interpreted needs, and available building materials also influenced adaptation of designs and methods. As a result, workers and companies contributed to existing patterns of functional and yet cost-effective mining industry architecture.

Area of Significance: Community Planning and Development: The area of *Community Planning and Development* is relevant to the workers' housing present in corridor settlements. In one sense, the need for workers' housing directly supported community growth. Workers' housing drew residents who became part of a community's population, which increased with available housing. The residents were working-class, many with families, who tended to support local businesses, participate in the community, and provide stability.

In another sense, workers' housing influenced community growth patterns and evolution. Workers' housing was usually concentrated in specific portions of a community, which residents recognized as labor-based neighborhoods. Preferring to live apart from labor, middle and upper-class residents formed their own enclaves in other portions of a settlement. Similarly, businesses frequented by labor clientele gravitated to the working-class neighborhoods, while businesses that catered to upper classes opened near their customer base. The result was an evolution of commercial and residential patterns based on class.

Some settlements were exclusively workers' housing and grew organically in response to local employment. In these communities, miners built cabins and houses to be near their points of work. Silver Creek in Clear Creek drainage is one example. A few settlements were established by mining companies specifically to house their employees. Workers' housing was a foundation for these types of settlements, which were important by supporting the mining industry.

Area of Significance: Exploration/Settlement: Workers' housing is important in the Area of *Exploration/Settlement* through its direct and close association with the mining industry. Relevant timeframe is 1859 through 1880 in Clear Creek drainage, and 1878 through 1885 in the Dillon and Frisco area. During these periods, mines and workers' housing were physical anchors for the frontier in the central Rocky Mountains. With the support of housing, miners penetrated most of the region, quantified its general geography, and outlined the economic geology. Through claim examination, sampling, and development, they prepared the region for investors and companies willing to risk capital. Localized mining industries and associated settlement patterns, including workers' housing, then quickly followed. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Workers' housing was a form of mining frontier settlement in itself. Concentrations of cabins and boardinghouses erected near groups of mines evolved into unincorporated settlements, which in turn evolved into towns. The numerous cabins and boardinghouses at isolated mines scattered throughout the mountains were a disbursed settlement pattern characteristic of the frontier.

<u>Area of Significance: Industry:</u> Workers' housing was important in the Area of *Industry* as an essential component of the mining industry. During the earliest years in Clear Creek drainage and the Dillon and Frisco area, mining companies were on the forefront of the frontier and brought social, economic, governmental, and transportation systems. As the industry grew, it became one of the most important forces shaping history in the central mountains. The industry was the largest employer, supported most of the communities, fostered commerce, drew railroads, and influenced politics and government. By producing an enormous amount of gold, silver, and industrial metals, the industry supported the regional economy and contributed on a statewide level. The industry also was the foundation of Euro-American settlement, which outlived the industry itself.

<u>Area of Significance: Social History:</u> As places of residence for mine labor, workers' housing is associated with the area of *Social History* as applied to the mining industry. Communal households were a place of cultural practices, preferences, and traditions, be the cultures American or from other countries and ethnicities. These traditions and values were adopted whole or in part by the residents, who carried them elsewhere. The result was cultural diffusion and evolution characteristic of Rocky Mountain mining.

<u>Workers' Housing Registration Requirements</u>

To qualify for the NRHP, a workers' housing building or complex must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above, as well as the events and trends important in the mining industry, or the host area of the I-70 Mountain Corridor.

Criterion B: Workers' Housing may be eligible under Criterion B provided that an important person lived at the site. The resource must retain physical integrity relative to that person's productive period of occupation and date to the same timeframe when the individual achieved significance. Integrity on an archaeological level is sufficient if the resource clearly reflects the housing. Few residences are expected to qualify because most workers did not render significant contributions. If a worker was important, then the researcher must explain the person's significant contributions in a brief biography. In some cases, important people owned housing or invested in associated companies but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Workers' housing can be eligible under Criterion C under several conditions. Here, it is best to discuss standing buildings separately from archaeological sites.

Currently, workers' residences in the forms of cabins, houses, and boardinghouses stand intact in Clear Creek drainage and in the Dillon and Frisco area. Small and simple houses and cabins, the most common types of residences, are representations of the simple and austere architecture typical of wage workers. The researcher must define the building type, timeframe, architectural style, and why the building is an important example. Boardinghouses are uncommon and reflect the adaptation of residential architecture to the needs of both the mining industry and the community. It should be noted that relatively few residential buildings retain integrity relative to a single timeframe due to alterations.

In a few cases, residential buildings may be representative examples of works by important architects and builders. The researcher must identify who the individual was and provide biographical information explaining why the person was important.

If the residence possesses innovative architectural aspects and retains integrity relative to the timeframes noted above, it may be eligible as an example of its type. Innovative aspects include adaptations of conventional architecture to environmental, climatologic, and geographic environments. They can also include unusual designs, functions, construction methods, and materials uses.

Many residential buildings are located in existing historic mining communities. If the community retains integrity as a whole and was important, a residence may be a contributing element if it is compatible in timeframe and appearance. Such residences contribute to the community's historic feel and ambiance. In such cases, the residence may be eligible because it belongs to a greater whole of importance.

Outside of existing communities, most workers' housing complexes have collapsed or have been removed, leaving archaeological features such as building ruins, building platforms, and privy pits. When on an archaeological level, the complexes can be eligible if they offer important or defining characteristics and attributes, and possess integrity relative to one of the timeframes above. Archaeological integrity requires intact assemblages of surface artifacts and non-architectural features clearly conveying the organization and infrastructure of the housing and aspects of the residents and their lifestyles. Such resources can be described as archaeological examples of workers' housing. Design of the complex is an important attribute, and the design may have been formal or a spontaneous response to local conditions. Evidence of how the residents inhabited the complex, conducted domestic activities, and added support facilities are additional attributes. Intact artifact assemblages are important because they reflect resident demography and lifestyle.

Even when reduced to archaeological features, housing complexes may be eligible as contributing elements of a greater whole when part of a historic community. The researcher must note that the complex retains archaeological integrity and contributes to the settlement's historic fabric, which is defined as the sum of the settlement's archaeological features.

NRHP Criterion D: Workers' housing offers a high potential for eligibility under Criterion D because it may contribute meaningful information in several areas. An analysis of a complex and any architectural features may enlighten the existing understanding of workers' housing and the residential environment associated with the mining industry. Workers' housing complexes often possess a diverse array of artifacts found on ground-surface. Building platforms, privy pits, and refuse dumps feature buried archaeological deposits with artifacts of a different nature. An analysis of both may reveal information regarding the lifestyles, social structures, and demography of workers, as well as the presence of families and women. Such studies are important because these subjects were not extensively documented at the time.

Eligible resources must possess physical integrity relative to one of the timeframes noted above. Intact buildings retain integrity when the period, appearance, design, and form are clearly evident. Additions and modifications tend to degrade integrity, although buildings may be eligible if they reflect evolution in use, tastes, materials, and construction methods over time.

Because most buildings outside of existing communities either collapsed or were dismantled, integrity will probably be on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the locations and arrangements of buildings and reflect aspects of the residents and their lifestyles.

Most of the seven aspects of historic integrity defined by the NRHP apply to workers' housing. Some complexes may possess standing buildings, which must retain the aspect of *location* to contribute to a resource's integrity. To retain integrity of *location*, the housing should be that present during the timeframe of occupation. For a resource to retain the aspect of *design*, the material remains, including archaeological features, must convey organization and planning applied to workers' housing. Resources may feature standing buildings that were reoccupied periodically. Residents may have altered a building and constructed additions, and in such cases, the building can retain the aspect of *design* if the material remains reflect sequential evolution. In integrity of *materials* and *workmanship*, the existing materials and workmanship should be those used during the timeframe. To retain the aspect of *setting*, the area around the resource, and the resource itself, must not have changed a great degree from its timeframe. If the resource lies in a mining landscape, the surrounding mines and industrial features should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of residence during the timeframe of occupation. Integrity of *association* exists where features convey a strong connectedness between the resource and a contemporary observer's ability to discern its function as workers' housing.

PROPERTY TYPE: ISOLATED RESIDENCE

Isolated residences are places of developed inhabitation not clearly tied to, or associated with, a specific industry or other pattern of subsistence. Such resources lack obvious characteristics that represent prospecting, mining, logging, transportation, or homesteading. Determining whether a resource in a mining district is an isolated residence can be subjective because it may have served as base of operations for prospectors, hunters, or homesteaders. Isolated residences are very simple and usually consist of a few residential features with no industrial or commercial attributes. Since the resource is not directly tied to a form of subsistence, occupation was usually brief and the volume of artifacts low.

Isolated Residence Significance

By definition, isolated residences cannot be directly attributed to an industry or other pattern of subsistence. For this reason, areas of significance remain unknown until detailed studies or archaeological investigations of a given site provide clarifying information.

Isolated Residence Registration Requirements

Isolated residences are common resources and lack defined significance because they cannot be tied to a specific industry or means of subsistence. However, buried archaeological deposits may clarify which industry the residents were associated with. If this seems likely, then the site may be eligible under Criterion D.

PROPERTY TYPE: MINING SETTLEMENT

Property Subtype: Unincorporated Settlement: Popularly known as mining camps, unincorporated settlements were informal communities established in response to several stimuli. They also served combinations of purposes. Mineral booms were among the most common reasons behind unincorporated settlements. When prospectors and miners joined a local rush, they tended to erect residences in a common area that offered flat ground, open space, and water. Informal settlements also grew as bedroom communities to house the workforce of a primary industry.

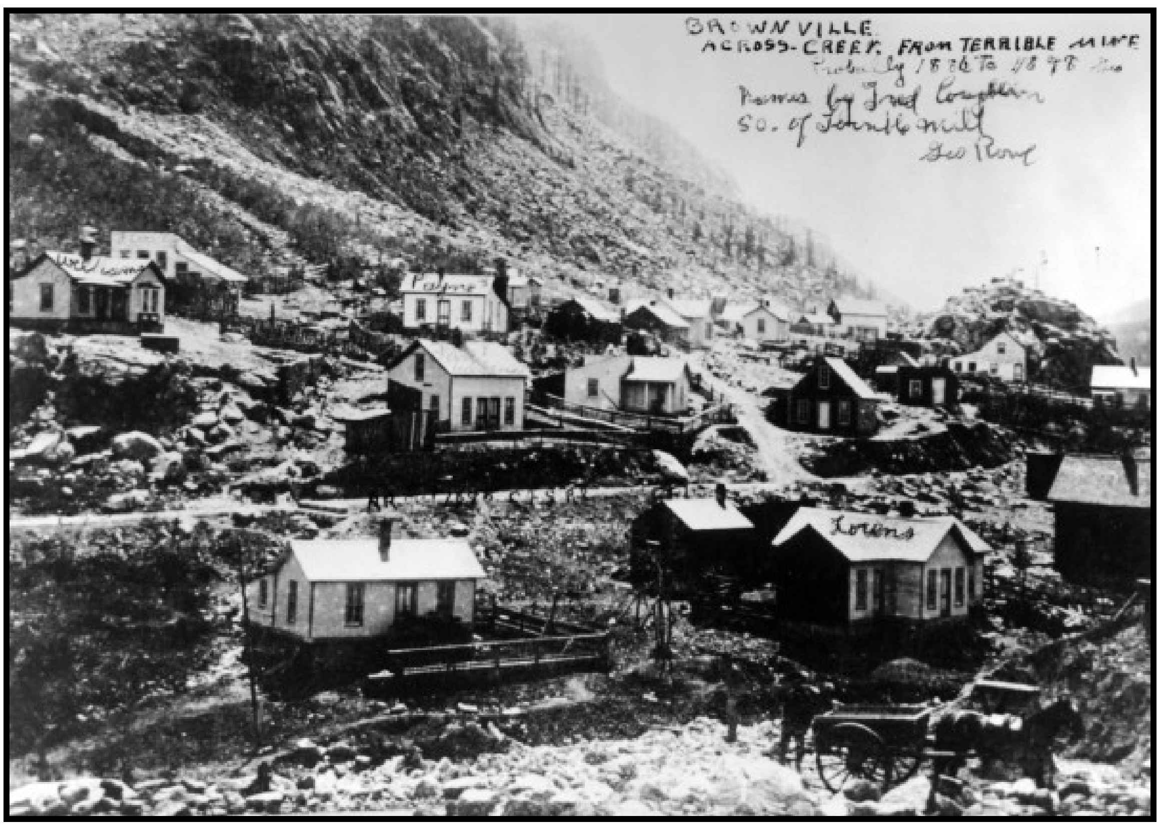
Unincorporated settlements were rarely planned in advance and instead evolved organically according to local housing needs. The communities usually possessed no formal organization or infrastructure, and their buildings tended to be disbursed among the most favorable microenvironments. Mining companies and individual workers built residences near their points of employment, and this took form as a settlement when concentrated in one area. When the population became large enough, entrepreneurs and community activists established basic services and businesses such as a post office, mercantile, saloon, and combination restaurant and hotel. The businesses then became the settlement center, although residences were few and scattered around.

As a center for a working population, an unincorporated settlement usually was the hub of a local transportation network. Several wagon roads linked the settlement with the nearest nodes of commerce, and packtrails fanned out to places of employment. Because draft animals were a principal transportation method, residences for multiple people had corrals. Sanitation was limited to privies, and water came from streams, springs, and wells. By the 1900s, some settlements enjoyed electricity for lighting, wired from nearby mines or mills.

Architecture tended to be vernacular in appearance and form. The buildings were rarely designed by architects and were instead planned in the field primarily for function and economy. The residents imitated familiar methods and forms as best they could, and adapted them to the local environment and incorporated available materials. Milled lumber was preferred for its regularity, but residents substituted local building materials such as logs and stone masonry.

When a settlement was in infancy, almost all its buildings were wall tents, small cabins, and buildings with any combination of logs, lumber, and canvas. Mature settlements often featured at least several substantial frame buildings, as well as log cabins with plank or board-and-batten siding for a formal appearance. By the 1900s, residents made increased use of corrugated sheet iron and imitation brick siding. Some business buildings had false fronts, and nearly all possessed gable roofs.

Today, few if any unincorporated settlements survive in high states of preservation. Although some settlements may still possess intact buildings, most have been reduced to archaeological sites. Features such as earthen platforms, foundations, and ruins represent the buildings. Such remnants are usually center to associated features such as yards, refuse dumps, privy pits, root cellars, and wells. At sites completely overgrown with sod, differentials in vegetation may outline any or all these features. If a researcher suspects a site to be an unincorporated settlement, then the researcher should survey a large area for outlying residences, primitive infrastructure such as community springs, and industrial complexes. Companies frequently built ore treatment mills and sawmills in drainages near settlements.



Brownville, pictured near Silver Plume during the late 1880s, is a good example of an unincorporated settlement. Little if any planning, surveyed grids of lots and blocks, or other organization is evident. Instead, the settlement grew organically at the intersection of several roads, with houses, mostly vernacular in design and appearance, located as the builders wished. Courtesy of Denver Public Library, X-7233.

Property Subtype: Townsite: Of all the resource types in the I-70 Mountain Corridor, townsites range the most in preservation, original elements, and authenticity. Some small towns changed little after their boom period, while others have been moved and include buildings modified to appear old. Although townsites certainly hold the potential to be eligible for the NRHP, applying the Criteria is more complicated than all the other types of mining resources. Small and simple townsites may be recorded and evaluated as individual entities and can be treated in a manner like the unincorporated settlements discussed above. But the large towns such as Georgetown and Frisco, with their numerous buildings and extant populations, require an approach different from a context generalized to the mining industry. Section F attempts to establish basic guidelines for addressing architecture, but the large towns warrant a separate context designed for architectural surveys and evaluating buildings in the urban environment. This is beyond the scope of the present guide. Below are broad eligibility guidelines only for small and simple townsites.

When a mineral boom matured from prospecting toward development and production, the new industry often drew a working-class population that demanded goods and services. The shift ushered in a stage of growth, and a common result was the evolution of unincorporated settlements into organized towns. In many cases, the towns remained small and were abandoned within a short time, but if the industry was successful, some became large and sophisticated.

Small or large, both forms of community shared some basic physical characteristics. An identifiable business district was the most elementary, offering goods and services proportional in volume and diversity to the population and demography. Towns in early stages of growth usually featured a few mercantiles, saloons, restaurants, and hotels, as well as a butcher, bakery, assayer, laundry, livery, and blacksmith. As the population increased in number and sophistication, entrepreneurs began additional businesses such as newspapers, law practices, surveying, confectioneries, clothing retailers, stationary and book stores, medical and dental, and hygiene. Gaming houses were ubiquitous, and towns large enough to afford some social anonymity also drew prostitution. Although not heavily documented, women and families were an essential and present component of mining town demography and reflected a stable, working-class population. They demanded Victorian-era social institutions such as schools, churches, fraternal organizations, and public meeting halls.

The organization patterns of both small and large towns were similar. Business districts, however small, served as town centers, and they were surrounded by professionally designed residences usually occupied by members of an upper socioeconomic status. In many towns, business proprietors lived in their commercial buildings, which could have been one or two stories in height. The town core conformed to a surveyed grid of lots and blocks, while outlying residences may have been scattered and haphazard in organization. They were usually inhabited by workers and other members of a low socioeconomic status. More workers often rented space in boardinghouses and family homes anywhere in town. As the town grew and population diversified, both the business and residential districts divided further among socioeconomic and even ethnic lines.

The architecture in towns was a function of several factors, including community development, success of the mining industry, timeframe, and distance from shipping and manufacturing centers. In a town's early period, the architecture tended to be vernacular in appearance and form. Builders adapted familiar forms and construction methods to suit function, environmental conditions, and economic resources. The builders preferred milled lumber and some manufactured elements, but made extensive use of local materials when these were costly or unavailable. Logs were common local materials for walls and roof beams, and rocks were used for foundations and other structural elements.

The earliest buildings in a town were wall tents and log cabins. Although the period 1859 to 1885 was early for the corridor in general, the concept of early was also relative to when a specific community was established. Within several years, the residents assembled their buildings from any combination of lumber, logs, canvas, and sheet iron. Frame architecture was preferred but unaffordable until the town had a sawmill or a wagon road to commercial centers. In form, most buildings were simple with rectangular or L-shaped plans, gabled roofs, and one or two stories. Commercial buildings often featured false fronts and plank walks or stoops. In constitution and structure, the buildings usually stood on informal foundations, had roofs sided with shingles or log strips, and featured walls clad with boards-and-battens, planks, or clapboards. By the late 1890s, corrugated sheet iron became a popular construction material. Members of upper classes added some ornamentation to their buildings such as gingerbread trim as a display of their socioeconomic status and to imitate architecture in established cities. Contiguous business districts also had boardwalks to spare patrons from mud.

Architectural improvements were hallmarks of community maturation and economic stability. New buildings tended to be larger than the old, commercial buildings were substantial, and elements of architectural style began to appear. Residents and business owners of upper socioeconomic statuses added the ornamentation necessary to impart Greek Revival, Italianate, and Queen Anne styles on both homes and commercial buildings. Even though some business owners did not attempt a specific architectural style, they still decorated their buildings with lathed columns, molding, ornamental brick- or woodwork, and polychromatic effects.

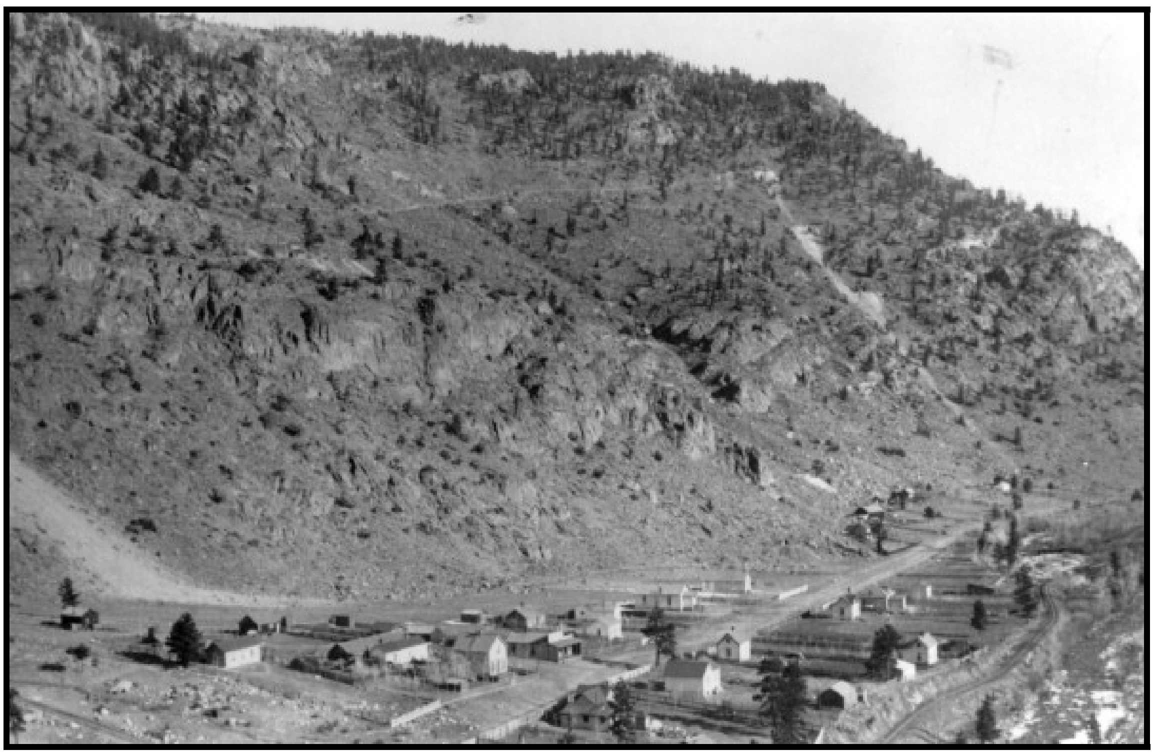
Standardized construction materials superseded logs. An increase in building lot values, the perceived obsolescence of logs, and the attraction of designed frame buildings of greater sizes all contributed to gradual architectural improvement. As a given town continued to grow, brick and stone masonry replaced lumber for some of the most important buildings, primarily in the business district. Fires, a widespread but not guaranteed occurrence, expedited the transition. In response to the popularity of masonry, sheet iron manufacturers introduced imitation brick and stone siding.

Most mining towns possessed infrastructures proportional in sophistication to the success of the mining industry, size of the population, and expectation of permanency. On a base level, most infrastructures catered to transportation, communication, and some forms of public utilities. Transportation infrastructures usually featured trunk roads that carried freight and passenger traffic to the town and feeder roads that extended to the surrounding mines and mills. Streets and footpaths directed traffic within the town, and even though many towns were arranged according to a grid, the roads and paths did not always conform. The ultimate transportation system was the railroad.

Early in a town's development, communication systems were limited primarily to the postal service and newspapers. By the early 1880s, the principal towns enjoyed the telegraph, followed by telephone systems within a few years. By around 1900, many towns of lesser importance also subscribed to telephone service.

Water systems were one form of public utility that saw application in both towns and workers' housing erected by mining companies. Water systems made an appearance in principal towns during the 1870s, and although some minor towns followed during the subsequent 20 years, many small communities never saw water systems. Adoption of flush toilets, bathtubs, and sinks during the 1890s and 1900s fostered a demand for sewer systems in the large towns. Common systems consisted of little more than pipes and culverts that drained into local waterways.

One of the most popular forms of public utility in the principal towns was electricity, which became common in Clear Creek drainage during the 1890s and in Frisco and Dillon in the 1900s. The ability to subscribe to domestic and commercial service was based on socioeconomic status, which excluded many residents until the 1940s.



Lawson, photographed around 1890, embodies many characteristics of a formally platted townsite. A small business district grew along a main street, and residences lie around the district's edges. Overall, the buildings conform to a grid of lots and blocks. Courtesy of Denver Public Library, X-12002.

Every center of mining had at least one developed townsite, and each was important for a wide variety of reasons. As historic resources, the small townsites were similar to unincorporated settlements in form, content, and changes over time. The two types of resources therefore share many characteristics today. State of preservation is one, and most have been reduced to archaeological sites. Site features such as earthen platforms, foundations, and ruins usually represent the buildings no longer standing. Buildings or their remnants are usually center to associated features such as yards, refuse dumps, privy pits, root cellars, and wells. Differentials in vegetation may outline any or all these features in sites not overgrown with trees.

The presence of intact buildings is another similarity between townsites and unincorporated settlements. Many townsites are still inhabited and offer combinations of new and historic architecture, and even those that are not may possess at least one original building. Architectural resources are important because they mark the location of what was a larger entity.

Townsites can differ from unincorporated settlements in the density and variety of archaeological features and artifacts. Historically, defined business districts anchored surrounding residential districts, however small. Thus, the density of archaeological features is greatest at the center of a townsite. Features representing commercial buildings line the main street, residential building platforms flank other streets, and all usually conform to a grid of lots and blocks.

If a researcher suspects a site to have been a town, the encompassing area should be surveyed for evidence of outlying residences, refuse dumps, water infrastructure, and telephone and power lines. Towns often had subsidiary industries such as sawmills, lumber yards, ore treatment mills, and drayage businesses with corrals. These are likely represented by archaeological complexes and can be recorded and evaluated separately if well outside the townsite.

Mining Settlement Significance

Settlements are fundamentally significant through their key roles in the mining industry. In a broad sense, settlements were places of inhabitation for workers, miners, investors, and many other mining industry participants. Residences provided shelter and granted their inhabitants an environment where they could attend to the basic necessities of life. Commercial businesses offered goods, services, and entertainment to the population. Settlements served as bases for cultural practices, leisure, socializing, communication, education, and numerous other activities. Industry was important as well, shaping settlement patterns, demography, feeling, and economies. Industry also fostered dependent enterprises such as consultants, freight outfits, and powerplants. In sum, settlements were the support system for the mining industry and its people. These and other important trends and patterns are summarized as the NRHP areas of significance below. They include Architecture, Commerce and Economics, Engineering, Exploration/Settlement, Industry, Politics/Government, Social History, and Transportation.

Area of Significance: Architecture: The corridor's townsites and unincorporated settlements were centers where utilitarian vernacular architecture was continually adapted for commercial, residential, and industrial use in the mountain mining industry. Townsites also were the prime vehicle for the introduction and adaptation of defined architectural form, design, methods, and styles in the mountain mining industry. It should be noted that when architectural styles changed, they continued to make a fresh presence in mining towns.

<u>*Areas of Significance: Commerce and Economics:*</u> In the Areas of *Commerce and Economics*, townsites and unincorporated settlements were centers of commerce, banking, business, and trade. Townsites and unincorporated settlements also served as anchors and conduits for capital and investment. The presence of established settlements, especially towns, lent legitimacy to a local mining industry, which fostered confidence among potential investors. When able to stay in a settlement, investors were more likely to personally examine a mining district and buy into its operations. Settlements became points through which that capital flowed from investors to associated mines and mills.

On a broad scale, settlements were part of and contributed to complex regional, statewide, and national economic and financial systems. For example, the inhabitants of the corridor's settlements consumed food and other domestic and commercial goods purchased from a variety of sources. Preserved food was shipped from packing companies in the Midwest and on the West Coast while fresh foods came from Colorado farms and ranches. Domestic and commercial produces were acquired from manufacturers in the East, Midwest, and the West Coast. By consuming preserved and fresh foods, settlement residents not only supported a complex national food transportation network, but also helped the development of farming and ranching in Colorado. The consumption of domestic and commercial goods had a similar impact.

<u>*Area of Significance: Community Planning and Development:*</u> Townsites and unincorporated settlements were important in the Area of *Community Planning and Development* in multiple ways. On a broad scale, towns, and to a lesser degree unincorporated settlements, were nodes and centers of infrastructure important to the mining industry. Aspects of infrastructure include transportation, communication, and utility systems. Fulfillment of this role influenced community growth and planning patterns, which in turn reinforced the role.

Townsites, and to a lesser degree unincorporated settlements, were vehicles that brought primitive urban planning to the corridor. Urban planning included townsite plats, organization within communities, passage of municipal ordinances, and business development.

On a regional scale, the townsites and unincorporated settlements influenced the distribution of population, social classes, gender, businesses, and some industrial facilities. The towns tended to draw specialty retail and service businesses, advanced transportation, power generation, upper classes, and diversity in population. Large unincorporated settlements were more industrial with mines, mills, basic businesses, drayage transportation, and working-class families. Primitive unincorporated settlements consisted of transitory populations of workers. The overall pattern was typical of the mining industry.

<u>*Area of Significance: Engineering:*</u> The *Engineering* Area of Significance applies primarily to designed infrastructure systems. Towns and large unincorporated settlements were vehicles that brought basic civil engineering projects to the mountains. Georgetown, Idaho Springs, and Silver Plume received advanced water systems at first for fire safety, and later modified for domestic consumption. These and other settlements also were important nodes in electrical and transportation systems. In building the systems, engineers adapted familiar design and construction principals to the specific

needs of communities. Available materials or equipment, capital, climate, and the environment influenced how the systems took form. Engineers elsewhere emulated the successful adaptations and avoided the failures, building functional systems in communities within and outside the corridor.

Area of Significance: Exploration/Settlement: The Area of *Exploration/Settlement* applies to settlements whose remains date between 1859 and 1880 in Clear Creek drainage, and 1878 through 1885 in the Dillon and Frisco area. During these periods, settlements were physical anchors for the frontier in the central Rocky Mountains. Miners and prospectors living in the settlements penetrated most of the region, quantified its general geography, and outlined the economic geology. The settlements became clearinghouses for the information, which guided investors and companies willing to risk capital. Localized mining industries and associated settlement patterns then quickly followed. The overall movement resulted in the exploration, settlement, and industrialization of the central Rocky Mountains.

Area of Significance: Industry: Townsites and unincorporated settlements were important in the Area of *Industry* through their support of mining. The settlements housed mining industry workers and the businesses that catered to them, as well as mining company offices and dependent industries. Towns were also centers of milling, transportation, communication, and government administration. These functions were vital to the success of the mining industry.

During the earliest years in Clear Creek drainage and the Dillon and Frisco area, the mining industry was a foundation of the frontier. As the industry grew, it became one of the most important forces shaping history in the central mountains. The industry was the largest employer, supported most of the communities, fostered commerce, drew railroads, and influenced politics and government. By producing an enormous amount of gold, silver, and industrial metals, the industry supported the regional economy and contributed on a statewide level. The industry also was the foundation of Euro-American settlement, which outlived the industry itself.

Area of Significance: Politics/Government: In the Area of *Politics/Government*, settlements were centers of law enforcement and judicial systems created in response to social and mining disputes and crimes. Administrative and regulatory bodies later developed in the principal towns, and they oversaw local government activities, claim registration and regulation, and records keeping. Designation as county seat was height of this trend. Settlements also served as polling stations, and overall populations proved instrumental in the election of government officials.

Area of Significance: Social History: Townsites and unincorporated settlements were associated with several trends in the Area of *Social History*. Settlements were centers for diffusion of cultural practices and traditions from a variety of ethnicities. Inhabitants passively followed some cultural patterns, traditions, and ways almost unconsciously in daily life. The inhabitants purposefully sought out other cultural traditions such as performances, lectures, salons, organizations, and community events. The patterns and traditions gradually evolved and diffused through the surrounding region, further influenced by the mining industry, wilderness landscapes, and frontier ambiance. The result was increased diversity and culture typical of the mining west. This mining culture then spread into most of Colorado with the movement of people.

The corridor's townsites and unincorporated settlements attracted a variety of individuals who did not work directly in mines or mills but were important to the development of the social fabric. This included women, families, day laborers, community activists, and businessmen. All were critical in social development. Their arrival fostered a demand for cultural and social institutions that were both embraced and tacitly tolerated. Institutions that communities accepted were schools, churches, civic associations, unions, and meeting halls. Tolerated institutions included prostitution businesses, dens of substance abuse, a drug trade, and saloons.

Area of Significance: Transportation: In the Area of *Transportation*, townsites and unincorporated settlements were transportation nodes and transfer points for the movement of goods and people. The supplies, equipment, and services required by mining companies and industry participants often flowed into the settlements prior to their distribution to consumers, and ore and mill products flowed out. The transportation systems included several stages and connections, depending on a settlement's remoteness and importance. Links ranged from rail service to wagons, and stages to pack trains.

Mining Settlement Registration Requirements

To qualify for the NRHP, a townsite or unincorporated settlement must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Settlements eligible under Criterion A should be associated with at least one area of significance noted above, as well as events and trends important in the corridor.

Criterion B: A settlement may be eligible under Criterion B when an important person spent an appreciable amount of time there. But conditions for eligibility are limited. Overall, the general inhabitation of a townsite by an important person is too indirect an association. The individual's specific residence or place of employment must be identified, and in such cases, only that place will qualify under Criterion B. The townsite can qualify as a whole if the person held a direct, regular, and frequent presence throughout. Examples include a contractor who personally constructed or maintained multiple buildings or infrastructure. Ownership of property or investment in a townsite company are too indirect an association for Criterion B. The individual of note must have been present on-site. The townsite must retain integrity, even if on an archaeological level, relative to when the person achieved significance. The researcher should provide a brief biography explaining why the individual was important and how the person was involved with the place. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Townsites can be eligible under Criterion C for a variety of reasons. Integrity at least on an archaeological level is required. Although some townsites currently possess standing buildings, all will include a majority of archaeological features.

Townsites can be eligible in entirety if the archaeological, architectural, or engineering features and artifacts clearly convey broad patterns of the community. The townsite's organization and design is one example. Although most designs were based on grids, some towns grew spontaneously in response to local conditions. Road intersections, railroads, and deposition of mine waste rock greatly influenced a town's ultimate form. The constitution and distribution of residences, businesses, and industrial facilities is another broad pattern. The transportation infrastructure, water sources, and waste disposal practices, however primitive, are additional patterns of importance.

Archaeological integrity requires intact assemblages of surface artifacts because they convey important information unavailable from other sources. Artifacts are necessary to interpret timeframe and function of the townsite as well as its individual buildings. Through analysis, the researcher may be able to determine the types and function of some buildings, even when represented by archaeological remnants.

Many townsites have a few standing buildings, and their presence can complicate a townsite's eligibility. Buildings retaining architectural integrity relative to a timeframe of importance may be contributing elements of a site. Architectural integrity is defined as appearance, materials, workmanship, and location conveying a timeframe. Settlements inhabited today often possess buildings that were constructed within recent years. If the number of such buildings exceeds those within the timeframe or disrupts the townsite's historic fabric, then the townsite as an entity may no longer possess necessary integrity.

Even if a townsite lacks integrity as a whole, standing buildings may be individually eligible under Criterion C. If the building retains architectural integrity relative to a timeframe of importance, it may represent a type of that era. Most buildings, however, were altered over time. They may be examples of serial occupation and changes in preferred materials, styles, and space requirements. The researcher must define the building type, timeframe, and architectural style, and why the building is an important example.

Some buildings possess innovative designs, construction methods, and materials in response to the conditions of a specific area. Such buildings may be eligible as adaptations of architecture to environment, climate, and geography.

In a few cases, buildings can be attributed to important architects and builders. The researcher must identify who the individual was and provide biographical information explaining why the person was important. If the building retains integrity relative to the original design, it may be eligible as the work of a master architect or builder.

Even when reduced to archaeological features, townsites may be eligible under Criterion C when they are contributing elements of historic mining landscapes. Archaeological features, roads, and changes in vegetation provide enough visual impact to contribute to the setting and feeling of an area. The site may also belong to a greater body of resources that, in total, represents an area's history.

Criterion D: Townsites offer a high potential for eligibility under Criterion D because most can contribute meaningful information in several areas. An analysis of the organization pattern and the distribution of gender, ethnicity, and class may enlighten the existing understanding of settlements associated with the mining industry. Townsites often possess a diverse array of artifacts found on ground-surface. Building platforms, privy pits, and refuse dumps feature buried archaeological deposits with artifacts of a different nature. An analysis of both may reveal information regarding the lifestyles, social structures, and demography of the residents, as well as the presence of families and women. Such studies are important because these subjects were not extensively documented at the time.

National Register-eligible townsites and unincorporated settlements must possess physical integrity relative to one of the timeframes of importance defined above. Because most buildings either collapsed or were dismantled, integrity will probably be primarily on an archaeological level. Integrity is sufficient when the material evidence permits virtual reconstruction of the locations and arrangements of buildings and infrastructure. The artifact assemblage should also reflect aspects of the residents and their lifestyles. Overall, the site must embody the defining characteristics of a townsite or unincorporated settlement, and convey its historical significance.

Most of the seven aspects of historical integrity defined by the NRHP apply to settlements. Some may possess standing structures, which must retain the aspect of *location* to contribute to a resource's integrity. In integrity of *location*, the structure should be that present during an important timeframe. For a resource to retain the aspect of *design*, the material remains, including archaeological features, must convey settlement organization and planning. Settlements may include standing buildings reoccupied periodically and altered over time. In such cases, the building can retain the aspect of *design* if the material remains reflect intentional evolution over time. Integrity of *materials* and *workmanship* are important where architectural styles and types are conveyed by specific *materials* and *workmanship*. To retain the aspect of *setting*, the area around the resource, and the resource itself, must not have changed a great degree from its important timeframe, except for the removal of buildings. If the settlement is separated from mining, then the natural landscape should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the sense or perception of settlement from an important timeframes. Integrity of *association* exists in cases where features convey a strong connectedness between settlement and a contemporary observer's ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: RURAL HISTORIC MINING LANDSCAPE

Rural Historic Landscapes are a large-scale property type representing the history of an area's human occupation, life ways, and relationship with the land. The National Park Service recognizes other types of landscapes for the NRHP, such as Designed Historic Landscapes. Rural Historic Landscapes evolved organically over time and possess characteristics distinguishing them from purposefully designed landscapes. The National Park Service explains Rural Historic Landscapes in detail in its *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. In overview, the Bulletin states:

> "A rural historic landscape is defined as a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features."[1]

Concise areas impacted by prospecting and the mining industry may qualify as Rural Historic Mining Landscapes. Such landscapes provide a physical context for individual resources, and when viewed in total, the resources in their setting constitute a greater whole. Extensive tracts of land, its natural features, and the smaller scale historic resources represent the people, and their traditions and land uses for mining in in the I-70 Mountain Corridor, and the central Rocky Mountains.

The National Park Service organized the defining characteristics of Rural Historic Landscapes into eleven categories. The first four are the result of processes, and the last seven are physical attributes.[2] The categories are listed below but are interpreted for mining landscapes:

1. *Land uses and activities:* Land use activities are the principal human forces that left an imprint on the landscape. Prospecting, mining, and associated development had an enormous physical impact in Clear Creek drainage, and around Frisco and Dillon. The mining industry contributed to settlement patterns, development of infrastructure, water use, and transportation networks. All the landscapes have been in continuous use, although no longer for mining.
2. *Patterns of spatial organization:* A combination of the natural environment, technology, economics, and the culture of mining affected how landscapes were organized. In most cases, the organization was a dynamic process and evolved organically rather than through wholesale planning. On a regional scale, the industrial geography of mining influenced distribution of communities, ore treatment centers, and transportation networks. Large-scale patterns established by industry may remain constant in mining landscapes, while individual features such as buildings and roads change over time. Geology may have been the most influential natural factor on a localized scale. The location of gold and silver governed where centers of mining developed. The distribution and richness of placer deposits and ore bodies influenced the spacing of individual operations.
3. *Response to the natural environment:* Rural landscapes were heavily influenced by the natural environment. Typically, natural topographical features and vegetation determined what land people chose to use and how, where they settled, and the locations of their communities and transportation networks. Mining defied traditional land use patterns because the natural environment became a secondary consideration. In the mining industry, people responded to the location of placer deposits and ore bodies first, and then adapted communities and transportation networks to the immediate natural environment. Forests influenced the choice of construction materials, the siting of individual buildings, and the fuel selected for heating and steam power.
4. *Cultural traditions:* In general, cultural traditions affected the way that land was used, occupied, and shaped. Social customs, ethnic identities, and trades and skills may be evident today in small-scale landscape features as well as overall uses of the land. Mining industry participants from a variety of backgrounds brought ethnic customs that spread and diffused into communities as they traveled. Influenced by industry and the environment, a culture specific to mining in the American West evolved, and it shaped the landscape.

   Social customs determined the structure of communities, their buildings, and infrastructure. Cultural traditions dictated how mines were developed, where mills were built, and what was done with the waste. Traditional building forms, methods of construction, stylistic finishes, and functional solutions evolved in the work of local individuals.
5. *Circulation networks:* Circulation networks are systems for transporting people, goods, and raw materials from one point to another. They range in scale from packtrails and footpaths, to roads and

[1] McClelland, et al., 1999:1.
[2] McClelland, et al., 1999:3.

railroads. Some networks were limited to mining districts, and others such as roads and railroads provided links with the outside.

6. *Boundary demarcations:* Boundary demarcations outline areas of ownership and land use, such as clusters of buildings defining townsites. They also separate smaller areas of specific functions, such as piles of tailings marking areas of placer mining. In mining landscapes, claim posts, ditches, meadows, roads, and railroads commonly marked historic boundaries.
7. *Vegetation related to land use:* Various types of vegetation bear a direct relationship to long-established patterns of land use. Whereas many landscapes change over time, vegetation is one of the most dynamic attributes. Some species may replace trees selectively cut by early inhabitants, and yet conform in community to historic vegetation patterns. Aspen trees, for example, may reclaim old clearcuts in evergreen forests while retaining the original shape of the cut. Vegetation may also reflect industrial impact on the land. Weeds and thistles, for example, grow in placer workings lacking topsoil. Geometric patterns of grass, brush, and trees can mark historic boundaries such as building and structure footprints. Introduced vegetation sometimes represents what were larger plantings such as crops, orchards, and gardens. Age of vegetation communities is also relevant. Older stands of brush or trees may reflect undeveloped land while young stands could have taken over land originally used for other purposes.
8. *Buildings, Structures, and Objects:* Various types of buildings, structures, and objects serve human needs related to the occupation and use of the land. Their function, materials, date, condition, construction methods, and location reflect the activities, customs, preferences, and skills of the people who built and used them. Mining industry buildings and structures exhibit patterns of vernacular design and methods typical of the central mountains. Some designs also may be unique to their region. Buildings and structures may reflect the sizes of historic mining operations, levels of capital investment or profitability, or era. The repeated use of construction methods, forms, and materials may indicate successful solutions to building needs, or demonstrate the unique skills, workmanship, or talent of local individuals involved in design and construction.
9. *Clusters:* Groupings of features reveal patterns of land use, as well as the customs, traditions, and preferences of people. Clusters of prospect workings and mines, for example, reflect the distribution of ore bodies and the response of mining industry participants. Mills, communities, and other landscape features are manifestations of transportation networks, topography, or other influences, cultural or natural. Repetition of similar clusters throughout a landscape may indicate patterns of siting, spatial organization, or specific land uses.
10. *Archaeological sites:* The sites of mines, mills, and communities may be marked by foundations, ruins, changes in vegetation, and other surface remains. They may provide information about land use, social history, settlement patterns, and the mining industry.
11. *Small-scale elements:* Examples of small-scale elements include signs, fence posts, and abandoned mining machinery. These elements add to the historic setting of a mining landscape and may be remnants of larger components.

The defining characteristics of a rural historic mining landscape also can be described in terms of "landscape of work."[3] Mining outfits molded the landscape for the efficiency, organization, and economics of finding ore, extracting it, and processing the material. Mining landscapes of work include characteristics such as placer mines on drainage floors and water collection systems that diverted streams and carried the water to the workings. Hardrock prospects are concentrated in areas where ore was likely, and hardrock mines lie on land where ore formations were confirmed, regardless of topography. Ore treatment mills were sited either at the mines or in drainages where water and open ground were available. Companies erected workers' housing at mines and mills that were distant from established communities. Unincorporated settlements and planned towns grew in the most suitable environments near the centers of mining and milling. Circulation systems in the form of packtrails linked prospects with communities, and roads connected mines, mills, and transportation centers. Ditch systems

[3] Messick, et al., 2001:62.

diverted water from streams to reservoirs for industrial and community consumption. The forests around the mines and communities were cut over to provide wood for heating, steam power, and lumber. Sawmills were located close to the mature stands to minimize the distance workers hauled the cut logs. All are variations on work related to mining.

Rural Historic Mining Landscape Significance

Because mining industry landscapes are large in scale, their significance as cultural resources can be assessed in a broad sense. The most relevant NRHP areas of significance include Architecture, Community Planning and Development, Economics, Engineering, Industry, and Transportation. Archaeology is another Area that may be relevant to some landscapes and not others. Because mining industry landscapes are diverse, complex, and offer numerous historic resources, most will be significant under multiple NRHP areas and criteria.

Period of Significance must be considered when determining the historical importance of rural historic landscapes. Although the Period applicable to mining in the I-70 Mountain Corridor spans 1859 to 1942, the effective timeframe varies slightly by corridor segment and land use. In a broad sense, mining was important throughout Clear Creek drainage from 1859 through 1920. The industry was largely quiet and unimportant during the 1920s, but returned to local and statewide significance from 1930 through 1942. Hardrock mining was locally significant in the area around Dillon and Frisco from 1878 through 1920.

Area of Significance: Archaeology: Mining landscapes are significant in the area of Archaeology when their historic resources have been reduced to archaeological sites. Most of the sites must retain integrity on an archaeological level, which is the ability of a site's features and artifacts to clearly convey timeframe, function, design, and content. On a landscape scale, studies of archaeological sites in their natural setting may reveal important aspects of the timber industry, its patterns, history, and people.

Area of Significance: Architecture: Those historic landscapes with standing buildings may be important in the area of architecture for several reasons. Mining industry participants adapted familiar building forms, designs, and methods of construction to the central Rocky Mountain. In their adaptation, miners responded to topography, natural landscape features, local climate, and available building materials. When distributed amid a landscape, multiple buildings can represent the evolution of rural architecture specific to mining in the mountains.

Areas of Significance: Commerce and Economics: The Areas of *Economics and Commerce* can manifest in mining landscapes. Assemblages of sites including mines, mills, roads, and railroads reflect the overall process of converting natural resources into wealth. The mines produced ore that was carried over the roads to mills. The ore was processed at the mills, gold and silver were recovered, and the concentrates shipped by road or rail to a smelter for final processing. Each stage furthered the ore-to-wealth cycle. Each stage also represents a divestment of money into the region through workers' wages and the consumption of goods. Communities in the landscape were local economic centers where the divested funds supported commerce. Much of the wealth remained within the corridor and became a major contribution to regional and statewide economic systems. The capital used to organize, equip, and support mining companies in turn shaped the land through their developments.

Areas of Significance: Community Planning and Development: Landscapes can be important in the Area of *Community Planning and Development* if they reveal settlement patterns characteristic of mining. Unlike traditional settlement patterns, mining industry participants established residential complexes near centers of mining or related industry regardless of environmental conditions. Proximity to mines and industry was a first priority, and the best microenvironment for a residence or community was second. Landscapes can reflect the development patterns of the industrial aspect of mining, and its geographic influence on settlement. It should be noted that settlement is not limited to concentrations of residences such as townsites. The workers' housing and prospectors' camps scattered throughout the mountains are a disbursed settlement pattern.

Area of Significance: Engineering: Historic landscapes can represent the widespread adaptation of engineering practices to mining in the central Rocky Mountains. Small-scale resources may be significant representations of mining engineering, and multiple structures within a single landscape may reflect the evolution of function, design, methods, workmanship, and materials. With small-scale resources, mining companies may have adapted familiar types of structures and machinery to the mountain environment. Mining operations may have also innovated new ways of solving problems posed by the land and its resources. Conditions included natural landscape features, local climate, and available capital and buildings materials. Complex systems such as water infrastructure for placer mining may be expressed across an entire landscape. On a large scale, landscapes may represent the incremental process of turning crude ore into an economic commodity, and the engineered facilities to do so.

Area of Significance: Industry: The Area of *Industry* is fundamental. Mining landscapes are tied to and represent the mining industry, which was the most important factor in the exploration and development of the corridor. The industry was the principal force behind the corridor's economy, infrastructure, permanent settlement, and culture. Further, the industry and its impacts on the land made Clear Creek drainage one of Colorado's most productive sources of mineral wealth and a center known in greater mining circles. Prospectors and mining outfits adapted known methods and technology to the drainage's physical environment, geology, and mineralogy. Through their efforts, they contributed to the development of mining technology and engineering in numerous ways. Many of the innovations were adopted elsewhere and forwarded mining and infrastructure in these places. Some of the innovations were small in scale such as individual pieces of machinery or structures. Others were landscape in scale like enormous mining and milling complexes.

Area of Significance: Landscape Architecture: The Area of *Landscape Architecture* involves landscapes affected by intentional designs and land uses. Infrastructure such as water systems and railroads are forms of purposeful large-scale land uses. Townsites, with grids of buildings and scattered outlying industries, are another. Large mine and mill complexes, where portions of the land were designated for specific functions, are a third. On a large scale, designed systems associated with mining changed the appearance of landscapes.

Area of Significance: Transportation: Mining depended on transportation systems to haul supplies to the mines, ore to mills, and finished products to market. Because of this, the mining industry fostered entire networks of packtrails, roads, and railroads in the corridor. The transportation systems were significant to mining and that industry's impact on the land. The systems were also significant because they affected other industries, settlement, historic trends, and land use.

Rural Historic Mining Landscape Registration Requirements

To qualify for the NRHP, a landscape must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: If a landscape and its contributing elements date to one of the mining industry's important timeframes, the landscape will be associated with important trends and events. Several of the Areas of Significance listed above will be relevant, as well.

Criterion B: Small-scale landscapes such as individual mines or milling complexes may be eligible under Criterion B through residence, employment, or other involvement by a significant individual. The associated resource must retain physical integrity relative to that person's occupation during the person's productive period of time. Integrity on an archaeological level is sufficient. In some cases, important people invested in mining companies or owned land but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on the ground for a sustained period of time.

Large-scale landscapes may be eligible under Criterion B, but relatively few will qualify because of their size. For an entire landscape to be eligible, an important person must have played a direct role and been present during its development or spent an appreciable amount of time throughout the terrain. A prominent mineral surveyor who platted many of the claims in a region is an example. Most large-scale mining landscapes, however, were not impacted by one individual. Instead, they evolved organically through the actions of numerous people.

Criterion C: Mining landscapes hold a high potential for eligibility under Criterion C. Landscapes may be eligible if buildings, structures, their archaeological remains, and natural features represent mining, its subsidiary industries, and their settlement patterns. Landscapes occupied for extended periods of time reflect the evolution of land use, while those occupied for a narrow period reflect land use patterns of that era.

A landscape may be eligible under Criterion C if it was the work of a master planner, engineer, geologist, architect, or other industry official. This usually applies to small-scale, engineered landscapes such mines, mills, infrastructures, and settlements. The researcher must identify the individual and the landscape history and explain who the individual was and why the person was important.

Most of the individual resources comprising the landscape should retain integrity at least on an archaeological level. Modern intrusions should either be minimal or compatible with the historic land use. The researcher must discuss how the landscape's characteristics and contributing elements represent an aspect of the mining industry.

Criterion D: Landscapes may be eligible under Criterion D when they hold a high potential to contribute meaningful information upon further study. The areas of inquiry can be broad and rely on information offered by the landscape as a whole rather than a few of its individual sites.

If residential complexes within the landscape possess building platforms, privy pits, and refuse dumps with buried archaeological deposits, testing and excavation may reveal important information regarding lifestyle and demography of the occupants. When the results from multiple complexes are compared, regional patterns may become apparent. Important areas of inquiry include but are not limited to diet, health, and substance abuse. Other areas of inquiry relate to the distribution of gender, families, ethnicities, professional occupation, and socioeconomic status.

Comparative studies of industrial sites may find patterns regarding the application of systems engineering, ore treatment processes, and preference of equipment. Other patterns regarding construction methods, materials, structural design, and architecture may become apparent. Such information can be compared to geology, mineralogy, and the successful or failed operations for a full understanding of a region's industry.

Intact underground mine workings is another area of inquiry under Criterion D. Groups of mines may feature connected workings that can contribute to the understanding of broad-scale mine engineering, planning, and operations.

Historic landscapes eligible for the NRHP must possess physical integrity relative to the timeframes of importance outlined above. According to the National Park Service: "Integrity requires that the various characteristics that shaped the land during the historic Period be present today in much the same way they were historically."[4] Continuity in occupation and use, however, changed mining landscapes in the corridor to some degree. Occupation and use are compatible with integrity when they maintain the character and feeling of the historic mining industry. Underground mining, logging, and continuation of railroad transportation are compatible, while modern intrusions should be few and unobtrusive. The presence of some landscape characteristics is more important to integrity than others. Mine dumps, placer tailings, preserved forests, historic circulation systems, and the types of small-scale features typical of mining should be evident.

Many of the seven aspects of historic integrity defined by the NRHP apply to mining landscapes, although not all need be present. *Location* is the place where significant activities that shaped land took place. A rural landscape whose characteristics are in their historic place has integrity of location. For integrity of *design*, the landscape features, both manmade and natural, must convey the evolution of land use typical of mining and dependent development. *Setting* is the physical environment within and surrounding a historic property. To retain integrity of setting, a landscape and bordering area must not have changed a great degree in overall character. Because the mining industry worked in the natural environment, aspects of mining and natural features should be present. For integrity of *feeling*, the landscape should

[4] McClelland, et al., 1999:21.

convey mining and associated settlement identifiable from a historical perspective and in the context of today's perceptions. Integrity of *association* exists where a combination of natural and manmade features conveys a strong connectedness between the landscape and a contemporary observer's ability to discern the historic mining industry and settlement.

MINING INDUSTRY BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Placer Mine Feature Types

Boom Dam: A dam intended to impound water for booming operations. Boom dams often featured a spillway or other form of breach that directed water into a boom ditch or drainage.
Boom Ditch: A ditch that directed water from a boom dam directly into placer workings.
Building Platform: A flat area that supported a building.
Building Ruin: The collapsed remains of a building.
Collection Ditch: A ditch that collected runoff from a placer mine for secondary uses or to impound sediments. A collection ditch should be located downstream from a placer mine.
Cut-Bank: The headwall of an excavation.
Dam: A water impoundment structure. Some dams for placer mines are earthen while others may consist of log cribbing filled with earth.
Ditch: An excavation that carried water to or from a placer mine. Ditches often tapped streams in adjacent drainages and featured a gentle gradient.
Flume: A wooden structure that carried water to or from a placer mine or carried a stream around a placer mine.
Flume Remnant: The structural remnants of a flume.
Monitor Station: A platform, tongue of earth, or perch where a hydraulic monitor was stationed. Monitor stations were usually strategically located amid hydraulic workings.
Penstock: A pipeline that carried water under great pressure for hydraulic mining. The penstock descended steeply from a pressure box down to the hydraulic workings, where feed pipes connected with hydraulic monitors. The penstock had gradual reductions in diameter, which increased the velocity and pressure of the water within.
Placer Pit: An excavation circular or ovoid in footprint where miners sought deep gravel.
Placer Trench: A linear excavation where miners sought deep gravel.
Placer Tailings: The hallmark of placer mining, tailings usually consist of ovoid or linear piles of gravel and rounded river cobbles.
Pressure Box: A wooden or masonry structure, usually far upslope from a hydraulic mine, that directed water into a penstock featuring a steep descent. A ditch or pipeline carried water to the pressure box from a stream or reservoir. The pressure box's elevation and the penstock's descent provided enough pressure for hydraulic mining.
Refuse Dump: A collection of industrial and structural debris cast off during operations.
Reservoir: A void behind a dam for water storage.
Shop Platform: An earthen platform that supported a shop building, which can be defined by artifacts such as shop refuse and coal.
Shop Ruin: A collapsed shop.
Shop Refuse Dump: A deposit of shop refuse such as anthracite coal, forge-cut iron scraps, hardware, and forge clinker, which is a scorious residue generated by burning coal.
Sluice: Similar to a flume, a sluice was a lengthy wooden structure with a plank floor and walls, and the floor featured riffles for collecting gold. Piles of rocks and timber piers typically supported the sluice, which was usually located at the bottom of a drainage.
Sluice Remnant: The remnants of a sluice, usually denoted by piers, posts, rock supports, and planks.
Supply Ditch: A ditch that delivered water to a placer mine.

Work Station: A platform alongside a sluice where workers supervised operations and maintained the sluice.

Hardrock Prospect Feature Types

Hardrock Prospect Buildings

Hoist House – Character-Defining Features

Hoist houses, associated with shaft operations, enclosed a hoist, its power source, and often a blacksmith shop. Most prospect outfits followed a form conventional to the mining industry, which was a rectangular footprint and a front-gabled or shed roof. Hoist houses were vernacular in that they followed no recognized architectural style, consisted of available materials, and were built as needed by the outfit.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform.
- Walls: Early hoist houses had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with planks or corrugated sheet iron over plank sheathing. During the 1930s, the walls may have consisted of planks nailed to cross-members, and joined at the corners to form the building.
- Roof: Front-gabled or shed form, supported by rafters, with plank decking and corrugated sheet iron, plank, or rolled asphalt cladding. Roof may feature angled cupola for passage of hoist cable.
- Chimney: Stovepipe for stove and blacksmith forge.
- Entry Door: Located in the front or side elevation, offset from center. Doors may have been salvaged factory-made panel versions or, more often, custom-made of planks.
- Windows: Fixed or sliding in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere. Fixed window, oriented vertically, high in front wall for visual of headframe.

Shop – Character-Defining Features

Located near the adit portal or shaft collar, a shop was a building enclosing blacksmith facilities where a worker fabricated and maintained tools and hardware. Simple shops usually featured a forge, a workbench, and possible hand-powered appliances such as a drill press. Most prospect outfits followed a form conventional to the mining industry, which was a rectangular footprint and a gabled roof. Shops were vernacular in that they had no recognized architectural style, consisted of available materials, and were built as needed by the outfit. In general, logs were commonly used prior to 1890 and lumber as early as 1880. Blacksmith debris and forge clinker are usually within.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform.
- Walls: Early shops had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with planks or corrugated sheet iron over plank sheathing. During the 1930s, the walls may have consisted of planks nailed to cross-members, and joined at the corners to form the building.
- Roof: Gabled or shed form. On early shops, construction was often planks laid over log beams. By 1890, construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Stovepipe for blacksmith forge.
- Entry Door: Located in the front or side elevation. Doors may have been salvaged, factory-made panel versions or, more often, custom-made of planks.
- Windows: Fixed or sliding in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Hardrock Prospect Features

Boiler: A boiler was a vessel that generated the steam that powered machinery. Most boilers at prospect sites will be temporary-class upright, locomotive, or Pennsylvania types discussed in Section E 4.

Boiler Foundation: Because portable boilers were self-contained and free-standing, prospect outfits usually stood them on platforms located near the hoist. Occasionally, however, workers erected rock or brick foundations or pads to support the boiler. The artifact assemblage around a foundation or platform can help the researcher identify it as that for a boiler. The assemblage should include clinker, which was a scorious, dark residue, as well as unburned bituminous coal, ash, water-level sight-glass fragments, boiler grate fragments, and pipe fittings.

Some prospect outfits installed upright boilers on square or circular dry-laid rock pads or excavated a shallow pit underneath the boiler to allow ashes from the firebox to drop through. The pad's size should approximate the boiler's diameter. Pennsylvania boilers and locomotive boilers stood on skids, which usually required no support. However, where the ground was soft or uneven, workers often laid parallel rock alignments to prevent the boiler from settling. In the absence of rock supports, the skids occasionally became embedded in the ground and left two parallel depressions the length and width of the boiler. For locomotive boilers without skids, which were rare, workers erected a rock or brick pylon to support the high rear, and laid a rock or brick pad that supported the firebox end.

Claim Marker: Prospectors erected claim markers at the corners of their claims. Some were 300 by 1,500 feet in area, and others were 500 by 1,500 feet in area. Markers ranged from cairns to blazes on trees to up-ended boulders. When a surveyor mapped and registered a claim, he usually etched the mineral survey number into a corner rock.

Claim Stake: A claim stake was the universally recognized form of claim marker. Claim stakes were usually 4x4 posts 4 feet high, although prospectors often substituted logs.

Draft Animal Track: Horse whims required a circular track around the apparatus so the draft animal could wind the cable drum. The tracks tended to be around 20 feet in diameter and cleared of major obstacles. Prospectors often graded semicircular platforms adjacent to a shaft for a track.

Forge: Nearly all prospect operations of substance featured a forge where a blacksmith heated steel implements. Most forges were vernacular in construction in that they were assembled with local materials. Prospectors built walls 3 by 3 feet in plan and 2 feet high with rocks or small logs, inserted a tuyere, and filled the interior with sorted gravel. In some cases, prospect outfits imported factory-made iron pan forges to their sites.

Forge Remnant: Forges collapsed over time and may manifest as a mound of gravel and remnants of the walls, usually impregnated with coal and forge clinker. When coal burned at high temperatures, it left a scorious, dark residue known as *clinker*.

Headframe: A frame made of timber or logs that stood over a shaft. Headframes associated with horse whims were often large tripods or tetrapods. Power hoisting systems usually employed two-post gallows headframes. All are discussed in Section E 4.

Headframe Ruin: The collapsed remnants of a headframe.

Headframe Foundation: Headframe foundations usually manifest as parallel timbers that flank a shaft and extend toward the area where a hoist was located.

Hoist: Hoists at prospects were usually horse whims, steam, petroleum, or small electric models, as described in Section E.

Hoist Foundation: Nearly all mechanical hoists were anchored to foundations to keep them in place, and a foundation's footprint can reflect the type of hoist. Foundations are common at prospect shaft sites and can usually be found aligned with and at least 20 feet from the shaft. Because of the ease of construction and low cost, prospectors usually assembled hoist foundations with timbers and occasionally with stone or concrete. Timber foundations decay and become buried over time, and often manifest today as rectangular groups of four to six anchor bolts projecting out of a hoist house platform.

Horse whims were usually bolted to timber foundations 2 by 2 feet in area at the bottom of a shallow pit. The trench for the cable and linkages often extends from the pit to the shaft.

Foundations for single-drum steam hoists are usually rectangular, flat, and feature at least four anchor bolts. They can range in size from 6 by 6 feet to as little as 2 by 3 feet in area. Foundations for single-drum electric hoists appear very similar to those for steam hoists. Steam hoists often left behind plumbing and gaskets, and the site should possess evidence of an associated boiler. The use of electric hoists often generated electrical insulators and wires.

Foundations for gasoline hoists are fairly distinct. Their footprint is that of an elongated rectangle at least 2 by 6 feet in area oriented toward and aligned with the shaft. Due to the engine's severe vibrations, prospectors often bolted hoists to concrete foundations at least one foot high. Gasoline hoist foundations usually feature at least two rows of three anchor bolts, with the rear two closer together than the rest. Gasoline hoists can leave distinct artifact assemblages including thin wires, spark plugs, small pipes, and fine machine parts.

Hoist House Platform: Hoist houses stood on platforms of leveled earth or waste rock at least 20 feet from, and aligned with, the shaft. Often, a platform is all that represents a hoist house, and it usually reflects the building's size and footprint. Evidence of a hoist and a shop is usually present.

Hoist House Ruin: The collapsed remnants of a hoist house.

Horse Whim: A horse whim was the most primitive type of mechanical hoist, and it was powered by a draft animal. Two types of whims were popular at different times (discussed above), and the researcher should specify the type of whim when recording a site. The *horizontal reel whim* consisted of a horizontally oriented cable reel at least 3 feet in diameter, fitted with a harness beam on top. The *geared whim* was compact and featured a vertical cable drum in a frame. A capstan, geared to the drum, featured a harness beam on top.

Horse Whim Pit: Prospectors often placed horse whims in shallow pits so the hoisting cable could pass through a trench to the headframe and pose no obstacle to the encircling draft animal. They often lined the pits with planks or logs to retain soil. Over time, the lining collapsed, leaving a concave depression where the whim was anchored and a linear depression extending to the shaft. The pit should be at the center of a draft animal track.

Mine Rail Line: A track for ore cars.

Mine Rail Line Remnant: When prospectors dismantled a track, they often left in-situ ties, impressions of ties, and sections of rails.

Pack Trail: A path less than 8 feet wide that provided access to prospect workings.

Prospect Adit: A horizontal entry underground denoted by a waste rock dump. An adit tended to be short and less than 3 by 6 feet in-the-clear, while a tunnel was larger. When collapsed, adits appear as trenches.

Prospect Pit: A circular or ovoid excavation surrounded by a small volume of waste rock.

Prospect Shaft: A vertical or inclined opening underground of shallow depth. When intact, shafts tend to be rectangular, and either 4 by 6 or 4 by 8 feet in-the-clear, the interior dimension. When collapsed, shafts manifest as circular areas of subsidence.

Prospect Trench: A linear excavation flanked by a small volume of waste rock.

Shop Platform: Shops usually stood on earthen platforms near the entry underground. The platforms may feature forge remnants and almost always possess artifacts such as forge-cut iron scraps, anthracite coal, and clinker, which is a scorious, ashy residue created by burning coal.

Shop Ruin: The collapsed remnants of a shop.

Waste Rock Dump: The waste material removed from underground workings.

Hardrock Mine Feature Types

Mine sites can possess an array of archaeological, engineering, and architectural features representing their historic surface plants. The most common manifestations are explained as the Feature Types below. In support of identification and interpretation, they are arranged under the common systems comprising mine surface plants. Researchers should also review Prospect Site Feature Types and see Section E 4 for complete context.

Hardrock Mine Buildings

Compressor House – Character Defining Features

Some large mines featured compressor houses specifically to shelter an air compressor, its power source, and associated components. The buildings postdate 1880 when rockdrills were adopted for boring blast-holes, and were common at large mines by 1900.

Compressor houses were vernacular in their industrial appearance, emphasis on function, and custom design often by the mining company. Although each was unique, they were based on several forms conventional to the mining industry. The most basic was rectangular in footprint with a front-gabled or shed roof and broad doors in front. Large compressor houses may have been L-shaped with the additional room used for storage or a shop.

- Core Plan: Rectangular or L.
- Stories: 1.
- Foundation: Log or timber footers on earthen platform for small buildings, and stone masonry or concrete under large versions.
- Walls: Frame construction sided with board-and-batten, planks, or corrugated sheet iron over plank sheathing.
- Roof: Gabled or shed form consisting of rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Pipes for compressor air intake. Steel smokestack for boiler.
- Entry Door: Located in the front and side elevation, doors were broad and custom-made of planks.
- Windows: Fixed, sliding, sash in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Hoist House – Character Defining Features

Hoist houses, associated with shaft operations, enclosed a hoist, its power source, and often a blacksmith shop. Most prospect outfits followed a form conventional to the mining industry, which was a rectangular footprint and a front-gabled or shed roof. Hoist houses were vernacular in that they followed no recognized architectural style, consisted of available materials, and were built as needed by the outfit.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform.
- Walls: Early hoist houses had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with planks or corrugated sheet iron over plank sheathing. During the 1930s, the walls may have consisted of planks nailed to cross-members, and joined at the corners to form the building.
- Roof: Front-gabled or shed form, supported by rafters, with plank decking and corrugated sheet iron, plank, or rolled asphalt cladding. Roof may feature angled cupola for passage of hoist cable.
- Chimney: Stovepipe for stove and blacksmith forge.
- Entry Door: Located in the front or side elevation, offset from center. Doors may have been salvaged, factory-made panel versions or, more often, custom-made of planks.
- Windows: Fixed or sliding in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere. Fixed window, oriented vertically, high in front wall for visual of headframe.

Privy –Character Defining Features

- Core Plan: Rectangular or square.
- Size: 3x4 to 5x8 feet in plan.
- Foundation: Log or timber posts, log footers, or corner rocks around open pit.
- Walls: Post-and-girt frame, or corner posts with cross-members, plank or board-and-batten siding on the exterior.
- Roof: Front or side-gabled, or shed, with plank decking, and rolled asphalt, asphalt shingles, or smooth or corrugated metal. Decking may span the walls or be fastened to 2x wood rafters.
- Entry Door: Entries were usually vertical plank doors, sometimes opening onto a plank deck.

Shaft House – Character Defining Features

A shaft house was a large building enclosing the shaft collar, the hoisting system, and usually a shop. Large shaft houses may have also encompassed an air compressor. Mine tracks extended away from the shaft and passed out of the building to ore bins and waste rock dump.

Like typical mine buildings, shaft houses were vernacular in design and construction. They had no recognized architectural style, were assembled from available materials, and built for function. Although each was unique in design, they were based on a handful of forms conventional to the mining industry. The most basic was rectangular in footprint with a front-gabled or shed roof and a cupola for the headframe. Large shaft houses may have been L-shaped, cross in plan, or possessed multiple extensions for hoist, boiler, and shop. The roof was highest over the headframe and sloped down toward the hoist. Logs were commonly used for small buildings prior to 1890, and lumber was used for large shaft houses as early as 1880.

- Core Plan: Rectangular, L, crossed, or complex/irregular.
- Stories: 1 with vaulted interior and cupola over headframe.
- Foundation: Log or timber footers on earthen platform for small buildings, and stone masonry or concrete under large versions.
- Walls: Early shaft houses had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with board-and-batten, planks, or corrugated sheet iron over plank sheathing.
- Roof: Gabled or shed form. On early shaft houses, construction was often planks laid over lumber rafters and beams. By 1890, construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding. Cupola over headframe.
- Chimney: Stovepipes for blacksmith forge and heating stove. Steel smokestack for boiler.
- Entry Door: Located in the front and side elevation, doors were broad and custom-made of planks.
- Windows: Fixed, sliding, sash in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Shop – Character Defining Features

Nearly every mine had a shop for the manufacture and repair of tools, hardware, and machinery. Shops included blacksmith facilities at the least; some were equipped with power-driven appliances for advanced work, and many were equipped for basic carpentry. To minimize handling of heavy iron, mining companies built their shops near the mine opening.

Shop buildings followed several basic vernacular forms in construction, appearance, and design. Most were custom facilities, built as needed with available materials, and planned according to a company's interpretation of function and efficiency. Prior to the 1890s, shops tended to be simple, rectangular, and had blacksmithing equipment in a major portion and a carpentry area in the rest. Many were of log construction, but mining companies preferred frame construction. During the 1890s, shops increased in size to accommodate more appliances, and by the 1900s, corrugated sheet iron grew in popularly for siding and roofs. Blacksmith and metal-working refuse should lie in and around the shop.

- Core Plan: Rectangular, L, or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform at small shops, and stone masonry or concrete at large shops. Timber or concrete pads for shop appliances are often within the main foundation.
- Walls: Early shops had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with board-and-batten, planks, or corrugated sheet iron over plank sheathing. During the 1930s, the walls may have consisted of planks nailed to cross-members and joined at the corners to form the building.
- Roof: Gabled or shed form. On early shops, construction was often planks laid over log beams. By 1890, construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Stovepipe for blacksmith forge.
- Entry Door: Located in the front or side elevation. Doors were broad and custom-made of planks.

- Windows: Fixed or sliding in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Stable – Character Defining Features

Prior to the 1920s, mining companies relied on draft animals for both underground and surface transportation. The companies erected stables to house the animals, and the buildings were often crude, low, and erected on poorly leveled ground. Distinguishing characteristics include wide doorways, stalls, feed mangers, and oat boxes.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform.
- Walls: Early stables had walls of horizontal logs, assembled with square, V, or saddle-notch joints. Chinking is absent. From the 1890s through 1910s, some stables were frame construction sided with planks or corrugated sheet iron over plank sheathing. During the 1930s, the walls may have consisted of planks nailed to cross-members and joined at the corners to form the building.
- Roof: Gabled or shed form. On early stables, construction was often planks laid over log beams. By 1890, construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: None.
- Entry Door: Located in the front or side elevation, doors were broad and custom-made of planks.
- Windows: Fixed or sliding in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Transformer House – Character Defining Features

Companies that employed electricity for lighting and power often erected transformer houses to shelter electrical equipment. They usually located the building away from the rest of the surface plant in case of fire. Transformer houses are relatively small, rarely exceeding 30 by 30 feet in plan, and usually feature brackets and mounts on posts for the transformers, as well as ports in the walls and numerous insulators for wires.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Log or timber footers on earthen platform.
- Walls: Most were frame construction sided with corrugated sheet iron over plank sheathing. Insulator brackets and ports for wires are common.
- Roof: Gabled or shed form. Construction was commonly rafters, plank decking, and corrugated sheet iron cladding.
- Chimney: None.
- Entry Door: Located in the front or side elevation, doors may have been custom-made of planks or corrugated sheet iron.
- Windows: Small transformer houses lacked windows. Large buildings may have features ore of two fixed units in any of the walls.

Tunnel House – Character Defining Features

A tunnel house was a building enclosing the tunnel portal, a shop, timber-dressing area, flume for mine drainage, and sometimes an ore sorting station. Large tunnel houses may have also encompassed an air compressor. Mine tracks extended from the tunnel through the building and out to ore bins and waste rock dump.

Like typical mine buildings, tunnel houses were vernacular in design and construction. They followed no recognized architectural style, were assembled from available materials, and built for function. Although each was unique in design, they were based on a handful of forms conventional to the mining industry. The most basic was rectangular in footprint with a front-gabled or shed roof and broad doors in front of the tunnel. Large tunnel houses may have been L-shaped or possessed multiple extensions for shop, compressor, boiler, and ore sorting. Logs were commonly used for small buildings prior to 1890, and lumber for large tunnel houses as early as 1880.

- Core Plan: Rectangular, L, or complex/irregular.
- Stories: 1 with vaulted interior.
- Foundation: Log or timber footers on earthen platform for small buildings, and stone masonry or concrete under large versions.
- Walls: Early tunnel houses had walls of horizontal logs, assembled with square, V, or saddle-notch joints. From the 1890s through 1910s, most were frame construction sided with board-and-batten, plank, or corrugated sheet iron over plank sheathing.
- Roof: Gabled or shed form. On early tunnel houses, construction was often planks laid over lumber rafters and beams. By 1890, construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Stovepipes for blacksmith forge and heating stove. Steel smokestack for boiler.
- Entry Door: Located in the front and side elevation, doors were broad and custom-made of planks.
- Windows: Fixed, sliding, sash in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

General Hardrock Mine Feature Types

Adit: A horizontal opening usually less than 3 by 6 feet in-the-clear. Collapsed adits manifest as linear areas of subsidence. Tunnels were larger horizontal openings greater than 3 by 6 feet in-the-clear.
Building Platform: A flat area upon which a building stood. If possible, the type of building should be specified in the feature description.
Cribbing: A latticework of logs usually intended to be filled with waste rock or earth. Some cribbing structures served as retaining walls for platforms and waste rock dumps, and others were foundations.
Explosives Magazine: Organized mining outfits erected magazines to store explosives away from a mine's surface plant. Some magazines were dugouts; some were stout stone structures, while others were no more than small sheds much like dog houses.
Machine Foundation: A timber, masonry, or concrete foundation for an unknown type of machine.
Mine Track: A rail line that facilitated the movement of ore cars around a mine.
Mine Track Remnant: When a rail line was dismantled, workers often left ties, impressions from ties, portions of rails, and the rail bed.
Pipeline: An assembly of pipes usually intended to carry water. Pipelines should not be confused with compressed air mains, which extended from a compressor into the underground workings.
Pipeline Remnant: When disassembled, pipelines left evidence such as linear depressions, series of footers, and lengths of pipe.
Privy: Most mines of substance featured a privy for the crew's personal use. Privies usually are small frame buildings with a door in the front and a bench inside with one or several cutouts for toilet seats. The buildings were vernacular in construction and stood on foundations of logs, lumber, or rocks over a pit.
Privy Pit: A privy pit was the waste receptacle underneath a privy building. When a pit was full, workers relocated the building, sometimes threw refuse into the depression, and covered it with a cap of earth or waste rock. Pits tend to manifest today as depressions less than 5 feet in diameter, often with artifacts and other materials in their walls and bottoms.
Refuse Dump: A collection of hardware, structural materials, and other cast-off items.
Road: Roads were graded for wagons and trucks and were usually at least 8 feet wide.
Shaft: A vertical or inclined opening underground usually at least 4 by 8 feet in area. Some shafts were divided into compartments. The largest compartment was the *hoisting compartment* and the smaller, usually less than 3 feet wide, was the *utility compartment*. Highly productive mines may have featured shafts with two hoisting compartments and one utility compartment. Evidence of a double-drum hoist should be associated with a three-compartment shaft. Collapsed shafts manifest as funnels of subsidence.
Shaft House Platform: Shaft houses usually stood on leveled platforms of earth or waste rock. When dismantled, shaft houses left distinct footprints surrounding evidence of the hoist, boiler, and shop. Differences in soil types and consistencies can reflect a shaft house's footprint. Large shaft houses often stood on rock foundations that can define the structure's perimeter.
Shaft House Ruin: The collapsed remains of a shaft house.
Stable: Prior to the 1920s, mining companies relied on draft animals for both underground and surface transportation. The companies erected stables to house the animals, and the buildings were often crude,

low, and erected on poorly leveled ground. Distinguishing characteristics include wide doorways, feed mangers, and oat boxes.
Stable Ruin: The collapsed remnants of a stable.
Timber Dressing Station: Timber dressing stations were work areas where miners reduced logs into timbers for underground support. Most stations were outdoors near the mine opening, and they tend to be represented by collections of raw logs and numerous cut wood scraps. Some were within the shaft house or tunnel house.
Timber Stockpile: A stockpile of mine timbers, often located near the mine opening. Mine timbers are usually 6 to 7 feet long and notched at both ends.
Trestle: A structure that supported a mine rail line, walkway, or pipeline. Workers often built small trestles on the flanks of waste rock dumps to support dead-end rail lines.
Trestle Remnant: Posts, single piers, or partial stringers left from a trestle.
Tunnel: A tunnel was a horizontal entry underground 3 by 6 feet in-the-clear (interior dimensions) or larger. Collapsed tunnels often manifest as linear areas of subsidence, possibly with pipes or rails projecting outward.
Tunnel House Platform: Tunnel houses commonly stood on cut-and-fill platforms graded at the tunnel portal. Large versions often had rock or concrete foundations. The platform or foundation, as well as differences in soil types and consistencies, can reflect the building's footprint. Artifacts and machine foundations can reveal the types of facilities that the building enclosed.
Tunnel House Ruin: The collapsed remains of a tunnel house.
Utility Pole: A pole that supported an electrical or communication line.
Ventilation Blower: Many operations employed ventilation blowers to force fresh air underground. They usually located the blower adjacent to the mine opening and attached an assemblage of ventilation tubes that extended underground. Large blowers had to be anchored to foundations, and most were belt-driven by an adjacent motor or steam engine.
Ventilation Blower Foundation: Blower foundations usually consisted of timbers, were 3 by 4 feet in area or less, and featured four anchor bolts. The foundations were embedded in the ground adjacent to the mine opening. A motor or small steam engine that powered the blower was usually bolted to an adjacent foundation.

Compressed Air System Feature Types

Air Compressor: An air compressor was a machine that compressed air that was piped underground to power rockdrills. Mining companies employed a variety of types that rose and fell in popularity between the 1870s and 1940s. For a list of types, their descriptions, and popularity age ranges, see Section E.
Air Compressor Foundation: Because of their great weight and powerful motion, air compressors had to be anchored to solid foundations. Workers often constructed timber foundations for small compressors and used either rock or brick masonry, or concrete for large models. Based on a foundation's footprint, the researcher can often determine the exact type of compressor. The foundations for the types of compressors are described in Section E.
Compressed Air Main: A pipeline that carried compressed air from a compressor into the underground workings.
Compressor House Platform: The platform that supported a compressor house. Compressor house platforms should feature a compressor foundation, a motor mount or boiler setting remnant, and an artifact assemblage consisting of machine parts and pipe fittings.
Compressor House Ruin: The collapsed remains of a compressor house.

Hoisting System Feature Types

Headframe: Mining operations erected four general types of headframes to meet the needs of ore production. The first is an enlarged version of the two-post gallows discussed above with Prospect Shafts. The second was the *four-post derrick*, which consisted of four posts joined with cross-braces and diagonal beams, all supported by two back braces. The third is the *six-post derrick*, which featured six posts instead of four. The last is a large *A frame*. Production-class headframes were more than 30 feet high and stood on well-built timber foundations.

Headframe Foundation: Foundations for production-class headframes consisted of a timber frame usually embedded in the waste rock surrounding a shaft. The timbers flanked the shaft and extended toward the area where the hoist was located. The foundation's length usually equaled the headframe's height.
Headframe Ruin: The collapsed remnants of a headframe.
Hoist: To meet the needs of ore production, mining companies engaged in production almost always employed power hoists. See Section E for types, descriptions, and age ranges for hoists.
Hoist Foundation: Few shaft mines retain their hoists and instead feature foundations, which are distinct today. The foundations for specific types of hoists are discussed in Section E.
Hoist House Platform: See Prospect Site Feature Types.
Hoist House Ruin: See Prospect Site Feature Types.

Power System Feature Types

Boiler: Many small, marginal mining operations employed portable boilers to power hoists and minor pieces of equipment, as did prospect outfits. However, mining companies wishing for a permanent, efficient source of steam usually installed return-tube boilers. For descriptions of boilers, see Section E 4.
Boiler Foundation: Boilers were usually dismantled when a mine closed, and in some cases, the masonry setting was removed as well. Distinct pads and footers may remain, and the type of boiler can be determined from this foundation. Artifacts such as ash, clinker, and scorched rocks and bricks are usually associated with boiler foundations. When portions of the setting remain, the researcher should record them as a *Boiler Setting Ruin*, discussed below.

Portable boilers left the most elementary foundations. Vertical boilers stood on dry-laid brick or stone pads, and workers arranged rock alignments for the skids of locomotive units. Some locomotive boilers lacked skids and instead were supported by simple rock or brick pylons, discussed above under prospects.

Typical return-tube boiler foundations were, flat, rectangular, and around 10 by 22 feet in area. Workers usually used rocks, although well-funded companies substituted bricks. In many cases a foundation may still retain the *bridge-wall*, which was a low row of bricks that forced flue gases against the boiler's belly. When visible, the bridge-wall crosses the foundation near its center.
Boiler Setting Ruin: When workers dismantled return-tube boilers, they almost always left the masonry setting. The structure rarely remained intact, however, and collapsed to some degree, becoming a *boiler setting ruin*. Collapsed settings range in appearance from mostly intact walls to mere piles of rubble. With some examination, the researcher may be able to determine the boiler type and location of the firebox. If the walls are intact, a ruin may feature the masonry bolts that anchored the façade, and the posts that supported the boiler shell. Most setting ruins also feature a bridge-wall, which was a low brick divider in the setting's interior. The wall usually stood between the firebox and the smoke chamber, and it forced flue gases up against the boiler's belly. Most return-tube boiler settings consisted of common bricks or rocks, and they featured cleaning ports near ground-level. Well-capitalized companies often lined fireboxes with fire bricks.
Boiler Clinker Dump: When workers shoveled residue out of a boiler's firebox, they usually dumped the material on the waste rock dump near the boiler. Boiler clinker dumps tend to be distinct and consist primarily of boiler clinkers, which are dark, scorious, ashy clasts created by burning coal. Boiler clinker dumps also usually include charred slate fragments, unburned bituminous coal, and structural and industrial hardware.
Motor: The common motor consisted of a cylindrical body, a belt pulley, and electrical wiring. Most motors were less than 4 by 5 feet in area.
Motor Foundation: Due to great weight and stresses created by motion, workers anchored motors to stout concrete foundations usually less than 4 by 5 feet in area. Foundations tend to be slightly rectangular, feature four to six anchor bolts, and are aligned with the machine that the motor powered.
Transformer House Platform: Workers usually erected transformer houses on cut-and-fill platforms that appear to be generic, except for a high proportion of electrical artifacts. Examples include cast-iron transformer cases, porcelain or slate switch panel fragments, fuses, porcelain insulators, high-voltage porcelain insulators, glass insulators, and wires.
Transformer House Ruin: The collapsed remnants of a transformer house.

Ore Storage and Processing Feature Types

Ore Bin: Mining outfits erected ore bins to contain payrock for shipment. Ore bins could be of the sloped-floor variety or open, flat-bottom structures. For a description of ore bin types, see Section E.
Ore Bin Platform or Foundation: A platform or foundation that supported an ore bin. Open, flat-bottom bins usually stood on a platform located on the flank of a waste rock dump so workers could dump payrock from an ore car. Sloped-floor bins usually stood on a combination of a platform, which supported the bin's head, and log or timber pilings that supported the remainder.
Ore Bin Ruin: The collapsed or partial remnants of an ore bin.
Ore Chute: A chute that directed payrock into an ore bin or into a vehicle.
Ore Chute Remnant: The collapsed remnants of an ore chute.
Ore Sorting House: Ore sorting houses, discussed in Section E, were complex structures that featured an ore bin at bottom, an overlying sorting room, and bins or chutes at top to receive raw ore.
Ore Sorting House Platform or Foundation: Platforms and foundations for sorting houses usually appear similar to those built for ore bins. The difference can manifest as discrete piles of large waste cobbles flanking the foundation. The piles are often different in appearance from the rest of the mine's common waste rock, and often consist of rough cobbles uniform in size.
Ore Sorting House Ruin: The collapsed remnants of a sorting house.

Shop Feature Systems

Backing Block: Some shops featured backing blocks to help workers sharpen the drill steels used by rockdrills. A backing block consisted of an iron rod 4 by 4 inches or less in cross-section and up to 8 feet long embedded in the shop floor near the forge. The block's surface featured a series of deep divots where the blacksmith rested the drill-steel's butt, and he leaned the drill-steel's neck against an anvil to brace the item for sharpening. Many mining outfits substituted a railroad rail for the iron rod.
Drill-Steel Sharpening Machine: During the 1910s, well-funded mining companies began adopting compressed air-powered machines to automate the process of sharpening drill-steels. Most sharpeners were upright units 2 by 3 feet in area, 3 to 5 feet high, and featured an assemblage of clamps and power hammers mounted on a cast iron pedestal. Sharpeners were always located in a shop.
Drill-Steel Sharpening Machine Foundation: Because drill-steel sharpening machines destroyed unpadded concrete foundations over time, they were usually bolted to foundations consisting of timbers or timber footers over concrete. Sharpener foundations are always located in a shop or on a shop platform, are usually 2 by 3 feet in area, and possess four to five anchor bolts.
Forge: Almost every mine shop featured a forge where blacksmiths heated iron. Several types of forges were popular, and most were 3 by 3 feet in area and 2 feet high. The *gravel-filled rock forge* consisted of dry-laid rock walls, the *wood box forge* had plank walls, and both were filled with gravel. The free-standing *iron pan forge* featured an iron pan supported by iron legs. Companies that required high volumes of work also installed cylindrical and square iron box forges usually 4 by 4 feet in area.
Forge Remnant: Over time, rock- and wood box forges decay, leaving mounds of gravel that often feature anthracite coal, clinker, and forge-cut iron scraps.
Lathe Foundation: Some mechanized shops featured a lathe to facilitate metal- and wood work. Lathes were usually bolted to parallel timbers around 2 by 8 feet in area or less.
Power Hammer Foundation: Mechanized mining companies installed power hammers to expedite metalwork. Many power hammers consisted of obsolete rockdrills bolted to timber posts, and they pounded items clamped to underlying tables. When removed, power hammers can be denoted by a heavy timber post up to 6 feet high and an adjacent timber stump where the table was located.
Shop Platform: The platform that supported a shop. An artifact assemblage including forge clinker, pieces of hardware, forge-cut iron scraps, cut pipe scraps, and cut wood scraps can help identify a shop platform.
Shop Ruin: The collapsed remains of a shop.
Shop Refuse Dump: A deposit or scatter of forge clinker, forge-cut iron scraps, cut pipe scraps, and pieces of hardware. Carpentry shops left an abundance of cut wood scraps, sawdust, and hardware.

Aerial Tramway Feature Systems

Ore Bin: Top terminals had bins for the input of crude ore onto the system and more bins to receive it at the bottom terminals. The bins were sloped floor types described above with mines.
Ore Bin Platform or Foundation: See mine Property Types above for a description.
Sheave Frame: All tramway types except for single-rope reversible systems had sheave wheels in the terminals for the traction cables. The sheaves were large-diameter iron wheels that spun on axles bolted to stout timber frames. On double-rope and Bleichert systems, the frame encompassed the wheel, while it left clearance around wheels for Hallidie systems. The frames were usually rectangular, cubic, with several layers of stringers tied with vertical posts. Diagonal buttresses braced the frame against horizontal forces.
Terminal Frame: Formally designed terminals had independent frames that supported the building and its components, often separately from the sheave frame. The frames were vernacular in that they were adapted to the conditions, needs, and performance of the system and its integration with the mine. Frames for Bleichert systems had hanging rails for the tram buckets bolted to the ceiling beams. The foundation was of concrete or timbers anchored to bedrock, and may have featured guides to direct the track cables to their anchors.
Terminal Building: The terminal building, usually custom-designed, encompassed the tram mechanism, braking station, and open floor where workers loaded or emptied tram buckets. Buildings were vernacular in construction, adapted to the environment, topography, and location at the mine. Form varied, but materials were usually lumber framing with corrugated sheet iron.
Tension Station: Lengthy Bleichert tramways consisted of multiple segments that operated independently. Tension stations joined the segments and served several functions. They allowed buckets to move uninterrupted from one segment to another, allowed the overall system to change pitch, and had anchors for the track cables. The stations consisted of timber frames on concrete or rock masonry foundations. Galleries through the structure provided passages for the buckets.
Tension Station Foundation: When dismantled, stations left symmetrical patterns of concrete, rock masonry, and timber footers for the frame. Tram hardware and debris usually lies scattered around.
Tram Tower: Towers supported cables between long spans. For a description of towers, see Section E 4.
Tram Tower Platform: Towers usually stood on earthen platforms cut out of a surrounding slope. Platforms for small towers were simple, flat areas while those for large towers may have featured rock retaining walls. Heavy structural materials and tram hardware may lie downslope.
Turning Station Foundation: Turning stations allowed lengthy tramways to curve around obstacles such as mountains. Also known as angle stations, the structures were a union between two independent segments, and in this regard, were similar to tension stations. Turning stations, however, also required the supervision of workers, sometimes to manually switch buckets from one line to another. Thus, turning stations were usually enclosed by a frame superstructure. The stations were custom-designed.

Ore Treatment Mill Feature Types

Mill sites often possess an array of archaeological, engineering, and architectural features that were components of the crushing, concentration, power, and support systems. To help researchers identify components and organize their data, the Feature Types below are arranged according to the general flow path employed at mills.

Ore Treatment Mill Buildings

Assay Shop – Character-Defining Features

Mills usually featured assay shops to track the efficiency of metals recovery and concentration. A metallurgist periodically tested samples of unprocessed crude ore and compared the results with tests on tailings and concentrates. If he found that the metals recovered by the mill approximated the amount in the crude ore, the metallurgist knew the mill functioned efficiently. The assay shop may have been within the overall mill building at small facilities, or provided with its own building at large plants. The shops had distinct appliances such as a free-standing or masonry assay furnace, a blower, a coal bin, and stout workbenches.

Assay shop buildings were usually constructed with the same materials and workmanship as the associated mill. Most were based on lumber frames, had ample windows, a chimney for the furnace, and a heavy subframe or foundation for crushing machinery. The shops were vernacular in that they had no recognized architectural style and were custom-designed for function and economy. A tall, brick chimney; machine foundations; and an artifact assemblage of assay debris are distinguishing characteristics.

- Core Plan: Rectangular, L, or square. Coal bin attached to side.
- Stories: 1 or 1 ½.
- Foundation: Log or timber footers on earthen platform for small buildings, and stone masonry or concrete under large versions. Brick or stone masonry pad for the assay furnace, and anchor bolts for furnace blower.
- Walls: Most were frame construction sided with board-and-batten, planks, or corrugated sheet iron over plank sheathing.
- Roof: Gabled or hipped. Construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Stovepipe for heating stove. Brick or stone masonry for assay furnace.
- Entry Door: Located in the front and side elevation, doors were factory-made panel units or custom-made of planks.
- Windows: Fixed, sliding, or sash in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere.

Mill Building – Character-Defining Features

Mill buildings were distinct in the mining landscape. Most enclosed the ore treatment machinery, power source, and other facilities under one roof. The buildings tended to be large, sloped in profile to conform to stairstep terraces or foundations, and irregular in plan.

Each mill was unique, professionally designed, and incorporated elements of both architecture and structural engineering. Most were based on a custom-designed frame that not only supported the walls and roof, but also appliances, bins, and the system of driveshafts and belts that ran the machinery. Given this function, most frames were made of heavy timbers and varied in design and construction. Foundations for small mills consisted of log or timber footers on earth, while stone or concrete sufficed at large plants. Well-designed mill buildings stood independently from interior structures such as bins and stamp batteries, allowing for replacement of the components. Most, however, were tied into the interior structures for economy of materials.

Although mills were professionally designed, they were vernacular in appearance. Prior to the 1910s, board-and-batten siding or walls of layered planks were common, while corrugated sheet iron and tarpaper dominated afterward.

- Core Plan: L or complex/irregular. Ore receiving and crushing was at the head, ore processing in the middle, and power source was usually in a lower level extension.
- Stories: 1 to 2, descending multiple stairsteps, with vaulted interior.
- Foundation: Log or timber footers on earthen platforms for small mills, and stone masonry or concrete under large versions.
- Walls: Most were frame construction sided with board-and-batten, planks, or various sheet iron, or rolled asphalt over plank sheathing. The walls may have stood independently of the principal mill frame or tied to the frame and interior structures.
- Roof: Gabled or shed at the head, and elongated shed over the main portion. Construction was commonly rafters, plank decking, and corrugated sheet iron, plank, or rolled asphalt cladding.
- Chimney: Stovepipes for heating stove and drying furnace. Steel smokestack for boiler.
- Entry Door: Located in the top story, side elevations, and lower level, doors were broad and custom-made of planks.
- Windows: Fixed, sliding, sash in any of the walls, made of 1x or 2x milled lumber. May be salvaged from elsewhere. Roof may have featured dormer units.

General Feature Types

Arrastra: An arrastra consisted of a circular stone floor ringed with low sidewalls, and a capstan at center. A draft animal tethered to a harness beam bolted to the capstan walked around the floor, dragging stones chained to the beam.
Arrastra Remnant: Arrastra remnants may retain portions of the floor, sidewalls, and capstan.
Assay Shop Platform: Assay shops often stood on earthen platforms or foundations of concrete and rock masonry. Distinct characteristics can define a platform as that for an assay shop. Foundations or other remnants of an assay furnace, its blower, and small crushers may remain. Artifact assemblages typically include furnace clinker, fire-bricks, broken assay crucibles, mineral samples, and laboratory artifacts.
Cistern: A concrete, masonry, or timber chamber that contained water for mill use. Because mills usually relied on gravity to pressurize plumbing, cisterns tend to be located upslope from a mill.
Conveyor: Mills relied on gravity to draw ore through a sequence of crushing and concentration machinery installed on terraces. Many designs used conveyors to return the ore to the upper terraces for reprocessing, or from one treatment stage to another. Early conveyors consisted of a bucket-line or spiral feed, and later conveyors consisted of belts on rollers. A timber or steel frame was the chassis for the assembly.
Conveyor Remnant: A partially disassembled conveyor.
Ditch: An excavation that carried water to a mill.
Flume: A wooden structure usually constructed with plank walls and a plank floor. Workers built flumes to convey water to or tailings away from a mill and to transfer slurry from one process to another within the mill.
Flume Remnant: The collapsed or buried remnants of a flume.
Machine Foundation: A foundation that anchored an unknown mill machine.
Mill Building Foundation: Mills stood on stout foundations that not only supported the building, but also machinery and structures within. The foundations had footers around the circumference for the walls, and additional footers on the terraces for the frame and machinery. At small mills, the foundations were timbers and logs embedded in earth. At large mills, the foundations consisted of concrete or masonry, and were often integrated with walls retaining the terraces.
Mill Building Ruin: A collapsed mill building.
Mill Platform/Terrace: Because mills relied on gravity to draw the ore through crushing and concentration, they were built over a series of terraces cut out of a slope. Often, the terraces are the principal features representing a mill. Each terrace supported a stage of treatment. When recorded, platforms should be numbered from the top down and described according to function.
Mill Tailings Dump: A deposit of finely ground rock flour and sand usually downslope or downstream from a mill.
Pipeline: An assembly of pipes that carried water.
Pipeline Remnant: The evidence left by a disassembled pipeline.
Privy: Most mill complexes included a privy for the crew's personal use.
Privy Pit: The pit that underlay a privy. Privy pits are often less than 5 feet in diameter and may feature artifacts visible in the walls and floor.
Pump Foundation: Often of concrete, pump foundations are rectangular, less than 2 by 4 feet in area, and may feature pipes.
Receiving Bin: Nearly all mills featured an ore bin at the head to receive crude ore for processing. The bins typically had sloped floors and discharge chutes in the front, which directed the ore into a stamp battery or primary crusher. The walls consisted of a timber frame sided on the interior by heavy planks.
Receiving Bin Platform or Foundation: Receiving bins stood on foundations and platforms similar to those for ore bins at mine sites. Timber or log footers embedded in the ground supported the frame, and cribbing or masonry may have supported the head and toe.
Receiving Bin Ruin: Remnants of receiving bins can be similar to those for ore bins at mine sites.
Refuse Dump: A collection of hardware, structural materials, and other cast-off items.
Reservoir: Some milling operations erected dams in drainages to impound water for use.
Utility Pole: A pole that carried electrical or telephone lines.
Water Tank: A large vessel, usually cylindrical, made of planks or sheet iron. To pressurize plumbing, water tanks were usually located near the head of a mill.

Water Tank Platform: Often a circular or semicircular platform for a tank. The platform's floor may feature a pipe.

Crushing System Feature Types

Jaw Crusher: A jaw crusher reduced crude ore from the receiving bin into gravel, completing the first stage of physical reduction. The heavy machine, also known as a Blake crusher, was located on the mill's upper terrace. Crushers usually featured jaws and dual flywheels powered by a belt. Small units were around 2 by 4 feet in area and large units were up to 4 by 8 feet in area.

Crusher Foundation: Due to severe vibrations, crushers were often anchored to stout timber or masonry foundations with timber footings. Small piles of crushed gravel often underlie crusher foundations.

Stamp Battery: Early mills relied on stamp batteries for primary crushing. After the mid-1880s, batteries often provided secondary crushing, reducing the gravel produced by a jaw crusher. A stamp battery consisted of a heavy timber gallows frame, heavy iron stamps that dropped into a battery box, and a cam shaft that raised and let the stamps fall. The cam rotated in the top of the frame, and it was fitted with a large bullwheel turned by a belt. The stamp shoes were fixed to steel rods that slid in guides. Batteries usually featured stamps in groups of five. The timber frame for a single group tended to be 7 feet wide, up to 15 feet high, and stood over a cast-iron battery box bolted to a timber pedestal. Initially, workers shoveled ore into the battery box for crushing, and by the 1890s, automatic feeders introduced the ore.

Stamp Battery Frame: In many cases salvage efforts dismantled the iron hardware from a stamp battery, leaving the timber frame. Bolts for the cam shaft and semicircular guides for the stamp rods are usually evident.

Stamp Battery Pedestal: Often, stamp mills were dismantled for use elsewhere, leaving a pedestal as the principal representation today. Stamp battery pedestals were rectangular, often 2 by 5 feet in area and 2 feet high, and consisted of timbers set on end. The pedestal anchored a cast-iron battery box in which the stamps crushed the ore.

Screening Station: Successful concentration and amalgamation required the crushed ore to be absolutely uniform in particle size after crushing. Screens in between each crushing stage allowed fine material to proceed while returning coarse particles for reprocessing. Trommels were preferred because they screened ore in a continuous flow. A trommel consisted of wire mesh cylinders nested together and bolted to a steel frame. As they rotated, fine material passed through while coarse particles rolled out and were returned.

Crushing Rolls: A crushing roll was an apparatus that provided secondary or tertiary crushing for ore already reduced to gravel. The apparatus featured a pair of large iron rollers set slightly apart in a cast-iron or heavy timber frame. As they rotated, the rollers drew gravel into the gap and fractured it. Small units were around 4 by 4 feet in area while common units were 6 by 6 feet in area. Crushing rolls were usually located on an upper mill terrace below the primary crusher.

Crushing Rolls Foundation: Crushing rolls were often anchored to a rectangular timber foundation consisting of heavy, horizontal beams bolted to posts that leaned slightly inward.

Huntington Mill: A Huntington mill was an apparatus that finely ground previously crushed ore, and some were used for amalgamation. The machine was based on a cast-iron pan approximately 6 feet in diameter and 3 to 4 feet deep ringed with a channel. A set of heavy iron rollers rotated across the pan floor and ground the ore to a slurry. Fine particles passed through screens breaching the walls and left via the channel.

Huntington Mill Foundation: Huntington mill foundations were factory-made, and the timbers often feature beveled edges. The foundation usually consisted of a rectangular timber footer 6 by 9 feet in area. The machine stood on heavy posts forming a 6 by 6 foot cube at one end, and the other end featured a raised block with a brace for the drive shaft.

Ball Mill: A ball mill was a steel vessel similar to today's cement mixer. The vessel tapered at one or both ends, rotated in heavy bearings, and was powered by a canvas belt and shaft. As the vessel rotated, steel balls inside tumbled and pulverized the ore into a fine slurry. Small units were 4 feet in diameter and 6 feet long. Ball mills were used for tertiary crushing in concentration mills and to recover gold with mercury in amalgamation plants.

Ball Mill Foundation: Ball mills were anchored to heavy concrete foundations distinct in footprint. The foundation featured three parallel pylons, usually 1 foot thick. Two pylons supported the vessel's ends.

The one for the narrow end was usually 2 feet long and 4 feet high, and the pylon for the broad end was 3 feet long and slightly lower. The third pylon, often square, stood away and anchored the driveshaft.
Rod Mill: A rod mill operated according to the same principals as a ball mill and saw like applications. The vessel, however, was cylindrical, and steel rods inside ground the ore.
Rod Mill Foundation: Rod mill foundations were similar to those for ball mills. Parallel pylons, usually 1 foot thick, 3 feet long, and as high, supported the vessel, and another pylon smaller in size anchored the driveshaft.

Concentration System Feature Types

Amalgamation Table: Amalgamation tables were only used in mills that processed simple gold and silver ores. The tables stood on heavy timber frames and sloped away from the toe of a stamp battery. The tabletops were usually copper, coated with mercury, and around 6 by 12 feet in area. The slurry of pulverized ore produced by the stamp battery trickled over the copper plate, and the mercury caught the gold. In early mills, a flume diverted the spent slurry out of the mill as tailings. Later, the flume delivered the slurry to other amalgamation appliances such as Huntington mills.
Amalgamation Table Frame: Amalgamation tables were usually removed from mills when the facilities were abandoned, leaving a heavy timber frame around 6 by 12 feet in area and at least 4 feet high.
Jig: A jig was a concentration appliance that enhanced the separation of metalliferous particles from waste. Common jigs consisted of a wood body with a V-shaped bottom that featured drain ports, and wood walls divided the interior into cells. A frame over the cells supported a cam shaft powered by a canvas belt. The shaft gently moved plungers up and down, agitating the slurry in the cells. The action kept light waste in suspension while allowing heavy, metalliferous material to drop out and settle in the V floor. A water current flushed the waste away. Most jigs were around 4 by 9 feet in area and 4 feet high.
Vanner: A vanner was a concentration apparatus between 4 by 8 and 6 by 13 feet in area. The machine featured a broad rubber belt that passed around rollers at both ends of a mobile iron frame. An eccentric cam imparted a vibrating motion that caused heavy, metalliferous particles to settle on the belt. The lighter waste remained on the surface and was washed into a flume by a jet of water. The waste may have flowed out of the mill as tailings, or continued to another set of concentration appliances. Scrapers removed the metalliferous material into another flume for recovery.
Vanner Foundation: Vanners were usually bolted to timber foundations that featured cross-members at both ends, stringers linking the cross-members, and braces for the frame. A flume for the waste slurry usually passed by the vanner's toe.
Vibrating Table: The vibrating table, introduced during the late 1890s, was one of the most successful and widely employed concentration apparatuses. Vibrating tables featured a slanted tabletop, often 5 by 15 feet in area, clad with rubber and narrow wooden riffles. The tabletops were often mounted at a slant on a mobile iron frame oscillated by an eccentric camp. The motion caused heavy, metalliferous material to settle against the riffles while a current of water washed the light waste into an adjacent flume.
Vibrating Table Foundation: Vibrating table foundations featured anchor bolts projecting out of three timber cross-members. Two cross-members were at the ends, and a third was parallel and near one of the ends. The foundations are typically around 12 to 15 feet in length.
Flotation Cells: Introduced during the early 1910s, flotation was a highly successful stage of concentration for complex ore. Flotation cells were based on a large rectangular wooden tank divided into compartments. Paddles agitated a slurry solution in each cell and swept a froth of metalliferous material over the cell's sides. The froth either flowed into a flume or into a second set of cells for additional concentration. A plank walkway often extended along the tank, and the assemblage stood on timbers on one of the mill's lower terraces.
Cyanide Tank: Cyanidation was an alternative to amalgamation for recovering gold from complex ore. Finely ground slurry was introduced into cyanidation tanks, where a dilute cyanide solution leached out the gold. Slowly rotating agitation arms on the tank floor ensured a constant blend. Similar to a water tank, the vessels were usually located on a mill's lowest terrace and provided a last stage of ore treatment.
Settling Tank: Some concentration mills featured settling tanks on the lowest platform where heavy, metalliferous fines gravitated out of spent slurry. Settling tanks were similar to wooden water tanks and often featured a revolving arm at center to exacerbate the settling process.

Power System Feature Types

Boiler: Prior to the 1910s, most mills were powered by steam engines. Return-tube boilers usually generated the steam. See Hardrock Mine Feature Types for a description of boilers.
Boiler Foundation: See Hardrock Mine Feature Types.
Boiler Setting Ruin: See Hardrock Mine Feature Types.
Boiler Clinker Dump: See Hardrock Mine Feature Types.
Motor: See Hardrock Mine Feature Types.
Motor Foundation: See Hardrock Mine Feature Types.
Overhead Driveshaft: Few mill appliances had their own independent power sources, and most were driven by a central engine or motor. Sets of overhead driveshafts and canvas belts transferred motion from the engine or motor to the appliances. Overhead driveshafts, also known as line-shafts, featured belt pulleys over each mill appliance and rotated in bearings bolted to the mill building's frame.
Steam Engine: Prior to the 1910s, steam engines were a common source of power for mills. Usually located on the mill's lowest terrace, the engine transferred motion to a system of overhead driveshafts via a canvas belt. Most engines were horizontal units between 2 and 3 feet in width and 8 to 12 feet long. A steam engine required a boiler.
Steam Engine Foundation: Steam engine foundations are often rectangular, studded with anchor bolts, and between 2 and 3 feet in width and 8 to 12 feet long. Workers built engine foundations with heavy timbers, brick or rock masonry, or concrete, and the foundations often featured a pylon for the outboard flywheel bearing.
Transformer Station: Those mills with electric power required transformer stations to convert and distribute the current. See Hardrock Mine Feature Types for a description.
Transformer Station Platform: See Hardrock Mine Feature Types.
Transformer Station Ruin: See Hardrock Mine Feature Types.

Smelter Feature Types

The features listed below are an abbreviated list of those expected at smelter sites. Smelters also included many of the same features as concentration mills, which are described in detail above.

Blower: Smelters relied on blowers to force an air blast into a furnace. A typical blower featured a ring of vanes encased in a wood or sheet iron shroud with a port for the outflow. A motor or steam engine powered the blower, and it often stood nearby. Blowers ranged from 3 to 8 feet in diameter.
Blower Foundation: A foundation that anchored a blower. Foundations were usually rectangular, less than 6 by 8 feet in area, and consisted of masonry, concrete, or timbers.
Coal Bin: Because smelters consumed high volumes of fuel, they almost always featured substantial bins for coal or coke. The bins were usually sloped-floor structures that facilitated a gravity-drawn flow of fuel from the structure.
Coal Bin Ruin: The collapsed remnants of a coal bin.
Coal Bin Foundation: Due to their great weight, coal bins usually stood on masonry or timber foundations. Scatters of coal or coke strongly suggest that a given foundation supported a coal bin.
Furnace: The smelters in the corridor relied on two general types of furnaces, depending on era. The earliest, dating from 1865 until around 1875, was a brick or rock masonry chamber, often with two floors, and ports for air drafts. The interior was lined with fire bricks. The masonry should feature evidence of intense heat and slag. The type of furnace used in later smelters was a free-standing, cylindrical steel vessel lined with fire bricks. These furnaces tended to be from 6 to 20 feet in diameter and as high. Workers input crushed ore in the top and drew out molten material through ports in the bottom.
Furnace Remnant: The collapsed remnant of a furnace.
Furnace Foundation: The early masonry furnaces stood on rectangular foundations of brick or rock integral with the chamber walls. The free-standing furnaces stood on brick or rock pads larger in footprint

than the steel vessel. A foundation for a blower is usually nearby. Furnace foundations almost always feature slag and evidence of heat.
Furnace Platform/Terrace: Furnaces usually stood on dedicated platforms or terraces within the smelter building. Because the furnace provided one of the last stages of ore treatment, the platform was among the lowest at a smelter. Evidence of a furnace, such as slag flows or a foundation, should remain. Free-standing steel furnaces often left little more than the foundation surrounded by slag flows, while masonry types may have left structural ruins.
Slag Dump: Slag is a vitreous waste left after ore was melted and the metal content drawn off. Smelting companies disposed of their slag in dumps downslope from the smelting complex.
Slag Flow: Uncontrolled releases of slag from a furnace created flows on the furnace platform. The flows appear similar to lava or smooth concrete.
Smelter Building: Smelter buildings were similar to those for ore treatment mills. Where possible, they were built over a series of platforms or terraces so gravity could draw the ore through the stages of preparation and smelting. Each terrace was usually dedicated to a specific treatment stage. For a description of the general constitution of the building, see Ore Treatment Mills above.
Smelter Building Foundation: The foundations for smelters were similar to ore treatment mills.

Mining Settlement Feature Types

The settlement Property Types offer a lengthy and diverse array of features, the most common of which are listed below. The researcher should review the entire roster because most Property Types share similar features. Only basic types of residential buildings associated with mines are described below, while those usually in unincorporated settlements and townsites are defined in the section on architecture.

Mining Settlement Building Types

Log Boardinghouse – Character-Defining Features

Mining companies erected boardinghouses for crews of four or more workers. The residents lived in a communal atmosphere, may have shared sleeping quarters, and usually consumed meals prepared in the building. Privies, outdoor work areas, and domestic refuse dumps or scatters are usually associated with boardinghouses.

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display “hog trough” construction, with flush sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames split from hand hewn logs or made of 1x or 2x milled lumber.

Frame Boardinghouse – Character-Defining Features

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.

- Walls: Post-and-girt or balloon frame sided on the exterior with two layers of planks sandwiching tarpaper or newspaper. Board-and-batten siding was common, as well. Planks were used in the interior.
- Roof: Front or side-gabled, with common rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames made of 1x or 2x milled lumber.

Log Bunkhouse – Character-Defining Features

Bunkhouses were a type of company housing where workers slept and spent leisure time, but did not regularly prepare food. Instead, they ate in a boardinghouse or company dining hall. Given this, bunkhouses often feature few food-related artifacts relative to the size of the building and the number of inhabitants.

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display “hog trough” construction, with flush sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames split from hand hewn logs or made of 1x or 2x milled lumber.

Frame Bunkhouse – Character-Defining Features

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Post-and-girt or balloon frame sided on the exterior with two layers of planks sandwiching tarpaper or newspaper. Board-and-batten siding was common, as well. Planks were used in the interior.
- Roof: Front or side-gabled, with common rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames made of 1x or 2x milled lumber.

Single-Pen Log Cabin – Character-Defining Features

A cabin was a self-contained residence for several workers or a family. In form, cabins were less than 20 by 25 feet in area and one story high. Workers built cabins with any combination of logs, lumber, canvas, and sheet iron. Cabins were vernacular in that the builder adapted conventional form and construction methods to local conditions, available materials, and need. Because cabins were self-contained households, they usually offer a wide array of domestic artifacts. Privies and refuse scatters are often associated.

- Core Plan: Rectangular, one room.

- Stories: 1 or 1½
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display "hog trough" construction, with flush sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe, typically near the rear end of the roof.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks and later were manufactured panel doors. Wooden door frames split from hand hewn logs or made of 1x or 2x milled lumber.
- Windows: Square or rectangular with frames split from hand hewn logs or made of 1x or 2x milled lumber.

Double-Pen Log Cabin – Character-Defining Features
- Core Plan: Rectangular, two rooms.
- Stories: 1 or 1½
- Foundation: Log or timber footers, or stone alignment, on earthen platform.
- Walls: Same construction as Single-Pen above.
- Roof: Same construction as Single-Pen above.
- Entry Door: Same construction as Single-Pen above.
- Windows: Same construction as Single-Pen above.

Rectangular Plan Frame Cabin – Character-Defining Features
- Core Plan: Rectangular.
- Stories: 1 or 1½.
- Foundation: Log or timber posts, log footers, or dry-laid stone laid on an earthen platform.
- Walls: Post-and-girt frame, horizontal planks or board-and-batten siding on the exterior, and plank siding on the interior.
- Roof: Front-gabled or side-gabled with wood shingles, rolled asphalt, asphalt shingles, or smooth or corrugated metal, over 1x wood decking fastened to 2x wood rafters.
- Chimney: Stovepipe.
- Entry Door: Located either under the gable for front-gable plan, or beneath the eave for side-gable plan. Entries were usually vertical plank doors and later manufactured panel doors.
- Windows: Vertical sash windows and wood frames made of 1x or 2x milled lumber.

Shotgun House (Rectangular Plan Subvariant)

A Shotgun House is a specific design one room wide, two or more rooms deep, and with entry in the gable end (front). Interior hallways are absent, and the rooms are divided by transverse interior walls and doorways. The front room was usually a parlor, with a kitchen to the rear. Other Shotgun House character-defining features are similar to those described above for rectangular plan wood frame dwellings.

Hall-and-Parlor House (Rectangular Plan Subvariant)

A Hall-and-Parlor plan is two rooms wide and one room deep. One room is somewhat larger than the other and typically served as a kitchen and communal living space. The smaller room was a bedroom. Hall-and-Parlor plan houses are covered by side-gable roofs, with the entry door on the side elevation and offset from center. Other character-defining features are similar to those described above for rectangular plan wood frame dwellings.

Privy – Character-Defining Features
- Core Plan: Rectangular or square.
- Size: 3x4 to 5x8 feet in plan.
- Foundation: Log or timber posts, log footers, or corner rocks around open pit.

- Walls: Post-and-girt frame, or corner posts with cross-members, plank or board-and-batten siding on the exterior.
- Roof: Front or side-gabled, or shed, with plank decking, and rolled asphalt, asphalt shingles, or smooth or corrugated metal. Decking may span the walls or be fastened to 2x wood rafters.
- Entry Door: Entries were usually vertical plank doors, sometimes opening onto a plank deck.

Prospector's Camp Features

Corral Remnant: Prospectors usually relied on pack animals to carry their goods and penned the animals in informal corrals near their camps. The corral boundaries maximized natural obstructions, and had fences of branches, stumps, and wire.
Dugout: A dugout was among the most impermanent and primitive forms of residence. They were created by prospectors who lacked wall tents but were unwilling to invest time and resources in superior accommodations. A dugout consisted of an excavation in a slope, 8 by 10 feet or larger in area, roofed with logs or branches covered with earth. The front often had a log or rock masonry façade, a window, and doorway. A chimney or stovepipe extended out the roof. Dugouts were not limited to residential use, and the design served other purposes. Root cellars, hay storage, and explosive magazines appear similar to dugouts. To recognize a resource as a dugout, it should be center to an assemblage of domestic refuse, which reflects inhabitation.
Dugout Ruin: Dugouts usually collapsed when abandoned. Ruins manifest as ovoid depressions embedded with structural materials. A sparse artifact assemblage of domestic refuse should be present.
Fire Hearth: Prospectors often built large outdoor rings or rock structures for cooking and heating fires. The ring should be near the tent or cabin platform and exhibit signs of aging such as collapse and revegetation.
Pack Trail: Pack trails often radiated outward from prospectors' camps to the areas under examination and to the nearest commercial centers. Most were created by foot and pack-animal traffic, and others were intentionally graded to fulfill claim assessment requirements. Pack trails are no wider than 8 feet.
Tent Platform: Prospectors often graded small platforms, usually less than 20 by 20 feet in area, for wall tents. In some cases, prospectors placed rocks on the platform's edges or corners to support a tent's wood pallet floor and drove stakes along the edges to guy the walls. A paucity of structural artifacts, the presence of tarpaper washers, and disbursed domestic artifacts characterize tent platforms.

Workers' Housing Features

Boardinghouse Platform: Boardinghouses usually stood on earthen platforms, which may feature rock or log footers and a collapsed root cellar. The platform often represents the building's size and footprint.
Boardinghouse Ruin: The structural remnants of a boardinghouse.
Bunkhouse: Bunkhouses were a type of company housing where workers slept and spent leisure time but did not regularly prepare food. Instead, they ate in a boardinghouse or company dining hall. Given this, bunkhouses often feature few food-related artifacts relative to the size of the building and the number of inhabitants. In form, construction, and style, bunkhouses were similar to boardinghouses, noted above.
Bunkhouse Platform: A platform where a bunkhouse stood. The platform should feature few food-related artifacts, and the platform usually represents the structure's size and footprint.
Bunkhouse Ruin: The structural remnants of a bunkhouse.
Cabin Ruin: The collapsed remains of a cabin.
Cellar Pit: Cellars, mistaken for dugout residences, were subterranean structures that provided cold storage for perishable food. They usually had plank walls retaining an earthen pit, a plank or log roof covered with earth, and a sunken doorway. In some cases, cellars were underneath cabins and boardinghouses. When the walls and roof collapsed, the cellars tend to manifest as pits with notches marking the entry. A lack of domestic refuse is a common attribute.
Chimney Remnant: A collapsed chimney, usually consisting of rocks or bricks. Chimneys are usually components of building platforms.

Cistern: Organized, well-capitalized residential complexes occasionally included cisterns for fresh water. Cisterns were plank, concrete, or stone masonry chambers sunk into the ground, usually with inlet and outflow pipes.
Corral: Pack animals provided transportation in the mining industry before 1940, when automobiles became common. Company housing complexes, unincorporated settlements, and towns almost always had corrals to impound multiple animals. The corrals varied widely in size, plan, and constitution, depending on the number of animals and type of impoundment operation. Livery businesses tended to build large corrals geometric in plan with wooden or wire fences, feed troughs, and stables. Mining companies, on the other hand, built smaller corrals that utilized natural features as barriers to save construction costs. Such corrals were built in open areas bordered by streams, rock outcrops, thickets, and slope changes, and incorporated combinations of branches, upended stumps, and wire as fencing.
Corral Remnant: After abandonment, corrals may feature evidence of their boundaries such as wires, branches, upended stumps, individual fence posts, and cobble alignments marking a fence line. The interior should either be open or feature vegetation younger than in the surrounding area.
Developed Spring: Settlements depended on water for existence, and residents were able to subsist on surface sources when a community was still in its early stages of growth. Springs were preferred because of their purity. When water was difficult to collect, the residents developed the spring by excavating a chamber, lining it with planks or masonry, and diverting drainage around the excavation.
Domestic Refuse Dump: People usually threw their solid refuse downslope from their residences, forming deposits of domestic artifacts. Large deposits that were high in volume qualify as dumps. Artifacts are usually domestic in nature, primarily food-related, and include food cans, fragmented bottles and tableware, and personal articles.
Domestic Refuse Scatter: A refuse scatter is a light amount of domestic artifacts disbursed over a broad area. Domestic scatters usually extend downslope from a residential feature.
Privy Pit: Privy pits were excavated in the ground underneath privies to receive waste. When a pit became full, the residents relocated the privy building, topped the depression off with domestic refuse, and shoveled over a soil cap. The cap subsided as the pit contents leached away and decayed, creating a depression usually less than 6 feet in diameter. Pits often feature backdirt downslope, some domestic refuse in the interior, and ashy soil. The pit may be surrounded by more refuse and footers for the privy building.
Residential Building: Settlement sites may feature buildings that material evidence defines as residential, but the buildings do not clearly possess the characteristics of boardinghouses, bunkhouses, or small cabins. Such buildings can be recorded as general residences.
Residential Building Platform: A platform, confirmed by artifacts, which supported an unspecified residential building.
Residential Building Ruin: The structural remnants of a residential building.
Road: Residential complexes usually required roads to accommodate traffic. Roads are at least 8 feet wide.
Root Cellar: Residences and businesses that handled high volumes of perishable food had root cellars for storage. Such enterprises were commonly boardinghouses, restaurants, hotels, and markets. Root cellars, often mistaken for dugouts, were excavated near their associated buildings. Walls usually made of rocks, logs, or lumber retained the earthen sides and a roof covered with more earth. Because root cellars were not residences, they usually offer few domestic artifacts and lack stovepipe ports.
Spring Box: A spring box was a small enclosure built over a developed spring. The structures had plank walls, often a masonry or concrete chamber, a roof, and an entry door.
Stable Ruin: A collapsed stable.
Well: Because many settlements lacked reliable and clean sources of water, residents turned to wells. Three types were common in mining districts. The earliest was a hand-dug shaft lined with dry-laid masonry and crowned by a platform at the collar. Once hardware was available, residents sank pipes into the ground and fitted them with hand-pumps. In some cases, communities or mining companies installed steam- or gasoline-powered pumping stations over large-diameter wells.

Townsite and Unincorporated Settlement Features

Townsites and unincorporated settlements usually included some of the same features described above with Workers' Housing. Common building types are described in the section on architecture.

Assay Shop: See Ore Treatment Mill Feature Types.
Assay Shop Foundation/Platform: Assay shops often stood on earthen platforms or foundations of concrete and rock masonry. Distinct characteristics can define a platform as that for an assay shop. Foundations or other remnants of an assay furnace, its blower, and small crushers may remain. Artifact assemblages typically include furnace clinker, fire-bricks, broken assay crucibles, mineral samples, and laboratory artifacts.
Blacksmith Shop: Blacksmiths were vital to mining communities because they manufactured hardware, maintained tools, and shoed draft animals. Nearly every community had a blacksmith, who kept shop on the fringes of the business district. Community blacksmith shops were equipped like those at mines, and the buildings were vernacular and simple in form. They were square, rectangular, or L-shaped, one-story, and gabled. In construction, they consisted of combinations of logs, lumber, and sheet iron, and were rough. The floor was the underlying earthen platform and the foundation usually of logs or rocks. The interior was open and featured workbenches, a coal bin, a forge, an anvil block, and a blower to force air into the forge.
Blacksmith Shop Platform: Blacksmith shops usually stood on earthen platforms larger than the building for storage of materials and large items. Rock alignments and deposits of forge clinker usually define the building's footprint. The artifact assemblage is distinct and includes much forge clinker, forge-cut iron scraps, hardware, and sheet iron.
Blacksmith Shop Ruin: The collapsed remnants of a blacksmith shop.
Commercial Building: See section on architecture.
Commercial Building Foundation/Platform: Primitive commercial buildings stood on logs or rocks laid on earthen platforms. Large buildings may have stood on formal foundations of masonry or concrete. Artifacts and buried archaeological deposits are often few because most service and retail businesses generated little refuse.
Commercial Building Ruin: The collapsed remnants of a commercial building.
Ditch: Many unincorporated settlements and towns featured ditches that delivered fresh water for consumption and other uses. The ditch, the most primitive public utility, tapped the nearest reliable source and carried the water through the settlement.
Hotel: See section on architecture.
Hotel Foundation/Platform: Small hotels stood on rock alignments and logs laid on earthen platforms, while larger hotels may have had formal masonry or concrete foundations. The platforms tend to be large and may feature a cellar pit if the hotel had a kitchen. The artifact assemblages are often distinct and can include a high proportion of small personal items, clothing, hardware, decorative domestic wares, furniture parts, and lamp parts. Large and numerous privy pits are often associated.
Livery: A livery was a business that temporarily boarded draft animals. Defining characteristics include corrals, collapsed fences, evidence of stables, earth packed by animal traffic, and manure deposits. Because of noisome pests and odors, liveries were usually located on the fringes of a settlement. The artifact assemblage should include a high proportion of tack straps and hardware.
Restaurant: See section on architecture.
Restaurant Foundation/Platform: Restaurant platforms are similar to those for commercial buildings, except they almost always offer large quantities of food cans, fragmented tableware and bottles, butchered bones, and kitchen implements.
Saloon: See section on architecture.
Saloon Foundation/Platform: Saloons stood on platforms similar to those for commercial buildings. The artifact assemblage is distinct and includes high proportions of fragmented bottles relative to other items.

Section F 2: Timber Industry Property Types and Registration Requirements

INTRODUCTION

This section lists types of historic resources common to the timber industry in the I-70 Mountain Corridor and provides their registration requirements. The Property Types are categorized according to the industry's two principal facets: lumber milling and railroad tie production. Itemized descriptions of the archaeological, structural, and architectural features are offered at the section's end to refine historic resource interpretation.

The following Property Types and Subtypes are developed in this section:

- Sawmill Site
- Logging Camp
  - Single Residence
  - Multiple Residence
- Loading Station
- Tie Collection Point
- Flume
- Rural Historic Timber Industry Landscape

PROPERTY TYPE: SAWMILL SITE

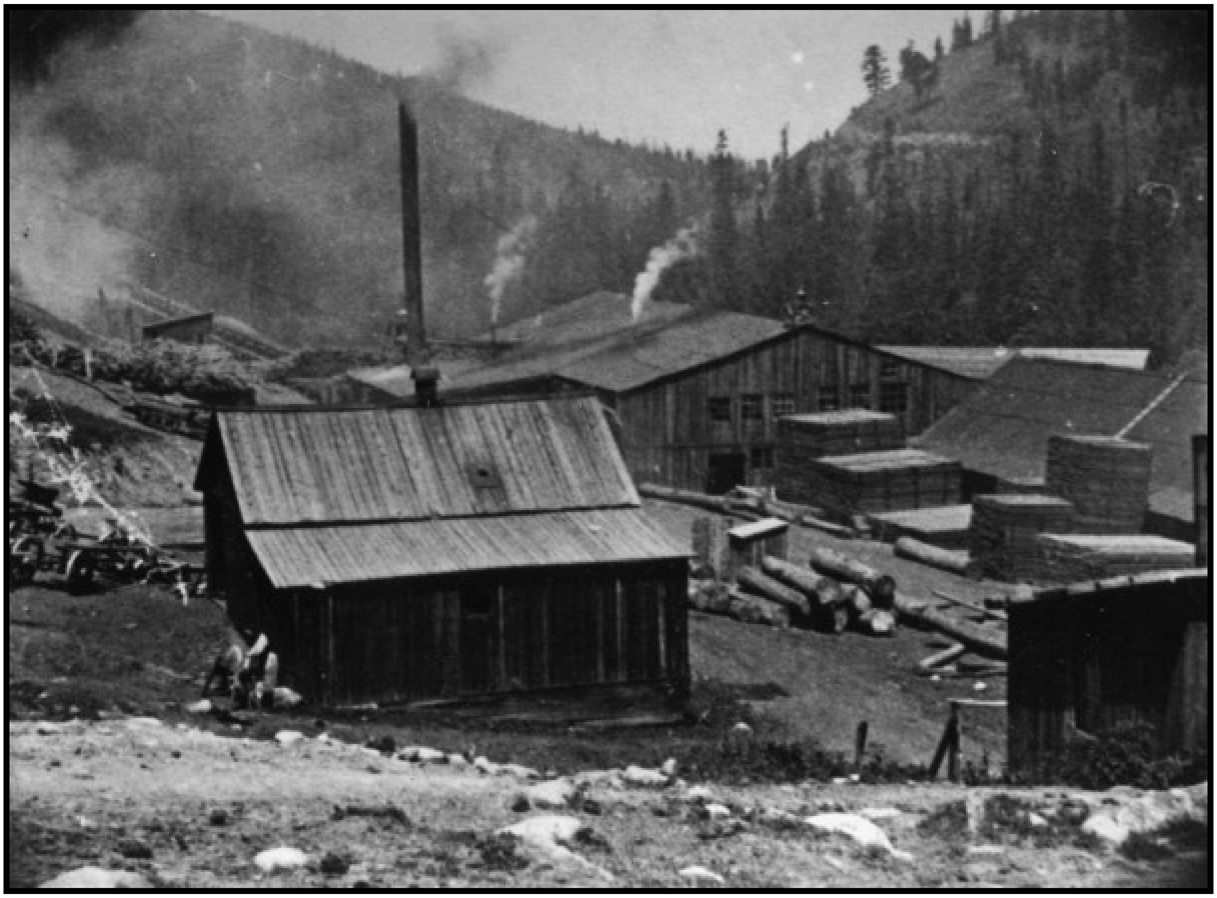
Sawmills were industrial complexes of buildings and engineered structures where workers reduced raw logs into lumber. Individuals and partnerships ran small mills, and organized companies operated the large facilities. Overall, the process of converting logs to lumber was uniform throughout the West, and probably nationwide. It began when teamsters delivered raw logs via wagon or mule to a stockpile slightly upslope from the sawmill. Flumes may have delivered logs to large facilities, and after the 1910s, lumber companies increasingly used trucks. Workers inspected the stockpiled logs, staged them on either a loading frame or earthen platform, and rolled them down to the sawmill one by one as needed.

The sawmill itself was an engineered structure rather than a building, although most were enclosed under a roof. The dominant aspect was a long, timber frame with two radial saws near center that cut lumber lengthwise and crosswise. Workers fastened one log at a time to a dolly on rails, and winched it along the frame and into the saw blades. When the dolly was moved back and forth, the saws cut away the rinds of bark and reduced the log into dimension lumber. Finished product left the frame on rollers or another dolly, and workers stacked it for shipment to market. They also collected the discard rinds known as mill slabs and threw them into stacks. Prior to around 1920, a steam engine usually powered the saw blades, and it and the boiler were bolted to a stout foundation adjacent to the saw frame's middle. After 1920, lumber outfits increasingly employed gasoline engines. Because sawmills had to be moved when a stand of timber had been cut over, their components were portable. As a result, the large frame, engines, boiler, and other pieces of equipment were designed to be disassembled.

Because lumber production methods and equipment were universal, sawmill form and configuration tended to follow the general template outlined above. Although most sawmills incorporated factory-made machinery, each was vernacular in engineering and construction. Vernacular sawmills were custom-designed, usually by the lumber company, to function in a specific environment or place while meeting needs of the operation. The company built the plant with a combination of factory-made and forged hardware, purchased lumber, locally harvested logs, and lumber previously cut by the company. Workers then assembled the materials according to their interpretation of the general sawmill template. When adapting the template, they considered the operation size, immediate environment, and available capital. Their construction skills, experience, and traditions of building and engineering were influential factors, as well.

Most saw complexes included buildings, and, like the sawmill, they, too, were almost always vernacular. Workers maintained tools and manufactured hardware in blacksmith shops, stored materials in sheds, and lived in cabins or boardinghouses. Lumber companies also kept draft animals, always present, in stables. Architects or engineers rarely designed and constructed the buildings, which were instead familiar forms that workers adapted to company needs, budget, and the surrounding environment. Workers assembled the buildings with materials available at the sawmill complex, primarily raw logs and lumber cut by the company. The buildings were also expressions of workers' techniques, methods, and cultural backgrounds.

Most of the sawmills in the I-70 Mountain Corridor were small facilities such as this one photographed near Silver Plume in 1938. They were simple for portability and relocation to fresh forests. The sawmill, frame enclosing the saw frame, and building around saw-blades and engine are at left. Finished lumber and logs are stockpiled near center, and workers' housing is right. Courtesy of Denver Public Library, X-17668.



The I-70 Mountain Corridor featured a few large sawmills comparable to the W.H. Woods plant in Winter Park, photographed around 1910. The large building in center background houses the saw-blades, steam engine, boiler, and probably planing machinery. A residential cabin stands in the foreground, raw logs are stacked in rows in the distant background, and finished lumber is stacked at right. Courtesy of Denver Public Library, X-14066.

In addition to buildings and the sawmill itself, complexes usually included aspects of primitive infrastructure that supported the workers and associated logging operation. Ditches and pipelines provided water for the workers and steam equipment, and flumes may have delivered raw logs or carried lumber away. Transportation systems included networks of skid trails to logged areas, and roads for freighting finished products to market. As with the sawmill proper, these aspects of infrastructure were rarely professionally designed and instead evolved organically in response to need.

Most sawmills in the I-70 Mountain Corridor were dismantled when they ended service, leaving few if any intact at present. As a result, those sites left today tend to be represented primarily by archaeological evidence. Timber bolsters and log cribbing may denote the log staging area, foundation footers and impressions left by timbers tend to reflect the saw frame, and debris and earthen platforms depict the locations of buildings. Sawmills also left distinct forms of refuse such as hardware, sawdust dumps, and stacks of mill slabs. Most sites are expected to retain poor physical integrity because they operated in environments that discouraged the preservation of features and artifacts. Revegetation, the accumulation of forest duff, and soil creep often obscures surface features. Moisture, organic soil, and duff conceal artifacts and disintegrates perishable items. Thus, sites that retain high degrees of archaeological integrity are uncommon.

Sawmill Site Significance

As historic resources, sawmill sites participated in and were associated with a variety of important trends and historical patterns. These are summarized as the NRHP areas of significance below, and include Commerce and Economics, Engineering, Community Planning, Exploration/Settlement, Industry, Politics/Government, and Social History.

Period of Significance must be considered when assessing the historical importance of sawmill sites. In general, the Period 1860 to 1920 covers the timber industry as a theme throughout the entire I-70 Mountain Corridor. But the industry's history was not uniform throughout the corridor, and narrower timeframes of importance may be more applicable to specific regions when assessing resource significance. The regions and important periods of time are: 1860 to 1920 in Clear Creek drainage, 1879 through 1912 in Summit County, and 1886 to 1920 along the Eagle and Colorado rivers. Some, if not all, the areas of significance below were applicable to lumber operations during these timeframes. Level of significance was mostly local, but statewide in some areas.

Areas of Significance: Commerce and Economics: The timber industry and its sawmills were significant in the areas of *Commerce* and *Economics* on local and statewide levels. At the local level, the industry converted natural resources into a cash product and diverted a large portion of the money into local economies. The lumber companies paid wages to their workers, hired contractors for various services, and purchased small items from sources in nearby towns. The lumber produced and consumed locally was also a contribution. Overall, the timber industry was large enough to have a significant local impact.

On a statewide level, lumber companies were part of and contributed to complex regional and statewide commercial and economic systems. For example, the companies in Clear Creek drainage shipped their products to Denver; the outfits in Summit County sold lumber in Leadville and the Robinson district; and the sawmills in Eagle County supplied Leadville, Red Cliff, and Aspen. The transactions supported a regional economy, and wed the timber industry with mining and railroads.

As another example, lumber companies acquired large machinery and other industrial goods from manufacturers mostly in Denver, and to a lesser degree from outside of Colorado. The manufacturers in Denver in turn purchased their materials from sources within and outside of Colorado. Given this, the lumber companies supported primarily Colorado's and secondarily other economies. It should be noted that large operations had a greater association with these trends than the small ones.

For a third example, the hundreds of workers employed by the lumber companies consumed food and other domestic goods purchased from a variety of sources. Preserved food was shipped from packing companies in the Midwest and on the West Coast, while fresh foods came from Colorado farms and ranches. By consuming both preserved and fresh foods, lumber company employees not only supported a complex food transportation network, but also helped the development of farming and ranching in Colorado. Merchants in the nearby towns handled most of the food and goods, and the acquisition of such therefore contributed to local economies. Large lumber companies consumed goods, services, and machinery in volume, and are therefore more closely allied with the above trends than the small operations. Cumulatively, however, the small companies outnumbered the substantial operations and had a significant impact.

Area of Significance: Community Planning: Lumber produced by sawmills was an important if not understated factor in the development patterns of the corridor's communities. In particular, lumber was the material basis for the types, forms, and construction of the buildings that constituted the communities. By producing lumber, the industry allowed settlements to evolve from collections of crude and cramped log cabins into towns of stately frame buildings. Using specific sizes of lumber and trim, building owners were able to express building function, their socioeconomic status through appearance, cultural preferences, and adapt architecture to the mountain climate. Collectively, the behavior manifested as development patterns, districts, and neighborhoods in the communities.

Area of Significance: Engineering: *Engineering* was an area of significance specific to sawmills. When erecting large plants, logging outfits adapted known lumber production technology and engineering to the most primitive environmental conditions including difficult terrain, inaccessibility, and an undeveloped landscape. In so doing, the outfits collectively contributed to the development of vernacular engineering specific to lumber production. Overall sawmill design, the arrangement of components, the preferred machinery, and the process for converting trees into lumber became a template that the timber industry implemented for decades.

Area of Significance: Exploration/Settlement: Sawmills were involved with the area of *Exploration/settlement* in three principal ways, primarily at a local level. The first applies to the remote reaches of Clear Creek drainage during the 1860s and the Eagle and Colorado rivers during the 1880s. In these regions, sawmills and their camps were among the earliest Euro-American outposts. From these bases, loggers explored areas ignored by prospectors, homesteaders, and ranchers, and contributed to a growing knowledge regarding I-70 Mountain Corridor geography.

Second, sawmills influenced settlement patterns in the remote portions of Clear Creek drainage, Ten Mile Canyon, the Dillon area, and the Eagle and Colorado rivers. Sawmills were the reason why some organized hamlets existed. Several of these, including Bakerville and Fisk's Station near the head of Clear Creek, would have dissolved were they not sawmill centers. With the support of logging, the hamlets were able to fulfill other roles such as frontier outpost, communications and transportation center, and point where prospectors and travelers sought shelter and supplies. Sawmills were also a mechanism for widespread, rural settlement in areas unsuitable for agriculture and mining. Mill workers and loggers lived in hundreds of crude cabins and boardinghouses scattered throughout the region's forests.

Third, sawmills directly supported many of the principal settlements in the corridor. Although the towns were not entirely dependent on logging, sawmills complemented other industries and economic sectors. Lumber companies contributed to local economies, did business with merchants, and employed town residents. This helped stabilize the principal settlements and allow them to become permanent.

Area of Significance: Industry: As sources of lumber, sawmills were important in the area of *Industry*. Significance is both local and statewide and should be considered for the region where the sawmill operated.

In Clear Creek drainage, lumber companies provided the physical materials that literally built the mining industry, all the settlements, and the three railroads. Mining was the county's economic foundation, and the county's mining industry was important to Colorado for a variety of reasons. The industry brought some of the first Euro-Americans to the central Rocky Mountains, contributed heavily to the state's economy, influenced social patterns, and was a national icon. On a statewide level, sawmills also produced a large amount of lumber for Denver, supporting growth there. The relevant timeframe is the late 1870s through the 1890s.

Lumber companies played a similar role in Summit County. The mining industry in Ten Mile Canyon and around Dillon depended on lumber produced by the region's sawmills. Similarly, the two railroads and the communities of Dillon, Frisco, and Wheeler were based on locally produced lumber. The sawmills also shipped thousands of board-feet of lumber to Leadville and the Robinson Mining District.

In the Eagle and Colorado River valleys, Eagle County, sawmills were the first important form of industry besides the Denver & Rio Grande Railroad. Their lumber supported early settlement, the railroad, and the communities of Minturn, Dotsero, Eagle, and Gypsum. The lumber companies also shipped products to Leadville, Red Cliff, and Aspen, and in so doing, contributed to the success of these major centers of mining.

Industry on the mining frontier is a relevant area of significance for the early sawmills in Clear Creek drainage and Summit County. Lumber producers were on the forefront of the frontier and provided the physical materials that fostered mining and associated settlement. Along with miners, loggers were the earliest Euro-American settlers.

Area of Significance: Politics/Government: Sawmills were the instruments that lumber companies used to exhaust forests on public lands, which encouraged federal regulation of logging. Prior to passage of the Forest Reserve Act in 1891, commercial logging was largely unregulated because the federal government provided no clear structure for the industry. The Forest Reserve Act allowed the president to designate forest reserves and control logging within their boundaries. But the federal government neglected to enforce the act due to a lack of support and insufficient funding for responsible agencies, such as the General Land Office and Department of the Interior. In the I-70 Mountain Corridor, the destruction of entire forests due to haste and wasteful practices became so blatant that Colorado state and federal foresters began responding during the 1890s. They enforced the act's regulations by shutting down offending sawmills and requiring lumber companies to follow a permitting process. The Roosevelt administration then created the Forest Service in 1905, and designated the Arapahoe and Roosevelt National Forests in Clear Creek drainage and the White River National Forest in Summit and Eagle counties to better regulate logging in the I-70 Mountain Corridor. The lumber companies and their large sawmills directly contributed to the designation of these national forests and permanent, strict regulation.

Area of Significance: Social History: As centers for large workforces, sawmills are associated with the area of *social history*. Lumber companies and mining in the I-70 Mountain Corridor shared the same general pool of labor and investors. Workers tended to migrate between the two industries, and investors often participated in both mining and lumber companies. Given this, mining and logging contributed to the evolution of local and statewide social structures together.

One form of social structure was the development of classes in Colorado. Local investors backed most of the sawmills, and the profits made from lumber helped some ascend to upper classes while cementing others in a growing middle class. The laborers, of whom there were many, formed a working class dependent on wages.

The other form of social structure was the workforce that made logging possible. Industrial-scale operations created a strong employment market that provided jobs to hundreds who lacked the skills for other industries. Some of those workers were immigrants, mostly from European countries, and the lumber industry provided them with pay, a foothold in the mountains, and opportunity for advancement. Because logging was integrally tied to mining, it was subject to the same cycles of boom and bust. These cycles required that the workers be mobile, which contrasted sharply with Colorado's sedentary farming and ranching culture. Each boom drew laborers from a variety of backgrounds and the busts propelled them to other regions and economic sectors in Colorado. The result was a mobile, adaptable, and diverse society.

Sawmill Site Registration Requirements

To qualify for the NRHP, sawmill sites must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A.

Criterion B: Sawmills may be eligible under Criterion B provided that an important person was physically present at the site on a sustained basis. Presence will most likely be through residence, employment, or other involvement with the logging operation. The associated resource must retain physical integrity relative to that person's productive period of occupation. Further, the resource must date to the same timeframe when the individual achieved significance. If the significance is through the person's presence on-site and participation in operations, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in lumber operations or owned sawmills but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

<u>*Criterion C:*</u> Sawmill sites may be eligible under Criterion C when they clearly exemplify a sawmill operation and possess integrity relative to one of the timeframes of significance at the section's beginning. Because most equipment and buildings were removed when a sawmill was abandoned, archaeological features and artifacts usually represent the operation. A site retains sufficient integrity on an archaeological level when the material evidence clearly conveys the overall complex's organization pattern, the sawmill design, support facilities, and historical operations. Intact buildings, structures, and machinery are rare, and may be important examples of engineering, technology, and architecture specific to lumber production. Some of these attributes may also reflect adaptation to the environment and resources typical of high-elevation mountains. Character-defining attributes must be evident, even if on an archaeological level. The log staging area, remnants of the saw frame, its power source, associated buildings, waste disposal area, and other facilities should be discernable.

Sawmill sites may be eligible under Criterion C if they are contributing elements of a historic logging landscape. Even when a sawmill site appears unimportant as an individual entity, it may provide context or belong to a greater body of nearby resources representing an area's history.

<u>*Criterion D:*</u> Sawmill sites may be eligible under Criterion D if they hold a high likelihood of yielding important information upon further study. Buried archaeological deposits are a common source of information, and they can manifest as privy pits, layered materials around building platforms, and thick sawdust dumps. Deposits amid a sawmill may include artifacts capable of enhancing our current understanding of workplace behavior, diet, and substance abuse. If the workers lived on-site, residential deposits may illuminate the currently dim portrait of loggers and their lifestyle.

If a site possesses structures and buildings, detailed examination may reveal how lumber companies adapted architecture and engineering to meet their needs in difficult high-altitude conditions. Process and infrastructure systems often lend themselves to detailed studies, and examples include sawing logs into lumber, powering the sawmill, and delivering water.

Eligible sawmill sites must possess physical integrity relative to one of the timeframes of significance outlined above. Because most small sawmills possessed few structures and little machinery, usually salvaged when a site was abandoned, integrity will probably be on an archaeological level. Although archaeological features now represent large sawmills, as well, today's sites may still offer intact buildings or engineered structures. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the operation. Common features encountered at sawmill complexes are noted under the feature types below.

Most of the seven aspects of historic integrity defined by the NRHP apply to sawmill sites. Intact buildings, structures, and machinery must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, the sawmill's material remains, including the archaeological features, must convey the facility's organization, planning, and engineering. To retain the aspect of *setting*, the area around the sawmill, and the resource itself, must not have changed a great degree from its timeframe of significance. If the resource is isolated, then the natural landscape and areas of stumpage should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain at least archaeological integrity. In terms of *feeling,* the resource should convey the sense or perception of logging. Integrity of *association* exists where structures, machinery, and archaeological features convey a sense of connectedness between logging and a contemporary observer's ability to discern the historic sawmill operation.

PROPERTY TYPE: LOGGING CAMP

Logging camps were residential centers for a timber industry workforce made up of loggers, builders, muleskinners, blacksmiths, cooks, and hostlers. Small, simple camps provided a few workers with housing and meals, while substantial complexes were also base camps with facilities in support of logging itself. Regardless of size, most camps included a blacksmith shop and stables for draft animals. Lumber companies and tie contractors established their camps near their points of work deep in the forest, too far from a sawmill or settlement for a reasonable commute by foot.

A historic resource can qualify as a logging camp if it meets certain conditions. First, the principal function must have been workers' housing. If the aspects of housing are associated with a sawmill site, then those aspects would be components of the sawmill site instead of being a resource in itself. Second, the resource should be nearby, if not within, an area of stumpage, thereby tying it to logging. Last, the resource should possess some of the physical characteristics described below.

Logging camps can be divided into two groups. The first is a single-residence camp, which consisted of one cabin and simple facilities that supported several workers and their logging operation. The other is a multiple residence camp. These had several residential buildings, almost always support facilities, and road access.

Logging Camp Subtypes

Single Residence Logging Camp: Single-residence camps had one residential building for a small team of loggers and also simple facilities that supported them in their immediate work. Loggers preferred to site their camps in the forest where they worked, but they were willing to commute short distances if a stream was available nearby. The camps remained primitive because the loggers occupied them on a temporary basis, just long enough to cut over the surrounding forest.

The residence was usually little more than a primitive cabin vernacular in form, materials, and construction. In general, the cabins were rarely designed by architects or engineers and instead were planned by loggers in the field to meet their daily domestic needs. The loggers relied on their knowledge of building form and construction to complete functional cabins that met their basic requirements at minimal cost. Most of their cabins were square or rectangular, single- or double-pen in plan, and less than 25 by 30 feet in area. Workers usually constructed the building with locally harvested logs on a cut-and-fill platform large enough for the floor. They assembled the walls with saddle, square, V, or dovetail joints, and chinked gaps between the logs with mud retained by log or lumber strips. The loggers then laid one or more ridge-beams across the walls to support a roof of split logs, lumber, or shingles. This general pattern changed little from the 1870s through the 1910s. During the 1860s, dry-laid rock foundations and stone fireplaces were common.

Although the residence was a camp's core feature, the camps also had several support facilities. A stable and corral were the most common because loggers almost always relied on draft animas to haul their products to a sawmill or shipping point. The stables were usually constructed with the same materials and workmanship as the cabins, except that they lacked windows, had wide doorways, and were drafty. The corrals varied in plan and were arranged on unaltered ground near the stable. Instead of erecting formal fences to bound the corral, loggers gathered materials such as downed branches and logs as barriers, and incorporated features such as stumps, rock outcrops, and stands of brush.

A blacksmith shop was another common facility, and it allowed loggers to sharpen tools and manufacture light hardware. The basic appliances included a forge and blower, an anvil, and a workbench. Where logging operations were intensive, the workers may have erected a dedicated building for the shop, although they usually arranged the appliances under an awning adjacent to the cabin.

In camp, loggers attended to the basic necessities of life, and those resources existing today usually offer evidence of this. Meals were a centerpiece of the logger's day, and the artifact assemblages at camp sites almost always have a high proportion of food-related items. Cans are common as loggers relied on preserved food and had little time for elaborate meals based on fresh ingredients. General domestic items are few because of the austerity and simplicity of logging camp lifestyles.

Waste disposal at single-residence camps was primitive. Privies served as toilets, and they tended to stand over shallow pits away from the cabin. The pits were shallow because the loggers expected their occupation to be brief. Household refuse was usually thrown downslope from the cabin and accumulated in the forms of scatters and dumps.

Although single-residence camps are associated with lumber operations, the camps tend to be strongly allied with railroad tie production. Lumber company employees often lived and worked in crews, while most tie hacks were independent contractors who usually worked in pairs.[1] A party of several hacks needed little more than a single cabin and a stable. Specific physical evidence may identify a given camp as that for tie hacks. Unfinished ties may lie around, and most of the stumps in the area should range from 10 to 20 inches in diameter, the preferred size for railroad ties.[2]

Because single-residence camps were occupied briefly and their buildings poorly assembled, the structural elements collapsed after abandonment. Thus, most camp sites tend to manifest as archaeological resources. Standing cabins and stables are uncommon and may be important if they are representative of logging camp architecture.

Multiple-Residence Logging Camp: Multiple-residence camps were lumber company outposts for intensive logging operations too far from a sawmill or settlement for a commute by foot. The camps had two or more residential buildings and industrial facilities that supported logging operations. Although some tie contractors employed crews large enough to justify multiple-residence camps, most can be attributed to lumber

[1] Reich, 2008:175.
[2] Reich, 2008:175; Wroten, 1956:243.

companies. To confirm whether a camp belonged to a lumber company, stumps in the area should be greater than 15 inches in diameter, a size preferred for lumber.

The residences ranged from primitive cabins to bunk- and boardinghouses, and most were vernacular in the same manner as those described with single-residence camps above. Although logs were the favored building material, some companies used frame construction in formally designed camps. The difference between a bunkhouse and boardinghouse was meal service. Although both buildings were intended to house multiple workers, meals were prepared and eaten in boardinghouses while workers merely slept and spent leisure time in bunkhouses. As a living environment, the camps were unimproved and rough because they were intended to be temporary and occupied only long enough to cut over the surrounding forest.

In addition to residences, the camps almost always had support facilities for the logging operation. Several stables and a corral were common because lumber companies required draft animals to haul their products to the sawmill or a loading station. The stables were usually constructed with logs, lacked windows, had wide doorways, and were drafty. The corrals tended to be informal as at single residence camps and arranged on unaltered ground by the stable.

A blacksmith shop was an important facility, and in it, a company blacksmith sharpened tools and manufactured light hardware. The shop was often in a dedicated wall tent or building constructed like the camp's others. Inside were basic appliances including a forge and blower, anvil, and workbench.

Where production was high, camps had loading stations where loggers stockpiled logs and transferred them onto wagons. The station, described below as a resource type, consisted of a clearing for the stockpile and elevated frames for rolling logs onto wagons.

In the camp, lumber companies provided for the workers' basic necessities, and those sites existing today offer evidence of this. Meals were a centerpiece of the logger's day, and the artifact assemblages at camp sites almost always have high proportions of food-related items. Although cans are common, companies also served meals based on fresh ingredients such butchered meat. If the company offered fresh food, it usually excavated a root cellar or a cellar pit underneath the kitchen as cold storage. General domestic items are usually few because of the austerity and simplicity of camp life.

Waste disposal at multiple-residence camps was primitive but somewhat organized. Privies served as toilets, and they tended to stand over deep pits away from the residences. Household refuse was usually thrown downslope and away from the residences, where it accumulated in the form of a distinct dump.

Because multiple-residence camps were intended to be impermanent, their buildings were poorly assembled and usually collapsed after abandonment. Thus, most camp sites tend to manifest as archaeological resources. Standing residences and stables are uncommon and may be important if they are representative of logging camp architecture.

Logging Camp Significance

Logging camps participated in and were associated with a variety of important trends and historical patterns. These are summarized as the NRHP areas of significance below and include Commerce and Economics, Community Planning, Exploration/Settlement, Industry, Politics/Government, and Social History. The applicability of each area differs slightly for camps associated with lumber production or tie cutting in cases when they can be distinguished apart in the field.

Period of Significance must be considered when assessing the historical importance of logging camps. The Period 1860 to 1920 covers the timber industry as a theme throughout the entire I-70 Mountain Corridor, but the industry's history was not uniform in all the corridor's regions. Narrower timeframes of importance specific to each region may be more applicable when assessing resource significance. The regions and important periods of time are 1860 to 1920 in Clear Creek drainage, 1879 through 1912 in Summit County, and 1886 to 1920 along the Eagle and Colorado rivers. Some, if not all, areas of significance below were applicable to lumber operations during these timeframes. Level of significance was mostly local, but statewide in some areas.

> *Areas of Significance: Economics and Commerce:* Logging camps are associated with the areas of *Commerce* and *Economics* because they housed the workforce that produced lumber and ties. Both lumber and tie camps were significant on local and statewide levels.
>
> At the local level, lumber and tie operations converted natural resources into a cash product and diverted a large portion of the money into local economies. Tie producers and lumber companies paid wages to their workers, hired contractors for various services, and purchased small items from sources in nearby towns. Overall, the industry was large enough to have a significant local impact.
>
> Lumber companies and tie producers were significant on a statewide level because they were part of and contributed to complex regional and statewide commercial and economic systems. In particular, the hundreds of tie hacks and lumber company employees consumed food and other domestic goods purchased from a variety of sources. Preserved food was shipped from packing companies in the Midwest and on the West Coast, while fresh foods came from Colorado farms and ranches. By consuming both preserved and fresh foods, the loggers not only supported a complex national food transportation network, but also helped the development of farming and ranching in Colorado. Merchants in the nearby towns handled most of the food and goods, and the acquisition of such therefore contributed to local economies.
>
> Lumber operations, more so than tie producers, contributed to statewide commercial and economic systems in other ways. For example, the companies in Clear Creek drainage shipped their products to Denver; the outfits in Summit County sold lumber in Leadville and the Robinson district; and the sawmills in Eagle County supplied Leadville, Red Cliff, and Aspen. The transactions supported a regional economy, and wed the timber industry with mining.
>
> As another example, lumber companies acquired large machinery and other industrial goods from manufacturers mostly in Denver, and to a lesser degree from outside of Colorado. The manufacturers in Denver in turn purchased their materials from

sources within and outside of Colorado. Given this, the lumber companies supported primarily Colorado's and secondarily other economies. It should be noted that tie producers had a minor association with these trends because their products were consumed locally and they used little machinery.

<u>*Area of Significance: Community Planning:*</u> Due in large part to the support of camps, lumber operations contributed to the area of *Community Planning* at a local level. Lumber was an important if not understated factor in the development patterns of the corridor's communities. In particular, lumber was the material basis for the types, forms, and construction of the buildings that constituted the communities. By producing lumber, the industry allowed settlements to evolve from collections of crude and cramped log cabins into towns of stately frame buildings. Using specific sizes of lumber and trim, building owners were able to express building function, their socioeconomic status through appearance, cultural preferences, and adapt architecture to the mountain climate. Collectively, the behavior manifested as development patterns, districts, and neighborhoods in the communities.

<u>*Area of Significance: Exploration/Settlement:*</u> Logging camps participated in the area of *Exploration/settlement* in three principal ways, primarily at a local level. The first applies to the remote reaches of Clear Creek drainage during the 1860s and the Eagle and Colorado rivers during the 1880s. Logging camps were among the earliest Euro-American outposts in the forests that were unsuitable for mining and agriculture. From these bases, loggers explored the regions and contributed to a growing knowledge regarding I-70 Mountain Corridor geography.

Second, logging camps were a form of widespread, rural settlement in forested areas untenable for agriculture and mining. Lumber workers and tie hacks lived in hundreds of crude cabins and boardinghouses scattered throughout Clear Creek drainage, Summit County, and the Eagle and Colorado River valleys.

Third, lumber and tie production directly supported many of the principal settlements in the corridor. Although the towns were not entirely dependent on logging, it complimented other industries and economic sectors. Lumber companies and tie producers contributed to local economies, did business with merchants, and employed town residents. This helped stabilize the principal settlements and allowed them to become permanent.

<u>*Area of Significance: Industry:*</u> By housing workers who produced lumber and ties, logging camps were important in the area of *Industry*. Significance is both local and statewide and should be considered for the region where the camp was located.

In Clear Creek drainage, lumber companies provided the physical materials that literally built the mining industry, all the settlements, and the three railroads. Mining was the drainage's economic foundation and was important to Colorado. On a statewide level, the companies also produced a large amount of lumber for Denver, supporting growth there from the late 1870s through the 1890s.

Separate from lumber, the railroad tie industry was important in Clear Creek drainage because it provided most of the ties for the three railroads there. The Colorado Central was first in 1877, and it revolutionized mining, settlement patterns and the quality of life. The railroad also opened the area for tourism, which became a significant industry afterward. The Georgetown, Breckenridge & Leadville was the second railroad, built in 1883 from Georgetown through Silver Plume to Graymont. That railroad improved mining and fostered logging in the western reaches of the county and was also known worldwide for its Georgetown Loop. The Argentine Central was last, graded in 1906 from Silver Plume into the Argentine Mining District. The railroad fostered a revival in the district and became a major tourist attraction. The applicable timeframe for the tie industry spans 1877 until a permanent decline struck the county in 1920.

In Summit County, lumber companies and tie hacks played similar roles to those in Clear Creek. The mining industry in Ten Mile Canyon and around Dillon and the communities of Dillon, Frisco, and Wheeler depended on local lumber. In addition, the lumber companies also shipped thousands of board-feet to Leadville and the Robinson Mining District. Tie hacks provided nearly all the ties for the two railroads that passed through Summit County. The Denver & Rio Grande arrived in 1881, and the Denver, South Park & Pacific began service the next year, and they were crucial to mining, governed settlement patterns, and opened new markets for the logging industry. The applicable timeframe for the tie industry spans 1881 until 1912.

In the Eagle and Colorado River valleys, tie and lumber production were among the earliest important industries. Of the two, tie production was first and began when the Denver & Rio Grande Railroad opened the region with its Glenwood Springs line in 1886. Tie hacks made that railroad possible. The railroad was instrumental in the settlement of the Colorado River valley, the success of Aspen, regional coal production, and the development of Glenwood Springs into a major destination resort. The relevant timeframe spans 1886 to 1920.

Although lumber production lagged by several years, it became as important as the tie industry. Lumber supported early settlement, the railroad, and the communities of Minturn, Dotsero, Eagle, and Gypsum. The lumber companies also shipped products to Leadville, Red Cliff, and Aspen, and in so doing, contributed to the success of these major centers of mining.

Industry on the mining frontier is a relevant area of significance for the early logging camps in Clear Creek drainage and Summit County. Lumber producers were on the forefront of the frontier and provided the physical materials that fostered mining and associated settlement. Along with miners, loggers were the earliest Euro-American settlers.

Area of Significance: Politics/Government: Logging camps were bases from which timber industry workers exhausted forests on public lands, encouraging the federal government to respond through regulation. Prior to passage of the Forest Reserve Act in 1891, commercial logging was largely unregulated because the federal government provided no clear structure for the industry. The Forest Reserve Act allowed the president to designate forest reserves and control logging within their boundaries. But the federal government neglected to enforce the act due to a lack of support and insufficient funding for responsible agencies, such as the General Land Office and Department of the Interior. In the I-70 Mountain Corridor, the destruction of entire forests due to haste and wasteful practices became so blatant that Colorado state and federal foresters took action during the 1890s. They enforced the act's regulations by shutting down offending sawmills and requiring lumber companies to follow a permitting process. The Roosevelt administration then created the Forest Service in 1905 and designated the Arapahoe and Roosevelt National Forests in Clear Creek drainage and the White River National Forest in Summit and Eagle counties to better regulate logging in the I-70 Mountain Corridor. The lumber companies and their large sawmills directly contributed to the designation of these national forests and permanent, strict regulation.

Area of Significance: Social History: As centers for large workforces, logging camps are associated with the area of *social history*. Logging and mining in the I-70 Mountain Corridor shared the same general pool of labor and investors. Investors often participated in both mining and lumber companies, and workers moved between mining, lumber operations, and tie cutting. Given this association, mining and logging contributed to the evolution of local and statewide social structures together.

One form of social structure was the development of classes in Colorado. Local investors backed most of the lumber companies, and the profits made from the products helped some ascend to upper classes while cementing others in a growing middle class. The laborers, of whom there were many, formed a working class dependent on wages.

The other form of social structure was the workforce that made logging possible. Lumber and tie operations created a strong employment market that provided jobs to hundreds who lacked the skills for other industries. Some of those workers were immigrants, mostly from European countries, and the timber industry provided them with pay, a foothold in the mountains, and opportunity for advancement. Because logging was integrally tied to mining, it was subject to the same cycles of boom and bust. These cycles required that the workers be mobile, which contrasted sharply with Colorado's sedentary farming and ranching culture. Each boom drew laborers from a variety of backgrounds and the busts propelled them to other regions and economic sectors in Colorado. The result was a mobile, adaptable, and diverse society.

Logging camps were important for other reasons within the area of *social history*. Communal residences were centers of communication between individuals, company officials, and the outside world. They were also the place of cultural practices, traditions, and diffusion, be the cultures American or from other countries and ethnicities. Last, residences were places where workers could attend to the necessities of life outside of the workplace. On a broad scale, workers' housing sheltered much of the logging industry's workforce and saw it fed.

Multiple-residence logging camps tend to be allied with class, workforce, and demography because they supported major workforces. Single-residence camps, on the other hand, tend to be associated primarily with tie production.

Logging Camp Site Registration Requirements

To qualify for the NRHP, logging camps must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above as well as events and trends important in their host segment of the I-70 Mountain Corridor.

Criterion B: Logging camps may be eligible under Criterion B if an important person was physically present at the site on a sustained basis. Presence will most likely be residence and involvement with the logging operation. The camp must date to the same timeframe when the individual achieved significance and retain physical integrity relative to that person's occupation. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in lumber operations or briefly visited logging camps, but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site for a prolonged time. In general, few camps are expected to qualify under Criterion B because it is difficult to prove a direct relationship with an important person.

Criterion C: Logging camps can be eligible under Criterion C when they meet certain conditions. Here, it is best to distinguish between resources with standing buildings from those that have been reduced to archaeological features.

Intact cabins, bunkhouses, and boardinghouses attributable to logging are likely in the I-70 Mountain Corridor. Small and simple cabins are the most common types of residences, and they tended not to be involved with important architectural contributions. However, they can represent the simple, austere, and vernacular architecture typical of the timber industry. Boardinghouses are uncommon and can reflect the adaptation of residential engineering and architecture to the needs of a logging operation and its workforce. If the residence possesses integrity relative to a timeframe of significance noted at the section's beginning, it may be eligible as an example of its type. Character defining aspects include adaptations of architecture to environment and geography. They can also include unusual designs, functions, construction methods, and materials uses.

Most logging camps have been reduced to archaeological features such as ruins, platforms, and privy pits. When on an archaeological level, complexes can be eligible if they clearly exemplify a single- or multiple-residence camp and possess integrity relative to a timeframe of significance. For a site to possess integrity on an archaeological level, its non-architectural features must clearly convey the content and organization of the camp. In addition, the demography and lifestyle of the residents should be interpretable from the surface artifacts. Such resources can be described as archaeological examples of logging camps. Design of the complex is an important characteristic, and it may have been planned or a spontaneous response to local conditions. Evidence of how the residents inhabited the complex and conducted domestic activities is another important attribute. Discernable support facilities are additional characteristics of significance. Most single-residence camps will probably not be eligible under Criterion C because they are common resources and usually lack sufficient integrity. Multiple-residence camps are less common and usually offer distinguishing characteristics.

Criterion D: Logging camps may be eligible under Criterion D if they are likely to contribute meaningful information. An analysis of the complex and any architectural features may enlighten the existing understanding of complexes, architecture, construction methods, and the residential environment associated with the timber industry. Logging camps often possess building platforms, privy pits, and refuse dumps that feature buried archaeological deposits. Testing and excavation may reveal information regarding the lifestyles, social structures, and demography of workers, as well as the presence of families and women. Such studies are important because these subjects were not extensively documented at the time.

Eligible logging camps must possess physical integrity relative to the timber industry Period of Significance in the I-70 Mountain Corridor. Because most buildings collapsed and materials of value were salvaged, integrity will probably be on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit a virtual reconstruction of the camp. Common features encountered at logging camps are noted under the feature types at the section's end.

Most of the seven aspects of historic integrity defined by the NRHP apply to logging camps. Some camps may possess standing buildings and other structures, which must retain the aspect of *location* to contribute to a resource's integrity. Intact buildings, structures, and machinery must be in their original places of use to retain integrity of *location*. To retain the aspect of *design*, the camp's material remains, including the archaeological features, must convey the organization and planning. To retain the aspect of *setting*, the area around the resource, and the resource itself, must not have changed a great degree from its period of significance. Because most camps were isolated, the natural landscape and areas of stumpage should be preserved. In terms of *feeling,* the resource should convey the perception of workers' housing from a historical perspective and from today's standpoint. Integrity of *association* exists where aspects of the camp convey a strong connectedness between logging and a contemporary observer's ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: LOADING STATION

Loading stations, exclusive to lumber production, were important nodes in the process of moving raw logs from forest to sawmill. In overview, the stations were transfer points where muleskinners dropped off freshly cut logs, and teamsters loaded them onto wagons for shipment to the sawmill. Because loading stations were used only as long as the timber lasted in a particular area, they were intended to be temporary. Given this, lumber companies invested little in their development, design, and construction. The railroad tie industry had similar facilities known as collection points, discussed below as a separate property type.

Loading stations often grew spontaneously where skid trails descended from a forest and met wagon roads leading out. At the intersection, loggers hacked a clearing where muleskinners could stockpile the logs and teamsters transferred them onto their wagons. The workers preferred to harness gravity for moving the logs, as with other resource extraction industries, and sited the stations on a minor slope. Muleskinners dragged the logs out of the forest, aligned them at the clearing's upper end, and inserted chalks so the logs would stay in place. One by one, workers removed the chalks, rolled the logs down to a transfer structure similar to a loading dock, and leveraged them onto a wagon parked alongside. Log stringers spanned the gap between the loading structure and the wagon and allowed the workers to roll the logs in a continuous movement. Because teamsters had great difficulty maneuvering their wagons, a loop road circled around the station and directed a one-way flow of traffic past the loading structure.

By the 1910s, lumber companies increasingly used trucks, which could back up to the loading structure on straight roads, eliminating the need for a complete loop.

Three types of loading structures were popular for much of the lumber industry's history, and all were vernacular in construction and design. The most common was a log cribbing ramp or platform, usually around 12 feet wide and 4 feet high. Workers assembled the cribbing over unaltered ground with saddle-notched joints or spikes, and left broad gaps between the logs. The wagon or truck merely pulled alongside and received its load. Another popular version was an earthen platform or ramp retained by logs. The last, reserved for areas of heavy production and railroad sidings, was a ramp or frame assembled from milled timbers. These lasted the longest.

Loading stations intended for long-term use or heavy production may have featured several transfer structures and other facilities in support of the logging operation. They could have included a storage shed, a blacksmith shop, and a derrick hoist to manage unwieldy logs. A derrick hoist was a primitive crane with a mast, boom, and winch, all on a swivel base. Cables and ropes guyed the mast, and the base was bolted to a stout timber foundation. Logging camps often featured loading stations, and in these cases, the stations would not be a property type in themselves but, instead, a component of the logging camp.

Loading Station Significance

Loading stations participated in and were associated with a few trends and historical patterns important to the timber industry. The most relevant NRHP areas of significance are Engineering, Industry, and Transportation.

Period of Significance must be considered when determining the historical importance of loading stations. In general, the Period 1860 to 1920 covers the timber industry as a theme throughout the entire I-70 Mountain Corridor. But the industry's history was not uniform throughout the corridor, and narrower timeframes of importance may be more applicable to specific regions. The regions and important periods of time are 1860 to 1920 in Clear Creek drainage, 1879 through 1912 in Summit County, and 1886 to 1920 along the Eagle and Colorado rivers. Level of significance was mostly local.

> *Area of Significance: Engineering:* Although loading stations were simple and vernacular, they were important in the area *Engineering*. Loggers planned the stations in the field to facilitate a flow of logs out of the forest, onto drayage vehicles, and to the sawmill. Design had to account for muleskinner traffic out of the forest, stockpiling the logs, using gravity to move them onto wagons, and traffic to the sawmill. With locally harvested logs and little else, the loggers adapted designs of loading docks and similar structures to complete functional stations.

> *Areas of Significance: Industry and Transportation:* Loading stations were important in the areas of both *Industry* and *Transportation* because they permitted lumber companies the use of wagons and trucks for hauling logs great distances to sawmills. Lumber outfits were able to work deeper in the forest and harvest larger and heavier trees than could be moved by dragging. As a result, the companies were able to increase their areas of harvest, expand their operations, and improve their efficiency. Loading stations were also an instrument that accelerated the exhaustion of the forests.

Loading Station Registration Requirements

To qualify for the NRHP, loading stations must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A. A confirmed timeframe is necessary to identify the events and trends with which a resource may be associated. Few are expected to qualify under Criterion A, however, because they are difficult to date.

Criterion B: Loading stations may be eligible under Criterion B provided that an important person was physically present at the site on a sustained basis. Presence will most likely be through involvement with the logging operation. The associated resource must date to the same timeframe when the individual achieved significance, and retain physical integrity relative to that person's productive period of time. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in lumber operations but were not present at the loading station. Such an association does not meet Criterion B. The individual of note must have been present on-site. Few if any loading stations will be eligible under Criterion B because it is difficult to establish a direct link between the resource and an important person.

Criterion C: Loading stations may be eligible under Criterion C when they clearly exemplify the resource type outlined above and possess integrity relative to one of the timeframes of significance at the section's beginning. Archaeological features and artifacts usually represent the station because materials of value were typically removed, and the remaining structural elements disintegrated. When a site's material evidence clearly conveys the station's organization pattern, movement of logs, and associated structures, the site retains integrity on an archaeological level. Intact structures are rare and may be important examples of engineering and construction specific to the movement of logs from forest to sawmill. Character defining attributes must be evident, even if on an archaeological level. The log staging area, remnants of the loading structure, transportation avenues, and other facilities should be discernable. Most small loading stations will probably not be eligible under Criterion C because they are common resources and usually lack integrity.

Criterion D: For eligibility under Criterion D, the loading station must be likely to yield important information upon further study. Because most stations are simple and offer little beyond the loading structure and roads, they are unlikely to qualify. Several exceptions may exist. First, testing and excavation of buried archaeological deposits such as privy pits or substantial refuse dumps may reveal information regarding timber industry workers' lifestyles, social structures, and the workplace. Second, if the station was large and complex, it may enhance the current understanding of how lumber outfits moved logs from forest to mill. These topics are important because they were not extensively documented at the time.

Eligible loading stations must possess physical integrity relative to one of the timber industry timeframes of significance. Most loading stations had few structures except for loading frames, and because these usually decayed and collapsed, the integrity will probably be on an archaeological level. For archaeological remains to possess sufficient integrity, they should permit the virtual reconstruction of the facility and its operation. A station retains integrity on an engineering level if the loading structures are present and intact. Common features encountered at loading stations are noted under the feature types below.

Most of the seven aspects of historic integrity defined by the NRHP apply to loading stations. Intact structures and buildings must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, loading station's material remains, including the archaeological features, must convey the facility's organization, planning, and engineering. To retain the aspect of *setting*, the area around the station, and the resource itself, must not have changed a great degree from its period of significance. Loading stations were usually isolated, requiring a natural landscape and areas of stumpage. If the resource lies adjacent to a railroad grade, then the grade should retain at least integrity on an archaeological level. In terms of *feeling*, the resource should convey the perception of logging. Integrity of *association* exists where structures and other features convey a strong connectedness between logging and a contemporary observer's ability to discern the collection and transfer of logs.

PROPERTY TYPE: TIE COLLECTION POINT

Tie collection points were to the railroad tie industry what loading stations were for lumber production. Specifically, tie collection points were exchanges between tie hacks in the forest and the tie recipients, which were railroad companies or their contractors. The tie hacks dragged finished ties out of the forest and stockpiled them at stations accessible by wagon, and teamsters transferred the ties onto their wagons for shipment to the consumer. When possible, tie hacks preferred to float ties down rivers and streams to retrieval points instead of using wagons. In the I-70 Mountain Corridor, only the Eagle and Colorado rivers provided sufficient flows for this practice, and a few tie collection points may have existed along their banks.

In overview, tie collection points were extremely simple facilities relatively close to the camps established by tie hacks. Like loading stations, they manifested as clearings where skid trails coalesced and main roads led out. Unlike loading stations, however, special structures to transfer the ties onto wagons were unnecessary. Because the ties were light and small, one or two workers could easily lift them into wagons for shipment. The tie hacks dragged their products out of the forest and into the clearing, where they neatly stacked them over log bolsters. A teamster then parked his wagon alongside and transferred the ties. The ties were often crosshatched in layers 4 to 8 feet high, and a single station could have featured multiple stacks built by different teams of tie hacks. The clearing often featured a loop road to facilitate a one-way flow of wagon traffic, although railroad companies increasingly used trucks that could back up. As a result, truck roads tended to be straight avenues.

In some cases, tie production was heavy enough to justify simple transfer structures for moving the ties onto wagons or trucks. Two types were popular for much of the industry's history. The most common was a ramp or platform made with log cribbing, usually around 6 feet wide and 4 feet high. The wagon or truck merely pulled alongside, and workers rolled the ties onto the vehicle. An earthen platform retained by logs was the other well-used design. The most productive tie collection points may offer evidence of these additional structures, as well as a storage shed and stable. Most collection points, however, were simple and now manifest as clearings, wagon roads, log bolsters, and possibly loose ties lying around. Some stations were components of logging camps established by tie workers, and in these cases, they would not be a property type in themselves. Instead, the sites would be included with the logging camp.

Tie Collection Point Significance

Tie collection points participated in and were associated with a few trends and historical patterns important to the timber industry. The most relevant NRHP areas of significance are Industry and Transportation.

Period of Significance must be considered when determining the historical importance of tie collection points. In general, the Period 1860 to 1920 covers the timber industry as a theme throughout the entire I-70 Mountain Corridor. But ties were only produced once railroads existed, and narrower timeframes of importance are therefore more applicable. By region, the important periods of time are 1877 to 1920 in Clear Creek drainage, 1881 through 1912 in Summit County, and 1886 to 1920 along the Eagle and Colorado rivers. Level of significance was mostly local.

> *Area of Significance: Industry:* Collection points were important in the area of *Industry* because they enhanced the ability of tie producers to work deep in the forest, beyond the immediate confines of a railroad corridor. By transferring ties onto wagons and trucks, tie producers were able to increase their areas of harvest and expand their operations. By improving the flow of finished ties out of the forests, collection points were also an instrument that accelerated the exhaustion of acceptable trees.

> *Area of Significance: Transportation:* In addition to the above, *Transportation* constitutes another area of significance. Locally produced ties were essential to the railroads constructed in Clear Creek, Summit, and Eagle counties. Tie collection points were important to the flow of those ties out of the forest, onto drayage vehicles, and to the railroads. Not only were collection points key during the initial construction of the railroads, but also for the regular maintenance that allowed the railroads to continue operations. All the railroads served by the tie industry were important in themselves (discussed under the Railroad Transportation portion of the context).

Tie Collection Point Registration Requirements

To qualify for the NRHP, tie collection points must meet at least one of the Criteria listed below and possess related physical integrity.

> *Criterion A:* Resources eligible under Criterion A must be associated with at least one area of significance noted above as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. A confirmed timeframe is necessary to

identify the events and trends with which a resource may be associated. Few sites are expected to qualify under Criterion A, however, because they are difficult to date.

<u>*Criterion B:*</u> Tie collection points may be eligible under Criterion B provided that an important person was physically present at the site on a sustained basis. Presence will most likely be through involvement with tie production or transportation. The associated resource must date to the same timeframe when the individual achieved significance, and retain physical integrity relative to that person's productive period of time. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in tie operations and freight outfits but were not present at the collection point. Such an association does not meet Criterion B. The individual of note must have been present on-site. Few if any collection points will be eligible under Criterion B because it is difficult to establish a direct link between the resource and an important person.

<u>*Criterion C:*</u> Tie collection points may be eligible under Criterion C when they meet several qualifications. First, the resource must clearly exemplify the resource type outlined above and possess defining characteristics. Second, the site must possess integrity relative to one of the timeframes of significance noted above. The tie staging area; evidence of tie stacks; log bolsters for the ties; transportation avenues; and remnants of loading structures, if any existed, should be discernable. Integrity is usually on an archaeological level since the above aspects were not engineered constructs and collection points rarely had buildings. Most collection points will probably not be eligible under Criterion C because they are common resources and usually lack sufficient integrity or defining characteristics.

<u>*Criterion D:*</u> For eligibility under Criterion D, collection points must be likely to yield important information upon further study. Because most are simple and offer little beyond a clearing and scattered ties, they are unlikely to qualify. Several exceptions may exist. First, testing and excavation of buried archaeological deposits such as privy pits or substantial refuse dumps may reveal information regarding timber industry workers' lifestyles, social structures, and the workplace. Second, if the collection point was large and complex, it may enhance the current understanding of how producers moved ties from forest to consumer. These topics are important because they were not extensively documented at the time.

Eligible collection points must possess physical integrity relative to one of the tie industry timeframes of significance noted above. Integrity is likely to be on an archaeological level because most collection points never had structures or buildings. Instead, they tended to consist of tie stacks, roads, and possibly platforms, which now manifest as archaeological features. For the archaeological remains to possess sufficient integrity, they should permit the virtual reconstruction of the collection point. Common features encountered at collection points are noted under the feature types below.

Most of the seven aspects of historic integrity defined by the NRHP apply to collection points. Intact structures and tie stacks must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, the collection point's material remains, including the archaeological features, must convey the facility's organization and planning, however primitive. To retain the aspect of *setting*, the area around the resource, and the resource itself, must not have changed a great degree from its period of significance. Because collection points were usually isolated, a natural landscape and areas of stumpage should be preserved. If the resource lies adjacent to a railroad grade, the grade should retain integrity at least on an archaeological level. In terms of *feeling*, the resource should convey the perception of tie production. Integrity of *association* exists where discernable features convey a strong connectedness between tie production and a contemporary observer's ability to discern the relationship of the site.

PROPERTY TYPE: FLUME

A flume was an engineered water system for conveying raw logs from forest to sawmill and finished lumber from sawmill to a distribution point. A cost-effective, functional flume required three critical resources including a reliable source of water, capital to engineer the structure, and enough timber to justify the expense. Although lumber companies generally preferred flumes over wagons and railroads, those in the I-70 Mountain Corridor had difficulty securing one, and often all, the requisite resources. Timber stands were inadequate, the companies were small and undercapitalized, and water rights were costly, providing any were available. As a result, few lumber companies in the I-70 Mountain Corridor built flumes, but several did complete short systems. The Clear Creek Fluming Company constructed what may have been the longest in 1881. Its flume carried both logs and sawed lumber from the High Line Sawmill at Fisk's Station near Loveland Pass down to a company yard in Silver Plume.[3]

Although most flumes were vernacular, custom-built, engineered structures, they were based on a common template. In overview, a flume was a watertight, wooden trough 2 to 4 feet in depth and as wide, supported by framing. The flume had to descend at a gentle and continuous angle from head to tail to establish a current, and this required formal surveying and engineering. The route contoured across slopes, wrapped around prominent points, and crossed drainages. Workers usually excavated a bed for the flume when on a slope, poured fill into minor drainages, and built the subframe directly on the soil.

To save costs, lumber companies kept the structural elements as simple as possible. The trough itself was either in box form with plank walls and a floor, or in V form with angled plank sides. Closely spaced box-frame sets wrapped around the floor and walls, tying them to a subframe underneath. The typical subframe consisted of two or four parallel timber stringers supporting the trough, sometimes over cross-members and a second layer of stingers.

Whenever possible, lumber companies laid the flume directly on the earthen bed, with rocks and logs filling in low areas. Occasionally, trestles spanned substantial drainages and crossed rock outcrops where a bed was impossible, but their use was limited due to the cost. Where the vertical relief and distance was short, the trestle may have been little more than pairs of log posts supporting the flume's subframe. Otherwise, the trestle was formally engineered with a series of piers on timber footers and tied together with horizontal braces and timber stringers.

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[3] Ellis and Ellis, 1983:150.

The head of the flume featured two facilities vital to its function as a transportation system. One was a water diversion structure, usually a low dam, in a stream. The dam, often log cribbing filled with gravel, was designed to slow the stream, elevate the water level, and shunt some of the flow through a headgate. The other facility was a loading station where workers transferred logs or lumber into the flume for shipment. A loading station consisted of little more than a ramp or platform of log cribbing that allowed logs to slide into the trough.

The flume tail featured another station where workers retrieved the logs and lumber. The products either dropped out of the end and into a pond or bumped against a screen and were lifted out. In general, flumes ranged from hundreds of feet to miles in length.

As a type of engineered transportation system, flumes were based on a common template and required exacting surveying and construction. But most were vernacular in materials and the specifics of design and assembly. Engineers adapted the template to the terrain, the needs of the lumber operation, and their interpretation of walls and support system. Further, they used available materials where possible to save costs. Like railroad grades and roads, flumes should be recorded as linear resources.

Flume Significance

Flumes participated in and were associated with a few trends and historical patterns important to the timber industry. The most relevant NRHP areas of significance are Engineering, Industry, and Transportation.

Period of Significance must be considered when determining the historical importance of flumes. In general, the Period 1860 to 1920 covers the timber industry as a theme throughout the entire I-70 Mountain Corridor. But the industry's history was not uniform throughout the corridor, and narrower timeframes of importance may be more applicable to specific regions. The regions and important periods of time are 1877 to 1920 in Clear Creek drainage, 1879 through 1912 in Summit County, and 1886 to 1920 along the Eagle and Colorado rivers. Level of significance was mostly local.

> *Areas of Significance: Industry and Transportation:* Flumes were important in the areas of both *Industry* and *Transportation* because they improved the efficiency of lumber companies and allowed them to increase production. Those flumes that delivered crude logs from an area of harvest to a sawmill enhanced the ability of lumber outfits to work deep in the forest and transport logs great distances to the sawmill. Thus, lumber companies were able to increase their areas of harvest and expand their operations. Those flumes that carried finished lumber from a sawmill to a distribution station or yard improved the ability of logging companies to move their products to market. Over the long term, this lowered operating costs and increased productivity. By increasing efficiency, the flumes also accelerated the exhaustion of the forests.
>
> *Area of Significance: Engineering:* Flumes were important in the area of *Engineering* as components of designed, large-scale transportation systems. In particular, flumes were integral to a system of moving logs from forest to sawmill and distributing the products to a distribution point. When planning a flume, a logging outfit had to consider a number of variables to ensure that the system functioned efficiently. The company had to secure a source of water, start the flume at that source, extend the flume through areas being

logged, incorporate loading stations, and establish a station at the sawmill. If the flume carried finished lumber, the flume had to end at an appropriate yard.

In addition to a system-wide level, flumes were significant as engineered structures. The overall route had to account for the water source, logging operations, topography, local land features, and then be surveyed to exacting specifications. Grading the bed required care, trestles over low points had to support considerable weight; the flume itself had to be watertight and withstand the impacts of logs and lumber. When constructing flumes, logging outfits adapted known structural engineering to the most primitive environmental conditions including difficult terrain, inaccessibility, and an undeveloped landscape. In so doing, the outfits collectively contributed to lumber production practices and water structure engineering and systems.

Flume Registration Requirements

To qualify for the NRHP, flumes must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A. A confirmed timeframe is necessary to identify the events and trends with which a resource may be associated. Timeframe may be determined by dating associated sites such as sawmills or terminus yards and through archival research.

Criterion B: Flumes have a potential for eligibility under Criterion B if an important person was directly associated with the system. Some flumes, especially large systems, can be traced to important individuals such as engineers and construction contractors. If the significance is through the person's presence on-site and direct participation in operations or construction, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. The associated resource must date to the same timeframe when the individual achieved significance and retain physical integrity relative to that person's productive period of time. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in lumber operations but were not present on the ground. Such an association does not meet Criterion B. The individual of note must have been present on-site.

Criterion C: Flumes may be eligible under Criterion C in two general circumstances. Isolated segments may be individually eligible if they clearly represent the flume structure. Defining characteristics including the bed and subframe must be present and represent the structure's design, construction methods, and materials. Because flumes were mostly dismantled and the remaining elements subsequently decayed, integrity will likely be on an archaeological level. The end points of the eligible segment should be clearly defined.

Flumes can be eligible in entirety only when the head and tail points are evident, and most of the connecting bed or route discernable. Further, the bed should possess archaeological or engineering features that clearly represent the flume itself and structures built to overcome obstacles. Integrity is likely to be on an archaeological level because structural elements were usually dismantled. For a flume bed to retain integrity on an archaeological level, the material evidence should clearly represent the flume route, end points, and intermediate stations. In general, intact structures such as the trough, its subframe, and trestles are uncommon and important representations of water system engineering and technology.

Criterion D: An entire flume system, or individual segments, may be eligible under Criterion D if further studies will provide important information upon further study. For the entire system to qualify, it must be discernable from end to end and important facilities in between identifiable. The flume can then be examined in the context of the logging operation for system-wide studies. Areas of inquiry include route engineering, how the flume interacted with the logging operation, how materials transportation was managed, and how the flume affected patterns of timber harvest. Water management is another system-wide area of inquiry, and the source, its input controls, the tail, and where the water went should be identifiable. Individual flume segments may be eligible if structural elements remain intact. They may reveal information regarding how flumes were designed and constructed and what materials were incorporated. In general, lumber production systems, water management, and flume design and construction are important topics of inquiry because their presence in the Rocky Mountains was not well documented.

Eligible flumes must possess physical integrity relative to one of the timber industry timeframes of significance noted above. The integrity of most flumes will probably be on an archaeological level because the structural elements were either salvaged for reuse or decayed and then collapsed. For archaeological remains to possess sufficient integrity, the material evidence should represent most of the flume bed as well as segments of the flume structure. Common features encountered at flumes are noted under the feature types below.

Most of the seven aspects of historic integrity defined by the NRHP apply to flumes. Intact structures must be in their original places of use to retain integrity of *location*. For a flume to retain the aspect of *design* on a system-wide scale, the flume or its bed must reflect planning, engineering, and integration with the logging operation and terrain. Individual segments retain integrity of *design* when elements of the flume structure represent the planning and design of the trough and its support system. To retain the aspect of *setting*, the area around the flume, and the resource itself, must not have changed a great degree from its period of significance. If the flume is isolated, then the natural landscape and areas of stumpage should be preserved. If the resource passes through other timber industry sites, then they should retain at least archaeological integrity. In terms of *feeling*, the resource should convey the perception of logging and the transportation of forest products. Integrity of *association* exists where structures and other features convey a strong connectedness between logging and a contemporary observer’s ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: RURAL HISTORIC TIMBER INDUSTRY LANDSCAPE

As large-scale cultural resources, Rural Historic Landscapes represent the history of an area's human occupation, life ways, and the relationship with the land. The National Park Service explains Rural Historic Landscapes in detail in its *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. In overview, the Bulletin states:

> "A rural historic landscape is defined as a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features."[4]

The National Park Service recognizes other landscape types such as designed historic landscapes, which were consciously planned according to specific principals. Rural historic landscapes, in contrast, evolved organically over time. Characteristics like this distinguish them from the other categories.

In the I-70 Mountain Corridor, rural, historic landscapes provide a physical context for historic resources left by the timber industry. The individual resources are components of a greater whole in terms of geography, history, and community, even when disbursed. In general, the extensive tracts of land combined with natural features and smaller scale historic resources represent the industry's history, people, and traditions.

Historic landscapes possess defining characteristics, and the National Park Service organized them into 11 categories. The first four are a result of processes instrumental in shaping the land, and the last seven are physical attributes apparent on the land.[5] All are tangible evidence of the activities, values, and beliefs of the people who occupied, developed, used, and shaped the land to serve human needs. The categories as adapted to timber industry landscapes in the I-70 Mountain Corridor include the following:

1. *Land uses and activities:* Land use activities are among the principal human forces that left an imprint on the land and influenced rural settlement. In the I-70 Mountain Corridor, the timber industry contributed to the occupation of areas unsuitable for mining or agriculture. Occupation includes industrial complexes, small hamlets, and cabins and boardinghouses disbursed through the forest. The timber industry also left an imprint of logging on the landscape. All the landscapes are still in continuous use, although no longer for logging.
2. *Patterns of spatial organization:* When timber industry workers occupied an area, they tended to follow patterns in land use, development, siting of facilities, resource consumption, boundary demarcation, and other physical manifestations. Those patterns, usually expressed by use and development, were a form of spatial organization on a landscape level. Spatial organization for logging was heavily influenced by a relationship between the industry's needs and major environmental conditions such as forests, topography, and availability of water. Organization was also a function of politics, economics, technology, and cultural values. The above factors determined areas of stumpage, siting of sawmills, road and trail systems, and

[4] McClelland, Linda Flint; Keller, J. Timothy; Keller, Genevieve P.; Melnick, Robert Z. *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes* National Park Service, 1999:1.
[5] McClelland, et al., 1999:3.

settlement patterns. Large-scale patterns characterizing the settlement and early history of a logged area may remain constant, while individual features such as buildings and roads changed over time.

3. *Response to the natural environment:* Major natural features such as mountains, streams, and forests governed both the location and organization of logging operations and their settlements. Climate and vegetation type influenced the siting of individual buildings, as well as timber industry complexes. Natural resources were paramount as the timber industry depended on the forests. Available materials, specifically lumber and logs, influenced the design and construction of buildings and structures.
4. *Cultural traditions:* In general, cultural traditions affect the way people used, occupied, and shaped the land. Religious beliefs, social customs, ethnic identities, and trades and skills may be evident today in both physical features and uses of the land. Timber industry workers brought ethnic customs into the I-70 Mountain Corridor, which successive generations perpetuated. Other customs originated with the timber industry and evolved with continued occupation of the region after the industry's dissolution. The cultural groups interacted with the environment, manipulating and altering it for logging, and sometimes altered their traditions in response.

   Cultural traditions determined the structure of timber industry communities by influencing the design and construction of buildings, location of roads, and ways that the land was used. Traditional building forms, methods of construction, stylistic finishes, and functional solutions evolved in the work of local individuals.
5. *Circulation networks:* Circulation networks are systems for transporting people, goods, and raw materials from one point to another. They range in scale from skid trails to roads to railroads. Local networks served individual logging operations while others such as roads and railroads provided links with the outside.
6. *Boundary demarcations:* Boundary demarcations separated different tracts of land, some intentionally and others inadvertently. Intentional boundaries such as fences, survey monuments, and roads could have defined ownership or land tracts dedicated for specific use, such as timber harvest. Inadvertent boundaries like streams, slope changes, and changes in tree species, influenced land use and development. Many types of boundaries still persist and influence traditional land use.
7. *Vegetation related to land use:* Various types of vegetation bear a direct relationship to patterns of land use, especially logging. Although many aspects of a landscape change over time, vegetation is one of the most dynamic. In forests, some indigenous species may replace others removed by logging and yet conform in community to historic vegetation patterns. Aspens, for example, often reclaim pine and fir clearcuts while still retaining the original shape of evergreen stand. Vegetation can reflect poor land stewardship. Thick stands of second-growth pines known as doghair tend to grow in heavily logged areas. Geometric patterns of grass, brush, and trees can mark historic boundaries, building and structure footprints, and transportation systems. Age of vegetation communities is also relevant. Older stands of trees may reflect uncut forests while young stands take over harvested areas.
8. *Buildings, Structures, and Objects:* Buildings, structures, and objects served human needs related to occupation and use of land. Their function, materials, date,

condition, construction, and location reflect the activities, customs, tastes, and skills of the people who built and used them. Timber industry buildings and structures often exhibit patterns of vernacular design and construction that may be common or unique in the corridor. They may reflect the sizes of historic logging operations, the economic state of timber enterprises, or the size of a workforce. The repeated use of methods, forms, and materials may indicate successful solutions to building needs, or demonstrate the unique skills, workmanship, or talent of a local individual.

9. *Clusters:* Groupings of buildings, logging facilities, or other timber industry features can reflect function, social tradition, climate, or other influences, cultural or natural. The arrangement of clusters may reveal information about historical and continuing activities, as well as the impact of technologies, and the preferences of particular generations. Repetition of similar clusters throughout a landscape may indicate vernacular patterns of siting, spatial organization, and land use. The location of clusters, such as several sawmills in a single community, may reflect broad patterns of a region's cultural geography.
10. *Archaeological sites:* The sites of sawmills, logging camps, and loading stations may be marked by foundations, ruins, changes in vegetation, and surface remains. They may provide information about land use, social history, industrial patterns, and settlement.
11. *Small-scale elements:* Examples of small-scale elements include tools, debris, stumps, and abandoned logging equipment. These elements add to the historic setting of a timber industry landscape and may be remnants of larger components, such as a fence post representing an earlier corral for draft animals.

The defining characteristics of a rural historic landscape also can be described in terms of "landscape of work."[6] When loggers developed large tracts of the natural environment for their operations, they molded the landscape for efficiency, organization, and suitability of timber harvest. Landscapes of work for logging feature defining characteristics and patterns. A common pattern included a central sawmill and satellite logging camps in the surrounding forest. Within each complex, the buildings and facilities were often clustered for efficiency of industrial operations and domestic work. Circulation systems in the form of roads and skid trails linked the cut areas with associated nodes of activity such as loading stations and the sawmill. Although industry preferred the geometry of straight boundaries, the age and tree species within a forest determined the shape and size of harvested areas.

Few timber industry landscapes of work are still in use for logging, but most offer some evidence of associated cultural traditions. The logging industry had tangible impacts on I-70 Mountain Corridor by changing its vegetation patterns, contributing to the development of road and railroad networks, and providing the physical materials used for many buildings and structures. Timber industry sites and aspects of the natural environment are interspersed, and both should be considered together as a whole.

Rural Historic Timber Industry Landscape Significance

[6] Messick, Denise P.; Joseph, J.W.; Adams, Natalie P. *Tilling the Earth: Georgia's Historic Agricultural Heritage, A Context* Stone Mountain, GA, New South Associates, 2001:62.

Because timber industry landscapes are large in scale, their significance as cultural resources can be assessed in a broad sense. The most relevant NRHP areas of significance include Architecture, Community Planning and Development, Economics, Engineering, Industry, and Transportation. Other areas that may be relevant to some landscapes and not others are Archaeology and Conservation. Because timber industry landscapes are diverse, complex, and offer numerous historic resources, most will be significant under multiple NRHP areas and criteria.

Period of Significance must be considered when determining the historical importance of rural historic landscapes. Although the Period applicable to the I-70 Mountain Corridor spans 1860 to 1920, the effective timeframe for logging varies slightly by corridor segment and land use. See the introduction in Section E for the timeframes.

Area of Significance: Archaeology: Timber industry landscapes are significant in the area of A*rchaeology* when their historic resources have been reduced to archaeological sites. Most of the sites must retain integrity on an archaeological level, which is the ability of a site's features and artifacts to clearly convey timeframe, function, design, and content. On a landscape scale, studies of archaeological sites in their natural setting may reveal important aspects of the timber industry, its patterns, history, and people.

Area of Significance: Architecture: Those historic landscapes with standing buildings may be important in the area of A*rchitecture* for several reasons. Loggers adapted familiar building forms, designs, and methods of construction to the Rocky Mountain forests. In their adaptation, loggers responded to topography, natural landscape features, local climate, and available building materials. When distributed amid a landscape, multiple buildings can represent the evolution of rural architecture specific to logging.

Areas of Significance: Community Planning and Development: Timber industry landscapes can be important in the areas of C*ommunity Planning* and D*evelopment* if they reveal settlement and land use patterns. Landscapes can reflect the patterns for the development of individual logging camps, logging as a regional industry, and its influence on entire communities.

Area of Significance: Conservation: Timber industry landscapes may be significant in the area of *Conservation* when involved in purposeful forest management. By the 1890s, federal and Colorado state foresters began regulating logging in the I-70 Mountain Corridor to preserve and manage timber resources, threatened by unsustainable and damaging harvest practices. Through purposeful management, they defined tracts for harvest and others for preservation, and even specified the minimum ages for target trees. Through these policies and others, conservation shaped the land.

Area of Significance: Economics: In the area of *Economics*, timber industry landscapes are a direct manifestation of converting natural resources into money. Entire forests in the corridor were cut, milled, and used locally or shipped away. Each processing stage and the trees themselves generated income, as well as other types of exchange. Much of the wealth remained within the corridor and became a major contribution to regional and statewide economic systems. The capital used to organize, equip, and support logging companies shaped the land through their developments and timber harvests.

Area of Significance: Engineering: Historic landscapes can represent the widespread adaptation of *Engineering* practices to the central Rocky Mountains. Representation may be through small-scale resources and large systems expressed across an entire landscape. With small-scale resources, logging operations may have adapted familiar types of structures and machinery to the mountain environment. Logging operations may have also innovated new ways of solving problems posed by the land and its resources. On a large scale, landscapes may feature engineered systems such as transportation networks or represent the incremental process of turning trees into lumber, and the engineered facilities to do so.

Area of Significance: Industry: Logging companies brought one of the most important industries into the corridor besides mining and agriculture. Logging was one of the few long-term industries, and although it suffered during periods of depression and resource exhaustion, logging provided jobs and converted natural resources into a cash product. Further, many of the products were vital to settlement and other fundamental industries in the corridor. Logging generated timbers for the mining industry and firewood, the most common heating fuel. Lumber companies made possible the corridor's buildings and structures, and tie outfits had a like relationship with the railroads.

Area of Significance: Transportation: Logging depended on transportation systems to haul trees to sawmills and finished products to market. Because of this, the timber industry fostered entire networks of skid trails, roads, and railroads in the corridor. The transportation systems were significant to logging and that industry's impact on the land. The systems were also significant because they affected other industries, settlement, historic trends, and land use.

Rural Historic Timber Industry Landscape Registration Requirements

To qualify for the NRHP, a timber industry landscape must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: To be eligible under Criterion A, landscapes relevant to the theme of timber industry must be associated with events and broad trends of importance. Examples of broad trends include, but are not limited to, the areas of significance noted above.

Criterion B: Large-scale landscapes may be eligible under Criterion B provided they were occupied by an important person for an extended period of time. A prominent forester, for example, may have spent considerable time supervising and living in a specific area. Small-scale landscapes such as individual sawmills and logging camps may be eligible through residence, employment, or other involvement by a significant individual. The associated resource must retain physical integrity relative to that person's occupation during their productive period of time. Further, the resource must date to the same timeframe as when the individual achieved significance. If an individual can be connected with the landscape, then the researcher must explain the individual's significant contributions in a brief biography. In some cases, important people invested in logging enterprises or owned land but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on the ground. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Historic landscapes may be eligible under Criterion C if buildings, structures, and landscape features represent logging and development patterns of associated communities. Because landscapes were occupied for extended periods of time, the patterns can be expected to reflect the evolution of general land use through the Period of Significance. Intact buildings may be significant representations of architecture specific to logging in the central mountains. Multiple buildings within a single landscape may represent the evolution of type, style, methods, workmanship, and materials. Similarly, structures may be significant representations of engineering specific to logging, and multiple structures within a single landscape may represent the evolution of function, design, methods, workmanship, and materials. Buildings and structures may also exemplify characteristics distinct to the corridor. Natural features often are contributing elements.

Criterion D: Buildings, structures, and land modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents land use patterns, then the landscape retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should represent the general layout of individual sites as well as their relationships to communities and the land. If archaeological features and artifacts offer important information regarding land use, community development, the application of engineering, or logging practices, then the landscape may qualify under Criterion D.

If complexes within the landscape possess building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography of the occupants. When the results from multiple complexes are compared, regional patterns may become apparent. Important areas of inquiry include but are not limited to diet, health, and substance abuse. Other areas of inquiry relate to the distribution of gender, families, ethnicities, professional occupation, and socioeconomic status.

Historic landscapes eligible for the NRHP must possess physical integrity relative to the Period of Significance outlined in Section E. According to the National Park Service: "Integrity requires that the various characteristics that shaped the land during the historic Period be present today in much the same way they were historically."[7] Continuity in occupation and use, however, changed logging landscapes in the corridor to some degree due. Occupation and use are compatible with integrity when they maintain the character and feeling of historic logging operations. Recreation, forestry, and continuation of logging are compatible, while modern intrusions should be few and unobtrusive. The presence of some landscape characteristics is

[7] McClelland, et al., 1999:21.

more important to integrity than others. Areas of stumpage, preserved forests, historic circulation systems, and the types of small-scale features typical of logging should be evident.

Many of the seven aspects of historic integrity defined by the NRHP apply to logging landscapes, although not all need be present. *Location* is the place where significant activities that shaped land took place. A rural landscape whose characteristics are in their historic place has integrity of location. For integrity of *design*, the landscape features, both manmade and natural, must convey organization and planning typical of logging. *Setting* is the physical environment within and surrounding a historic property. To retain integrity of setting, a landscape and bordering area must not have changed a great degree in overall character. Because the timber industry worked in the natural environment and especially forests, aspects of both should be present. For integrity of *feeling*, the landscape should convey logging and associated settlement identifiable from a historical perspective and in the context of today's perceptions. Integrity of *association* exists where a combination of natural and manmade features conveys a strong connectedness between the landscape and a contemporary observer's ability to discern the historic timber industry and settlement.

TIMBER INDUSTRY BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Sawmill Feature Types

The types of features specific to sawmill complexes are listed below. As recipients of logs and distributors of lumber, sawmills were centers of transportation networks that included skid trails, roads, and sometimes flumes. Lumber companies also provided housing for loggers and the sawmill crew. Given this, today's sawmill sites often include related buildings, structures, and archaeological features. These are described below under Transportation, Flume, and Logging Camp features.

Features Representing the Sawmill

Boiler: A boiler was a vessel that generated steam for a sawmill's drive engines. Most boilers were portable upright, locomotive, or Pennsylvania types. *Upright boilers* were the least costly and easiest to transport, but also the most inefficient. They featured a vertical shell over a firebox and a smokestack on top. To heat water inside the shell, flue gases rose from the firebox through a cluster of tubes in the shell and exited the smokestack. Upright boilers were self-contained and stood on a cast-iron base requiring no foundation, although workers often placed them on rock pads. The shells ranged from 2 feet in diameter and 7 feet high to 5 feet in diameter and 12 feet high.

The *locomotive boiler* was one of the most popular and derived its name from its application in railroad locomotives. The boiler consisted of a horizontal shell perforated with flue tubes, a firebox underneath one end, and an attachment for a smokestack at the other. The firebox and shell were manufactured as a single, riveted iron unit, which stood on skids. To heat water, hot flue gases left the firebox, traveled through the tubes, and exited the smokestack. Small boilers featured a shell 2 feet in diameter, 4 feet high including the fire box, and as long as 8 feet. Large units featured a 5-foot diameter shell, stood 9 feet high, and were up to 23 feet long. Medium-sized boilers, in between in size, were usually employed at sawmills.

The *Pennsylvania boiler* was similar in appearance to locomotive units and stood on skids, but the flue gases traveled a different and more efficient path. They left the firebox, traveled through the shell via a set of lower tubes, gathered in a chamber at the shell rear, returned through an upper set of tubes, and exited the smokestack. As a general description, Pennsylvania boilers featured a horizontal shell with a firebox under one end, a sealed rear, and a manifold for a smokestack over the firebox.

Boiler Foundation: Because portable boilers were self-contained and free-standing, their sites required little formal preparation beyond an earthen platform adjacent to the sawmill. Some lumber outfits installed *upright boilers* on square or circular dry-laid rock pads or over shallow pits that collected ashes from the firebox. *Pennsylvania* and *locomotive boilers* stood on skids, which usually required no support. Where the ground was soft or uneven, workers often laid parallel rock alignments to prevent the boiler from settling. In the absence of rock supports, the skids occasionally created two parallel depressions the length and width of the boiler. The artifact assemblage around a foundation or platform should include clinker, unburned bituminous coal, ash, water-level sight-glass fragments, and pipe fittings.

Engine Foundation: Drive engines, steam and petroleum, powered saws and other machinery via canvas drive-belts. This required a location adjacent to the mechanical components of a saw frame. The engines were bolted to timber footers fastened either to the saw frame or anchor logs embedded in the ground.

Flume: Cutting logs into lumber generated high volumes of sawdust that had to be disposed of as waste. Most sawmills had a plank flume, 1 by 1 to 2 by 2 feet in height and width, extending underneath the saw frame to carry the sawdust to a dump somewhere downslope from the mill.

Flume Remnant: The collapsed remnants of a flume.

Loading Platform: The head of the sawmill featured an elevated platform where workers staged raw logs to be cut into lumber. The platform, concurrent in elevation with the mill's saw frame, was either a framework of logs or an earthen pad with log bolsters. Workers rolled logs off the platform and fastened them to a dolly on the saw frame.

Loading Platform Remnant: The decayed remnants of a loading platform.

Log Dolly: A log dolly was a carriage that rolled on a track of steel or timber rails the length of the saw frame. The dolly braced individual logs for reduction into lumber. Workers clamped the log in place and winched the dolly toward the mill's saw blades.

Log Stockpile: A pile or stack of raw logs staged for reduction into lumber.

Mill Slab Pile: Mill slabs were the bark-clad rinds cut away from raw logs during milling. Because mill slabs had little commercial value, lumber companies stacked them in piles as waste.

Platform: An intentionally graded flat area or workspace.

Sawdust Dump: Sawmills usually relied on a small flume to carry sawdust away and downslope from the saw frame. The flume dumped the sawdust directly onto the ground, creating a thick deposit over time.

Saw Frame: The saw frame, the principal component of a sawmill, was a linear timber structure that supported mechanical saws, dollies, and the engine. Saw frames were 20 to 100 feet long, 3 to 6 feet wide, and as high. The frame was bolted to a foundation of timber footers and stringers usually laid on an earthen platform.

Saw Frame Platform: Saw frames stood on linear, flat areas often paved with earthen fill. When the frame was removed, its platform typically remains. The platform approximates the frame's footprint and usually features impressions left by the frame's timber footers and stringers. Sawdust, wood chips, and mechanical artifacts should be present.

Saw Frame Remnant: The decayed remnants of a saw frame.

Sawmill Building: To shelter workers and equipment from adverse weather, lumber companies enclosed the saw frame and drive mechanism in a frame building vernacular in design and construction. Most were shed in form, open on one side, and elongated to enclose the saw frame. The lumber outfit adapted conventional construction methods to meet its needs, budget, and integration with the sawmill.

Sawmill Building Platform: When dismantled, sawmill buildings usually left an earthen platform and impressions from the foundation footers. These aspects generally outline the building's footprint and encompass evidence of the saw frame and drive mechanism.

Steam Engine: Prior to the 1920s, steam donkey engines powered sawmills. The apparatuses were either vertical or horizontal in configuration and had flywheels for canvas drive-belts.

Utility Engine: By the 1920s, lumber companies used petroleum engines to drive sawmill machinery. The engine was usually bolted to a timber foundation adjacent to the saw mechanism on the mill's saw frame. Engines of the 1920s and 1930s may have been single-cylinder units with large flywheels that powered machinery via canvas drive-belts. Later engines were similar to those in trucks, with a cowling, radiator, and chassis.

Sawmill sites today are represented primarily by archaeological features such as foundations, debris, and ruins. The sawmill site in the photo, near Breckenridge, includes engineered structures and machinery, as well. The object near center is a drive engine, which is rare at sites today. The debris alignment is a partially intact saw-frame. Source: Eric Twitty.

Sawmill Support Facilities

Building Platform: Sawmills had ancillary buildings that usually stood on earthen platforms amid the complex. In most cases, the buildings were removed, leaving the platform and associated artifacts. The archaeological feature can be recorded as a generic building platform if the building function cannot be determined.
Building Ruin: The collapsed debris left by an ancillary building.
Cistern: Sawmills powered by steam occasionally included cisterns to store boiler water. Cisterns were vernacular structures countersunk into the ground and constructed with rock masonry, concrete, or planks.
Corral: Lumber companies relied on draft animals to deliver logs to the mill and haul away finished lumber. Most sawmills had corrals for the animals, and they were fenced with piles of rocks, debris, wires lashed to trees, and rails fixed to posts.
Corral Remnant: The decayed remains of a corral.
Incinerator: When in one location for a prolonged time, lumber companies installed incinerators to burn waste. Incinerators were often prefabricated structures similar to inverted cones, and they ranged from 8 to 20 feet in diameter and as high. The base featured a doorway, and screens at top arrested sparks.
Incinerator Foundation: When an incinerator was removed, it left either an earthen pad or concrete foundation engulfed by ash and charcoal.
Shop: Most sawmills included a shop in which a worker fabricated and maintained tools and hardware. Simple shops usually featured a blacksmith forge, anvil, workbench, and hand-powered appliances such as

a drill press. At large sawmill complexes, the shop may have been equipped for carpentry, as well. The buildings were vernacular in materials and construction, gabled or shed in form, and usually less than 20 by 30 feet in area. Workers designed shops in the field for function and cost and assembled them with logs and occasionally lumber. Wide doorways, a window, and a stovepipe port over the forge are defining characteristics. Anthracite coal and forge clinker should blanket the floor.

Shop Platform: Blacksmith shops usually stood on earthen platforms, which represent the facility after the building was dismantled. Shop platforms often feature forge remnants and artifacts such as forge-cut iron scraps, anthracite coal, and clinker, which is a scorious, ashy residue created by burning coal.

Shop Ruin: The collapsed remnants of a shop.

Shop Refuse Dump: Prolonged shop work generated waste that blacksmiths threw outside their buildings. Over time, they created a distinct artifact assemblage of forge clinker, forge-cut iron scraps, cut pipe scraps, and pieces of hardware. Forge clinker consists of small pieces of scorious, ashy residue and unburned anthracite coal. Carpentry shops left an abundance of cut wood scraps, sawdust, and hardware.

Stable: Sawmill complexes often featured stables to house draft animals. The buildings were vernacular in materials and construction, gabled or shed in form, and usually less than 20 by 30 feet in area. Workers designed stables in the field for function and cost and assembled them with logs and occasionally lumber. Wide doorways, open gaps in the walls, a manger, and possibly an oat box are defining characteristics. Because stables were not residences, they offer few if any domestic artifacts.

Stable Ruin: The collapsed remains of a stable.

Logging Camp Feature Types

The types of features specific to logging camps are listed below. The camps were also centers of transportation networks that included skid trails, roads, and sometimes flumes. Related aspects are described below under Transportation and Flume features.

Logging Camp Buildings

Log Boardinghouse – Character-Defining Features

Logging companies erected boardinghouses for crews of four or more workers. The residents lived in a communal atmosphere, may have shared sleeping quarters, and usually consumed meals prepared in the building. Privies, outdoor work areas, and domestic refuse dumps or scatters are usually associated with boardinghouses.

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display “hog trough” construction, with flush-sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front- or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks, and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames split from hand-hewn logs or made of 1x or 2x milled lumber.

Frame Boardinghouse – Character-Defining Features

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.

- Walls: Post-and-girt or balloon frame sided on the exterior with two layers of planks sandwiching tarpaper or newspaper. Board-and-batten siding was common, as well. Planks were used in the interior.
- Roof: Front- or side-gabled, with common rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks, and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames made of 1x or 2x milled lumber.

Log Bunkhouse – Character-Defining Features

Bunkhouses were a type of company housing where workers slept and spent leisure time but did not regularly prepare food. Instead, they ate in a boardinghouse or company dining hall. Given this, bunkhouses often feature few food-related artifacts relative to the size of the building and the number of inhabitants.

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display “hog trough” construction, with flush-sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front- or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks, and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames split from hand hewn logs or made of 1x or 2x milled lumber.

Frame Bunkhouse – Character-Defining Features

- Core Plan: Rectangular or L-shaped, two or more rooms.
- Stories: 1, 1½, or 2.
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Post-and-girt or balloon frame sided on the exterior with two layers of planks sandwiching tarpaper or newspaper. Board-and-batten siding was common, as well. Planks were used in the interior.
- Roof: Front- or side-gabled, with common rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks, and later were manufactured panel doors. Wooden door frames were made of 1x or 2x milled lumber.
- Windows: Square or rectangular, often sliding, with frames made of 1x or 2x milled lumber.

Single-Pen Log Cabin – Character-Defining Features

A cabin was a self-contained residence for several workers or a family. In form, cabins were less than 20 by 25 feet in area and one story high. Workers built cabins with any combination of logs, lumber, canvas, and sheet iron. Cabins were vernacular in that the builder adapted conventional form and construction methods to local conditions, available materials, and need. Because cabins were self-contained households, they usually offer a wide array of domestic artifacts. Privies and refuse scatters are often associated.

- Core Plan: Rectangular, one room.

- Stories: 1 or 1½
- Foundation: Log or timber footers, or crude stone foundation, on earthen platform.
- Walls: Horizontal logs, round or hewn, assembled with square, V, saddle, or dovetailed joints. Corners may also display "hog trough" construction, with flush-sawn log ends nailed to end-plates. Gaps chinked with mud retained by log or lumber strips.
- Roof: Front- or side-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stovepipe, typically near the rear end of the roof.
- Entry Door: Usually located in the front, with roof extension sheltering the entry. Early doors were made on site of vertical planks, and later were manufactured panel doors. Wooden door frames split from hand-hewn logs or made of 1x or 2x milled lumber.
- Windows: Square or rectangular with frames split from hand hewn logs or made of 1x or 2x milled lumber.

Double-Pen Log Cabin – Character-Defining Features
- Core Plan: Rectangular, two rooms.
- Stories: 1 or 1½
- Foundation: Log or timber footers, or stone alignment, on earthen platform.
- Walls: Same construction as Single-Pen above.
- Roof: Same construction as Single-Pen above.
- Entry Door: Same construction as Single-Pen above.
- Windows: Same construction as Single-Pen above.

Rectangular Plan Frame Cabin –Character-Defining Features
- Core Plan: Rectangular.
- Stories: 1 or 1½.
- Foundation: Log or timber posts, log footers, or dry-laid stone laid on an earthen platform.
- Walls: Post-and-girt frame, horizontal planks or board-and-batten siding on the exterior, and plank siding on the interior.
- Roof: Front-gabled or side-gabled with wood shingles, rolled asphalt, asphalt shingles, or smooth or corrugated metal, over 1x wood decking fastened to 2x wood rafters.
- Chimney: Stovepipe.
- Entry Door: Located either under the gable for front-gable plan, or beneath the eave for side-gable plan. Entries were usually vertical plank doors, and later manufactured panel doors.
- Windows: Vertical sash windows and wood frames made of 1x or 2x milled lumber.

Privy –Character-Defining Features
- Core Plan: Rectangular or square.
- Size: 3x4 to 5x8 feet in plan.
- Foundation: Log or timber posts, log footers, or corner rocks around open pit.
- Walls: Post-and-girt frame, or corner posts with cross-members, plank or board-and-batten siding on the exterior.
- Roof: Front- or side-gabled, or shed, with plank decking, and rolled asphalt, asphalt shingles, or smooth or corrugated metal. Decking may span the walls or be fastened to 2x wood rafters.
- Entry Door: Entries were usually vertical plank doors, sometimes opening onto a plank deck.

Logging Camp Structures and Archaeological Features

Boardinghouse Platform: Boardinghouses usually stood on earthen platforms, which represent the building after the architectural elements are gone. The platform may feature rock or log footers for the building and a collapsed root cellar for food storage underneath. The platform or footers often outline the building's size and footprint.
Boardinghouse Ruin: The structural remnants of a boardinghouse.

Bunkhouse Platform: Bunkhouses stood on the same types of earthen platforms described above for boardinghouses, but without root cellars. The platform should feature few food-related artifacts because meals were generally prepared and consumed elsewhere.
Bunkhouse Ruin: The structural remnants of a bunkhouse.
Cabin Platform: Cabins usually stood on earthen platforms, which represent the building after the architectural elements are gone. The platform may feature rock or log footers outlining the building's size and footprint.
Cabin Ruin: The collapsed remains of a cabin.

Most logging residences were small cabins, usually represented today either as earthen platforms or ruins such as the one above near Breckenridge. Source: Eric Twitty.

Cellar Pit: Cellars, mistaken for dugout residences, were subterranean structures for cold storage of perishable food. They usually had plank or log walls retaining an earthen pit, a plank or log roof covered with earth, and a sunken doorway. In some cases, cellars were underneath cabins and boardinghouses. When the walls and roof collapsed, the cellars tend to manifest as pits with notches marking the entry. A lack of domestic refuse is a common attribute.
Cistern: Organized, well-capitalized camps occasionally included cisterns to store potable water. Cisterns were countersunk into the ground and were constructed with rock masonry, concrete, or planks.
Corral: Because the logging industry relied on draft animals, camps almost always included a corral. Some fences were properly constructed with wire and posts, and most were bounded by alignments of stumps, cut slash, and logs with natural features.
Corral Remnant: After abandonment, corrals may feature evidence of their boundaries such as wires, branches, upended stumps, individual fence posts, and cobble alignments marking a fence line. The interior should either be open or feature vegetation younger than in the surrounding area.
Developed Spring: Loggers and their draft animals depended on water for existence, and preferred springs because of their purity. When water was difficult to collect, loggers developed the spring by excavating a chamber, lining it with planks or masonry, and diverting drainage around the excavation.

Ditch: Some residential complexes feature ditches that delivered fresh water for consumption and other uses. Such ditches are minor excavations and may descend through the camp at a steep pitch.
Domestic Refuse Dump: In camp, loggers threw their household refuse downslope from boardinghouses and cabins. Over time, they created substantial concentrations of food-related and other household artifacts such as food cans, fragmented bottles and tableware, and personal articles.
Domestic Refuse Scatter: A disbursed scatter of domestic refuse, usually extending downslope from a residential feature.
Privy Pit: Privy pits were excavated in the ground to receive waste from privies. When a pit became full, camp residents relocated the privy building, topped the depression off with domestic refuse, and shoveled over a soil cap. The cap subsided as the pit contents leached away and decayed, creating a depression usually less than 6 feet in diameter. Pits often feature backdirt downslope, some domestic refuse in the interior, and ashy soil. The pit may be surrounded by more refuse and footers for the privy building.
Root Cellar: Residences and businesses that handled high volumes of perishable food had root cellars for storage. Such enterprises were commonly boardinghouses, restaurants, hotels, and markets. Root cellars, often mistaken for dugouts, were excavated near their associated buildings. Walls usually made of rocks, logs, or lumber retained the earthen sides and a roof covered with more earth. Because root cellars were not residences, they usually offer few domestic artifacts and lack stovepipe ports.
Shop: Because logging camps were centers of operations, they usually included a shop where workers maintained tools and fabricated hardware. The shops were like those at sawmills, described above.
Shop Platform: See the description above with sawmill features.
Shop Ruin: See the description above with sawmill features.
Shop Refuse Dump: See the description above with sawmill features.
Spring Box: A spring box was a small enclosure built over a developed spring. The structures had plank walls, often a masonry or concrete chamber, a roof, and an entry door.
Stable: Because logging camps were centers of operations, they usually included a stable to house draft animals. See the description above with sawmill features.
Stable Ruin: See the description above with sawmill features.

Transportation System Feature Types

Corduroy Road: Erosion and mud created by logging traffic often rendered roads impassable in wet areas. In response, logging outfits paved dap sections with available resources, which in forests, were trees. They laid a tight series of logs 90 degrees across the road, and although the rough surface was unpleasant for pedestrians and wagons, it eased the task of skidding logs.
Road: When not on a railroad, sawmills relied on wagons to ship their lumber to market. Wagons required roads, which were usually 7 to 12 feet wide and lined with cobbles exhumed by traffic.
Skid Trail: Skid trails were ruts and furrows that muleskinners created by dragging logs out of the forest with draft animals. The trails descended downslope along paths of fewest obstacles, and usually ended at a sawmill, loading station, or tie collection point. Over time, traffic eroded the trails into channels less than 8 feet wide. Trails descending steep slopes were also known as timber slides.
Timber Slide: A timber slide was another name for a skid trail, described above.

Loading Station and Tie Collection Point Feature Types

The types of features specific to loading stations and tie collection points are listed below. By nature, the stations and collection points were centers of transportation networks that included skid trails, roads, and sometimes flumes. Related aspects are described below under Transportation and Flume features.

Building Platform: Loading stations and tie collection points occasionally featured utilitarian buildings for storage or shelter. When removed, the building often left an earthen platform approximating its footprint. Buildings used for general purposes tend not to feature distinguishing artifact assemblages.
Building Ruin: The collapsed remnants of a utilitarian building or storage shed.

Hoisting Derrick Foundation: Hoisting derricks were primitive cranes, and lumber companies occasionally erected them at loading stations to move cumbersome logs. A derrick had a mast timber, a boom timber, and a winch, all on a turntable. The mast was nearly vertical, fixed to the turntable, and guyed with ropes. The boom hinged at the mast base, and it was raised and lowered with ropes. The hoisting cable lifted the logs, and it passed from the winch through pulleys on the mast and over the boom. The turntable was proportional to the size of the derrick, and the ones for logging ranged from 2 by 2 to 5 by 5 feet in area. A foundation slightly larger in size anchored the turntable. The foundation was typically made with short log stringers bolted to more logs buried with rock ballast.

Loading Frame: A structure made of logs or timbers that allowed teamsters to roll raw logs from a stockpile onto their wagons for shipment to a sawmill. Workers usually built the frame on a slope adjacent to and above a road. Most were around 12 feet wide, 4 feet high, and constructed with log cribbing. Long-term versions consisted of milled timbers. Tie collection points with high volumes of traffic also had loading frames, although rare. The frames were around 6 feet wide and 4 feet high.

Loading Platform: Loading platforms were similar in shape, size, and location to loading frames. The difference was that platforms consisted of earth usually retained by log cribbing.

Log Stockpile: A collection of cut logs staged for transportation.

Loop Road: Because wagons had great difficulty turning around and backing up, loading stations featured loop roads that directed a one-way flow of traffic past the loading frame. The teamster could pull alongside, transfer the logs, and continue around the loop.

Refuse Dump: Loading stations used for prolonged periods of time also served as maintenance centers where loggers repaired equipment and manufactured items. They threw hardware, structural materials, and other refuse into piles along the edges of the clearing.

Shop: Large loading stations and tie collection points also served as bases of logging operations. Some featured shops where loggers serviced tools and fabricated hardware. For a description, see sawmill features above.

Shop Platform: See sawmill features above.

Shop Ruin: See sawmill features above.

Stable: Occasionally, loading stations and collection points included stables to house draft animals. For a description, see sawmill features above.

Stable Ruin: See sawmill features above.

Tie Stack: Most tie collection points lacked transfer structures. Instead, workers neatly stacked their ties for shipment to a railroad. They crosshatched layers of ties as high as around 8 feet on log bolsters.

Tie Stockpile: In some cases, tie producers chose to stockpile finished ties in arrangements other than crosshatched stacks. They laid rows over a platform or log bolsters, or simply dumped them in a jumbled pile on the ground.

Winch Anchor: Some logs were too heavy and large to be dragged by draft animals. In such cases, lumber companies substituted donkey winches and reeled the logs to loading stations. Prior to the 1920s, the winches were steam-powered, and afterward, they were driven by gasoline engines. In either case, the winches were self-contained on a bedplate that rested on the ground. Cables lashed to several anchor points held the winch in place.

Flume Feature Types

Diversion Dam: A diversion dam was a structure that shunted stream flow into the headgate of a flume. The dam was intended to raise the water to headgate level but not entirely block the stream. Dams were vernacular in construction and design and usually consisted of log cribbing cells filled with gravel, although some were made of lumber.

Flume: A flume was an engineered structure that carried water, logs, and lumber from loading stations at the head down to receiving stations at the tail. Flumes ranged from 2 to 4 feet in width and as high, and were hundreds of feet to miles in length. Box flumes featured plank walls and a floor bound on all sides with box-frame sets. V flumes had plank walls joined at the bottom. Both rested on a subframe of cross-members and timber stringers.

Flume Bed: Where possible, lumber companies built flumes directly on the surface of prepared earthen beds graded across slopes. The beds were flat, 2 to 6 feet wide, and descended at gentle angles to maintain a flow from head to tail.

Flume Ruin: The structural remnants of a flume.
Headgate: The top end of a flume featured a headgate to admit or shut off the flow of water. A headgate typically featured plank slats or a sliding steel panel in tracks.
Loading Frame: Loading frames allowed workers to stockpile logs and lumber at a loading point and gently drop the materials into the flume. Frames consisted of either log cribbing or milled timbers.
Loading Platform: A loading platform performed the same function as a loading ramp, and it consisted of an earthen pad retained by log cribbing.
Storage Frame: When workers retrieved lumber and logs from the tail of the flume, they stacked the material on a frame to dry it while in storage. The frame consisted of either logs or lumber.
Storage Platform: A storage platform performed the same function as a storage frame, and it consisted of an earthen pad retained by log cribbing. Workers elevated the lumber or logs above the ground on bolsters.
Trestle: Trestles carried flumes over substantial drainages and other low points. Short trestles may have consisted of little more than pairs of log posts supporting the flume's subframe. Long or high trestles featured timber piers, footers, and stringers supporting the subframe.
Trestle Remnant: The collapsed ruins of a trestle. Usually, the footers, posts, and abutments are evident.

Section F 3: High-Altitude Agriculture Property Types and Registration Requirements

INTRODUCTION

Section F provides descriptions of and registration requirements for the historic property types associated with homesteads, farms, and ranches in the I-70 Mountain Corridor. In 1999, Thomas H. and R. Laurie Simmons (Front Range Research Associates) produced *Historic Ranching Resources of South Park, Colorado,* a well-written Multiple Property Documentation Form for evaluating historic agricultural resources in Park County. The discussion of property types and subtypes for the I-70 Mountain Corridor follows the Simmons' precedent because of similarities in themes and resources. Itemized descriptions of the archaeological, structural, and architectural features have been added to refine the interpretation of the historic resources expected in the corridor.

The following property types and subtypes are developed in this section:

- Homestead
  - Residential Buildings
  - Homestead Support Facilities
  - Livestock and Crop Storage Facilities
- Ranch
  - Residential Buildings
  - Ranch Support Facilities
  - Livestock and Crop Storage Facilities
- Farm
  - Residential Buildings
  - Farm Support Facilities
  - Livestock and Crop Storage Facilities

- Agricultural Rural Historic Landscape

PROPERTY TYPE: HOMESTEAD

A homestead can often be characterized as a primitive agricultural settlement arranged on a tract of previously undeveloped rural land, usually in a frontier environment. An individual could secure a single homestead plat of 160 acres (quarter-section), and as many as four families settled adjoining plats and built their houses for mutual assistance. In some cases, logging companies and ranchers convinced individuals to plat homesteads and convey the land to their operations not for agriculture, but instead for the natural resources. These plats do not qualify as a Homestead property type.[1]

Homesteads depended on agriculture for subsistence and income, and by definition, produced goods in limited quantities. In the Clear Creek and Blue River drainages, the high altitude climate limited agriculture to livestock such as cattle, hogs, and fowl, and cold-weather crops including hay, root vegetables, and greens. The climate along the Eagle and Colorado rivers was gentler and allowed homesteaders to produce a greater variety of crops. When agriculture became commercial in scale, the homestead can be redefined as a ranch or farm.

Homesteaders sometimes used their complexes as bases for other businesses to supplement income. Blacksmithing, horseshoeing, and woodcutting were common. When on popular routes, homesteaders advertized their establishments as stage stops where travelers could billet overnight. Some homesteads also originated formal settlements, exemplified by the evolution of John Bocco's establishment on the Eagle River into the town of Minturn.

Homesteads consisted of much more than a primitive residence in a frontier setting. They also had facilities to support daily life and agricultural operations and fields for crops and livestock. The facilities for living included a well or spring, root cellar, outhouse, and an area where the residents disposed of solid waste. To support agriculture, the homesteader maintained a blacksmith shop, barn, stable, corral, feed trough, and additional water sources. Most of these improvements were buildings and structures clustered around the residence, while those for livestock were far enough away to minimize vermin. Agricultural fields surrounded the homestead complex, and those for crops were fenced, plowed, and the cobbles removed. Irrigation ditches provided water, and the homesteaders threw the cobbles into piles at the field corners or along the downslope edges.

Because homesteads were built in open territory, or by individuals with limited resources, the buildings tended to be small, simple, and consisted of local materials. Logs were a universal resource throughout the I-70 Mountain Corridor, although some settlers also used native stone. Lumber became widely available after the 1870s in the Clear Creek and Blue River drainages and by the 1880s on the Eagle and Colorado rivers. Concurrently, homesteaders turned to frame construction for principal buildings, although many continued to use logs into the 1910s. Corrugated sheet iron became popular for roofs by the 1900s, regardless of location.

Today, few homesteads survive completely intact or appear exactly as they did when founded. Many evolved over time, and although the core buildings such as the residence and barn may date to the original time of settlement, homesteaders added facilities during continued occupation. Thus, buildings and structures often feature a variety of construction materials, methods, and workmanship.

[1] Defebaugh, James Elliott *History of the Lumber Industry of America* Chicago, IL, The American Lumberman, 1906:387; Steen, Harold K. *The U.S. Forest Service: A History* Seattle, WA, University of Washington Press, 1976:8; Wroten, William H. *The Railroad Tie Industry in the Central Rocky Mountain Region, 1867-1900* Dissertation, University of Colorado, CO, 1956:192.

Many complexes have suffered demolition by neglect, or their structures and buildings removed, nevertheless leaving distinct archaeological evidence. When the evidence clearly represents the homestead and its history, the assemblage may qualify for the NRHP as an archaeological expression of a homestead.

Homestead Property Subtypes

Property Subtype: Homestead Residential Building: Early settlers erected three general types of homestead residences: dugouts, log cabins, and small houses of wood-frame construction. These three types are described below. All served a similar function as a center of life at the homestead. The dwelling was where settlers slept, cooked, dined, attended to domestic duties, and conducted business. Because the I-70 Mountain Corridor was generally settled from east to west, homestead residences in Clear Creek County date from circa 1860 to 1880, while those in the Blue River Valley in Summit County date from circa 1865 to 1890, and those in the Eagle and Colorado River valleys date from circa 1870 to 1920. The oldest, most rudimentary, residences are therefore likely in the Clear Creek drainage, with newer, more elaborate homestead dwellings located on the western side of the Continental Divide. Nearly all residences can be expected to be vernacular in form and construction. Those in Clear Creek and Summit counties are likely to be built from locally available materials and heavily influenced by the local climate, topography, availability of water, and other physical characteristics specific to the region. Residences in the Eagle and Colorado River Valleys, conversely, are more likely to be built with dimensional lumber and manufactured materials, brought to the region by the railroad and purchased from local suppliers. The newer dwellings are also more likely to display stylistic influences and ornamental details, disseminated by pattern books and popular architectural magazines. Character-defining features of homestead residences are summarized at the subsection's end**.**

Dugout: Dugouts were the earliest and most primitive homestead residences. They were usually erected by impoverished individuals who had little time and few resources when initially developing homestead claims. Settlers almost always considered dugouts to be temporary residences and replaced them when they had enough money and materials.

The settler excavated a deep incision in a slope, smoothed the earthen sides and rear as walls, added a façade front, and installed a low-angle roof over a log ridge-beam. Excavating a chamber out of a slope simplified construction, minimized building materials, and afforded maximum protection from the elements once the dugout was complete. Dugouts may appear similar to root cellars, although they possess distinguishing characteristics that reflect domestic occupation instead of cold-storage. First, dugouts are rectangular and at least 12 by 15 feet in area and 6 feet high inside, which provided sufficient living space. Second, the façades featured frame doorways, windows, and roof extensions that sheltered the entry. The windows may have been without glazing, and doors were often made of wood planks. Third, homesteaders cooked food in their dugouts, usually either in open hearths or on cast-iron stoves. Thus, dugouts usually had a stone chimney or stovepipe port in their roofs for the stove. Last, dugouts feature domestic artifacts left from residential occupation.

Because dugouts were typically built into hillsides, their façades were a primary element above grade. The façade consisted of locally harvested logs, rocks, or lumber when available. Most of the lumber was rough-cut and true in dimension, instead of slightly smaller than the designated stock. When homesteaders used logs for the façade, they treated them in three ways. The simplest were to leave them round with bark intact. Another was to peel the bark away. The third was to hand hew the logs into timbers with an axe or adz. The logs were assembled into the wall with saddle- or square-notched corner joints. Gaps between the logs were chinked with any combination of small stones, sand, straw, animal hair, moss, newspapers, bits of wood, and other available materials. Split strips or rough mortar or clay held the chinking in place. The sill logs were placed either directly on the ground, or on a dry-laid stone foundation designed to keep the dugout from settling.

Homesteaders usually covered their dugouts with front-gabled or barrel-shaped roofs, sometimes referred to as boxcar roofs. Regardless of era, most roofs were based on similar elements. A center ridge-beam extended lengthwise across the dugout, and depending on the structure's size, may have been flanked by additional beams. Rafters and plank decking often supported sheet-iron cladding or earth. Settlers often substituted closely spaced logs for the decking.

The earliest entry doors were made of planks split from hand-hewn, squared logs. Somewhat later, entry doors, door frames, and window frames, were made of rough-cut lumber or mill-slabs, which were the rinds of trees cut away at a local sawmill. Homesteaders preferred mill-slabs because lumber companies considered them waste and gave the material away. Early in an area's history, glass was very costly if not difficult to obtain. Thus, homesteaders often substituted wax paper or white cloth for proper glazing.

Cabin: Homesteaders constructed dugouts primarily as temporary shelters, often in advance of winter weather, with an understanding that they would be replaced by a permanent residence as time and money allowed. The earliest type of permanent residence was a log cabin, followed by progressively more elaborate houses of wood-frame construction. As explained in Section E, dugouts, early homestead cabins, and frame houses were vernacular, as well as traditional. Their construction was influenced by local materials, the climate, topography, soil conditions, availability of water, and other physical characteristics specific to the region. Cabins were traditional because they were a product of the construction methods and techniques employed by their builders, passed down through generations, and adapted to the Colorado frontier.

Later in the homesteading movement, settlers constructed their dwellings with a combination of indigenous materials, dimensional lumber, and manufactured supplies. Early homestead residences also reflected the needs and visions of their builders. For example, an unmarried homesteader did not require as large or elaborate a dwelling as a homesteader with a family. Such cabins were vernacular and rarely conformed to an architectural style, but some were stylistically influenced.

Homestead cabins follow some continuity in architectural materials, workmanship, and form. Prior to 1900, homesteaders extensively used hand-hewn or peeled logs, and stone masonry less often. Afterward, homesteaders increasingly used lumber with timeframe specific to region. Homesteaders assembled cabin walls with square, saddle, or V-notch joints, and laid sill logs as foundations.

Log cabins may be categorized by an architectural terminology pertaining to their core plan, roof type, materials, door and window placement, number of rooms, and ancillary features such as porches. Most cabins were rectangular in plan with a gable roof and featured either a single room (single-pen cabin) or two rooms (double-pen cabin). Rectangular, double-pen cabins may be subdivided into the Shotgun and Hall-and-Parlor plans. A Shotgun cabin was one room wide, two rooms deep, and covered by a front-gable roof. The floorplan lacked interior hallways, and a log wall with doorway separated the two rooms. The Hall-and-Parlor plan featured a side-gable roof and two rooms of different sizes. The larger served as general living space and kitchen, while the smaller was usually a bedroom.

Gabled-L and Gabled-T type cabins featured several rooms in L-shaped or T-shaped floorplans covered by cross-gabled roofs. The cabins were larger than the rectangular versions above, and were usually 1½-stories high with enough room in the upper story to serve as sleeping quarters for some family members.

Wood-Frame House: Homesteaders built frame residences primarily after railroads increased availability and decreased costs of manufactured materials. Timeframe varied according to corridor segment history. Frame residences were based on a dimensional lumber skeleton, sided on the exterior with sheathing boards, and clad with lapped horizontal wood or horizontal weatherboard siding. Exterior walls were sometimes re-clad with rolled asphalt, particularly on the windward side to provide additional protection from the elements.

Homesteaders erected their frame houses on several types of foundations, almost always arranged on cut-and-fill earthen platforms. The simplest and least expensive were impermanent footers of logs, timbers, or dry-laid rocks. The footers outlined the building footprint and often included interior pilings or dividers for center support. After a house was removed, it may be represented by the above archaeological features.

Lasting foundations were made of native stone, poured concrete, and by the 1910s, cinderblocks. Early stone foundations were often later coated with concrete pargeting. Poured concrete foundations consisted of cement, sand, gravel and water poured into plank forms, which left patterns from the wood grain and joints when dismantled. Hollow cinderblocks were usually purchased commercially; although some homesteaders made their own by pouring concrete into block-shaped molds.

Frame homestead houses were covered by front-gabled, side-gabled, cross-gabled, or hipped-roofs, with 1-inch plank decking on 2-inch thick rafters. The decking was clad with shingles, sheet metal, rolled asphalt, or corrugated sheet iron. The rafter ends were exposed beneath the eaves, covered by a fascia board, or boxed. A stone or brick chimney, or stovepipe, typically extended up from the rear of the house. Door and window placement depended on the core plan.

The basic house form was a rectangle with subtypes or variants similar to those for the log cabins outlined above. A Shotgun type was rectangular in plan, one-room wide, and at least two rooms deep with no interior hallways. It was covered by a front-gable roof with the entry under the gable end. The Hall-and-Parlor plan was also rectangular but covered by a side-gable roof with the entry beneath the eave. Hall-and-Parlor houses featured two different-sized rooms, with the larger as general living space and kitchen, and the smaller primarily a bedroom.

Homesteaders occasionally built houses according to other types and plans. Those that may exist in the I-70 Mountain Corridor include the L-Shaped plan, the T-Shaped plan, the I-House plan, the Hipped-Roof Box type, the Pyramid Cottage, the Foursquare type, the Classic Cottage, and the Bungalow type. All are described at the subsection's end**.**

Property Subtype: Homestead Support Facilities: Homestead residences were too small and primitive to enclose all the functions that supported daily life, and they lacked sanitation. Settlers built exterior facilities around the residence to provide water, heating fuel, food storage, and waste disposal. The support facilities were important because they administered to the necessities of frontier life. Outbuildings enclosed some facilities such as wood storage or a spring, and structures and objects served other functions.

In many cases, support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the homestead complex or for individual eligibility. A list of the most common secondary support facilities, their character-defining features, and their archaeological manifestations is at the subsection's end.

Property Subtype: Homestead Livestock and Crop Storage Support Facilities: Homesteads had outbuildings, structures, and objects that supported agricultural operations. These facilities were important because they directly affected the settlers' livelihood, allowed them to realize income, and even to survive. Some facilities were specific to livestock, and they were usually clustered together. Because homesteaders practiced agriculture on a limited scale, the support facilities were smaller and simpler than those on ranches and farms. A common design included a stable, chicken coop, rabbit hutch, tack shed, and water source clustered around a barn and corral. Facilities for crops were close to the fields and included a grain shed and a potato cellar.

In many cases, the support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the homestead complex, or for individual eligibility.

Homestead Significance

As historic resources, homesteads were associated with and participated in a variety of important trends and historical patterns. These are summarized as the NRHP areas of significance below, and they include Agriculture, Architecture, Commerce and Economics, Engineering, Exploration/Settlement, Industry, and Politics/Government.

Period of Significance must be considered when determining the historical importance of homesteads. Although the general Period applicable to agriculture in the I-70 Mountain Corridor spans 1860 to 1955, homesteading was an important movement for a smaller portion of this timeframe. Further, each corridor segment had slightly different years. The relevant period of time in Clear Creek County spanned 1860 to 1880 and in the Blue River drainage from 1865 through 1890. Along the Eagle and Colorado rivers, homesteading was important from 1870 until 1920. Some, if not all, the areas of significance below were applicable to homesteading during these timeframes. Level of significance was most likely local, and possibly statewide.

Area of Significance: Agriculture: Homesteading was an important agricultural institution in the central mountains for several reasons. The earliest homesteaders adapted known agricultural practices to the rigorous mountain climate. Through trial and error, they determined which crops would grow, when to plant and harvest, and how to keep animals. Cumulatively, the body of knowledge became a foundation for ranching and farming, which succeeded homesteading.

Area of Significance: Architecture: Homesteads were important in the area of architecture for several reasons. Settlers adapted familiar building designs and methods of construction to the frontier conditions of the Rocky Mountains. Some of the conditions included topography, natural landscape features, local climate, and available building materials. In many cases, tight economic constraints influenced how settlers adapted designs and materials. As a result, homesteaders contributed to existing patterns of functional and yet cost-effective rural frontier architecture.

Areas of Significance: Commerce and Economics: Homesteaders were an important link in the early frontier economy of the central mountains. They produced feed for miners, loggers, and their animals and sold these materials to local markets. In so doing, homesteaders pioneered the agricultural segment of mountain commerce and contributed to the growing complexity of regional economies.

Area of Significance: Engineering: Homesteads were a vehicle for the adaptation of agricultural engineering practices to the Rocky Mountain frontier. On a scale respective to an entire homestead, the settlers planned the overall property improvements according to their perception of efficiency but within environmental constraints. They considered the needs of residential occupation, animal husbandry, cultivation, and irrigation. On the scale of individual structures within the homestead, the settlers combined known construction methods with local building materials for functional facilities. The designs were often informal and vernacular while meeting financial budgets and the homesteader's needs.

Area of Significance: Exploration/Settlement: Homesteaders were among the first permanent settlers in the central mountains. In the Clear Creek and Blue River drainages, they arrived within a short time after prospectors and miners, most of whom were transient. Homesteaders pioneered several sections of the Eagle and Colorado rivers and settled in advance of other forms of industry. In so doing, homesteaders anchored permanent settlement.

Homesteaders exerted a stabilizing influence in the I-70 Mountain Corridor. Mining and logging were the principal industries and supported the regional economies and populations. But because these industries were based on resource extraction, they underwent cycles of boom and bust, which created instability. Homesteading, by contrast, was mostly sustainable, and its permanent population and their economic contributions moderated the bust periods.

Homesteads fostered the growth of some communities in the corridor. The Floyd homestead on Floyd Hill, Clear Creek County, and an establishment on the Blue River, Summit County, served as important stations on key road networks. These and other homesteads provided support to the travelers who then settled the corridor. Individual and groups of homesteads also were the seeds for permanent towns such as Dillon, Dotsero, Eagle, and Minturn.

Area of Significance: Industry: Although homesteads were not voluminous producers of agricultural goods, they nonetheless played an important role in the agricultural industry. Collectively, homesteads were the foundation of agriculture as a business in the mountains, and that industry became one of the most important economic sectors.

Area of Significance: Politics/Government: Homesteads were physical manifestations of federal policies designed to encourage settlement of the West. The Homestead Act of 1862 provided title to 160 acres after five years occupation and payment of application fees. The Timber Culture Act of 1873 allowed settlers to buy 160 acres for $1.25 per acre if they planted one-quarter with trees and maintained them for ten years. The Desert Land Act of 1877 conveyed 640 acres for $.25 per acre if the claimant proved irrigation within three years. All three acts fostered homesteading as a movement, resulting in the settlement of entire regions. Collectively, the homesteaders established a permanent Euro-American presence and economic foundation in those regions.

Homestead Registration Requirements

To qualify for the NRHP, a homestead must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance above, notably historic events and trends that were important in the evolution of their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A.

Criterion B: Homesteads may be eligible under Criterion B provided that an important person lived at the site. The homestead must retain physical integrity relative to that person's productive period of occupation. Further, the homestead's material manifestation must date to the same timeframe of when the individual achieved significance. Few homesteads are expected to qualify because most settlers did not render significant contributions. If a homesteader was important, the researcher must explain the person's significant contributions in a brief biography. In some cases, important people filed homestead plats but did not occupy the property and instead rented or leased the land out. Such an association does not meet Criterion B. The individual of note must have been present on-site. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

> _Criterion C:_ Homesteads may be eligible under Criterion C if the buildings are good representative examples of significant architectural types or styles. Similarly, a homestead may be eligible if the structures and objects are good representative examples of significant engineering types or designs. The overall assemblage of buildings, structures, and archaeological features may also be a sound example of design, agricultural practices, and land use specific to homesteads. Discernable patterns of cultivation, irrigation, or animal husbandry may be expressed as a rural historic landscape. In such cases, the homestead may qualify as the historic landscape property type discussed below.
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> _Criterion D:_ Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents the homestead during the Period of Significance, the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the homestead complex and land use patterns. If archaeological features and artifacts offer important information regarding homestead design and operation, settlement patterns, or aspects of homesteader demography and lifestyles, then the site may qualify under Criterion D.
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> If the homestead possesses building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding agricultural lifestyle and demography on the frontier. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, agricultural practices, and animal husbandry.

Homesteads must possess physical integrity relative to the Period of Significance outlined in Section E. Few homesteads will appear as they did when initially established. Some were occupied for extended periods and modified over time. Such homesteads represent the evolution and, most likely, the expansion of agricultural complexes. Most homesteads were, however, abandoned when the settlers sold the land or moved to superior complexes. These resources tend to be in advanced states of decay and can qualify as archaeological sites.

Many of the seven aspects of historic integrity defined by the NRHP may apply to homesteads, although not all need be present. To retain integrity of *location*, a structure or building should be on the homestead, although some buildings and structures may have been moved short distances from their original place of construction. For a resource to retain integrity of *design*, the homestead's material remains must convey the organization and planning of the residential complex, the support facilities, cultivation, and animal husbandry. To retain the aspect of *setting*, the homestead complex and the surrounding agricultural land must not have changed a great degree from its period of occupation. In terms of *feeling*, the homestead should convey a perception of frontier settlement and agriculture from a historical perspective and in the context of regional land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between homesteading and a contemporary observer's ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: RANCH

A ranch was a business enterprise that specialized in breeding, raising, and grazing livestock in commercial numbers. Many ranches began as homesteads, but when they crossed the threshold into commercial livestock, they became ranches by definition. Isolation in primitive conditions required operations to be self-sufficient to some degree, and they grew produce and also feed for livestock. Given this, ranches commonly featured some attributes characteristic of the farm property type defined below. Most ranches in the I-70 Mountain Corridor worked with cattle, which were infrastructure-intensive, and some also kept sheep that had simple needs.

Ranchers sometimes used their complexes as bases for other businesses to supplement income. Blacksmithing, horseshoeing, and selling extra produce and fodder were common. When on popular routes, ranchers advertized their establishments as stage stops where travelers could billet overnight. During the mid-1890s, a deep national depression made ranching difficult, and some establishments supplemented their income by accepting vacationers from the Midwest and East. These dude ranches introduced their temporary boarders to the ranching way of life for a fee and became part cattle operation and part destination resort. Popularity of dude ranches increased during the 1900s and may have reached a peak during the 1910s.

The size and content of a ranch was a function of its business model, era, and location. Early ranches run by families tended to be small with only the most essential buildings and structures, while companies invested capital in specialized facilities for large numbers of workers and livestock. Many ranches that started small grew over time, and their complexes tend to include a spectrum of buildings and structures sequential in age.

In form, ranches followed traditional agricultural land use patterns and consisted of a cluster of residential buildings, support structures, and other facilities on expansive tracts of rural land. Most were arranged according to variations of concentricity. The residential buildings formed a core, and the support facilities were scattered around the outside. This complex was center to a band of maintained, cultivated, and fenced fields, surrounded in turn by open range land, usually publically owned. Large ranching outfits erected satellite support facilities in distant range land, including corrals, wells, hay barns, and line camps.

Like homesteaders, ranchers sited their residences near sources of water and preferred springs because of their purity. Small ranches usually had a substantial house for the family and a cabin for several cowboys. Large ranches added a bunkhouse and a cookhouse for a workforce, and even a guesthouse for visiting investors. Nearly all ranches had other facilities that supported daily life such as a well or spring, root cellar, smokehouse, outhouses, and an area where the residents disposed of solid waste.

Ranch complexes always included facilities that supported the business of tending livestock. Outfits arranged barns, stables, corrals, loading chutes, and feedlots in connected systems to move, segregate, and feed animals. These distinguishing characteristics tend to be large in scale to accommodate livestock in commercial numbers. Associated support facilities typically included a blacksmith shop, tack shed, and water system, however primitive. In the interest of self-sufficiency, ranching outfits built chicken coops, rabbit hutches, and milking sheds and maintained produce gardens.

Era and location influenced the materials, construction, and sizes of individual buildings and structures. Buildings erected when an area was in a frontier state were often simple, small, and made of local materials. Logs were universal throughout the I-70 Mountain Corridor, and some ranchers also used native stone. Lumber became widely available by the 1870s in the Clear Creek and Blue River drainages and by the 1880s on the Eagle and Colorado rivers. Ranchers then transitioned into frame construction for principal buildings, although many continued to use logs into the 1910s. Corrugated sheet iron became popular for roofs by the 1900s.

Today, few ranches survive completely intact or appear exactly as they did when founded. Many evolved over time, and although the core buildings such as the residence and barn may date to the original time of settlement, ranchers added facilities during continued occupation. Thus, even when on a single ranch, buildings and structures may feature a variety of construction materials, methods, and workmanship.

Many complexes have suffered demolition by neglect, or their structures and buildings removed, nevertheless leaving distinct archaeological evidence. When the evidence clearly represents the ranch and its history, the assemblage may qualify for the NRHP as an archaeological expression of a ranch.

Ranch Property Subtypes

Property Subtype: Ranch Residential Building: The primary residential building at a ranch was the ranch house, where the family slept, cooked, dined, attended to domestic duties, conducted their livestock business, and otherwise interacted as a family. The kitchen was a center of life, and it was usually large and well-appointed. At large-scale company ranches, some houses had quarters for visiting investors and a dining room for hands.

Most ranches also had cabins that served one of several functions. Company ranches sometimes maintained a cabin as a guesthouse, which tended to be small but well-appointed. Ranchers also allotted cabins or bunkhouses for cowboys and ranch hands who lived communally. Such cabins housed several individuals in shared bedrooms and a common room. Companies with large operations employed workforces that were too numerous for simple cabins. Instead, the cowboys and hands lived in bunkhouses that featured small bedrooms, a common room, and sometimes a kitchen. The workers usually dined together and shared sleeping space.

Ranch houses went through a similar evolution as homestead houses. Further, many early ranch houses were transitional residences originally built for a homestead. These were typically small, single-story, rectangular-shaped cabins of log or wood frame construction (as described above under the Homestead property subtypes). As ranches became economically viable enterprises, transitional dwellings were replaced with more substantial 1½-story, Gabled-L, and Gabled-T shaped houses and eventually by recognizable types such as the I-House, Hipped-Roof, Foursquare, and Bungalow.

Early ranch houses were vernacular, and their form and construction was influenced by a number of factors. They were not architect-designed or built by professional contractors, and instead were influenced by the perceived needs and abilities of their owners. Construction was affected by the climate, topography, soil conditions, availability of building materials, and other physical characteristics specific to the region. Ranch houses were also a product of economic factors and of time by the dissemination of popular building materials, techniques, styles, and details. Early ranch houses were traditional because they reflected the construction techniques, traditions, and cultural influences passed down through generations, brought west by early ranchers, and adapted to the Colorado frontier.

After commercial lumber became available, ranch houses were predominantly built of frame construction, and less often, of brick and stone. Although many were still vernacular in form, they displayed stylistic influences and ornamental details reflecting the ranchers' individual tastes and traditions, and increasingly, the architectural fashions then in vogue.

By the 1890s, the spread of architectural styles and ornamental details, popularized by architectural pattern books and magazines, increasingly influenced the appearance of ranch houses. House plans and ornamental details became available through Sears, Roebuck & Company and popular magazines such as *House Beautiful* and *Ladies Home Journal*. Around the same time, architectural publications such as the *Craftsman, Western Architect* and *Architectural Record* began promoting and distributing plans for specific types of houses, notably the Craftsman Bungalow. The influence of such publications, and the availability of manufactured materials, was first seen in ornamental details such as porch rails, columns, brackets, and other decorative elements, which were applied to vernacular residences. Newer houses tended to reflect the latest architectural trends and styles, although vernacular and traditional influences were common well into the twentieth century. The character-defining features for common ranch house types are at the subsection's end.

Property Subtype: Ranch Support Facilities: Houses and cabins served basic needs of ranch life, but they were unable to fulfill all functions. Other facilities around the residences provided water, heating fuel, food storage, and waste disposal. The support facilities were important because they provided for necessities in addition to shelter and food preparation.

In many cases, support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the ranch complex or for individual eligibility. A list of the most common secondary support facilities and their archaeological manifestations is at the section's end.

Property Subtype: Livestock and Crop Support Facilities: Breeding, grazing, and shipping livestock in commercial numbers required facilities specific to the industry. The most iconic were barns and systems of corrals, and these are synonymous with ranching. Cattle had to be branded, dehorned, separated by breed or gender, and divided into groups for shipping. Systems of corrals were an interface between the range and ranch complex, and they allowed cowboys to accomplish these tasks. After driving a herd into a central corral, cowboys pushed them deeper into the system, and by opening gates, sent cattle to specific destinations such as a feedlot, dehorning cage, or loading chute. Most corral systems had water sources and feed troughs. Facilities for tending cattle and also horses were nearby and included tool sheds, tack sheds, and stables.

Most ranches were self-sufficient to some degree, and they had facilities for livestock other than cattle, for growing fodder, and to process some agricultural products. These facilities were important because they granted ranch families some independence and allowed them to realize income from surplus products. Livestock-specific facilities were located away from the residences and could have included a pig pen, chicken coop, and rabbit hutch. Facilities for crops were close to the fields and included a grain shed or silo and haystacks.

In many cases, the support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the ranch complex or for individual eligibility. A list of the most common support facilities and their archaeological manifestations is at the section's end.

Ranch Significance

Ranches were associated with and participated in a variety of important trends. These are summarized as the areas of significance discussed below, and include Agriculture, Commerce and Economics, Exploration/Settlement, Industry, and Social History.

Period of Significance must be considered when determining the historical importance of ranches. Although the period applicable to the I-70 Mountain Corridor spans 1860 to 1955, ranching was an important movement for a smaller portion of this timeframe. Further, the significance of ranching varies slightly by corridor segment. Ranching was important in Clear Creek County between 1870 and 1900 and in the rest of the corridor from 1875 until 1955. Some, if not all, the areas of significance below were applicable to ranching during these timeframes. Level of significance was mostly local, and statewide in some cases.

Area of Significance: Agriculture: Ranching was an important agricultural institution in the central mountains for several reasons. The earliest ranchers adapted known livestock practices to the rigorous mountain climate. Through trial and error, they determined which breeds were the most suitable, how to ensure reliable sources of feed, and how to manage open rangeland. Cumulatively, the body of knowledge became a foundation for sustainable ranching, vital to the economy and permanent Euro-American presence.

Area of Significance: Architecture: Ranches were important in the area of architecture for several reasons. Ranchers adapted familiar building designs and methods of construction to the frontier conditions of the Rocky Mountains. Some of the conditions included topography, natural landscape features, local climate, and available building materials. In many cases, economic constraints influenced how ranchers adapted designs and materials. Ranchers were among the earliest permanent settlers to introduce formal building design and elements of architectural style to the central mountains. They did so primarily with residential buildings, and although most were vernacular, some ranchers relied on formal designs and incorporated elements of architectural style. Overall, ranchers contributed to the development of rural architecture in the central mountains.

Areas of Significance: Commerce and Economics: Ranching began its commercial significance as an important link in the early frontier economy of the central mountains. Ranchers produced meat for miners and loggers, and fodder for their animals, and sold these materials at local market. In so doing, ranchers fostered the agricultural segment of mountain commerce and contributed to the growing complexity of regional economies.

By the 1880s, ranching became one of the most stabile forms of commerce in the mountains. Mining and logging were the principal industries and supported the regional economies and populations. But because these industries were based on resource extraction, they underwent cycles of boom and bust, which created instability. Ranching, by contrast, was mostly sustainable and depended on distant markets as much as local outlets, which translated into greater stability. The permanent ranching population and its economic contributions moderated the bust periods and helped some towns such as Dillon, Gypsum, and Eagle to weather the depressions that affected mining communities.

Area of Significance: Engineering: Ranches were a vehicle for the adaptation of agricultural and livestock engineering practices to the Rocky Mountain frontier. On a scale respective of an entire ranch, the cattlemen planned the overall property improvements according to their perception of efficiency in several arenas. They considered the needs of residential occupation by the family and workforce within the context of the immediate environment. Ranchers arranged crop storage facilities to enhance cultivation processes and handle harvested products. They planned irrigation to deliver water from a source to fields and livestock. Most important, ranchers designed systems of barns, stables, and corrals to process livestock in commercial numbers.

On the scale of individual structures, the cattlemen combined known construction methods with local building materials for functional facilities. The designs were often informal and vernacular while meeting financial budgets and the needs of immediate conditions.

Area of Significance: Exploration/Settlement: Ranches can be associated with several important aspects of exploration and settlement. Cattlemen were among the first permanent settlers in the Blue River drainage, arriving within a short time after miners and homesteaders. Ranchers pioneered several sections of the Eagle and Colorado rivers and settled in advance of other forms of industry. When defining their grazing ranges, early ranchers explored those areas missed by prospectors and contributed to a growing body of knowledge regarding regional geography and natural resources.

Ranching fostered the growth of some communities in the corridor. Towns such as Dillon, Dotsero, Eagle, and Gypsum depended on the ranching economy as much as mining or railroads. Because ranching was sustainable, these towns remained stable and even grew during times when mining towns went bust.

Area of Significance: Industry: Independent ranchers, but especially company operations, brought one of the first formal industries into the corridor besides mining and logging. Ranching was one of the few sustainable industries, and although it suffered during periods of depression, ranching provided some economic stability. The industry produced food, provided employment, and supported the towns of Dillon, Dotsero, Eagle, Gypsum, and Minturn.

Area of Significance: Politics/Government: Ranches were physical manifestations of federal policies designed to encourage settlement of the West. The Homestead Act of

1862 provided title to 160 acres after five years occupation and payment of application fees. The Timber Culture Act of 1873 allowed settlers to buy 160 acres for $1.25 per acre if they planted one-quarter with trees and maintained them for 10 years. The Desert Land Act of 1877 conveyed 640 acres for $.25 per acre if the claimant proved irrigation within three years. Ranchers used all three acts to secure prime ranch land that remained in service for decades.

The livestock industry directly influenced the federal government's change in attitude toward public land from passive to active management. In response to overgrazing and other lapses in stewardship, the Department of Agriculture began issuing grazing permits on Forest Reserve land in 1899, and the General Land Office followed with Department of the Interior land in 1901. The government passed the Newlands Act the following year and initiated large water diversion projects that benefitted ranching. Last, the cattle industry demanded better policy for setting aside public lands, and the government instituted the Taylor Grazing Act in 1934. All shaped the livestock industry.

Ranch Registration Requirements

To qualify for the NRHP, a ranch must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Ranches eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A.

Criterion B: Ranches may be eligible under Criterion B if an important person was physically present at the site for a substantial span of time. Presence will most likely be through residence, employment, or other involvement with the ranching operation. The associated resource must date to the same timeframe of when the individual achieved significance and retain physical integrity relative to that person's productive period of occupation. If a rancher was important, the researcher must explain the rancher's significant contributions in a brief biography. In some cases, important people invested in livestock operations or owned the ranch, but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site. *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: A ranch may be eligible under Criterion C if its buildings are good representative examples of significant architectural types or styles. Similarly, a ranch may be eligible if its structures and objects are good representative examples of significant engineering types or designs. The overall assemblage of buildings, structures, and archaeological features may also be a sound example of design, agricultural practices, and land use specific to ranches. Discernable patterns of cultivation, irrigation, or animal husbandry may be expressed as a rural historic landscape. In such cases, the homestead may qualify as the historic landscape property type discussed below.

<u>*Criterion D:*</u> Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents the ranch during the Period of Significance, the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the ranch complex and aspects of the livestock operation. If archaeological features and artifacts offer important information regarding ranch design and operation, then the site may qualify under Criterion D. The site may also qualify if the material remains reflect settlement patterns, or aspects of the demography and lifestyles of the ranch family, operator, or workforce.

If the ranch possesses building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography within the livestock industry. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, agricultural practices, and animal husbandry.

Ranches must possess physical integrity relative to the Period of Significance outlined in Section E. Few ranches will appear as they did when initially established. Many were occupied for extended periods and modified over time. Such ranches represent the evolution and, most likely, changes in the livestock operation. Ranchers abandoned obsolete or worn structures and buildings in favor of new ones and moved some buildings and structures to fulfill needs. Thus, some buildings and structures may not be in their exact location of construction, and others may be in advanced states of decay.

Many of the NRHP aspects of historic integrity apply to ranches. To retain integrity of *location*, a structure or building should be on the ranch in a location of functional use. For a resource to retain integrity of *design*, the ranch's material remains must convey the organization and planning of the residential complex, support facilities, and cultivation. To retain *setting*, the ranch complex and the surrounding agricultural land must not have changed a great degree from its occupation. In terms of *feeling*, the resource should convey ranching from a historical perspective and in the context of land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between ranching and a contemporary observer's ability to discern the historic activity that occurred at the location.

<u>PROPERTY TYPE: FARM</u>

A farm was an agricultural business that specialized in growing grain and produce on a commercial scale. Many farms began as homesteads, but when they crossed the threshold into commercial agriculture, they became farms by definition. Isolation required operations to be self-sufficient to some degree, and they kept livestock and grew fodder. Such farms featured some attributes characteristic of the ranch property type defined above. Most farms in the I-70 Mountain Corridor produced cold weather vegetables, tree fruit, and grain.

The size and content of a farm was a function of its business model, era, and location. Early and remote farms, usually run by families, tended to be small and consisted of essential buildings and structures. Companies invested capital in advanced irrigation systems, mechanization, and workers' housing. Many farms that started small grew over time, and their complexes tended to include a variety of buildings and structures different in age.

Farms followed traditional agricultural land use patterns and consisted of a cluster of residential buildings, support structures and outbuildings, and expansive tracts of cultivated land. Most were concentrically arranged around a water supply, preferably a spring because of purity. The residential buildings formed a core, and the support facilities were scattered around the outside. This complex was center to irrigated fields of crops that required intensive cultivation, and they were in turn surrounded by dry fields planted with fodder or grain.

Small farms usually had substantial houses for the family and cabins for several hands, and agricultural companies added bunkhouses and cookhouses for seasonal workforces. Nearly all farms had other facilities that supported daily life such as a well or spring, root cellar, smokehouse, outhouses, and an area where the residents disposed of solid waste.

Farm complexes included facilities that supported the business of growing and harvesting crops. Most of these improvements were near the residence, although some were adjacent to produce fields. Farmers relied on draft animals for motive power and other livestock as food. Cattle produced milk, chickens laid eggs, and these animals, as well as pigs, were also butchered for meat. Barns, stables, corrals, coops, and poultry houses typically sheltered the livestock. Farmers kept produce in storehouses, root vegetables in potato cellars, eggs and dairy in cold cellars, and grain in silos and grain sheds. In the arid mountains, irrigation was necessary for agriculture on a commercial scale, and most farms had water systems of varying sophistication. At a minimum, feed ditches collected water from a source, often a stream or water company canal, and distribution ditches then carried portions of the flow to high points on the field. By the 1910s, pumps extracted water from wells and piped it into ditches, and during the 1950s, rotary spray systems distributed water over fields. In general, crop storage buildings and structures and substantial irrigation systems are distinguishing characteristics of farms as a property type. Other outbuildings typically included a blacksmith shop, tack shed, equipment barns, and milking sheds.

Era and location influenced the materials, construction, and sizes of individual buildings and structures. Early buildings were simple, small, and made of local materials. Logs were universal throughout the I-70 Mountain Corridor, and farmers made extensive use of native stone for storage buildings. Lumber became widely available by the 1870s in the Clear Creek and Blue River drainages and by the 1880s on the Eagle and Colorado rivers. Farmers then transitioned into frame construction for principal buildings, although many continued to use logs into the 1910s. Corrugated sheet iron became popular for roofs by the 1900s.

Today, few farms survive completely intact or appear exactly as they did when established. Many evolved over time, and although the core buildings such as the residence and barn may date to the original time of settlement, farmers added facilities during continued occupation. Thus, even when on a single farm, buildings and structures may feature a variety of construction materials, methods, and workmanship.

Many complexes have suffered demolition by neglect, or their structures and buildings removed, nevertheless leaving distinct archaeological evidence. When the evidence clearly represents the farm and its history, the assemblage may qualify for the NRHP as an archaeological expression of a farm.

<u>Farm Property Subtypes</u>

Property Subtype: Farm Residential Building: The primary residential building at a farm was the farmhouse, where the family slept, cooked, dined, attended to domestic duties, conducted their agricultural business, and otherwise interacted as a family. The kitchen was a center of life, and it was usually large and well-appointed. Some houses at company operations had quarters for visitors and a dining room for hired hands. Most farms also had cabins for extended family and hands. The cabins were small and had several bedrooms and a common room. Families occupied cabins as self-contained households, and in such cases, the cabins featured kitchens. Farm hands typically shared quarters and dined together on meals provided by the farmer. Companies with large operations employed workforces that were too numerous for simple cabins. Instead, the hands lived in bunkhouses that featured bedrooms and a common area. The occupancy of cabins and bunkhouses by farm hands tended to be somewhat seasonal, corresponding with planting and harvest.

Farmhouses went through a similar evolution as ranch and homestead houses. Many early farmhouses were transitional dwellings built by a homesteader. These were typically small, single-story, rectangular-shaped dwellings of log or wood frame construction (as described above under the Homestead property subtypes). As farms became economically viable enterprises, transitional dwellings were replaced with more substantial 1½-story, Gabled-L, and Gabled-T shaped dwellings and eventually, by recognizable dwelling types such as the I-House, Hipped-Roof Box, Foursquare, Classic Cottage, and Bungalow.

Early farmhouses were vernacular, and their form and construction was influenced by a number of factors. They were not architect-designed or built by a professional contractor, and instead were influenced by the perceived needs and abilities of their owners. Construction was affected by the climate, topography, soil conditions, availability of building materials, and other physical characteristics specific to the region. Farmhouses were also a product of economic factors and of time by the dissemination of popular building materials, techniques, styles and details. Early farmhouses were traditional because they reflected the construction techniques, traditions, and cultural influences passed down through generations and adapted to the Colorado frontier.

Because most farms postdated railroads and the rise of the lumber industry, houses were predominantly built of frame construction and occasionally of brick and stone. In time, they also displayed stylistic influences and ornamental details, which reflected a farmer's individual tastes and traditions, and increasingly, the architectural fashions then in vogue. Although such farmhouses were vernacular, they were not constructed with local materials, but rather with manufactured lumber and other building supplies, delivered by the railroad and purchased from local retail suppliers.

Although farmhouses continued to reflect their owners' traditions, they also were increasingly influenced by the spread of architectural styles and ornamental details, made popular by the diffusion of architectural pattern books and magazines. House plans and ornamental details became available through Sears, Roebuck & Company and popular magazines such as *House Beautiful* and *Ladies Home Journal*. Around the same time, architectural publications such as the *Craftsman*, *Western Architect* and *Architectural Record* began to promote and distribute plans for specific types of houses, notably the Craftsman Bungalow. The influence of such publications, and the availability of manufactured materials, initially manifested as ornamental details such as porch rails, columns, brackets, and other decorative elements, often applied to vernacular residences. New houses tended to reflect the latest architectural trends and styles, although vernacular and traditional influences were common well into the twentieth century.

The character-defining features for the predominant types of farmhouse dwellings are summarized below in Buildings, Structures and Archaeological Features Common to Homesteads, Ranches, and Farms**.**

Property Subtype: Farm Support Facilities: Houses and cabins served many basic needs of farm life, but they were unable to fulfill all functions. Other facilities around the residences provided water, heating fuel, food storage, and waste disposal. The support facilities were important because they provided for necessities in addition to shelter and food preparation.

In many cases, support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the farm complex or for individual eligibility. A list of the most common secondary support facilities and their archaeological manifestations is at the section's end.

Property Subtype: Farm Livestock and Crop Support Facilities: Commercial farming required facilities specific to the industry. The most iconic were barns and crop storage buildings and structures, and these are characteristic of the property subtype. Farms also had facilities for livestock and processing some agricultural products such as dairy. These facilities were important because they allowed farming operations some diversity of income and economic independence. Livestock-specific facilities were located away from the residences and included a corral, pig pen, chicken coop, and rabbit hutch. Facilities for crops were close to the fields and included a grain shed or silo, potato cellars, and haystacks.

In many cases, the support facilities decayed due to neglect or were intentionally dismantled, leaving material evidence in various states of preservation. When reduced to manifestations that are buried or on ground-surface, the facilities can be categorized as archaeological features. Such remnants may be evaluated as contributing elements of the farm complex or for individual eligibility. A list of the most common support facilities and their archaeological manifestations is at the section's end.

Farm Significance

As historic resources, farms were associated with and participated in a variety of important trends. These are summarized as the areas of significance discussed below, and they include Agriculture, Architecture, Commerce and Economics, Engineering, Industry, and Politics/Government. Significance is local in most cases, although some trends are statewide.

Period of Significance must be considered when determining the historical importance of farming. Although the Period applicable to the I-70 Mountain Corridor spans 1860 to 1955, farming was an important movement for a smaller portion of this timeframe. Further, the significance of farming varies slightly by corridor segment. Commercial farming was not important in Clear Creek County because the region was not conducive to agriculture, and the railroad hauled in agricultural products from elsewhere. Farming was important in along the Eagle and Colorado rivers from 1885 until 1955 and along the Blue River from around 1900 until 1920.

Area of Significance: Agriculture: Farming was an important agricultural institution in the central mountains for several reasons. The earliest farmers adapted known agricultural practices to the rigorous mountain climate. Through trial and error, they determined which crops were the most suitable, what the growing seasons were, and appropriate cultivation methods. Cumulatively, the body of knowledge became a foundation for sustainable farming, which was vital to the economy and for providing food to Colorado.

Farmers also directly fostered the development of irrigation systems, which were a requisite for successful agriculture. Farmers built some of the systems, and they subscribed to the water companies that built others. The systems were lasting and allow agriculture to continue today.

Area of Significance: Architecture: Farms were important in the area of architecture for several reasons. Farmers adapted building designs and methods of construction already established for agriculture to the frontier conditions of the Rocky Mountains. Some of the conditions included topography, natural landscape features, local climate, and available buildings materials. In many cases, economic constraints influenced how farmers adapted designs and materials. Farmers participated in the introduction of formal building design and elements of architectural style to the Eagle and Colorado River valleys. They did so primarily with residential buildings, and although most were vernacular, some farmers relied on formal designs and incorporated elements of architectural style.

Areas of Significance: Commerce and Economics: Farming began its commercial significance as an important link in the early frontier economy of the central mountains. Farmers grew produce for miners and loggers, and fodder for their animals, and sold these materials at local market. In so doing, farmers fostered the agricultural segment of mountain commerce and contributed to the growing complexity of regional economies.

By around 1900, farming became one of the most stabile forms of commerce in the mountains. Mining and logging were the principal industries and supported the regional economies and populations. But because these industries were based on resource extraction, they underwent cycles of boom and bust, which created instability. Farming, by contrast, was mostly sustainable and depended on external markets as much as local outlets, which translated into greater stability. The permanent farming population and its economic contributions moderated the bust periods and helped some towns such as Dillon, Gypsum, and Eagle to weather the depressions that affected the mining communities.

Area of Significance: Engineering: Farms were a vehicle for the adaptation of agricultural engineering practices to the central Rocky Mountains. On a scale respective of an entire farm, the growers planned the overall property improvements according to their perception of efficiency in several arenas. They considered the needs of residential occupation for the family and workforce within the context of the immediate environment. Farmers arranged support facilities to enhance cultivation processes, and crop storage facilities for harvested products. Most important, they planned irrigation systems to deliver water from source to field. Although most of the engineering was vernacular, irrigation required surveying and an understanding of water systems.

On the scale of individual structures within the farm, growers combined known construction methods with local building materials for functional facilities. The designs were often informal and vernacular while meeting financial budgets and the needs of immediate conditions.

Area of Significance: Industry: Independent farmers, but especially company operations, brought one of the most important formal industries into the corridor besides mining and logging. Farming was also one of the few sustainable industries, and although it suffered during periods of depression, farming provided some economic stability. The industry produced food, provided employment, and supported the towns of Dillon, Dotsero, Eagle, and Gypsum.

Area of Significance: Politics/Government: The agricultural industry directly influenced politics and government in several ways. First, the industry was largely reliant on irrigation, and the water was diverted from streams and rivers. In some cases, farmers controlled their own supply, but most farmers subscribed to cooperatives and companies. Such organizations secured water rights to ensure reliable supplies. In so doing, and by defending their rights against other claimants, the organizations contributed to the complex field of water law and associated government administrations.

Second, farming influenced the federal government's change in policy regarding publicly held natural resources from passive to active management. In 1902, the government passed the Newlands Act to foster the growth of the agricultural industry. The act charged the Bureau of Reclamation with creating large-scale water diversion and distribution systems, supporting agriculture in otherwise arid lands.

Farm Registration Requirements

To qualify for the NRHP, a farm must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Resources eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A.

Criterion B: Farms may be eligible under Criterion B provided that an important person was physically present at the site for a substantial length of time. Presence will most likely be through residence, employment, or other involvement with the farming operation. The associated resource must retain physical integrity relative to that person's productive period of occupation. Further, the resource must date to the same timeframe when the individual achieved significance. If a farmer was important, the researcher must explain the farmer's significant contributions in a brief biography. In some cases, important people invested in or owned farms but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on-site.

Criterion C: Farms may be eligible under Criterion C if the buildings are good representative examples of significant architectural types or styles. Similarly, a farm may be eligible if the structures and objects are good representative examples of significant engineering types or designs. The overall assemblage of buildings, structures, and archaeological features may also be a sound example of design, agricultural practices, and land use specific to farms. Discernable patterns of cultivation, irrigation, or animal husbandry may be expressed as a rural historic landscape. In such cases, the homestead may qualify as the historic landscape property type discussed below.

Criterion D: Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents the farm during the Period of Significance, the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the farm complex and aspects of the agricultural operation. If archaeological features and artifacts offer important information regarding farm design and operation, the site may qualify under Criterion D. The site may also qualify if the material remains reflect settlement patterns, or aspects of the demography and lifestyles of the farm family, operator, or workforce. Common architectural, structural, and archaeological features are noted under the feature types below.

If the farm possesses building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography within the farming industry. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, agricultural practices, and animal husbandry.

Farms must possess physical integrity relative to the Period of Significance outlined in Section E. Few farms will appear as they did when initially established, and many were occupied for extended periods and modified over time. Such farms represent the evolution and, most likely, mechanization of the agricultural operation. Farmers abandoned obsolete or worn structures and buildings in favor of new ones, and moved some buildings and structures to fulfill needs. Thus, some buildings and structures may not be in their exact location of construction, and others may be in advanced states of decay.

Many of the seven aspects of historic integrity defined by the NRHP may apply to farms, although not all need be present. To retain integrity of *location*, a structure or building should be on the farm in a location of functional use. For a resource to retain integrity of *design*, the farm's material remains must convey the organization and planning of the residential complex, the support facilities, agricultural facilities, and cultivation. To retain the aspect of *setting*, the farm complex and the surrounding agricultural land must not have changed a great degree from its period of occupation. In terms of *feeling*, the resource should convey a perception of farming from a historical perspective and in the context of regional land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between farming and a contemporary observer's ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: RURAL HISTORIC AGRICULTURAL LANDSCAPE

Rural Historic Landscapes are large-scale cultural resources that, in a broad sense, represent the history of an area's human occupation, life ways, and the relationship with the land. For the National Register, the National Park Service recognizes other types of landscapes such as designed historic landscapes. Rural historic landscapes possess characteristics that distinguish them from the other categories. Designed historic landscapes, for example, were consciously planned according to specific principals, often of landscape architecture. Rural historic landscapes, in contrast, evolved organically over time. The National Park Service explains Rural Historic Landscapes in detail in its *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. In overview, the Bulletin states:

> "A rural historic landscape is defined as a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features."[2]

Within the theme of agriculture, rural historic landscapes form a physical context for homestead, ranch, and farm resources in the I-70 Mountain Corridor. The individual resources are components of a greater whole in terms of geography, history, and community, even when disbursed. In general, the extensive tracts of land combined with natural features and smaller scale historic resources represent the history, people, and traditions of homesteading, ranching, and farming.

Historic landscapes possess defining characteristics, and the National Park Service organized them into 11 categories. The first four are a result of processes, and the last seven are physical attributes.[3] The categories are relevant to agricultural landscapes in the I-70 Mountain Corridor, and include the following:

1. *Land uses and activities:* Land use activities are among the principal human forces that influenced how rural communities were shaped and organized. In the I-70 Mountain Corridor, farming and ranching contributed to community organization and left an imprint of agriculture on the landscape. All the landscapes are still in continuous use, although not necessarily for agriculture.
2. *Patterns of spatial organization:* When people inhabited an area, they tended to follow patterns in land use, development, siting of facilities, resource consumption, boundary demarcation, and other physical manifestations. Those patterns, usually expressed by use and development, were a form of spatial organization on a landscape level. Spatial organization for agriculture was heavily influenced by a relationship between needs and major environmental conditions such as climate, soil, topography, and other natural features. Organization was also a function of politics, economics, technology, and cultural values. These factors determined settlement patterns, proximity to agricultural markets, and the availability of transportation.

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[2] McClelland, Linda Flint; Keller, J. Timothy; Keller, Genevieve P.; Melnick, Robert Z. *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes* National Park Service, 1999:1.
[3] McClelland, et al., 1999:3.

Organization can be reflected by road and railroad systems, field patterns, distances between farms or ranches, proximity to water sources, and the orientation of structures to sun and wind. Large-scale patterns characterizing the settlement and early history of a rural area may remain constant, while individual features, such as buildings and roads, changed over time.

3. *Response to the natural environment:* Major natural features, such as mountains, streams, lakes, forests, and grasslands, governed both the location and organization of rural communities. Climate and vegetation type, for example, influenced the siting of individual buildings as well as entire agricultural complexes. Natural resources were also important, as farmers and ranchers depended on arable land and water. Available materials, such as stone or logs, shaped the construction of many buildings and structures. Traditions in land use, construction methods, and social customs evolved over time as people in the corridor adapted to the physiography and ecology.
4. *Cultural traditions:* Cultural traditions affect the way that people used, occupied, and shaped the land. Religious beliefs, social customs, ethnic identities, and trades and skills may be evident today in both physical features and uses of the land. Farmers and ranchers brought ethnic customs, which successive generations perpetuated. Other customs originated within a community during initial development and evolved with continued occupation. The cultural groups interacted with the environment, manipulating and altering it for agriculture, and sometimes altered their traditions in response.

   Cultural traditions determined the structure of communities by influencing the diversity of buildings, location of roads and railroads, and ways that the land was worked. Social customs dictated the crops planted or livestock raised. Traditional building forms, methods of construction, stylistic finishes, and functional solutions evolved in the work of local individuals.
5. *Circulation networks:* Circulation networks are systems for transporting people, goods, and raw materials from one point to another. They range in scale from livestock trails and footpaths, to roads, highways, and railroads. Some networks served farms and ranches internally, and others such as highways and railroads provided links with the outside.
6. *Boundary demarcations:* Boundary demarcations separated different tracts of land, some intentionally and others inadvertently. Intentional boundaries such as fences, walls, and roads could have defined ownership or land tracts dedicated for specific use, such as cultivation or grazing. Inadvertent boundaries like streams, slope changes, and railroads, influenced land use to some degree and served as natural barriers for development. Many types of boundaries still persist and influence traditional land use.
7. *Vegetation related to land use:* Various types of vegetation bear a direct relationship to long-established patterns of land use. Although many aspects of a landscape change over time, vegetation is one of the most dynamic. Indigenous species may replace introduced species, and yet conform in community to historic patterns of planting. Native grass, for example, may reclaim abandoned fields and retain the original shape of the field. Vegetation may also reflect poor land stewardship. Weeds and thistles subsume overgrazed pasture, and sage brush becomes established on fields lacking topsoil. Geometric patterns of grass, brush, and trees can mark historic boundaries, building and structure footprints, and irrigation systems. Introduced vegetation sometimes represents larger plantings such as crops, orchards, and gardens. Age of vegetation communities is also relevant. Older stands of brush or trees may reflect undeveloped land while young stands could have taken over land originally used for other purposes.
8. *Buildings, structures, and objects:* Various buildings, structures, and objects served human needs related to occupation and use of the land. Their function, materials, date, condition, construction methods, and location reflect the historic activities, customs, tastes, and skills of the people who built and used them. Rural buildings and structures often exhibit patterns of vernacular design that may be common to the corridor or unique to their community. They may reflect the sizes of historic ranching or farming operations, the economic state of agricultural enterprises, or family sizes. The repeated use of methods, forms, and materials of construction may indicate successful solutions to building needs or demonstrate the unique skills, workmanship, or talent of a local individual.
9. *Clusters:* Groupings of buildings, agricultural facilities, irrigation structures, or other features can reflect function, social tradition, climate, or other influences, cultural or natural. The arrangement of clusters may reveal information about historical and continuing activities, as well as the impact of varying technologies, and the preferences of particular generations. Repetition of similar clusters throughout a landscape may indicate vernacular patterns of siting, spatial organization, and land use.

The location of clusters, such as adjoining homesteads, may reflect broad patterns of a region's cultural geography.

10. *Archaeological sites:* The sites of ranches, farms, and homesteads may be marked by foundations, ruins, changes in vegetation, and surface remains. They may provide information about land use, social history, settlement patterns, and agriculture.
11. *Small-scale elements:* Examples of small-scale elements include signs, fence posts, stumps, and abandoned agricultural machinery. These elements add to the historic setting of an agricultural landscape and may be remnants of larger components, such as a lone fruit trees representing an earlier grove.

The defining characteristics of a rural historic landscape also can be described in terms of "landscape of work."[4] When settlers converted large tracts of the natural environment for their agricultural operations, they molded the landscape for efficiency, organization, sustainability, and suitability of crops and grazing. Landscapes of work for agriculture feature defining characteristics and patterns. A common pattern included a central residence, nearby outbuildings and structures for occupant needs, and more outbuildings and facilities in support of agriculture. Further, the residential outbuildings and facilities were often clustered for efficiency of domestic work and likewise for the agricultural facilities. Fields and pasture were also organized for efficiency of work. Crops requiring intensive cultivation were nearest the residential complex for ease of accessibility, and grazing pasture and fields for less intensive crops were farther away. Circulation systems in the form of roads and paths linked the fields and associated nodes of activity, such as grain sheds and corrals, with the farm or ranch complex. Irrigation systems connected water-intensive crops with sources such as streams and community ditches. Although topography, stream channels, and available flat ground dictated the shape of some fields, farmers and ranchers preferred the geometry of straight boundaries. Fences, irrigation systems, circulation systems, and tracts of natural landscape also conformed to the linear preference.

In many cases, landscapes of work are still in use for agriculture and support the continuation of rural cultural traditions. Homesteaders, ranchers, and farmers had tangible impacts on I-70 Mountain Corridor by converting natural areas into fields, changing stream patterns and redistributing water, and erecting their residential complexes in locations with specific conditions. Agricultural facilities and aspects of the natural environment may be interspersed, and both should be considered together as a whole. Because landscapes were used continually over time, most will probably encompass combinations of resources specific to the property types of homesteads, ranches, and farms.

Rural Historic Agricultural Landscape Significance

Because multiple historic resources and natural features make up rural historic landscapes, significance can be assessed in terms of the broad, historical theme of agricultural settlement and industry. Further, significance can be assessed within the narrower subsets of homesteading, ranching, and farming. The most relevant NRHP areas of significance include Agriculture, Architecture, Community Planning and Development, Engineering, Exploration/Settlement, Industry, and Landscape Architecture. Because of complexity, diversity of constituent historic resources, most landscapes will be significant under multiple NRHP areas and criteria.

[4] Messick, Denise P.; Joseph, J.W.; Adams, Natalie P. *Tilling the Earth: Georgia's Historic Agricultural Heritage, A Context* Stone Mountain, GA, New South Associates, 2001:62.

Period of Significance must be considered when determining the historical importance of rural historic landscapes. Although the Period applicable to the I-70 Mountain Corridor spans 1860 to 1955, the effective timeframe for agriculture varies slightly by corridor segment and land use. See the introduction of agriculture in Section E for the timeframes.

Area of Significance: Agriculture: Rural historic landscapes are tied to and are representations of agriculture, which was important in the central mountains. Homesteaders, ranchers, and farmers adapted known agricultural practices to the mountain climate. Once they were successful, they implemented cultivation and grazing on a scale large enough to support regional economies and contribute food to Colorado.

Farmers and ranchers also constructed irrigation systems, which were a requisite for successful agriculture. These were a part of and influenced the development of landscapes. In particular, the systems allowed agriculture to spread across expansive tracts of land, and many still serve this function today.

Area of Significance: Architecture: Those historic landscapes with standing buildings are important in the area of architecture for several reasons. Homesteaders, ranchers, and farmers adapted building designs and methods of construction already established for agriculture to the frontier conditions of the Rocky Mountains. Some of the conditions included topography, natural landscape features, local climate, and available buildings materials. Settlers also participated in the introduction of formal building design and elements of architectural styles. In the context of a landscape, a spectrum of buildings can represent the evolution of rural architectural development.

Areas of Significance: Community Planning and Development: Rural landscapes can be important in the area of community planning and development if they reveal settlement and land use patterns. Landscapes can reflect the patterns for the development of individual agricultural enterprises, the development of agriculture as a regional industry, and its influence on entire communities.

Area of Significance: Engineering: Historic landscapes can represent the widespread adaptation of agricultural engineering practices to the central Rocky Mountains. Irrigation, for example, was necessary for the success of most agriculture as an industry, and landscapes often illustrate the redistribution of water for the industry on a regional scale. As another example, patterns among pastures and fields can reflect planning and design patterns around plowing, planting, and harvesting technology. Homesteaders and farmers often dedicated certain fields to specific types of crops in predictable ways.

Area of Significance: Industry: Homesteaders, ranchers, and farmers, and their companies, brought one of the most important recognized industries into the corridor besides mining and logging. Agriculture was one of the few sustainable industries, and although it suffered during periods of depression, agriculture provided some economic stability. The industry produced food, provided employment, and supported the towns of Dillon, Dotsero, Eagle, Gypsum, and Wolcott.

Area of Significance: Landscape Architecture: By nature, agriculture involved the modification of extensive land tracts. Homesteaders and farmers purposefully converted natural areas into fields, and ranchers changed vegetation patterns by grazing their cattle and sheep. The above participants also impacted stream patterns, redistributed water, and erected their residential complexes in locations with specific conditions. On a large scale, agriculture changed the appearance of landscapes and their ecosystems.

Rural Historic Agricultural Landscape Registration Requirements

To qualify for the NRHP, a landscape must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: To be eligible under Criterion A, landscapes relevant to the theme of agriculture must be associated with events and broad trends of importance. Examples of broad trends include, but are not limited to, the areas of significance noted above.

Criterion B: Large-scale landscapes may be eligible under Criterion B provided that they were occupied by an important person for an extended period of time. Small-scale landscapes such as individual homesteads, ranches, and farms may be eligible through residence, employment, or other involvement by a significant individual. The associated resource must retain physical integrity relative to that person's occupation during the person's productive period of time. Further, the resource must date to the same timeframe of when the individual achieved significance. If an individual can be connected with the landscape, then the researcher must explain the individual's significant contributions in a brief biography. In some cases, important people invested in agricultural enterprises or owned land but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on the ground. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Historic landscapes may be eligible under Criterion C if buildings, structures, and landscape features represent agricultural land use and community development patterns. Because landscapes were occupied for extended periods of time, the patterns can be expected to reflect the evolution of general land use through the Period of Significance. Intact buildings may be significant representations of agricultural architecture in the central mountains. Multiple buildings within a single landscape may represent the evolution of type, style, methods, workmanship, and materials. Similarly, structures may be significant representations of agricultural engineering, and multiple structures within a single landscape may represent the evolution of function, design, methods, workmanship, and materials. Buildings and structures may also exemplify characteristics distinct to the corridor. Natural features often are contributing elements.

Criterion D: Buildings, structures, and land modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents land use patterns, then the landscape retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should represent the general layout of individual homesteads, ranches, and farms, as well as their relationships to the community. If archaeological features and artifacts offer important information regarding land use, community development, the application of engineering, or agricultural practices, then the landscape may qualify under Criterion D.

If complexes within the landscape possess building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography of the occupants. When the results from multiple complexes are compared, regional patterns may become apparent. Important areas of inquiry may include but are not limited to diet, health, and substance abuse. Other areas of inquiry relate to the distribution of gender, families, ethnicities, professional occupation, and socioeconomic status.

Historic landscapes eligible for the NRHP must possess physical integrity relative to the Period of Significance outlined in Section E. According to the National Park Service: "Integrity requires that the various characteristics that shaped the land during the historic Period be present today in much the same way they were historically."[5] All the landscapes in the I-70 Mountain Corridor changed to varying degrees due to continuity in occupation and use. Continuations of agricultural traditions and use can be compatible with integrity by maintaining the character and feeling of agriculture. Modern intrusions can compromise integrity if out of keeping with agricultural land use patterns. Such intrusions should be few and unobtrusive.

The presence of some characteristics is more important to integrity than others. In terms of agriculture, land use patterns, vegetation, circulation systems, and the types of small-scale features typical of farms and ranches should be present.

Many of the seven aspects of historic integrity defined by the NRHP may apply to rural historic landscapes, although not all need be present. *Location* is the place where the significant activities that shaped land took place. A rural landscape whose characteristics retain their historic location has integrity of location. For integrity of *design*, the landscape features, both manmade and natural, must convey organization and planning relative to agricultural land use. *Setting* is the physical environment within and surrounding a historic property. Both large-scale and small-scale features form a setting that conveys agricultural land use, settlement patterns, and cultural traditions. To retain integrity of setting, a landscape and bordering area must not have changed a great degree in overall character. For integrity of *feeling,* the landscape should convey agriculture and associated settlement from a historical perspective, and in the context of today's perceptions. Integrity of *association* exists where a combination of natural and manmade features conveys a strong connectedness between the landscape and a contemporary observer's ability to discern the historic agricultural industry and settlement.

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[5] McClelland, et al., 1999:21.

HIGH-ALTITUDE AGRICULTURE BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Homestead, Ranch, and Farm Residence Types

Homestead Dugout – Character-Defining Features

- One-story rectangular plan, at least 12 feet wide, 15 feet long, and 6 feet high.
- Built into slope.
- Horizontal round or hand-hewn log walls, with chinking, assembled with square-notched, V-notched, or saddle-notched front corners.
- Earthen floor, with sill logs resting directly on grade or crude stone foundation.
- Front-gable roof, with ridge-beam, log rafters, decking of split logs, mill-slabs, or planks, covered with earth.
- Stone chimney or stovepipe.
- Roof gable often overhangs the entry.
- Door and window frame members are one or two inches thick by four to eight inches wide.

Single-Pen Log Cabin – Character-Defining Features

- Core Plan: Rectangular, one room.
- Stories: 1 or 1½
- Foundation: Log or timber footers on earthen platform, crude stone foundation, or stone piers at the corners. Later foundations were concrete or concrete pargeting over stone.
- Walls: Horizontal logs, round or hewn, with chinking, assembled with square, V, saddle, or dovetailed joints. Corners may also display "hog trough" construction, with flush-sawn log ends nailed to end-plates.
- Roof: Front-gabled, with log beams or rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Stone chimney or stovepipe, typically near the rear of the roof.
- Entry Door: Usually located in the gable end (front), with roof extension sheltering the entry. Early doors were made on-site of vertical planks and later were manufactured panel doors. Wooden door frames split from hand hewn logs or made of 1x or 2x milled lumber.
- Windows: Square or rectangular with frames split from hand hewn logs or made of 1x or 2x milled lumber.
- Porch: Small wood plank porch floor at the entry door, covered by the extended overhang of the roof eave or by a gable or shed porch roof with knee brace supports.

Double-Pen Log Cabin – Character-Defining Features

- Core Plan: Rectangular, two rooms.
- Stories: 1 or 1½
- Foundation: Log or timber footers on earthen platform, rudimentary stone foundation, or stone piers at the corners. Later foundations were of concrete or concrete pargeting over stone.
- Walls: Same construction as Single-Pen above.
- Roof: Same construction as Single-Pen above.
- Entry Door: Same construction as Single-Pen above.
- Windows: Same construction as Single-Pen above.
- Porch: Small wood plank porch floor at the entry, covered by a roof overhang or by a gable or shed porch roof with knee brace supports.

Shotgun Log Cabin – Character-Defining Features

A Shotgun Cabin is one-room wide, two or more rooms deep, with entry in the gable end (regarding front-gabled plan). There are no interior hallways, and the rooms are divided by transverse interior walls with doorways. The front room was usually the parlor, with the kitchen to the rear. Both log and wood frame examples may exist.

Hall-and-Parlor Log Cabin – Character-Defining Features

- Core Plan: Rectangular, two rooms, with one room larger than the other. The larger room typically served as the kitchen and living space, while the smaller room served as a bedroom.
- Stories: 1 or 1½
- Foundation: Log or timber footers on earthen platform, rudimentary stone foundation, or stone piers at the corners. Later foundations were of concrete or concrete pargeting over stone.
- Walls: Same construction as Single-Pen above.
- Roof: Same construction as Single-Pen above.
- Chimney: Stone chimney or stovepipe, typically near the rear end of the roof.
- Entry Door: Located on the side elevation, beneath the roof eave (regarding side-gable plan), offset from center and entering the larger of the two rooms.
- Windows: Same construction as Single-Pen above.
- Porch: Small, wood plank porch floor at the entry door, covered by the roof eave or by a gable or shed porch roof with knee brace supports.

Gabled-L Log Cabin – Character-Defining Features

- Core Plan: L-Shaped, with a cross-gabled roof, a parlor in the side-gabled wing, a bedroom in the front-gabled wing, and kitchen at rear.
- Stories: 1½, often with room for sleeping quarters in the upper half story.
- Foundation: Low, uncoursed stone foundation. Beginning circa 1900, foundations were of made of poured concrete or stone with concrete pargeting.
- Walls: Same construction as Single-Pen above.
- Roof: Same construction as Single-Pen above. Some 1½-story Gabled-L cabins had dormers, usually over the façade.
- Chimney: Same construction as Single-Pen above.
- Entry Door: Usually in the side-gabled wing, entering the house from a porch in the building's L-shaped plan.
- Windows: Vertical sash windows, often with a 2/2 glazing pattern and wood frames made of 1x or 2x milled lumber.
- Porch: An open, narrow porch often extended along the front of the building's L-shaped plan. Floors were wood planks, or, later tongue-in-groove. Shed or low-pitched hipped roof, supported by vertical logs, 4x4" square posts, or turned columns. Some Gabled-L cabins feature porch railings made of small-diameter logs, mill slabs, or dimensional lumber.

Gabled-T Plan Log Cabin – Character-Defining Features

- Core Plan: T-Shaped, cross-gabled roof, usually with a side-gabled front wing and a centered intersecting rear gable. An enclosed shed-roofed rear porch, either original or an early addition, often filled in one of the voids formed by the T-shaped plan.
- Stories: 1½, with small bedrooms in the upper half story.
- Foundation: Low, uncoursed stone foundation. Beginning circa 1900, foundations were often poured concrete or stone with concrete pargeting.
- Walls: Same construction as L-Shaped Cabin above.
- Roof: Cross-gabled, with sheet metal or shingles over 1x plank decking fastened to rafters with collar ties. Later clad with corrugated sheet iron, rolled asphalt, or asphalt shingles. Some Gabled-T log dwellings feature dormers, usually with gable or shed roofs.
- Chimney: Stone chimney or stovepipe, typically on the roof ridge or just below the ridge on the rear slope.
- Entry Door: Often centered in the side-gabled wing, with a separate rear entry door into an enclosed, one-story, shed-roofed rear porch. Wooden door frames were usually made of 1x or 2x milled lumber.
- Windows: Vertically oriented sash windows, most often originally with a 2/2 glazing pattern, and with wood frames made of 1x or 2x milled lumber.

- Porch: Same construction as L-Shaped Cabin above.

Rectangular Plan Frame Cabin –Character-Defining Features

- Core Plan: Rectangular.
- Stories: 1 or 1½.
- Foundation: Some foundations were log or timber posts, or footers laid on an earthen platform. Others were made of coursed stone, later with concrete pargeting, poured concrete, or concrete blocks.
- Walls: Horizontal planks or horizontal weatherboard siding, over 1x wood sheathing and 2x wood framing.
- Roof: Front-gabled or side-gabled with wood shingles, rolled asphalt, asphalt shingles, or smooth or corrugated metal, over 1x wood decking fastened to 2x wood rafters with 1x or 2x wood collar ties.
- Chimney: Stone or brick chimney or stovepipe.
- Entry Door: Located either under the gable for front-gable plan or beneath the eave for side-gable plan. Entries were usually vertical plank doors, and later manufactured panel doors. Elaborate, paneled doors feature vertical panels, sash lights, and occasionally decorative scrollwork in the rails.
- Windows: Vertical sash windows, often with a 2/2 glazing pattern, and wood frames made of 1x or 2x milled lumber.
- Porch: Small plank floor at the entry, covered by an extended roof eave or a gable or shed roof with knee brace supports. Porches are occasionally somewhat larger, with shed or low-pitched hipped roofs supported by 4x4" square posts or turned columns.

Shotgun House (Rectangular Plan Subvariant)

A Shotgun House is a specific design one-room wide, two or more rooms deep, and with entry in the gable end (front). Interior hallways are absent, and the rooms are divided by transverse interior walls and doorways. The front room was usually a parlor, with a kitchen to the rear. Other Shotgun House character defining features are similar to those described above for rectangular plan, wood frame dwellings.

Hall-and-Parlor House (Rectangular Plan Subvariant)

A Hall-and-Parlor plan is two-rooms wide and one-room deep. One room is somewhat larger than the other and typically served as a kitchen and communal living space. The smaller room was a bedroom. Hall-and-Parlor plan houses are covered by side-gable roofs, with the entry door on the side elevation and offset from center. Other character-defining features are similar to those described above for rectangular plan wood frame dwellings.

Gabled-L Plan Frame House – Character-Defining Features

- Core Plan: L-Shaped, with a side-gabled roof over a parlor in main portion, a bedroom in a front-gabled wing, and the kitchen to the rear.
- Stories: 1½, with small bedrooms in the upper half story.
- Foundation: Same construction as Rectangular Frame Cabin above.
- Roof: Cross-gabled in form, clad with wood shingles, rolled asphalt, asphalt shingles, or smooth or corrugated metal over 1x wood decking fastened to 2x wood rafters with 1x or 2x wood collar ties. Some Gabled-L houses feature dormers with gable or shed roofs, usually over the façade.
- Chimney: Stone or brick chimney or metal stovepipe, typically on the roof ridge or below the ridge on the rear slope.
- Entry Door: Usually located in the main, side gabled wing, in the open area formed by the building's L-shaped plan. Early entry doors were of vertical planks, and later manufactured vertical panel doors. Elaborate panel doors feature upper sash lights and occasionally decorative scrollwork in the rails.
- Windows: Vertical sash windows, most often originally with a 2/2 glazing pattern, in frames of 1x or 2x milled lumber.
- Porch: An open, narrow porch extends along the front of the main, side-gabled wing in the void formed by the building's L-shaped plan. Early floors were made of planks, supplanted by tongue-in-groove planks. Shed or low-pitched hipped roofs, supported by 4x4" square posts or turned columns.

Gabled-T Plan Frame House – Character-Defining Features

- Core Plan: T-Shaped, cross-gabled roof, usually with a side-gabled main portion and a centered intersecting rear gable. An enclosed shed-roofed rear porch, either original or an early addition, often filled one of the notches in the T-shaped plan.
- Stories: 1½, with small bedrooms in the upper half story.
- Foundation: Same construction as L-Plan Frame House above.
- Walls: Same construction as L-Plan Frame House above.
- Roof: Same construction as L-Plan Frame House above.
- Chimney: Stone or brick chimney or metal stovepipe, typically on or near the roof ridge of the intersecting rear gable.
- Entry Door: Often centered in the main portion, with a rear door opening into an enclosed, one-story, shed-roofed porch in one of the voids formed by the T-shaped plan.
- Windows: Same construction as L-Plan Frame House above.
- Porch: Same construction as L-Plan Frame House above.

I-House Wood Frame Dwelling – Character-Defining Features

The I-House is an enlarged version of the Hall-and-Parlor plan. The design is two-rooms wide, one-room deep, with a central passage or hallway separating the rooms. Beginning circa 1840, this floor plan proliferated in rural Midwestern states beginning with the letter I (Illinois, Indiana, and Iowa) and became known as the I-House. With a three-bay façade, rather than the two-bay façade of Hall-and-Parlor plan houses, the design presents an illusion of being substantial. I-Houses in Colorado were built primarily in rural areas between circa 1875 and 1910.

- Core Plan: Rectangular
- Stories: 1 or 1½
- Foundation: Same construction as L-Plan Frame House above.
- Walls: Same construction as L-Plan Frame House above.
- Roof: Same construction as L-Plan Frame House above.
- Chimney: Brick or stone chimney, usually centered on the roof ridge.
- Entry Door: Centered in the main portion beneath the roof eave, and entering the central passageway between the two rooms. Early doors are usually of vertical planks, supplanted later by manufactured paneled doors. Elaborate panel doors may feature upper sash lights and occasionally decorative scrollwork in the rail.
- Windows: Same construction as L-Plan Frame House above.
- Porch: Small, often uncovered, plank porch at the entry. Porches typically lack ornamentation, and are often uncovered.

Hipped-Roof Box House – Character-Defining Features

A Hipped-Roof Box type house is a simple rectangular (nearly square) plan covered by a hipped roof. The type is usually slightly shorter across the façade than the length, with typical dimensions of 24 feet by 26 feet, 26 feet by 28 feet, and 28 feet by 30 feet. The core plan was often modified by the construction of an enclosed, shed-roofed rear mud porch, either as part of the original construction or as an early addition. The Hipped-Roof Box was a dominant type in modest residential neighborhoods and rural areas throughout Colorado into the 1930s.

- Core Plan: Rectangular (nearly square)
- Stories: 1
- Foundation: Same construction as L-Plan Frame House above.
- Walls: Same construction as L-Plan Frame House above.
- Roof: Hipped, often covered with asphalt shingles, rolled asphalt, or smooth or corrugated iron over 1x wood decking boards fastened to 2x wood rafters.
- Chimney: Brick or stone chimney, usually centered on the roof ridge or slightly below the ridge on the rear-facing roof slope.
- Entry Door: Entries are primarily manufactured panel doors centered in the front. Elaborate doors feature upper sash lights and occasionally decorative scrollwork in the rail.

- Windows: Vertically oriented sash windows, often with 1/1 or 2/2 glazing patterns, in wood frames made of 1x or 2x milled lumber.
- Porch: Small plank floor at the entry, typically covered by a shed or low-pitched hipped roof. Knee brace supports or square wood posts may hold up the porch roof.

Pyramid Cottage (Hipped-Roof Box Dwelling Subvariant)

A Pyramid Cottage is a small, usually square, version of the Hipped-Roof Box house. Its primary defining features are its pyramidal hipped roof, square shape, and minimal ornamentation.

Foursquare House – Character-Defining Features

Also known as the American Foursquare, the Foursquare House is a 2½-story version of the Hipped-Roof Box. Foursquare houses are rectangular (nearly square) in plan and covered by hipped roofs with a hipped-roof dormer centered on the roof slope overlooking the façade. Foursquares are usually slightly shorter across the façade than in length, with typical dimensions of 28 feet by 30 feet, 30 by 32 feet and 34 by 36 feet. The core plan was often modified by the construction of an enclosed, shed-roofed rear mud porch, either as part of the original construction or as an early addition. Usually of frame or brick construction, the Foursquare was a dominant housing type in residential neighborhoods, and to a lesser extent in rural areas in Colorado, into the 1930s.

- Core Plan: Rectangular (nearly square)
- Stories: 2½
- Foundation: Same construction as Hipped-Roof Box House above.
- Walls: Horizontal plank or weatherboard siding, over 1x wood sheathing and 2x balloon framing, or brick or sandstone masonry exterior walls.
- Roof: Hipped, often covered with asphalt shingles, or smooth or corrugated iron, over 1x decking boards fastened to 2x wood rafters. Some versions feature a hipped-roof dormer centered over the façade.
- Chimney: Brick or stone chimney, usually centered on the roof ridge or slightly below on the rear roof.
- Entry Door: Same door type and location as Hipped-Roof Box House above. Entry doors on masonry Foursquares may be spanned by a sandstone lintel or by a segmental brick arch.
- Windows: Vertical sash windows, often with 1/1 or 2/2 glazing patterns, and painted frames of 1x or 2x milled lumber. Windows on masonry Foursquares may feature sandstone lugsills and lintels or sandstone lintels and segmental brick arches.
- Porch: Foursquare houses feature broad front porches covered by low-pitched, hipped roofs, and less often by shed roofs. Frame Foursquares often have tongue-in-groove floors, Tuscan columns or squared posts, and an open or closed railing. Masonry Foursquares may feature tongue-in-groove plank or concrete floors, Tuscan columns, or brick pillars with sandstone capping.

Classic Cottage House – Character-Defining Features

The Classic Cottage is a stylized, 1½-story version of the Foursquare house. It has a rectangular (nearly square) plan, a hipped roof often with flared eaves, and a hipped-roof dormer centered over the façade. Classic Cottage houses are usually of brick or stone masonry, and frame examples are rare. The core plan was often modified with an enclosed, shed-roofed mud porch at rear, either original in construction or an early addition. The Classic Cottage was a relatively common type in both residential neighborhoods and in rural areas throughout Colorado between circa 1905 and the early 1930s.

- Core Plan: Rectangular (nearly square)
- Stories: 1½
- Foundation: Low perimeter walls made of coursed stone or poured concrete.
- Walls: Brick or stone masonry, and rarely frame construction.
- Roof: Hipped with flared eaves, covered with asphalt shingles or rolled asphalt, over 1x wood decking boards fastened to 2x wood rafters. Hipped-roof dormer with flared eaves centered over the façade.
- Chimney: Brick or stone chimney, usually centered on the roof ridge or slightly below on the rear slope.

- Entry Door: Manufactured panel doors offset from center. The doors feature vertical panels, upper sash lights, and occasionally decorative scrollwork in the rail. The doorframes occasionally feature transom lights and sidelights. In masonry Classic Cottages, sandstone lintels or segmental brick arches spanned the doorways.
- Windows: Vertically oriented sash windows, often with a 1/1 glazing pattern in painted wood frames made of 1x or 2x milled lumber. Windows on brick and stone Classic Cottages may feature sandstone lugsills and lintels or sandstone lintels and segmental brick arches.
- Porch: Classic Cottage houses feature broad front porches with concrete floors, closed knee walls, and heavy, square pillars or Tuscan columns. Those with brick walls usually have brick knee walls and pillars, often with sandstone capping. Porches are usually covered by low-pitched, hipped roofs or are recessed under the front eave of the house's hipped roof.

Bungalow House – Character-Defining Features

Inspired by the Arts and Crafts movement in America and the Craftsman architectural style, the Bungalow is a modest, 1-story or 1½-story version of the Craftsman style house. Popularized by trade journals and magazines, the Bungalow became the most common type of modernistic house built throughout America between circa 1905 and the early 1930s. By 1920, a variety of pattern books provided plans for Bungalow homes, and precut packages could be purchased via mail order and delivered by rail. The Bungalow reached its peak in the early 1920s when *Bungalow Magazine* went into publication extolling the virtues of "Bungalow-living." Numerous Bungalows were erected throughout Colorado's urban neighborhoods, small towns, and rural areas.

Bungalows feature low, horizontal lines; low-pitched, gabled or hipped roofs; exposed rafter ends beneath widely overhanging eaves; and exposed purlins and ridgepoles, often with knee braces in the upper gable ends. Facades are dominated by a broad stairway leading to a full or nearly full-width front porch. Porch roofs are supported by battered pedestals, topped by large, square-post piers, creating a heavy, horizontal emphasis. Windows are predominantly double-hung with divided (ribbon-style) lights in the upper sash and a single pane in the lower sash. Foundations and walls are often painted warm, natural colors to help tie the dwelling into its natural landscape.

- Core Plan: Rectangular
- Stories: 1 or 1½
- Foundation: Coursed stone or poured concrete, sometimes faced with stone, or painted a warm, natural color.
- Walls: Horizontal wood siding or brick masonry.
- Roof: Broadly pitched, front-gabled, side-gabled, or occasionally hipped, with asphalt shingles over 1x decking boards fastened to 2x wood rafters. Eaves extend in long overhang with exposed rafter ends, decorative purlins, and ridgepoles, and knee braces in the upper gable ends. False half-timbering or stick work may appear under the gable ends, which are sometimes clipped. Side-gabled Bungalows often have a low-profile dormer centered over the façade, with a low-pitched gable, hipped, or shed roof.
- Chimney: Brick or stone chimney, usually centered on the roof ridge or slightly below on the rear slope. Many Bungalows also feature a brick fireplace chimney on one side.
- Entry Door: Manufactured panel doors or solid slabs, often stained natural brown. Vertical sash lights are common. Entries may feature transom lights and sidelights. Entry doors on brick Bungalows are sometimes spanned by sandstone lintels.
- Windows: Usually vertical with divided (ribbon-style) lights in the upper sash and a single pane in the lower sash. Frames are painted or stained and made of 1x or 2x milled lumber. Window frames on brick Bungalows may have sandstone lugsills and lintels.
- Porch: An open, full-width, or nearly full-width Craftsman style porch is a dominant feature of a Bungalow house. The porch floor may be concrete and feature a set of wide concrete or sandstone steps often flanked by knee walls. The porch is surrounded by a closed brick knee wall, battered brick pedestals, tapered wood piers, and a low-pitched gable roof.

Secondary Support Facility Feature Types

Blacksmith Shop: A building where a settler fabricated and maintained tools and hardware. Simple shops usually featured a blacksmith forge, workbench, and possibly hand-powered appliances such as a drill press or lathe. Blacksmith shops that are no longer intact qualify as archaeological features If the building collapsed but most of the materials are present, they may be recorded as a blacksmith shop ruin. If the building materials are gone as well, then the leveled earthen footprint on which the building stood is a blacksmith shop platform. Shop platforms may feature forge remnants and artifacts such as forge-cut iron scraps, anthracite coal, and clinker, which is a scorious, ashy residue created by burning coal.

Cookhouse: Companies erected cookhouses at large farms and ranches to feed workforces en masse. A cookhouse was a building, usually vernacular form, which had a large kitchen and dining area. The kitchen often included an institutional cookstove, a brick chimney, counters, and plumbing. If the building collapsed but most of the materials are present, it may be recorded as a cookhouse ruin. If the building materials are gone as well, then the leveled earthen footprint on which the building stood is a cookhouse platform. A foundation for the walls and masonry oven, if one existed, may be present. Artifact assemblages typically include high volumes of food preparation items, tableware fragments, cans, and stove ash, but few general domestic materials.

Domestic Refuse Dump: A substantial concentration of domestic refuse, usually downslope from a residential feature. Domestic refuse dumps consist primarily of food-related and other household artifacts such as food cans, fragmented bottles and tableware, and personal articles.

Domestic Refuse Scatter: A disbursed scatter of domestic refuse, usually downslope from a residential feature.

Garden Plot: To be self-sufficient, homesteaders and ranch families dedicated small plots of ground near the house for growing produce. The plot was fenced, and soils were rich and well cultivated. If the fence no longer stands, it may be represented by postholes, vegetation, or raised earthen berms.

Icehouse: Ranchers used icehouses both to store ice for warm months and as primitive refrigerators. Icehouses usually were countersunk into the ground and consisted of stone masonry for insulation, and they featured storage shelves. Collapsed icehouses may be recorded as ruins.

Privy: A building that served as a toilet facility. Privies stood over pits, were around 4 by 5 feet in area, and featured a bench with a cut-out as a toilet seat.

Privy Pit: Privy pits manifest as minor depressions surrounded by backdirt and may retain footers from the privy structure.

Root Cellar: Root cellars were independent structures used for food storage. They often manifest as small dugouts with earthen roofs and façades of rocks, logs, or lumber. When collapsed, a root cellar may be recorded as a root cellar ruin.

Smokehouse: Ranch families preserved meat by jerking and smoking in small, insulated buildings. Windows were few, and the buildings had drying racks, chimneys, or stovepipes.

Spring House: When possible, settlers relied on springs for drinking water because of their purity. The settler erected a small masonry or frame enclosure over the spring to keep out debris, and provided an outlet for overflow water. The enclosure usually had a gabled or shed roof. Collapsed remnants of spring houses may be recorded as ruins.

Storehouse: Storehouses were small buildings of lumber or logs for the storage of goods other than food. Collapsed remnants of storehouses may be recorded as ruins.

Well: Where surface water was unavailable, settlers sank wells to supply domestic needs. Early wells are circular and usually lined with open masonry. Later wells were pipes with hand pumps.

Woodshed: Because wood was a primary heating and cooking fuel, a supply kept dry in a shed was critical. Sheds were small, of log or frame construction, and may have been open. Wood scraps and sawdust should encompass the structure, if no cordwood remains. Collapsed remnants of woodsheds may be recorded as ruins.

Wood Stack: A stack of cordwood.

Work Platform: An intentionally graded flat area for domestic activities such as laundry, chopping wood, and butchering meat.

Livestock and Crop Storage Support Facility Feature Types

Barn: A barn was a multipurpose building that housed fodder, tack, agricultural equipment and tools, and draft animals. Depending on location and era, settlers used logs, lumber, or a combination for walls and roofs. Large barns had at least lumber roofs, if not lumber walls. Most were drafty and had wide doorways and lofts. If the barn collapsed but most of the materials are present, they may be recorded as a barn ruin. If the building materials are gone as well, then the leveled earthen footprint on which the barn stood is a barn platform. They may feature a large area, manure deposits, and artifacts such as agricultural hardware and tack.

Chicken Coop: Chicken coops were usually small, made of lumber, divided into shelves, and had one open face. A chicken run fenced with chicken wire surrounded the coop.

Corral: Corrals were fenced enclosures that impounded cattle and draft animals, usually adjacent to a barn or stable. Fences often consisted of logs or wire. If the fences collapsed or are represented by posts and alignments of postholes, the corral may qualify as a corral remnant.

Dehorning Cage: Cowboys cut the horns off some cattle, and because the cattle strenuously protested, they were held fast in cages. Steel braces engaged by a lever clamped the head and steel combs pressed down on the body. The cage was at the end of a narrow chute that linked two corrals.

Feed Trough: Feed troughs contained fodder for draft animals and cattle, and they were usually located in a corral. Most troughs were V-shaped, 3 feet wide, as deep, and 6 to 8 feet long.

Grain Shed: Settlers erected grain sheds to store grain in bulk form. They were shed or gabled in form and of frame construction with plank siding on the interior face. Inside, the shed was divided for different grain types. If the shed collapsed, it can be recorded as a grain shed ruin.

Loading Chute: By the 1930s, farmers and ranchers used trucks to haul cattle either to market or to a railroad shipping point. Inclined ramps with fenced sides directed cattle into the trucks, and they were connected to corrals.

Milking Barn: Dairy products were an important source of income for many farms, and cows were milked in buildings known as dairy barns, milking barns, and milk houses. Most milking barns were of frame construction and sided with planks or, by the 1950s, corrugated sheet iron. The interiors were designed to be washed and featured stalls lined with sheet iron, as well as concrete floors with drainage systems. The collapsed remnants of a milking barn may be recorded as a ruin, and if most of the structural material is gone, then the concrete floor qualifies as a foundation. The floors often feature raised dividers marking the stalls, drains, and channels to shunt rinse water.

Potato Cellar: Potato cellars, similar to bunkers, were countersunk into the ground, lagged on the interior with planks, and covered with earth. The cellars were at least 8 by 10 feet in area with broad doorways. Collapsed potato cellars can be recorded as ruins.

Poultry House: Some farmers raised chickens and turkeys in commercial numbers and kept the fowl in elongated frame buildings. The interior featured two or more rows of cubicles for the birds usually on concrete floors. The structures were shed or gabled in form and based on lumber frames sided with planks or, by the 1950s, corrugated sheet iron. Collapsed remnants may be recorded as ruins, and the concrete floors qualify as foundations.

Rabbit Hutch: Rabbit hutches were small sheds elevated on legs with an open face of chicken wire. The interior was divided into several cells for rabbits.

Refuse Dump: Settlers cached debris, old structural material, surplus fencing, and obsolete equipment in scatters near the barn.

Silo: Silos were tall, cylindrical structures at least 8 feet in diameter for the storage of bulk grain. Most were made of masonry or concrete, and a few were of planks bound with steel hoops. One side had ports for loading and unloading grain. Because of their size and weight, silos required foundations of masonry or concrete, which have circular footprints. Such features can be recorded as silo foundations.

Stable: Horses were a principal means of transportation around ranches, and they were housed in stables separately from common livestock. Stables were similar to but smaller than barns. Their interiors were divided into stalls with feed troughs, and lofts for the storage of fodder. The collapsed remnants of a stable may be recorded as a ruin, and when most of the structural debris is gone, the earthen footprint qualifies as a stable platform. Outlines of the walls, manure deposits, and postholes for the stalls are often evident.

Tack Shed: A small building in which settlers stored tack and hardware for managing animals. Tack houses were usually shed in form and of logs or lumber. The interior should feature nails and hooks for hanging tack and shelves for tools. When collapsed, the tack shed can be recorded as a tack shed ruin.
Water Trough: Water troughs were usually located in corrals, and they provided livestock with water. They consist of planks, are usually 3 feet wide and as deep, have flat bottoms, and a feed pipe.
Well: Where surface water was unavailable, settlers sank wells to provide water for livestock. Most wells were pipes with pumps.
Windmill: A windmill featured a fan atop a tower that stood over a well. The fan powered a pump via linkage hardware. Prior to the 1890s, the towers were made of timbers, and afterward, of steel. Windmills provided water to livestock or for crop irrigation. Collapsed remnants of windmills are ruins.

Rural Historic Agricultural Landscape Feature Types

Fence: Fences were erected to control the movement of livestock and to define property boundaries. Prior to the 1890s, log rail fences were common, and afterward, wire and barbed wire were common. Isolated posts, postholes, and linear cobbles or vegetation may represent abandoned fence lines.
Field: A field dedicated to growing crops. Cultivated fields were usually fenced, plowed, irrigated, and cleared of rocks, which were thrown in piles along the edges.
Irrigation System: Systems of supply ditches delivered water to a crop field, and lateral ditches distributed the water over the field. Supply ditches may have captured water from nearby streams or may have been filled from wells. Early ditches were channels in the ground, and by the 1940s, growers increasingly lined them with concrete to prevent seepage. Gates admitted the water into lateral ditches.
Livestock Path: When livestock wandered a landscape, they often followed the same routes between areas of shelter, feed, and water. Over time, the traffic created distinct trails similar to graded footpaths.
Natural Landscape Features: Rural landscapes usually possess natural features such as rock outcrops, historic groves of old-growth trees, steep slopes, and areas of unaltered vegetation or ground.
Open Range: Open range was unimproved, often fenced, and dedicated to feeding livestock.
Orchard: Farmers who grew fruit in commercial volumes planted rows of trees bordered by fences and access roads.
Pasture: A field dedicated to growing hay for forage by livestock. The fields were usually fenced, plowed, and cleared of rocks. Pastures often featured facilities for moving cattle, such as corrals and loading chutes.
Road: Roads were components of circulation systems and facilitated the movement of people, wagons, and equipment. Within farms, ranches, and homesteads, roads linked fields and support facilities. Abandoned roads may be represented by raised beds, linear vegetation patterns, and cuts.
Rock Pile: When growers cleared fields of rocks during plowing, they usually piled them on the edges of the field. The presence of a rock pile in an overgrown and abandoned field indicates that it was cultivated.
Spring: Springs were important sources of water in rural landscapes and issued from subsurface geological features. When in a natural state, a spring is often surrounded by cottonwoods or willows and lush grass. In many cases, homesteaders and ranchers developed springs for livestock. Such springs may manifest as a pool in an excavation, possibly with adjacent water troughs or springhouses.
Stock Pond: Settlers and ranchers excavated large depressions in drainage floors to collect water for livestock.
Vineyard: Farmers who grew grapes in commercial volumes planted rows of grapevines supported by rows of stakes and trellises. Vineyards were often bordered by fences and access roads. Rows of stakes and knotty stumps may remain from abandoned vineyards.
Streams: Landscapes often featured drainages that carried permanent streams. Some segments were unaltered while agricultural operations modified others for livestock or water diversion.
Well: Where surface water was unavailable, growers sank wells to provide water for irrigation. Most wells were on the edges of fields and featured pipes with pumps.
Wellhouse: A small frame building that enclosed a well and pump, usually on the edge of a field. Wellhouses were made of lumber, brick, or stone masonry.
Windmill: See livestock and crop storage.
Windmill Ruin: See livestock and crop storage.

Section F 4: Electric Power Property Types and Registration Requirements

INTRODUCTION

Historic resources left from the power industry can be expected throughout the I-70 Mountain Corridor. Some are still in use, others are abandoned, and most have been dismantled and now manifest as archaeological sites. It should be noted that archaeological sites have as much potential for significance as intact facilities. Nearly all the powerplants, their infrastructures, and substations were built at corridor towns and mines rather than remote areas in between. Other types of power-related resources, such as electrical lines, water systems, and reservoirs, can be found anywhere in the corridor. When isolated, these resources should be traced to their parent systems and evaluated for significance in this context.

This section defines historic electrical generation resources common to the I-70 Mountain Corridor and their registration requirements. Itemized descriptions of the archaeological, structural, and architectural features are offered at the section's end to refine resource interpretation.

The following Property Types are developed in this section:

Powerplant Site
Substation
Powerline
Infrastructure Components
Reservoirs

PROPERTY TYPE: POWERPLANT SITE

Powerplants were fundamental to every electrical system because they generated current and directed it onto the network of transmission lines. Most powerplants were individual, free-standing buildings whose sizes were proportionate to their generating capacity. Small plants were similar in size to today's single-family residences and featured at least one generator also known as a dynamo, its motive source, a switchpanel, electrical transformers, and wiring. High-capacity plants were multistory edifices with separate rooms for two or three dynamos, multiple transformers, and switchpanels. Most of the powerplants that served Clear Creek and Summit counties tended to be small, while the Shoshone facility was a multistory type.

Generating facilities employed two sources of motive power to turn their dynamos. From the 1880s through the 1910s, most electric companies and mining companies preferred hydropower because water was abundant and relatively inexpensive. The companies merely provided capital for the powerplant and hydropower infrastructure and allowed the water to do the work. By the 1890s, electric companies installed steam engines for backup in hydropower plants, and even used steam exclusively at a few plants.

In hydro plants, a carefully engineered infrastructure system delivered the water under pressure to the powerplant for generation. Inside, a high-pressure water jet played against a bronze or iron waterwheel belted to a dynamo. The infrastructure system began when a diversion structure captured flow from a stream or reservoir outlet, screened out coarse debris, and shunted the water into a flume or large-diameter pipeline. The water source was higher in elevation than the plant, and sometimes miles away. Immediately above the plant, the pipeline or flume emptied into an exchange structure known as a pressure box. Most pressure boxes were at least 4 by 6 feet in plan and as high, assembled with concrete or timbers, and had an inlet at the top and a penstock leaving the bottom.

The penstock was the final pipeline to the hydro plant, and it delivered water under pressure. Descent downslope increased the water current's force, and a series of diameter reductions boosted the velocity. As the pipeline approached the powerhouse, it became horizontal and forked. One drained the penstock for maintenance, and the other was a live line passing underneath the powerplant's floor. The line entered a narrow channel featuring the waterwheel and ended with a nozzle that played a jet against the wheel's cups. The channel was a fully enclosed masonry or concrete slot with a splash-guard preventing spray from soaking the powerhouse interior. The waterwheel was geared to a solid driveshaft that rotated in heavy bearings, and the assembly was bolted to concrete or masonry pylons. Either a canvas belt, a drive-chain, or gearing transferred motion from the driveshaft to the dynamo, bolted to another, nearby pylon. Large powerhouses had multiple waterwheels and dynamos, each with its own foundation pylon. Electricity went to an interior transformer station and then switchpanel and out the building to a substation (see Substation Property Type).

In the Rocky Mountains, most electricity providers found that winter presented significant problems for hydropower operations. Severe cold often froze water sources, pipelines, and valves, and interfered with generation. In response, the companies installed steam engines in their hydro plants as a standby in the event the water system failed. A few powerplants, such as the Seaton Mountain facility in Idaho Springs, relied exclusively on steam as a motive source. In such plants, a steam engine turned a main driveshaft usually through a chain-drive or gearing. The driveshaft then powered one or more dynamos through the same coupling as hydro plants above. Small plants had single-cylinder, straight-line engines; large facilities used dual cylinder duplex engines, and both models were bolted to stout concrete or masonry foundations. One or more boilers supplied the steam, and they were usually sequestered in a separate room to keep the engine and dynamos free of grit. Boilers required bins for coal and plumbing systems for feed water. Return-tube boilers were the most popular type, although large powerplants such as the United Light & Power facility in Georgetown had water-tube boilers because of their efficiency. As can be inferred from above, powerplant design was complicated and had to draw from several disciplines, including fluid dynamics and electrical, mechanical, and structural engineering. An understanding of architecture was also necessary because the generating system required a powerhouse building, and ancillary outbuildings.

In general, powerhouses were professionally designed, often by the system engineer, and assembled with standard materials such as dimension lumber, factory-made hardware, and commercial sheet iron. Each building was a custom design reflecting the engineer's interpretation of how best to meet the needs of a specific plant. The engineer adapted structural elements and other aspects of industrial architecture to the configuration and size of the generating system. As a building type, powerhouses can be described as industrial vernacular in design, form, and appearance.

Although no two powerhouses were identical in the I-70 Mountain Corridor, all shared a few general characteristics. In materials, early buildings consisted of wood framing and plank siding, and sheet-iron siding by the late 1890s because of its fire resistance. In form, small powerhouses were rectangular with gabled roofs, multiple vertical windows, and broad doorways. Large versions featured extensions for equipment, storage, and an office. Hydro facilities were always located at the base of a slope so gravity could pressurize the penstock, and steam-powered plants had smokestacks for the boilers. The buildings usually stood on well-graded platforms, and the walls may have rested on an impermanent foundation such as timber footers. But because of its weight, movement, and horizontal stress, the machinery was almost always anchored to masonry or concrete foundations. Each piece of equipment had its own distinct pylon, whose footprint corresponded to the machine's bedplate. The tops of the foundations were usually the same in elevation so a plank floor could surround the entire assemblage.

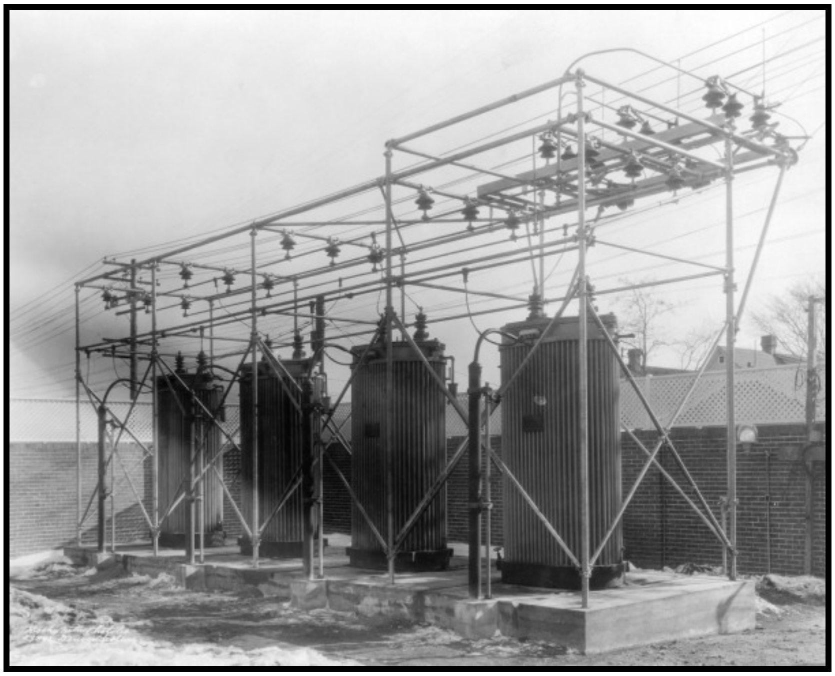
This powerplant, pictured on the floor of Clear Creek near Idaho Springs around 1910, probably belonged to the Seaton Mountain Electric Light, Heat & Power Company. The plant is a good example of a hydrofacility. A flume delivered water to penstocks, angled pipes descending into the building. Now under pressure, the water turned several dynamos within. Note the overflow channel at left. Powerhouses such as the one above tend to be represented by archaeological features such as foundations. Courtesy of Denver Public Library, MCC-371.

In some cases, mining companies operated powerplants that were too small and simple to justify their own buildings. These in-house powerplants were no more than a dynamo installed in a mill, and they were usually coupled to the mill's steam engine. At some mines, such as the Stanley near Idaho Springs, the dynamo was in the compressor house and belted to an existing steam engine.

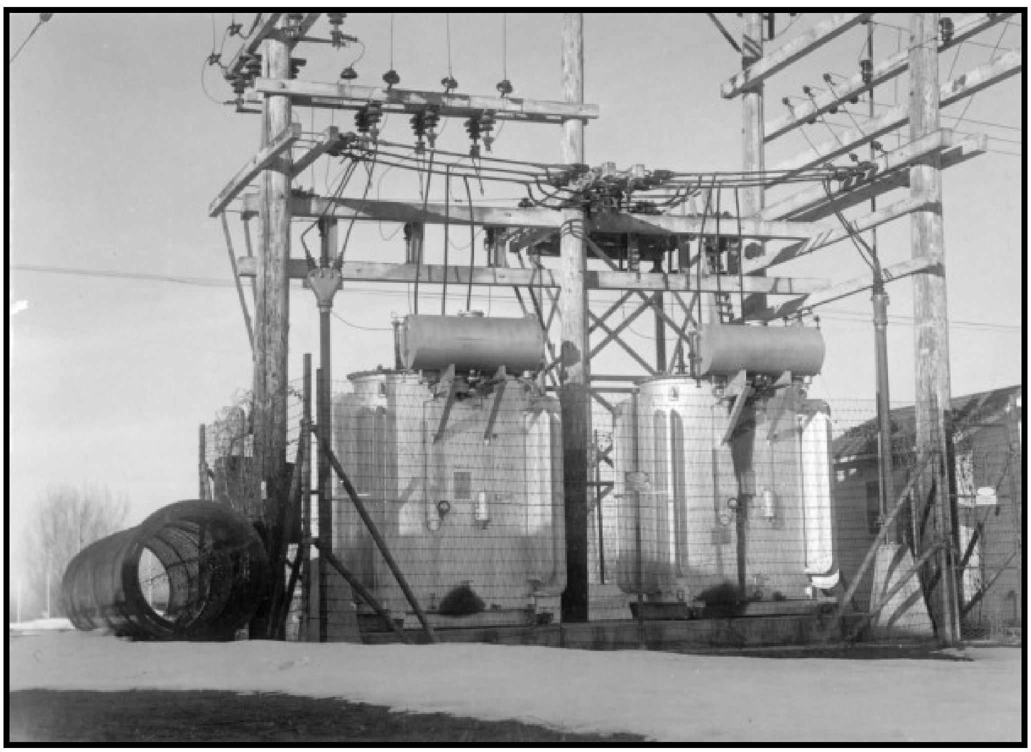
Nearly all the powerplants in the I-70 Mountain Corridor were dismantled when retired, except for the Shoshone, Georgetown, and Cabin Creek facilities, and are now represented primarily by archaeological features. Ditches, pipeline beds, concrete pylons, and cisterns often remain from water systems. Earthen platforms and wall footers typically outline the footprints of the powerhouse buildings. Within these, dynamo and steam engine foundations manifest as concrete or masonry blocks, and channels reflect the waterwheels. Mounds of scorched brick surrounded by coal and clinker denote the location of steam boilers. Powerhouses also left distinct industrial debris such as electrical hardware, plumbing, and large pressure fittings.

PROPERTY TYPE: SUBSTATION

All electrical systems relied on substations, also known as transformer stations, to convert the current generated by powerhouses. In general, substations converted voltage and current in an inverse relationship for either transmission or consumption. Thus, substations were usually located at both ends of a transmission line and at distribution points in between. Most powerplants featured a substation where the system's transmission lines began. Step-up transformers increased voltage and reduced current for long-distance transmission over the main lines. At key points on the lines, more substations converted the current for distribution to consumers. There, step-down transformers decreased the voltage and increased the current, and they sent the power to points of use over distribution lines. For systems with extremely high voltage, such as the Shoshone line, a series of substations converted the power for consumption.



This substation in Denver is representative of distribution facilities in I-70 Mountain Corridor communities and industrial centers. The station consists of a bank of transformers, wiring, and frame on a concrete foundation. Courtesy of Denver Public Library, X-



Substations such as the one above converted electricity as generated in a powerplant for transmission, or from the transmission lines to a distribution system. The substation consists of incoming transmission lines, large transformers, and out-going distribution lines. Courtesy of Denver Public Library, X-29750.

Substations varied in size, configuration, and equipment according to service area. Transformers accomplished the conversion at nearly all substations, and their number depended on voltage, current, and distribution lines. At small facilities, utility poles carried a transmission line to several transformers, and distribution lies sent the reduced voltage to consumers. Early substations featured the transformers in a shed, while substations built after around 1930 featured the transformers on a frame mounted to utility poles. At large substations, a transformer house enclosed multiple transformers, circuit-breakers, and a switchpanel. Large facilities also had arrays of utility poles and occasionally storage sheds for transformer fluid and electrical supplies. When a substation is part of a powerplant site, the substation would not be an independent property type in itself, and instead belong to the encompassing powerplant complex.

PROPERTY TYPE: POWERLINE

Powerlines were fundamental to the operation of any electrical system. They carried electricity from the powerplant to substations, and then distributed the current from those stations to consumers throughout a provider's service area. Powerlines should be recorded as linear resources because of their length and configuration.

Powerlines can be divided into the categories of transmission lines and distribution lines. Transmission lines were main arteries carrying high-voltage electricity from a substation at the powerplant across an electric company's service territory. At line's end, and points between, step-down substations drew current from the transmission line and converted it to a lower voltage for use. Distribution lines then carried the reduced current through concentrations of consumers. Tap lines connected each consumer with the distribution line, and in later years, a small transformer served as the physical junction. Both transmission and distribution lines were engineered structures assembled with factory-made parts. Because of their importance and function, transmission lines were often formally designed by an electrical engineer and constructed according to planned specifications. Distribution lines may have been formally designed or planned in the field in response to immediate conditions and needs.

Power companies built transmission lines according to specifications that were different than distribution lines. For small-scale systems such as those in Clear Creek and Summit counties, the typical transmission line consisted of tall poles crowned with cross-members reinforced with iron brackets. The cross-members featured high-voltage glass, or, after the 1900s, porcelain insulators screwed to wooden pegs. Solid copper wires, lashed to the insulators, carried the electricity. One transmission line may have actually featured three or four wires and their insulators. To protect the system from storm lightning, two or three grounding wires were pinned directly to the wooden cross-members in hopes that they would intercept strikes. The poles were often numbered with tags, and some had date nails with the last two digits of the year when they were erected.

Large-scale systems, such as that for the Shoshone powerplant, transmitted the electricity in very high voltages, requiring lines superior in materials and construction to local systems. The towers were steel constructs that bore the weight of heavy cables and withstood strong wind shear. The wires consisted of copper cables braided around hemp cores, and they were anchored to the towers with chains of disk insulators. In the I-70 Mountain Corridor, the Central Colorado Power Company installed such towers when it began the Shoshone system in 1907, and the United Hydro-Electric Company replaced wooden poles with steel on its line from Georgetown to Lamartine in 1910. Although the general design changed little and steel continued to be use, most if not all the early towers were replaced with those in existence today.[1]

Distribution lines were similar in design and materials to the small-scale transmission lines described above. But distribution lines had several distinguishing characteristics. One was a greater number of cross-members and individual wires. Each wire served a local zone of consumers, such as a city block or a heavy power user like a mine or mill. Another difference was that distribution lines featured connections at many of the poles for tap lines, which descended to individual consumers. Last, the cross-members also carried telephone lines.

PROPERTY TYPE: INFRASTRUCTURE COMPONENTS

Infrastructure components are a broad resource category including constructs and facilities other than powerplants, substations, and power lines and are in direct support of building and operating an electrical system. Most components were concentrated around powerplants because these facilities depended on an infrastructure to generate and transmit electricity.

Infrastructure components can be divided into two categories. In one category, the components are individual pieces of larger systems. For example, ditches, pipelines, and penstocks are components in themselves but are more important as aspects of a water delivery system for a hydro plant. In such cases, the components of a system should be recorded and evaluated in the context of the greater infrastructure to which they belonged. Infrastructure systems associated with the power industry can include water collection and distribution, roads and bridges, and steam. The second category of infrastructure components includes independent facilities that served the overall electrical system. Offices, storehouses, machinery, and equipment yards are examples.

Nearly all components of infrastructure were purposefully constructed to fulfill a specific role in an electrical system. Some components were formally designed by an engineer and assembled with standardized building materials and factory-made hardware. Often, the same components were integral with a larger system. Pipelines and headgates are examples, and they were usually parts of greater water systems. Other infrastructure components, usually small-scale structures, were vernacular in that they were assembled with available materials in the field by experienced workers to fulfill an immediate need. Solitary objects and structures, such as poles, fences, and signs, can qualify as independent resources unless associated with a larger site. In such cases, they should be recorded as features of their associated complexes. The types of infrastructure components are too numerous to list here, and the researcher should refer to the feature descriptions at the section's end.

[1] "Current News" *Mining Science* 9/1/10 p211.

Infrastructure components include facilities and constructs in support of powerplants and their electric grids. Flumes and pipelines for hydropower, such as these in construction for the Stanley Mine near Idaho Springs in1894, are the most common components. Many have been dismantled and are now represented by archaeological features. Courtesy of DLP, Z-4767.

PROPERTY TYPE: RESERVOIR

Hydropower plants were only as reliable as their water source. Initially, electric companies attempted to secure water directly from constantly flowing streams, but drought and freezes quickly proved this method to be insufficient for plant reliability. In response, nearly all the companies in the I-70 Mountain Corridor constructed reservoirs to impound bodies of water for a constant, all-year flow. The Central Colorado Power Company and several independent mining companies were exceptions. The mining companies ran small powerplants that required little water, and they found that directly diverting large streams provided them with enough. Central Colorado originally intended to build a series of reservoirs for its Shoshone plant, but it settled for the natural flow of the Colorado River.

Most of the electric companies built two types of reservoirs. The most popular was to modify and adapt existing lakes because they already were natural storage basins. The modifications focused on increasing the storage capacity by raising the water level, and improving the outflow for deeper discharge. Low dams of earth and rock rubble across the mouth of the lake sufficiently elevated the water level, and with little engineering and capital. A concrete or masonry spillway may have been the only formally designed portion of the dam. The natural outflow channel was deepened to give the entire water body a greater head to draw from. The channel passed underneath the dam and may have been improved with more concrete or masonry and a gate valve. The channel mouth, below the dam, may have had a diversion structure that split the outflow between the powerplant's water system and the original stream bed. Sometimes, the diversion structure was far downstream because of the water system's engineering requirements, or if the powerplant lacked senior water rights. During the early 1900s, the United Light & Power Company modified Clear, Green, Murray, and Silver Dollar lakes above Georgetown. It should be noted that not all lakes with improved outlets in the I-70 Mountain Corridor were for powerplants, as some were harnessed for other uses.[2]

Artificial water bodies were the second type of reservoir, and they were much smaller than natural lakes. The power companies secured a suitable drainage that featured a natural constriction with an open area behind and built a dam in the constriction. The dams were often earthen berms retained on the inside with rock rubble or log cribbing. A ditch delivered water captured elsewhere to the reservoir's head, and an outlet channel directed release flows into the original drainage. The channel extended under the dam and was a box culvert lined with concrete, masonry, or planks. Its intake was a drain fitted with debris screens and a gate valve at the dam base. Artificial reservoirs tended to be small because power companies lacked the funds for dams with enough structural integrity to impound high volumes of water.

ELECTRIC POWER PROPERTY TYPE SIGNIFICANCE

Although powerplants, substations, powerlines, infrastructure components, and reservoirs are described as individual Property Types, they constituted the electrical systems in the I-70 Mountain Corridor. Every electrical system included most if not all these Property Types, and no system could have functioned without them. In overview, powerplants generated the electricity, and substations converted it into forms for either transmission or use by consumers. Powerlines carried electricity as generated through the corridor, and distributed an adjusted current to the consumers. Infrastructure components provided support for entire electrical systems or their individual facilities and delivered water to hydro plants. Reservoirs contained reliable sources of water for hydro plants, which generated most of the electricity in the corridor.

At first, the electrical systems provided local service in Clear Creek and Summit counties, and later became components of a large grid extending through much of northeastern Colorado. The systems generated and distributed electricity to consumers, and that energy source revolutionized industry, business, lifestyle, the economy, and electrical technology. The electrical systems and their Property Types were important in a number of NRHP areas of significance, including Community Planning, Economics, Engineering, Historic Archaeology, Industry, Invention, Landscape Architecture, and Social History. As parts of greater electrical systems, the Property Types also share the same general registration requirements.

Period of Significance must be considered when assessing the historical importance of the Property Types. In general, the Period 1883 to 1970 covers electrical generation as a theme throughout the entire corridor. But the industry's history was not uniform, and narrower timeframes of importance may be more applicable to specific regions when assessing resource significance. The regions and important periods of time are 1883 to 1970 in Clear Creek drainage, 1898 through 1936 in Summit County, and 1906 to 1970 along the Eagle and Colorado rivers. Level of significance will be local, statewide, and national in some areas.

[2] Colorado Power Company, 1920:4; Gidlund, 1925.

Areas of Significance: Community Planning and Social History: Electric lighting, made possible by power generation, was significant in the areas of *Social History* and *Community Planning* for the changes it brought. Electric lighting affected the lifestyles of corridor residents by replacing candles, and gas and kerosene lamps. Indoors, electric lighting allowed people to accomplish more at night, and benefitted health and safety by reducing the risk of fire and improving air quality. Outdoors, electric lighting reduced crime and made afterhours business and nightlife more attractive to a greater number and variety of people.

Electric lighting changed social patterns in those communities without gas systems, such as Frisco. Until electric lighting, residents relied on candles and kerosene lamps, which were dim and difficult to carry outdoors at night. These conditions limited the activities that residents were able to engage in and encouraged them instead to schedule around daylight hours. The superior illumination of electric lighting then lessened the limitations imposed by nighttime.

Changes in social patterns and municipal lighting influenced community development. Business districts became more concentrated around lighting circuits, and electric lighting further distinguished affluent from working-class residents, who were less likely to afford service. A town’s nighttime lighting patterns then distinguished affluent neighborhoods and business districts from low socioeconomic status areas.

Area of Significance: Economics: Electrical systems were significant in the area of *Economics* on local and statewide levels because they directly supported industry and the income it generated. Between 1883 and 1910, electricity increasingly benefitted mining and dependent industries, the financial cornerstones of Clear Creek and Summit counties. With electricity, mining and milling companies were able to convert greater tonnages of ore over a longer period of time into wealth. When the Shoshone system was brought on line in 1910, it not only continued to support mining in Clear Creek and Summit counties, but now Eagle and Lake counties as well. Because this trend affected such a large area, level of significance is statewide. The mining industry underwent a substantial revival during the Great Depression due to increases in the values of gold and silver. Electricity underwrote the revival and allowed mining companies to convert ore into income, desperately needed in the counties at the time. The contribution was also important to Colorado’s economy, which suffered due to the poor economic climate.

Electricity supported other industries and commercial business. On a local level, these sectors followed trends that were similar to mining. When the Shoshone grid was completed in 1911, however, it fostered industry and business throughout central Colorado, and the cumulative economic impact was substantial.

Reservoirs were involved with a separate set of economic impacts. Although built to serve powerplants, reservoirs supported other forms of business that contributed to diversified local economies. In particular, reservoirs were used for recreation such as fishing, camping, and destination resorts. Their reliable water also supported industry such as mining, logging, and manufacturing.

Areas of Significance: Engineering and Invention: Some electrical systems were important on statewide and national levels for their participation in the development of electrical engineering and technology. The early systems were built at a time when electrical engineering, and especially hydropower, was in a nascent state of development. Further, engineers grappled with difficult environmental conditions including hostile terrain, an undeveloped landscape, high winds, and arctic winter conditions. By functioning correctly in an adverse environment, the systems contributed to the empirical body of knowledge regarding plant design, equipment, operations, and associated infrastructure. This was especially true of DC systems predating 1900, AC systems predating 1910, and the Shoshone powerplant.

The Shoshone plant contributed to the development of large-scale hydropower projects and knowledge regarding extensive electrical systems. The Shoshone system was the largest in the state for its time, generated the second-highest voltage in the nation, and required adaptation of existing technology to withstand the environmental rigors of the Rocky Mountains. The powerline and substations joined the system with independent grids in Summit and Clear Creek counties, Leadville, Denver, and Boulder. In so doing, they contributed to the development of grid unification. The powerline was a major engineering accomplishment in itself. The route crossed some of the most rugged topography attempted, required exacting surveying, and had to be carefully planned. In addition, the cable had to carry an unusually high voltage and withstand extreme winds. To this end, the Central Colorado Power Company engineered a special steel cable and couplings to the copper cable.

Prior to 1900, water system engineering for hydropower was in a nascent state of development. Similarly, the use of steam engines to run the dynamos in a powerplant was still being developed. By functioning correctly, water and steam systems contributed to the empirical body of knowledge of how to keep a powerplant running in a constant and reliable nature. This was particularly important in the West, where water was scarce and had to be carried great distances to the powerplants.

Area of Significance: Historic Archaeology: Relatively little is currently known about the engineering and technology of early electrical generation in the West. The same applies to how powerplants evolved over time, and daily operations. Archival sources provide some information in this important area of inquiry, but the body of data is incomplete because of limited documentation at the time. Thus, studies of powerplants and their sites can fill in the numerous data gaps, provided these resources retain physical integrity relative to the electric operation. Examination of powerhouse machinery, foundations, and other features may enhance the current understanding of the specifics of electrical generation. The analysis of water infrastructures and remnants of steam equipment can further knowledge of the motive power for electrical generation. Other features and aspects will add detail regarding the constitution of powerplants and their operation.

Area of Significance: Industry: Electrical systems made numerous contributions on local and statewide levels in the area of *Industry*. Benefit to mining is one of the most important. Electricity lowered the cost of ore production at the mines, and as a result, companies were able to extract lower grades of payrock than before. Similarly, electricity reduced the costs of ore treatment in the mills, which were then able to accept the low-grade payrock. The net result was a prolonged mining industry, which was the economic foundation local to Clear Creek and Summit counties until approximately

1920. In large part because of electricity, Clear Creek County's mining industry was significant on a statewide level until 1920.

Electricity directly fostered a revival of mining during the Great Depression, and the industry had an important impact throughout the central mountains during this time. When the industry revived, it provided numerous jobs and economic contributions in an era when these were in short supply and dearly needed. Electricity available through the unified grid underwrote the revival because many mining operations relied on the power source to run machinery. The unified grid provided service to mines throughout the central mountains, including Clear Creek, Eagle, Lake, and Summit counties.

Besides its impact on mining, electricity dramatically improved other forms of industry, commercial business, and the quality of life. Prior to the unification of the grids in Clear Creek and Summit counties, the impact was on a local level. When the grids were connected with the Shoshone system, the impact increased in geography, and by 1911, it was statewide.

The electrical industry helped Colorado maintain a national reputation as a center of technological innovation. The AC systems in Clear Creek County were built relatively early in the history of electricity and served as examples that engineers adapted elsewhere. The Shoshone system was particularly large, overcame unprecedented environmental problems, linked a number of disparate grids, and had an unusually high voltage. Ultimately, the system became a component of one of the largest grids in the Rocky Mountain region, and it provided the state's most densely settled area with power.

The infrastructures associated with hydro plants contributed to knowledge of water systems for electric generation. Providers secured water rights and constructed infrastructure systems to deliver water to their plants for public utility purposes. In so doing, the companies fostered the development of a specialized subset of water law, which was and still is important in the arid West.

Area of Significance: Landscape Architecture: When large in scale, all the Property Types may be significant in the area of *Landscape Architecture* when they represent system design on a landscape level. In these cases, the electric power industry purposefully altered the landscape to provide energy for consumption on a regional basis. The large-scale systems, or their remnants, can impart a strong sense of industry and engineering regarding natural resource use.

Electric Power Property Type Registration Requirements

To qualify for the NRHP, the Property Types must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Property Types eligible under Criterion A must be associated with at least one listed area of significance, as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. Archival research will probably reveal additional historical associations not covered in Section E.

Criterion B: The Property Types may be eligible under Criterion B if an important person was physically present at the site on a sustained basis. Presence will probably be through employment, operations management, or construction. Powerplants are the most likely to qualify because they were workplaces where individuals spent periods of time. Engineers and electrical experts in particular tended to run powerplants and maintain offices there. The other Property Types are less likely to qualify because they were not places of residence or employment. Construction of a facility is the principal exception, provided that the notable individual was personally involved on-site.

The site must retain physical integrity relative to the person's productive period of occupation, and date to the same timeframe when the individual achieved significance. If significance is through the person's presence on-site and the person's participation in operations or construction, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. A brief biography is necessary to explain the individual's significant contributions. In some cases, important people invested in electricity providers or owned property, but did not occupy the site. Such an association does not meet Criterion B. The individual of note must have been present on-site. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: The Property Types may be eligible under Criterion C when they clearly exemplify their specific category of facility, and possess integrity relative to one of the timeframes of significance at the section's beginning. Because most equipment and buildings were removed when a facility was retired, integrity is usually on an archaeological level. A site retains sufficient integrity on an archaeological level when the material evidence clearly conveys function, overall design, structures and equipment, operations, and timeframe. Intact buildings, structures, and machinery are rare and important, and may qualify individually as examples of engineering, technology, and architecture specific to early power generation. For a site to be eligible, it should possess character-defining attributes even if on an archaeological level.

At *powerplants*, the dynamos, their motive source, and drivetrain should be discernable from intact components or their archaeological manifestations. For hydroplants, this includes the water system, waterwheel channels, and machinery foundations. For steam plants, the engine, boiler, dynamo, and driveshaft foundations are included. The powerhouse footprint and indication of associated facilities should be interpretable.

At *substations*, sufficient integrity requires either an assemblage of equipment and structures older than 50 years, or their clear representation through distinguishable archaeological evidence. The locations of utility poles, transformers, other electrical equipment, and buildings, if any, need be identifiable.

For *powerlines*, integrity requires a series of utility poles older than 50 years, and they should represent the design, engineering, and function of a power transmission or distribution system. If a powerline has been dismantled, its eligibility is unlikely because the archaeological evidence is usually insufficient.

Infrastructure components must be older than 50 years and offer enough evidence to convey their design, engineering, and function. In the case of water systems, the diversion structure, pipeline or flume route, pressure box, and penstock route should be discernable. In the case of small-scale components, the facility, its function, and relationship to the electric system should be identifiable.

For *reservoirs*, the resource must clearly represent the improvements made for water storage and diversion. Included are the water inlet, basin, dam, outflow, and diversion structures.

Some Property Types may be eligible as representative works of master engineers. In such cases, the researcher must explain why the resource was an important work, and who the engineer was.

The Property Types may also be eligible if they are contributing elements of historic landscapes. When in an urban setting, nearby buildings and structures should be similar in age, and the Property Type should contribute to the community's historic feeling. When in a mining district, the Property Type, or its archaeological remnants, should contribute to the feeling of industry imparted by surrounding resources.

<u>*Criterion D:*</u> Property Types may be eligible under Criterion D if they will yield important information upon further study. In general, the researcher must state the arena of inquiry, why it is important, and how the resource will address the questions.

If a site possesses structures and buildings, detailed examination may reveal how engineers adapted architecture and engineering to generate, convert, or convey electricity in difficult, high-altitude conditions.

Powerplant sites predating 1910 could contribute to the subjects of early plant design, technology, operations, and equipment.

Substations and *powerlines* may reveal information about early electrical current transmission, conversion, and distribution. Electrical system and grid interface is another arena of inquiry.

Infrastructure components can contribute to facility planning and organization, routing electricity, and the support facilities required for an electrical system. Intensive studies of water systems and reservoirs may enhance the existing knowledge of early diversion, distribution, storage, and hydropower generation.

Eligible Property Types must possess physical integrity relative to one of the timeframes of significance outlined above. Because most system components were dismantled when retired, integrity will probably be on an archaeological level. For archaeological remains to possess sufficient integrity, the material evidence should permit the virtual reconstruction of the facility, its operation, and timeframe. Common features for the Property Types are at the section's end.

Most of the seven aspects of integrity defined by the NRHP apply to the Property Types. Intact buildings, structures, and machinery must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, the material remains, including the archaeological features, must convey the facility's organization, planning, and engineering. To retain integrity of materials, the structures and machinery should date to a timeframe of significance. To retain the aspect of *setting*, the area surrounding the resource must not have changed a great degree from its operational timeframe. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining landscape, then the surrounding mines and industrial features should retain integrity at least on an archaeological level. If the site lies in an urban setting, then adjacent buildings and structures should appear to be similar in age. In terms of *feeling,* the resource should convey the perception of its function from a historical perspective and from today's standpoint. Integrity of *association* exists where structures, machinery, and archaeological features convey a strong sense of connectedness between the resource and a contemporary observer's ability to discern the historic function.

ELECTRIC POWER BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Powerplant Feature Types

Hydropower System Features

Hydropower plants depended on water to generate electricity, and a system of ditches, pipelines, and other structures delivered the water from a source. A variety of structural and archaeological features currently represent the water delivery systems, some of which were extensive. The features described below include only those close to or integral with a powerplant. Other features commonly associated with the rest of the system, away from the powerplant, are described under the category of Infrastructure Components.

Driveshaft: In hydro plants, waterwheels were the motive source for the dynamos. A driveshaft was an intermediary mechanism that transferred motion from the waterwheels to dynamos. The waterwheels turned the shaft via gearing, and the shaft transferred the power to the dynamo via a canvas belt, drive-chain, or more gearing. The shaft was a solid steel rod at least 6 feet long, and rotated in bearings bolted to concrete or masonry pylons.
Driveshaft Foundation: Driveshafts rotated in heavy bearings that had to firmly anchored to pylons of concrete or masonry. The pylons are typically at least 1 by 1 feet in plan, feature anchor bolts on top, and are arranged in rows.
Nozzle: A nozzle squirted a high-pressure jet of water against the cups of a waterwheel to turn the device. Nozzles were of brass, bronze, or cast iron, and fastened to the end of a pressure pipe in a waterwheel foundation.
Nozzle Mount: A bracket or brace that held a nozzle steady in a waterwheel foundation.
Outflow Channel: An outflow channel conveyed spent water from a waterwheel out of a powerhouse. The channel passed from the waterwheel foundation, under the powerhouse floor, and downslope and away from the building. At powerplants with multiple waterwheels, several channels may have joined into a common ditch.
Penstock: A penstock was the pipeline that delivered water under pressure to the powerhouse. The pipeline began at a pressure box above the plant and descended so gravity could increase the force of the water falling within. Distinct diameter reductions further boosted the velocity of the water. When the penstock reached the slope base by the powerhouse, it became nearly horizontal and forked. Pressure pipelines continued into the powerhouse.
Penstock Bed: Penstocks were usually laid in depressed beds, which may have featured concrete footings to secure the pipe.
Penstock Remnant: A partially disassembled penstock and its bed.
Pipeline: A large-diameter pipe that carried water to or from the powerplant.
Pipeline Bed: A raised or depressed bed for a pipeline, sometimes with concrete footings.
Pipeline Remnant: A partially disassembled pipeline and its bed.
Pressure Box: A wooden or concrete tank, upslope from a powerplant, that directed water into a penstock for final pressurization. A ditch or pipeline delivered water to the pressure box from a stream or reservoir. The pressure box's elevation and the penstock's descent created enough force for the water to turn a waterwheel in the powerhouse.
Pressure Box Platform: Pressure boxes stood on earthen platforms below a ditch or reservoir. A penstock, or its bed, will descend from the platform, which may feature concrete, masonry, or timber footers.

Pressure Pipeline: A pressure pipeline was the final link between a penstock and the waterwheels inside the powerhouse. The pipeline carried water under great pressure beneath the powerhouse floor to the waterwheel channel, and ended with a nozzle. The pipeline was assembled with bolted steel segments, and had to be anchored to concrete pylons.

Valve: Penstocks and pipelines featured large valves at strategic points to redirect or stop water flows.

Valve Box: Valves were often enclosed in concrete, masonry, or plank boxes.

Waterwheel: Waterwheels converted the energy of pressurized water into mechanical motion for the dynamos. Waterwheels were of brass, bronze, or cast iron, 3 to 12 feet in diameter, and featured cups around the outside. A high-pressure jet against the cups spun the wheel, which rotated in heavy bearings within a waterwheel channel. The axle featured a gear that turned an adjacent driveshaft.

Waterwheel Channel: Waterwheels spun in narrow channels integral with a powerhouse foundation. The waterwheel and jet nozzle were bolted to a foundation that flanked the channel. An iron shroud covered the channel and prevented spray from soaking the powerhouse interior. In general, channels were between 1 and 3 feet in width, and 2 to 6 feet deep. An outflow carried spent water out the channel bottom.

Waterwheel Foundation: Waterwheels rotated in heavy iron bearings that had to be firmly anchored in place. The bearings were bolted to concrete or masonry blocks flanking a waterwheel channel. The blocks are symmetrical and feature two to four bolts each.

Steam Power Features

Boiler: A boiler was an iron vessel where extreme heat converted water into pressurized steam. Plumbing carried the steam from the boiler to an engine, which turned a powerplant's dynamos. Electric companies relied on two types of boilers: return-tube and the water-tube units. The return-tube boiler, the most popular, consisted of a riveted plate-iron shell encased in a masonry setting. The shell was cylindrical, oriented horizontally, and featured numerous flue tubes. The most common size was approximately 5 feet in diameter and 16 feet long, and the masonry setting was 3 feet wider and 3 feet longer. The boiler's front almost always featured a cast-iron façade enshrouding a firebox underneath the shell. The façade featured a large upper door so workers could swab out the flue tubes, and lower doors to feed the fire and remove ash. When the boiler operated, the flue gases left the firebox, traveled through the setting and along the shell's bottom, rose into a smoke chamber in the setting's rear. In so doing, the gases heated the outside of the water-filled shell. The gases then returned through the flue-tubes perforating the shell, heating the water from within the shell.

Often, the boiler shell was salvaged when a powerplant was retired, leaving only the masonry setting. For the researcher to record a feature as a return-tube boiler, it must possess the shell. If only the masonry is left, then it should be recorded as a *Boiler Setting Ruin* (described below).

Water-tube boilers were more efficient than return-tube units, providing the most steam for the least floorspace and fuel. Water-tube boilers were also costly, complex, and required advanced engineering. In terms of design, the water-tube boiler was the antithesis of the return-tube unit. When the boiler operated, superheated gases traveled from the firebox around the tubes instead of through them, and exited via a smokestack. The tubes were filled with water, which volatized into steam and rose into an overhead drum. The assemblage of tubes and drum stood on girders over a large brick setting, which featured iron hatches on the sides for cleaning and maintenance. A cast iron façade covered the tubes and firebox, and plumbing delivered fresh water, improved circulation, and permitted the unit to be drained.

Boiler Foundation: Boilers and their masonry settings were built on sound foundations that were flat. Most were slabs of concrete or brick masonry, although some outfits substituted rocks. Boiler foundations often feature iron braces, large-diameter pipes, and scattered bricks.

Boiler Setting Ruin: When boilers were dismantled, the hardware was usually extracted, leaving the masonry setting in a damaged state. Collapsed settings range in appearance from mostly intact masonry walls to piles of rubble. With some examination, the researcher may be able to discern enough of the walls to reconstruct the boiler type, size, and location of the firebox. Most setting remnants feature a bridge wall, which was a low brick divider in the setting's interior. The wall usually stood between the firebox and smoke chamber, and forced flue gases up against the boiler's belly. Most boiler settings consisted of common bricks on the exterior and fire bricks within.

Boiler Clinker Dump: When a boiler operated, intense heat fused impurities in the fuel coal into a scorious, ashy residue termed clinker. Workers usually deposited the ash and clinker outside the powerhouse, forming a boiler clinker dump over time. Boiler clinker dumps also usually include slate fragments, unburned bituminous coal, and structural and industrial hardware.

Cistern: A concrete, masonry, or timber chamber that contained water for boilers or shop use. Because powerplants usually relied on gravity to pressurize plumbing, cisterns tend to be located upslope.

Coal Bin: Coal bins contained fuel for a powerplant's boiler. Most were of the sloped-floor variety and stood on a combination of cribbing and posts. Chutes projecting out of the front permitted a worker to unload coal and move it to the boiler.

Coal Bin Platform or Foundation: A platform or foundation that supported a coal bin. Sloped-floor bins usually stood on a platform and log or timber pilings. Coal fragments and dust are usually associated.

Coal Bin Ruin: The collapsed remnants of a coal bin.

Steam Engine: Prior to the 1920s, steam engines were a motive source for dynamos. Located on a powerplant's central floor, the engine transferred motion to a driveshaft via a canvas belt, chain-drive, or gearing. The driveshaft was connected to the dynamo via more belts or gearing. Small powerplants had horizontal engines between 2 and 4 feet in width and 8 to 20 feet long. The steam cylinder was at one end, a large flywheel was at the other end, and drive-rods connected the two. Large powerplants relied on duplex engines with two steam cylinders flanking a central flywheel. A steam engine required a boiler.

Steam Engine Foundation: Steam engine foundations are often rectangular, studded with anchor bolts, and between 2 and 5 feet in width and 8 to 22 feet long. Workers built engine foundations with brick or rock masonry, or concrete, and the foundations often featured a pylon for the outboard flywheel bearing.

Water Main: Steam systems required dedicated water mains to provide the boiler with a constant supply of feed water. Mains ranged in size from 2 to 12 inches in diameter.

Water Tank: A large vessel, usually cylindrical, made of planks or sheet iron. To pressurize plumbing, water tanks were usually located above a powerplant.

Water Tank Platform: Often a circular or semicircular platform for a tank. The platform's floor may feature a pipe.

Electrical Generation Features

Dynamo: A dynamo consisted of a wire-wound core in a cast-iron body, and it generated electricity when turning rapidly. Dynamos appeared similar to large motors, featured flywheels or gearing for motion, and were bolted to solid concrete or masonry foundations.

Dynamo Foundation: Foundations for dynamos were rectangular, 1 by 2 to 6 by 10 feet in area, and consisted of concrete or masonry. Four or six anchor bolts held the dynamo fast.

Switchpanel: A switchpanel featured switches, contacts, fuses, and indictors that completed a powerplant's electric circuitry. Switchpanels were slabs of marble, slate, porcelain, or artificial and infusible material, and usually stood upright on steel supports. Because of their function, switchpanels were convergence points for wiring and conduits.

Switchpanel Foundation: Switchpanels stood on steel legs bolted to timber or masonry footings. Clusters of small anchor bolts, and convergence points for wiring and conduits, often denote the location for a switchpanel.

Transformer Station: Within a powerhouse, a bank of transformers coordinated the electricity generated by the dynamos. Small banks were usually bolted to the powerhouse wall or support frame, and large banks were free-standing on independent frames. Electricity left the transformer station and went to a larger substation outside the powerhouse.

Transformer Station Foundation: Large banks of transformers often stood on concrete or timber footings. The foundation was rectangular, 1 to 3 feet wide, and 3 to 8 feet long.

Utility Pole: Powerplants featured numerous utility poles to carry electrical and telephone wires.

Powerhouse Features

Office: Electrical companies usually erected an office adjacent or attached to the powerhouse for administration. The building may have been professionally designed by an engineer or planned in the field by the construction crew, and assembled with standard materials. Because offices had no architectural style and were built for function and economy, they can be described as an industrial version of vernacular. In form, offices had gabled or hipped roofs, were rectangular or L in plan, and of frame construction. The interior tended to have no machinery or equipment, and the walls had large windows.

Office Foundation: The timber, concrete, or masonry footings that supported an office. The associated artifact assemblage tended to lack industrial and domestic refuse, and feature administrative and communication items.

Office Platform: An earthen platform on which an office stood. The associated artifact assemblage tended to lack industrial hardware and domestic refuse, and feature administrative and communication items.

Outhouse: Prior to the widespread adoption of flush toilets, powerhouse workers relied on outhouses for their personal use. Outhouses usually had gabled or shed roofs, were around 5 by 6 feet in plan, featured a bench as a toilet seat, and stood over a pit.

Outhouse Pit: The pit that underlay an outhouse.

Pond: Some hydropower plants featured a pond immediately downslope to collect spent water.

Powerhouse: A powerhouse was the building that enclosed electrical generation equipment and its motive source. Most powerhouses were professionally designed by an engineer, and assembled with standard materials and factory-made hardware. When designing a powerhouse, the engineer adapted industrial architecture to the type, configuration, and size of the generating system. As a result, most if not all powerhouses were custom designs, unadorned and industrial in appearance. In size, the buildings were as small as single-family residences and as large as warehouses. In form, they ranged in plan from rectangular to complex with multiple extensions, and had gabled or cross-gabled roofs. In construction, most powerhouses were based on heavy frames, with plank, board-and-batten, or sheet-iron siding. The buildings stood on concrete or masonry foundations, often separate from the machinery mounts.

Powerhouse Foundation: Most powerhouse foundations consisted of concrete or masonry, outlined the building's footprint, and had interior piers supporting the floor. The foundation was often separate from the machinery mounts. Directly associated artifact assemblages typically include switchpanel fragments, numerous insulators, wires, and fuses.

Powerhouse Platform: Small powerhouses stood on impermanent foundations laid on earthen platforms. Workers usually graded such platforms with cut-and-fill methods and erected rock or cribbing walls to retain the cut- and fill-banks. Directly associated artifact assemblages typically include switchpanel fragments, numerous insulators, wires, and fuses.

Storehouse: An industrial building used primarily to store surplus materials and equipment. Storehouses ranged in size, had shed or gabled roofs, usually lacked windows, and featured broad doorways.

Storehouse Foundation: Large storehouses stood on well-built timber, concrete, or masonry foundations intended to bear great weight. Because storehouses were sites of little activity, they offer few artifacts.

Storehouse Platform: Small and light-duty storehouses stood on earthen platforms. Because storehouses were sites of little activity, they offer few artifacts.

Substation Feature Types

Distribution Line: Distribution lines carried adjusted current from substations to consumers. A single line could have featured numerous wires fastened to cross-members on a series of utility poles. Early wires were bare iron or copper, and later wires were sheathed with rubber or plastic.

Equipment Frame: Substations included electrical equipment in addition to transformers, such as circuit-breakers, grounds, junctions, rectifiers, and switchpanels. The equipment was usually bolted to steel or timber frames near transformers or utility poles.

Equipment Frame Foundation: Equipment frames were usually bolted to concrete or masonry pads or pylons near transformers or utility poles.

Fence: Fences often enclosed substations. Early fences consisted of planks or barbed wire, and by the 1950s, many were of chain link.

Storehouse: See Powerplant Features above.

Storehouse Foundation: See Powerplant Features above.

Storehouse Platform: See Powerplant Features above.

Transformer Frame: Most substations had banks of transformers that were mounted to frames capable of bearing weight. At small substations, the frames were 3 by 15 feet or less in plan, assembled from timbers, and rested on a foundation or spanned a gap between utility poles. At large substations, the frames were steel, supported several banks of transformers, and rested on a concrete foundation.

Transformer Frame Foundation: Transformers were bolted to frames were usually anchored to concrete or masonry pads or pylons with anchor bolts. The foundation may have been in a transformer house, or on an earthen platform.

Transformer House: Transformer houses were frame buildings that enclosed transformers, electric junctions, and other equipment. Inside, the transformers stood on a foundation while wiring and other equipment was fastened to the walls. Large transformer houses were professionally designed, small buildings were often planned in the field, and all were assembled with standard materials and factory-made hardware. When planning a transformer house, the builder had to consider interior equipment size and configuration, substation location, and integration with the rest of the electrical system. In form, transformer houses were square or rectangular, had gabled or shed roofs, and ranged in size from small sheds to cabins. They usually lacked windows, and wires entered through ports in the walls.

Transformer House Platform: Transformer houses usually stood on impermanent foundations laid over earthen platforms. Artifact assemblages feature high proportions of electrical hardware.

Transmission Line: A transmission line carried high voltage current from either a powerplant or another substation through a provider's service area. A single line often featured several large-diameter wires fastened to chains of insulators on utility poles. Early wires were bare iron or copper, and later wires were aluminum.

Utility Pole: Utility poles are among the most common features in an electrical system. The poles carried transmission, distribution, and other lines, or supported electrical equipment. Some poles feature date nails stamped with the last two digits of the installation year.

Yard: The area around a substation was a yard kept free of vegetation, cleared of obstacles, and used for storage.

Infrastructure Feature Types

Water System Features

Water system features were components of a network that provided water to hydropower plants. Those system aspects away from the powerplant are listed below, and those at the powerplant are above.

Ditch: Ditches were inexpensive channels excavated into a slope, and they carried water for power generation. Ditches had to be carefully surveyed for necessary gradient, and they contoured from a diversion structure on a stream to a point upslope from the powerplant. There, the ditch delivered water to a pressure box. Ditches often featured intermediary gates that drained water prior to servicing.

Diversion Dam: Those electrical companies that lacked reservoirs drew water from streams. A dam diverted some, but not all, the stream into a headgate, which captured the water for the powerplant. Such dams were intended to slow the stream and create a pond, but not to completely impound the flow. Diversion dams ranged in height from 2 to 20 feet, featured a collection ditch or headgate on one side, and had a spillway. The dams were made of gravel-filled log cribbing, rock masonry, or concrete.

Diversion Dam Ruin: The collapsed or eroded remnants of a diversion dam.

Diversion Structure: A diversion structure captured water from a stream or reservoir and directed it into a ditch or flume for the powerplant. The structure featured a baffle in the stream channel that gathered water, and a headgate that admitted flow into the ditch, pipeline, or flume. A rock or concrete channel near the headgate minimized erosion, a screen prevented coarse material from passing into the flume or pipeline, and a catwalk allowed workers to access the headgate. The ditch and headgate were proportionate to the amount of water required by the powerplant. Concrete or masonry prevented the baffle and ditch mouth from collapsing and eroding away. Impermanent structures were made of dry-laid rock walls and timbers.

Diversion Structure Ruin: The collapsed or eroded remnants of a diversion structure. After abandonment, even concrete and masonry structures crumbled and filled with gravel.

Flume: A flume served the same function as a ditch, and some ditches featured flume sections to carry water over and around obstructions. Most flumes consisted of plank walls and a floor nailed to the inside of box-frame sets, which were supported underneath by timber stringers. Flumes had to be carefully

surveyed to maintain gradient, and they contoured from a diversion structure on a stream to a point upslope from the powerplant. There, the flume delivered water to a pressure box. Flumes often featured intermediary gates that drained water prior to servicing.
Flume Bed: Flumes usually rested on a narrow bench cut out of a slope. When the flume was removed, lumber, nails, and the bench remained.
Flume Remnant: A collapsed flume.
Headgate: A headgate admitted water into the mouth of a ditch, flume, or pipeline. Small headgates featured plank walls and slots for a plank or steel gate. Large headgates had concrete or masonry walls and a steel gate raised with either a hand winch or worm gear. A catwalk over the gate provided access.
Headgate Remnant: The eroded or collapsed ruins of a headgate.
Pipeline: A pipeline served the same function as a ditch, and some ditches featured pipeline sections to carry water over and around obstructions. Most pipelines were riveted or spiral-welded steel tubes supported underneath by timber footers. They contoured from a diversion structure on a stream to a point upslope from the powerplant. There, the pipeline delivered water to a pressure box. Pipelines often featured intermediary gate valves that drained water prior to servicing.
Pipeline Bed: Pipelines usually rested on timber footers laid on a narrow bench cut out of a slope. When the pipe was removed, the footers and bench remained.
Pipeline Remnant: A partially disassembled pipeline.
Pressure Box: See Powerplant Features.
Pressure Box Platform: See Powerplant Features.
Pressure Box Ruin: See Powerplant Features.

System Maintenance Features

Electrical systems required regular maintenance, repairs to components, and the storage of materials. Facilities that carried out these functions can be found at a powerplant, central yard, or individually.

Loading Dock/Platform: Maintenance yards and storehouses often featured loading docks and platforms to transfer heavy appliances and materials off trucks or railroad cars. The docks were frame structures with piling foundations and plank decking. Some were of concrete.
Maintenance Yard: Power companies responsible for extensive grids designated yards for their service facilities. Often fenced, most yards included a shop, storehouse, loading dock, and an open area for poles, cable spools, and large appliances such as transformers.
Office: Electrical companies usually erected an office adjacent to maintenance facilities to house administration. See Powerplant Feature Types.
Office Foundation: See Powerplant Feature Types.
Office Platform: See Powerplant Feature Types.
Outhouse: See Powerplant Feature Types.
Outhouse Pit: The pit that underlay an outhouse.
Shop: Electric companies repaired and serviced hardware and equipment in shop buildings. Nearly all had capabilities for blacksmithing, machining, and carpentry. Blacksmith work areas featured a forge, an anvil, hand tools, a workbench, and a bin for anthracite coal. Adjoining were machining appliances such as a lathe, drill-press, pipe cutter, power hammer, and welder. The carpentry station had a drill press, lathe, power saw, planer, and other equipment. Electric motors powered the equipment via a system of driveshafts and canvas belts. Large shops were professionally designed, small buildings were often planned in the field, and all were assembled with standard materials and factory-made hardware. When planning a shop, the builder had to consider interior equipment size and configuration, and cost. In form, shops were square or rectangular, had gabled roofs, and ranged in size from small cabins to warehouses.
Shop Foundation: The shop building and the power appliances within were anchored to concrete or timber foundations on an earthen platform. The building foundation reflected the structure's footprint, and the appliance foundations were specific to individual machines. The artifact assemblage includes shop and blacksmithing refuse.
Shop Platform: Small, light-duty shops stood on impermanent foundations of timbers on an earthen platform. When dismantled, the facility left primarily the platform and an artifact assemblage heavy with shop refuse.
Shop Ruin: The collapsed remnants of a shop.

Shop Refuse Dump: Shop work generated refuse in the form of forge-cut iron scraps, metal turnings, wood scraps, and machine parts. Employees threw these materials downslope from the building, forming concentrated dumps. The size of the dump reflected the intensity and duration of shop work.
Shop Refuse Scatter: A scatter of shop refuse, usually around the shop building.
Storehouse: See Powerplant Features.
Storehouse Foundation: See Powerplant Features.
Storehouse Platform: See Powerplant Features.
Utility Pole: Maintenance facilities naturally relied on electricity for lighting and power. Utility poles supported the wires, light fixtures, a transformer, and switchpanel.

Reservoir Feature Types

Catwalk: Catwalks were narrow piers, walkways, or scaffolds that allowed workers to access reservoir structures and valve wheels. Most catwalks had plank decking over timber stringers, supported by timber or log piers.
Dam: Dams impounded water for long-term storage and eventual diversion into a hydro-plant's water system. Most dams blocked minor drainages or the mouths of natural lakes. Low dams consisted of concrete, masonry, or earth retained by log cribbing and boulders. High dams were almost exclusively of concrete. One side featured a spillway, and the center had a drain that directed water into a pipeline. A wheel above the drain engaged the valve that admitted water.
Dam Ruin: The breached and eroded remnants of a dam.
Ditch: Ditches were surface excavations that carried water into a reservoir, or sent diverted water away to a powerplant. Ditches contoured across slopes and required exacting surveying to maintain gradient.
Diversion Structure: The base of a dam had a structure that controlled reservoir outflow, captured some of the current, screened coarse debris, and shunted the water into a ditch, flume, or pipeline. Diversion structures on large dams were usually chambers of concrete or masonry, or of planks on small dams. Water came from the dam's drain either through a pipe or outflow channel.
Inlet: Well-built reservoirs featured a structure that regulated and measured the input of water. Concrete and timber cribbing slowed the flow, decreased erosion, and had a gauge for measuring volume.
Level Gauge: The volume of water in a reservoir was measured by numbers painted on the face of a dam or vertical structure. The numbers represented common units of measure such as miner's inches, acre-feet, or gallons.
Outflow Channel: A drain, built into the dam base, siphoned water from the reservoir bottom and directed it into an outflow channel. The structure then carried the water under the dam to a diversion structure. The drain may have been a large-diameter pipe or a box culvert made of concrete or planks.
Pier: Large reservoirs had piers extending outward from the dam and over the drain pipe so a worker could manipulate the valve wheel. Some reservoirs also had piers for skiffs. The structures consisted of log pilings and plank decks.
Spillway: Nearly all dams had spillways to control the release of overflow water and prevent the erosion it otherwise caused. The spillway was usually on one end of the dam. Large dams featured concrete or masonry spillways, while those on small dams were of dry-laid rock or timber cribbing. The spillway directed the water into a drainage below the dam.
Valve: Valves controlled the amount of water exiting the reservoir's main drain and occasionally an emergency drain. On small dams, the valves were exposed gates in steel tracks, and raised by hand winches. On large dams, they were integral with the drain pipe and were raised via a gear turned by wheel.
Valve House: Large dams had valve houses, which were sheds that enclosed the valve mechanism. The sheds were small, impermanent, and planned in the field.
Valve Mechanism: Most valves were of the gate type, and a mechanism raised and lowered the heavy steel gates. The mechanism for an exposed gate was a hand winch anchored to a concrete or masonry foundation. The mechanism for a gate in a main drain was a worm gear turned by a wheel. The gear and wheel rotated in bearings bolted to steel or timber brackets.

Section F 5: Railroad Property Types and Registration Requirements

INTRODUCTION

Each drainage in the I-70 Mountain Corridor features historic resources from the railroad lines reviewed in Section E. Abandoned grades, whole or in segments, are the most common, while some tunnels, bridges, and culverts exist. Each railroad company also built right-of-way structures and service facilities along their lines in support of ongoing operations. Most have been dismantled and may be represented by archaeological features and artifacts. Archaeological resources could be eligible for the NRHP when their material evidence clearly conveys a property type and its design, function, general timeframe, and significance.

Two railroads still operate in the corridor. The Burlington Northern Santa Fe runs regional and transcontinental trains over a modified historic grade along the Colorado River in the corridor's western portion. The grade ascends the river from Glenwood Springs east to Dotsero and continues along the river north and out of the corridor. The segment from Glenwood Springs to Dotsero is the Leadville to Glenwood grade built in 1887 by the Denver & Rio Grande. The segment from Dotsero north is the Dotsero Cutoff completed by the Denver & Rio Grande Western in 1934. The rest of the Leadville to Glenwood line continues east from Dotsero through the corridor and is presently intact but abandoned. The Colorado Historical Society owns the second railroad, a tourist steam operation on a rebuilt Georgetown Loop in Clear Creek County. Both railroads are a blend of historic features, modified historic aspects, and recent additions, and should be evaluated under all NRHP Criteria, including exception G for resources achieving significance within the last 50 years.

This section defines historic railroad resources common to the I-70 Mountain Corridor, and their registration requirements. Itemized descriptions of archaeological, structural, and architectural features are offered at the section's end to refine resource interpretation.

The following Property Types are developed in this section:

- Railroad Grade
- Tunnel
- Drainage Structure
    - Culvert
    - Bridge
- Right-of-Way Structures and Objects
- Service Facility
    - Service Building
    - Service Structure
- Depot
    - Combination Depot
    - Flag Depot
    - Freight Depot
    - Passenger Depot
    - Temporary Depot

PROPERTY TYPE: RAILROAD GRADE

A grade is the principal structure of any railroad route and should be recorded as a linear resource, even when in segments. In his Colorado railroad context, Fraser notes that "The graded railroad route forms the basis for the entire railroad, virtually defining the line itself. The Roadbed, and to a broader extent the legal right-of-way for the railroad and adjacent railroad-related structures and natural features, delineates the historic corridor constituted by the railroad."[1]

Railroad grades are distinct, large-scale, structures whose designs were heavily influenced by the mechanics of locomotives and their trains of cars. In form, grades preferred straight lines, broad curves, and gradients rarely exceeding five percent to accommodate the limited traction power and turning radii of locomotives. Grades also featured smooth surfaces with gradual slope transitions to prevent trains of cars from parting. Thus, extensive cuts, fills, bridges, and sweeping curves were necessary in mountain conditions to maintain a consistent pitch.

Historically, most railroad grades included the rail bed, cuts and fills to level the surface, a layer of ballast, the track, and associated aspects such as spurs, sidings, and switches. The bed, a foundation for the track and ballast, had to be surveyed and graded to exacting specifications. Afterward, workers paved the bed with a veneer of ballast to provide a smooth, well-drained surface. Contractors preferred local gravel and sand and they frequently substituted waste rock from mines and slag from smelters when in mining districts. To save costs, however, many of Colorado's mountain railroads used poorly sorted rock rubble mixed with earth, and in some cases, nothing at all.

Once the ballast was ready, track gangs assembled the track. All the railroad companies in the I-70 Mountain Corridor initially built their tracks to narrow-gauge specifications in which the rails were spiked exactly 3 feet apart inside-width. The gauge was well suited for mountain conditions because it cost less to construct and negotiated tighter curves. By the late 1880s, the Denver & Rio Grande and possibly the other carriers began converting to standard-gauge with rails spiked exactly 4 feet and 8½ inches apart inside-width. Standard-gauge was universal among non-mountain railroads.

All railroad tracks were assemblages of rails spiked to ties, often with ballast tamped around the ties to keep them from shifting. The ties were 6 to 7 inches thick, 6 to 12 inches wide, 6 to 8 feet long for standard-gauge lines, and shorter for narrow-gauge tracks. While ties treated with creosote lasted the longest and were the norm for most railroads, Colorado companies often used raw, locally cut versions to reduce construction costs. The savings were short-term, however, because such ties rotted and had to be replaced within five years. The rails were spiked directly to the ties in the early years of railroading, which further shortened the ties' lives. In later years, various types of steel tie plates were inserted underneath the rails, increasing longevity. The rails themselves came in various weights measured in pounds-per-yard, with heavier rails being more durable but costly than light rails. Narrow-gauge tracks universally incorporated rails that were lighter than standard-gauge lines, primarily because they were easier to mold to the tight turns characteristic of narrow-gauge construction. During the first several decades, narrow-gauge rails were typically 20 to 30 pounds per yard, and in later

[1] Fraser, 1997:142.

decades, the weight increased to 40 to 45 pounds per yard. By contrast, standard-gauge rails ranged from 45 to 135 pounds per yard.[2]

While all railroad grades featured a main line, they often had minor tracks that controlled the flow of traffic and directed trains to service points. Sidings paralleled the main line and had entry and exit switches, and spurs were dead-end tracks. Named for their configuration, wyes extended away from the main line at oblique angles and had entry and exit switches. Wyes usually joined two main lines together so trains could pass from to the other unbroken, and they were also used on dead-end spurs to turn locomotives around.

The late 1880s photo of the Denver & Rio Grande line through Glenwood Canyon exemplifies a typical railroad grade and common characteristics. Evident are cuts and fills to level the grade, and gentle curves and straight lines required by locomotives. The track consists of rails, ties, and a veneer of ballast over the carefully flattened surface of the gravel bed. Courtesy of Denver Public Library, CHS.J3885.

[2] Fraser, 1997:142.

PROPERTY TYPE: TUNNEL

Railroad companies made every effort to grade their lines around major topographic obstacles instead of pushing through. Open-cuts and tunnels, bores blasted through obstructions for train passage, were very costly and time consuming to complete. Because of this, railroad companies avoided entire routes, like the Union Pacific Railroad abandoning its plans to cross the Great Divide from Silver Plume into Summit County. In some cases, routes such as the Denver & Rio Grande line in Glenwood Canyon encountered bedrock outcrops for which no alternative existed but to blast through. Relatively short tunnels, such as those in that canyon, were not as difficult to bore as lengthy passages because they required little infrastructure to sustain construction.

In the I-70 Mountain Corridor, most if not all the tunnels are limited to Glenwood Canyon, where they are fairly short and simple. Tunnels had to be accurately surveyed to be compatible with the associated railroad grade and large enough to accommodate locomotives. Like bridges, railroad companies constructed tunnels with the utmost practicality and no superfluous ornamentation. In boring tunnels, railroad companies adapted methods of drilling and blasting from underground mining. For this reason, the companies also often attempted to secure miners as labor. The workers drilled blast-holes by hand with hammers and drill-steels, used dynamite to blast the rock, and hauled waste rock out in ore cars or wheelbarrows. If the tunnel was long, they may have used mechanical rockdrills powered by an on-site air compressor. Some of the waste rock was dumped at the tunnel mouth, forming a dump, while much of the material was used as fill or ballast on the new railroad track.

PROPERTY TYPE: DRAINAGE STRUCTURE

All the railroads in the I-70 Mountain Corridor crossed numerous drainages, creeks, and rivers to maintain negotiable grades. In Clear Creek County, the Georgetown, Breckenridge & Leadville Railroad even looped over itself. Drainage structures were constructs facilitating the crossings, and their subtypes can be found throughout the corridor. Bridges literally carried tracks over streams or rivers, and most were large enough to require formal engineering. Culverts, on the other hand, directed runoff underneath the railroad bed, and were within the grasp of experienced crews in design and construction.

Drainage Structure Subtypes

Property Subtype: Culvert: Culverts directed low-flow creeks and seasonal drainages underneath or through the base of a railroad bed. The structures were the simplest and least costly drainage crossings because they were short in length, easy to build with available materials, and required no formal engineering. Usually construction contractors adapted one of several common designs, depending on drainage size and anticipated runoff. Pipe culverts were installed in minor gullies, and they consisted of several tubes laid slightly above the drainage floor and buried with rail bed fill. Wood stave, terracotta, and riveted sheet iron pipes were common from the 1880s through the 1910s. Nested cast iron and concrete segments, and full-length corrugated steel tubes were substituted afterward.

Pipes were generally inadequate for high volumes of storm runoff because they plugged easily. To accommodate greater stream flows, railroad companies at first built masonry culverts typically consisting of a flat floor, vertical walls, and an arched ceiling. By the 1900s, concrete became popular, and it was either poured in place or precast in sheets and assembled in the drainage. All were buried with fill and featured flared ends both to retain the rail bed and protect the masonry from erosion.

Box culverts were another popular drainage structure, primarily because of their low cost and ease of construction. Wood was common for small sizes and concrete was best for large structures, and all consisted of a flat floor and vertical walls capped with a flat ceiling.

Property Subtype: Bridge: Bridges are perhaps the best known and most iconic drainage crossing. Because of cost and time required for construction, railroad companies reserved bridges for drainages and waterways that were too broad and deep for culverts. Bridges were engineered structures, and nearly all in the mountains were constructed to provide service at a reasonable cost with little thought for aesthetics. Companies tended to build simple, wooden trestles early in a railroad's life and used steel and concrete by the 1910s.[3]

Every bridge consisted of a superstructure carrying the railroad track, and a substructure, which were the load-bearing elements in support. Substructures included abutments anchoring both ends of the bridge, and if the bridge was lengthy, vertical pilings, piers, or bents were added in between. Abutments had flat platforms or terraces upholding the superstructure and walls retaining fill material in the bridge approaches. Long bridges required intermediate supports, and engineers favored three general types. Pilings, the simplest and least costly, were vertical posts driven into the ground, and they directly supported the superstructure elements. Piers, a type of columnar support, consisted of two or more posts joined at top by a cap and at bottom by a footer. Bents, another columnar support system, were elongated piers with bracing for rigidity. A bent consisted of vertical posts tied together with caps, footers, intermediate cross-members, and diagonal bracing for rigidity. The outside posts were usually at a batter, or inward slant. Initially, railroad companies assembled substructures with logs and timbers because they were inexpensive, locally available, and easy to assemble. Wood, however, was perishable, and in later years, companies substituted rock masonry and concrete.

The bridge's superstructure was a horizontal latticework of beams spanning the gap between the abutments. Stringers were the principal beams extending from one abutment to the other and bore the most weight. Joists were smaller timbers laid in series 90 degrees across the stringers, and they usually supported a deck oriented in the same direction as the bridge. Ties, rails, and more plank decking were nailed to the deck plates, and they served as the top-surface of the entire structure.

According to railroad historian Clayton Fraser, bridges were categorized by materials, configuration, support system, and relationship to the railroad track. Bridges were also defined by the number of spans, which were the lengths between supports. Single-span bridges crossed from abutment to abutment with no intermediate support, two-span bridges featured two segments supported by a pier somewhere near center, three-span bridges had three lengths supported by two piers, and so forth.

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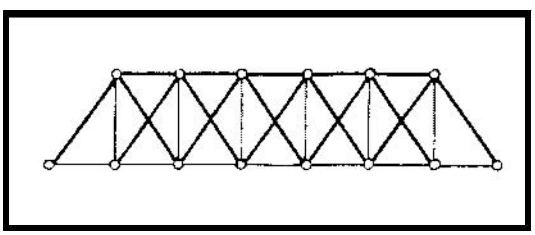
[3] Fraser, 1997:179.

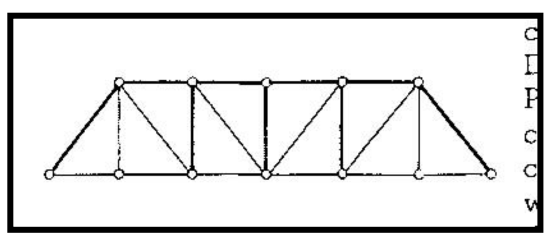
Only two general bridge types were common in the I-70 Mountain Corridor, the timber stringer and the truss. The timber stringer was widely used through the 1910s because of its simplicity, low cost, quick construction time, and adaptability to field conditions. Single-span versions were little more than stringers, the railroad track, and plank decking. In multispan versions, piers or bents supported the stringers, and they were usually tied together by lattice-works of horizontal and diagonal braces. The overall design was adapted to location, and materials were often logs or timbers. Such bridges were expected to last 20 to 30 years and then replaced in part or entirety.[4]

Truss bridges were more complex, requiring formal design according to engineering principals, but were able to carry more weight over longer spans. At least seven designs existed, and all were based on a system of horizontal lower and upper chords. The lower chords were under tension and bore weight of the railroad track and decking. The upper chords were under compression and suspended the lower chords with lattice of vertical and diagonal braces. Truss bridges were factory-made in regular lengths, shipped in pieces, and easily assembled. The Howe and Pratt varieties consisted of timbers and iron fittings, while the other types generally consisted of steel beams. Truss bridges were more costly to build but required much less maintenance than timber stringer types. Most of the truss bridges in Colorado were based on the Pratt pattern and built well into the twentieth century.[5]

When steel became widely available and the weight of trains increased during the mid- twentieth century, railroad companies adapted steel to the old timber stringer design. Steel stringer bridges consisted of single spans of tightly spaced I-beams between 20 and 40 feet long, which supported either the railroad track, or a top sheet for ballast. Steel girder bridges featured two or three stringers of enlarged I-beams riveted together, and these were used for multiple spans from 25 to more than 100 feet in length.



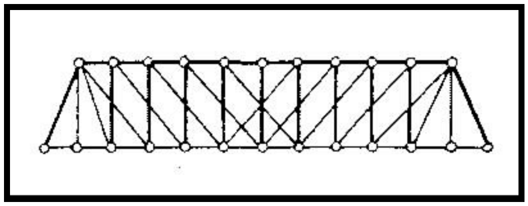
Howe truss bridge. Source: Fraser, 1997:185

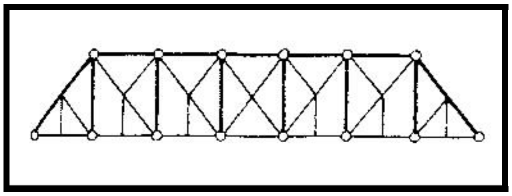


Pratt truss bridge. Source: Fraser, 1997:187

[4] Fraser, 1997:184.
[5] Fraser, 1997:187.

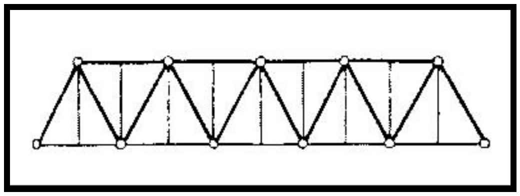
Whipple truss bridge. Source: Fraser, 1997:187

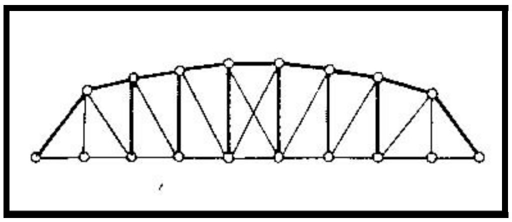




Baltimore truss bridge. Source: Fraser, 1997:188

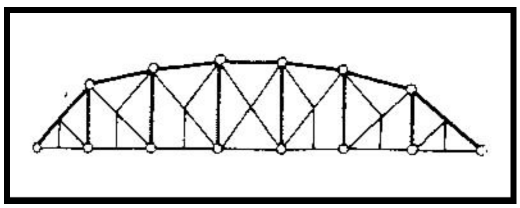
Warren truss bridge. Source: Fraser, 1997:188





Parker truss bridge. Source: Fraser, 1997:187

Pennsylvania truss bridge. Source: Fraser, 1997:188

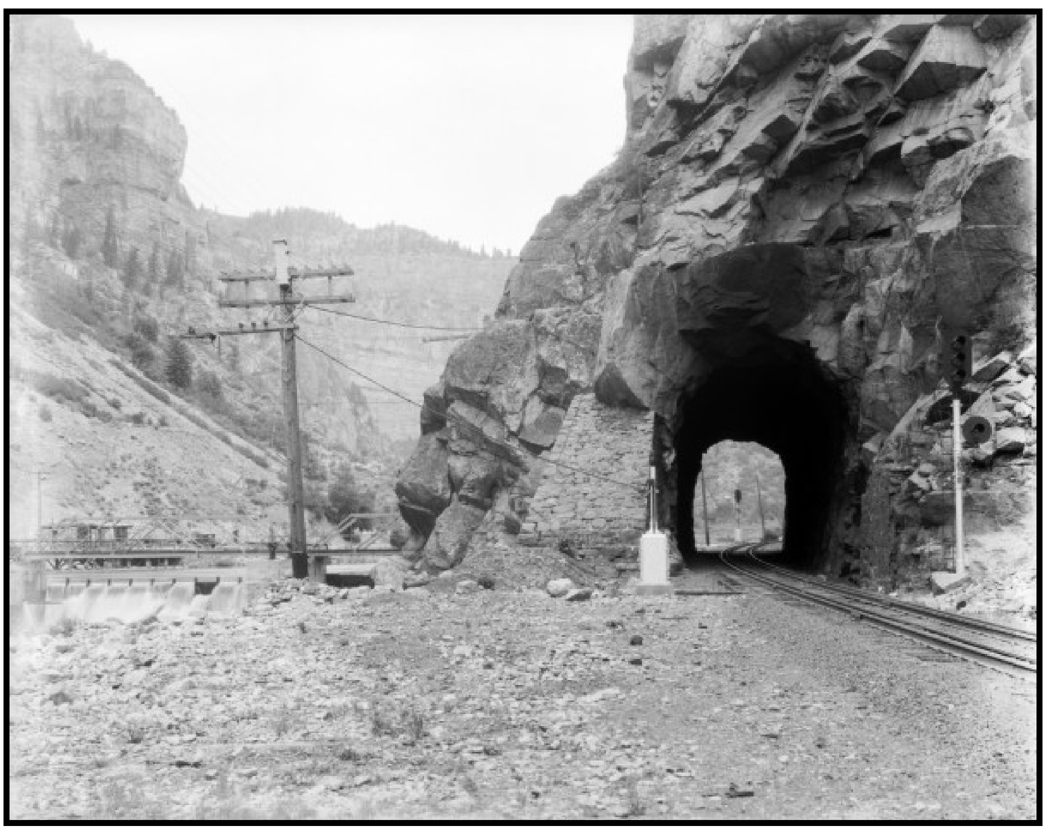


This bridge near Minturn is a three-span steel stringer bridge. The type, common in the corridor, replaced most other bridges. Courtesy of Denver Public Library, GB-6254.

PROPERTY TYPE: RIGHT-OF-WAY STRUCTURES AND OBJECTS

Right-of-way structures are a broad resource category adapted from Clayton Fraser's Colorado railroad context. The category includes objects, buildings, and structures other than bridges in support of railroad operation and maintenance. Further, the facilities were located directly along railroad lines, usually within the right-of-way. Common right-of-way structures and objects are listed and described in detail at the back of this section's end.

Structures and objects may be self-contained resources in themselves, components of small-scale systems, or components of railroad-wide systems. Signs, fences, and switching devices are examples of independent resources and are best recorded as features of the associated railroad. They may be factory-made, built as needed with available materials, or a combination of both. A locomotive water tank, its feed plumbing, and pump exemplify a small-scale feature system, defined here as a group of components in close proximity designed to function as an entity. These systems were often planned in the field according to immediate need and local conditions, and built with a combination of local materials and factory-made components. Small-scale systems may be recorded and evaluated in themselves or with the greater railroad. Railroad-wide systems consisted of components related in function, and distributed along a large portion of the railroad line. A signal light is an example, being a node in a larger traffic control system with sensors and other lights elsewhere along the railroad. Such an assemblage should be recorded and evaluated with the parent railroad.



The circa 1925 photo a typical railroad tunnel and right-of-way objects and structures in Glenwood Canyon by the Shoshone diversion dam, left background. The utility pole is a structure, and the signal lights objects. All are contributing elements of the railroad as a resource. Courtesy of Denver Public Library, GB-6399.

Right-of-way structures include constructs for transferring freight along railroad grades. Examples include ore bins, frames for logs and lumber, and loading docks. These resources qualify as right-of-way structures when independent and built specifically for the railroad. But when they are a component of a site separate in function from the railroad, such as a mine or sawmill, these resources should be recorded with their parent site.

PROPERTY TYPE: SERVICE FACILITIES

Mountain railroading came with many challenges. Keeping the system and its equipment in running order was a perpetual and costly process because the conditions and climate caused heavy wear. Hardware, structural elements, tools, machinery, and rolling stock required regular maintenance if not replacement. Railroad companies completed most of this work at centralized yards located outside of the I-70 Mountain Corridor. But they also had satellite facilities at strategic points within the corridor, occasionally on spurs and sidings, and primarily in centers of operation such as Georgetown, Silver Plume, Frisco, and Dotsero. The yards also were used for freight transfer and storage, and sometimes workers' housing. The resources involved in the maintenance and ongoing support of railroad operations fall within the broad category of service facilities. The common types are listed and described in detail at the section's end.

Service facilities included open work stations, structures, buildings, and mechanical systems usually clustered together at a small yard, a rail siding, or spur. Most were dedicated to maintenance operations, although yards were also used for the storage and transfer of custom freight and railroad materials. A typical yard on a mountain railroad line may have included one or two shops for machining and carpentry, and an open-air work station where large pieces of equipment were serviced. Workers stored lubricants, solvents, and other goods in a small oil house, and tools and handcars for track maintenance in a tool shed. Locomotives received coal and traction sand from bins along a spur track or siding, where train crews also stationed snowplows and empty cars. Multiuse yards sometimes had loading docks, storage sheds, and hoisting derricks for freight.

Service Facility Property Subtypes

Property Subtype: Service Building: The category includes buildings in support, of maintenance and freight operations. Shops, storehouses, and car sheds are types that existed in the I-70 Mountain Corridor, and a few examples may have survived. The buildings were usually components of larger service complexes found in switchyards and along sidings.

When planning the buildings, railroad companies prioritized function and cost over appearance, which tended to be utilitarian and unadorned. Most of the buildings were of frame construction, sided with planks or sheet iron, and roofed with shingles, rolled asphalt, or more sheet iron. Those along tracks were elevated on pilings while others away from tracks were on foundations of timbers, masonry, or concrete. The companies often implemented standardized designs for large buildings such as shops and warehouses, while workers assembled small buildings according to skill, available materials, and their interpretation of need. Construction methods, materials, and appearance usually imitated other railroad buildings. As a result, small buildings tended to be vernacular and simple in form, but similar in appearance to railroad architecture.

Service buildings, described at the section's end, can be recorded and evaluated for significance independently if the surrounding setting and associated facilities lack integrity. Otherwise, they should be treated as a component of the larger service complex if physical context survives.

Railroad sidings and yards, such as this one at Minturn in 1954; usually feature service buildings and structures. Service buildings and structures can be evaluated for significance individually, but are best done so within the context of the greater resource. Courtesy of Denver Public Library, RR-1739.

Property Subtype: Service Structure: Service structures were non-architectural constructs associated with railroad maintenance and operations. Loading docks, hoisting derricks, and water and fuel tanks are examples of designed structures. When planning loading docks, workers often imitated versions seen elsewhere, and they assembled the structures with available materials such as a combination of logs and lumber. Hoisting derricks and water tanks combined factory-made hardware with support structures made from milled lumber or steel assembled in the field.

Service structures may be self-contained resources in themselves, components of small-scale systems, or components of larger railroad complexes. Loading docks and hoisting derricks are examples of self-contained structures. A locomotive water tank, its feed plumbing, and pump exemplify a small-scale feature system, defined here as a group of components in close proximity and designed to function as an entity. These systems were often planned in the field according to immediate need and local conditions, and built with a combination of local materials and factory-made components. Independent structures and small-scale systems may be recorded and evaluated in themselves if the greater facility or setting lost their integrity. Service yards, with their buildings and structures, qualify as railroad complexes and should be recorded as evaluated as a single entity when possible.

PROPERTY TYPE: DEPOT

Depots are among the most celebrated icons of the railroad industry. The depot was a crown jewel for every mountain community served by a railroad because it was a symbol of rail service, a status of economic success, and a representation of corporate presence, which were strong values of the time. Depots were also focal points for the movement of people and freight, and communication in the forms of newspapers, mail, telegraphs, and telephones. Railroad companies assigned great importance to depots for a number of reasons. Ticket and freight offices were principal places of business where revenues were collected. Administrative offices were centers of regional operations, coordination among trains, maintenance, and railroad communications. Some depots even offered housing for regional railroad employees.

In his railroad context, Clayton Fraser placed depots in their own category because of both their importance and their prevalence relative among surviving railroad structures. Fraser identified five general types of depots common in Colorado. The categories include combination, flag, passenger, temporary, and terminal depots. Some mountain communities with productive resource extraction industries also had a sixth category not mentioned by Fraser: the freight depot. All categories except for terminal depots either existed or were highly likely in the I-70 Mountain Corridor. A few examples may still stand, others are now archaeological sites, and some have been completely lost to urban development, highway construction, and Dillon Reservoir.[6]

Depot Property Subtypes

Property Subtype: Combination Depot: Railroad companies built combination depots in small communities offering passenger and freight business, but not in enough volume for separate facilities. In the I-70 Mountain Corridor, such settlements included Dumont, Lawson, Frisco, Wheeler, and Minturn.

As the name implies, combination depots were single buildings divided between passenger service, freight, and railroad operations. These depots were the most common type in Colorado, and they conformed to a limited variety of floor plans. Many railroad companies employed standard designs, and in some cases the depots were prefabricated, shipped in parts, and assembled on-site.

Combination depots were architecturally distinct frame buildings on an elevated foundation adjacent to a railroad track. The smallest, reserved for rural routes with limited service, was a two-room structure where passengers waited in the agent's quarters, and the agent conducted his business and kept packages in a freight room.[7]

Most depots were, however, larger and more sophisticated. They were rectangular or L-shaped in floor plan with individual rooms for a ticket and administration office, passenger waiting room, secure baggage room, and freight storage. The office and baggage room were usually at center with passenger and freight rooms at either end. Depots in busy areas also may have featured an express freight locker by the

[6] Fraser, 1997:156.
[7] Fraser, 1997:157.

office, and living quarters in a loft for the station staff, train crews, and maintenance workers.[8]

In terms of appearance, depots featured lofty gabled roofs and deep overhangs, clapboard or shiplap siding, and plank platforms along the track side and freight room. The office faced the track and usually had bay windows, the passenger room featured tall double-hung windows, and the freight room lacked windows and instead offered broad, panel doors. Railroad companies often enclosed the base with a skirt, nailed trim around the doors and windows, and added decorative detailing on the corners and roofline.

The Idaho Springs railroad depot was a combination type with typical architectural characteristics. The railroad tracks are on the other side. Courtesy of Denver Public Library, OP-6385.

Property Subtype: Flag Depot: Flag depots were the smallest type of station, built in areas where business was minor. Although these depots were common to interurban lines, they could have existed on isolated stretches of the railroads in the I-70 Mountain Corridor. The depots were so named because they lacked ticket agents and instead required the passengers to flag down approaching trains.[9]

The typical depot was based on an elevated plank platform adjacent to a track. Near center was a frame pavilion with three walls and a gabled roof enclosing several benches. Another set of benches underneath a gabled awning roof extended off the pavilion and provided additional seating.[10]

[8] Fraser, 1997:157.
[9] Fraser, 1997:159.
[10] Fraser, 1997:159.

Frisco featured a flag depot, photographed during the 1890s or 1900s. This version was fully enclosed with wood stove to keep passengers warm in winter. Courtesy of Denver Public Library, X-8544.

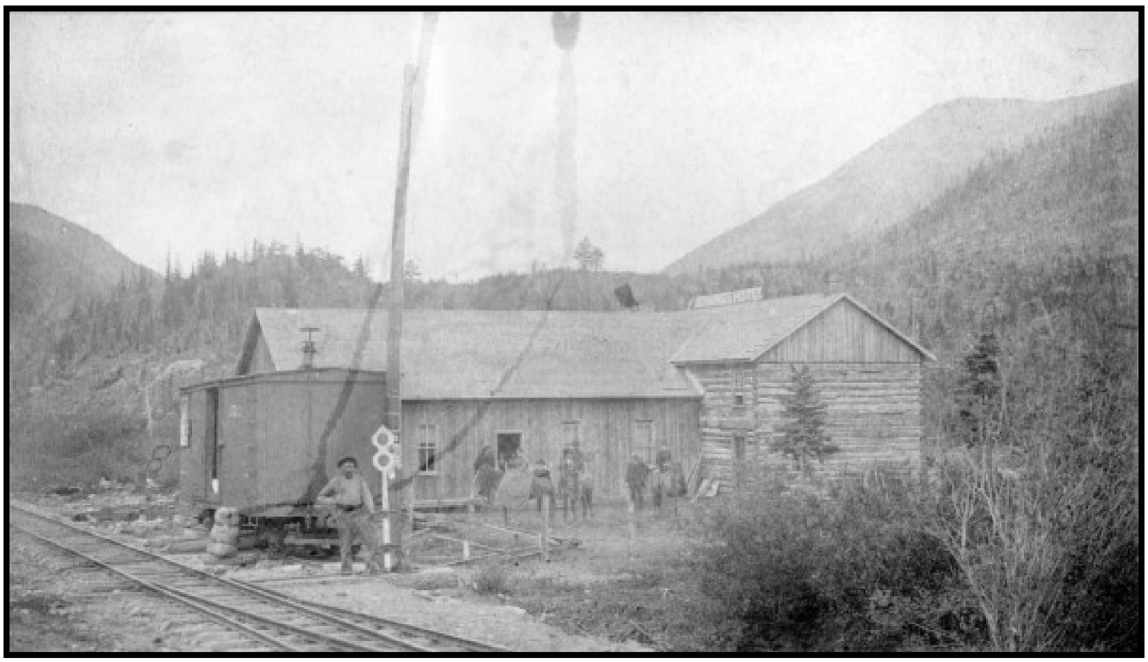
Property Subtype: Freight Depot: Railroad companies built freight depots in mountain communities with highly productive industries such as mining and logging. In the I-70 Mountain Corridor, towns such as Georgetown, Silver Plume, and Dillon qualified. The depots were dedicated to the movement of high volumes of freight and did not necessarily have formal accommodations for passengers. Instead, passengers usually boarded trains at separate passenger depots described below.

Freight depots often featured a warehouse with an office, as well as loading platforms, hoisting derrick, and specialty loading structures. In Clear Creek County, for example, these structures could have been ore bins or frames for lumber and logs. Because loading freight took time, the depots were usually located on a siding so that cars could be uncoupled from the train and left. Empty land surrounded the depot for the storage of bulk freight such as lumber, hay, and ore.

Property Subtype: Passenger Depot: Passenger depots were a counterpart to freight depots, and they were built in communities where passenger business was high enough to justify a dedicated facility. The simplest depots had a ticket office, waiting room, and baggage room on a single floor, with an adjoining plank platform fronting the railroad track. Large depots may have been two-story buildings with an express office, mail room, administration office, break room for train crews, dining room, and toilets. Overall, the floor plans and architectural styles were similar to those of combination depots.

Property Subtype: Temporary Depot: Temporary depots were another simple type of station, and their purpose was meet to meet short-term needs. When railroad companies first graded into a new area, they often constructed a temporary depot to secure business while a permanent station or yard was in construction. Railroad companies also installed temporary depots to test the amount of passenger and freight business that new markets could offer. If the amount of traffic was sound, then the company may have replaced the temporary depot with a permanent station. Railroad companies occasionally installed temporary depots when dismantling the facilities along a line prior to final abandonment.[11]

Two types of temporary depots were common. One was an assemblage of portable modules brought to a site on flat cars and set up in imitation of a combination depot. Railroad cars, either a passenger coach or boxcar, housed the second type of temporary depot. These were parked literally at the end of the line and were used primarily for passenger traffic and light freight. The Georgetown, Breckenridge & Leadville railroad installed such a station at Graymont in 1883.[12]



The boxcar at left is a temporary depot at Graymont, end of the line for the Georgetown, Breckenridge & Leadville Railroad. The depot served area mining companies and tourists staying at the Jennings Hotel, background. Courtesy of Denver Public Library, Z-2566.

RAILROAD PROPERTY TYPE SIGNIFICANCE

The railroad grades, tunnels, right-of-way structures, service facilities, and depots described as Property Types above were components of larger railroad systems. Every railroad included most if not all these Property Types, and no system could have functioned without them. In overview, railroad grades were the lines themselves, featuring the tracks used by trains. Tunnels and drainage structures allowed the tracks to pass through or over topographic

[11] Fraser, 1997:159.
[12] Fraser, 1997:159.

impediments common to mountain routes. Without these structures, the railroad lines would have been impossible. Right-of-way structures facilitated orderly, all-season operations necessary for the success of any mountain railroad. Related signs and signals controlled traffic, and fences and snowsheds kept the tracks clear, which resulted in efficiency and safety. Coal bins and water tanks, also within a right-of-way, fed locomotives and kept them running between stations. Service facilities supported the maintenance, ongoing operations, and freight business required for long-term service. Depots were nodes of administration and business, serving as exchanges for people, freight, communications, and money.

The railroads fulfilled numerous functions important on local and statewide levels. They provided their service areas with inexpensive transportation and an all-season link with the outside world. In so doing, the railroads revolutionized industry, economy, settlement, and quality of life among corridor communities. On a broader level, the corridor's railroad lines were part of a statewide system with ties to a national network. These connections facilitated a flow of natural resources to consumers outside the corridor, goods in, and a mass movement of people between a variety of places. As a result, Colorado's wealth increased, its industries expanded and diversified, and the central mountains became closely allied with other portions of the state.

Because the above railroad Property Types were integral to and critical components of the corridor's railroad systems, they share the same general registration requirements. The Property Types were important in a number of NRHP areas of significance, including Community Planning, Commerce and Economics, Engineering, Industry, Transportation, and Landscape Architecture.

Period of Significance must be considered when assessing the historical importance of railroads. In general, the Period 1873 to present covers railroad transportation as a theme throughout the corridor. But the individual railroad lines were important only when they operated, thus narrower timeframes of importance are more applicable when assessing resource significance. The important periods of time by region are 1873 to 1940 in Clear Creek drainage, 1882 through 1937 in Summit County, and 1886 to present along the Eagle and Colorado rivers. Level of significance will be local, statewide, and national for transcontinental lines.

> *Area of Significance: Community Planning:* All the railroads were significant in the area of *Community Planning* because they influenced settlement patterns and were even the reason for the existence of some corridor communities. In particular, Graymont in Clear Creek County and Minturn in Eagle County were established by railroad companies. Graymont became an important railhead and tourist destination, but later abandoned. Minturn began as a construction camp, continued as a railroad service hub, and is still a local commercial center. When railroads arrived in the corridor's other communities, they increased the importance of those communities by encouraging local industry, trade and commerce, and development along rights-of-way. The communities were then able to weather economic cycles and deterioration of natural resource-based industries better than the settlements lacking rail service.
>
> *Areas of Significance: Commerce and Economics:* Railroads were significant in the areas of *Commerce* and *Economics* on local and statewide levels because they were a major conduit for trade, input of investment capital, and the movement of cash.

In terms of trade, the railroads radically changed the economies of their service areas by offering low-cost freight transportation. The price of goods and industrial supplies fell, while the worth of natural resources increased. Industry then grew, produced more, and generated greater income. Industry and residents had more money as a result, and the dollar had a higher relative value with increased purchasing power. Businesses and residents were able to buy higher volumes of goods at lower prices than before, improving daily life and conditions for industry.

In terms of capital, the railroads increased investment in their service areas in two principal ways. First, they fostered a sense of confidence among business financiers, who perceived railroads as a reflection of prosperity and a secure investment climate. Second, railroads allowed financiers to personally survey a region and its resources for their investment potential. Those financiers were more likely to visit in the comfort of a railroad and provide capital for ventures made tangible through personal examination.

In the movement of cash, railroads were the prime carrier of physical money into a region. The money went to banks, businesses, and local government. Further, railroads shipped gold and silver bullion produced in mining districts to financial institutions in Colorado's banking centers. This movement of wealth was a cornerstone of Colorado's economy.

Area of Significance: Engineering: As components of larger mountain railroad systems, the corridor's lines are significant in the area of *Engineering* for several contributions. Levels range from local to national. The Rocky Mountains presented a combination of topographic and climatic conditions few companies previously faced when planning and running railroads.

Company engineers had to adapt conventional design principals when planning their routes through tight mountain canyons, up steep grades, and across bedrock slopes. In some cases, engineers overcame restrictive topography with innovative engineering solutions. The Georgetown Loop, the Argentine Central, and the line through Glenwood Canyon, for example, were precedent-setting in their own ways.

The mountain conditions presented challenges to ongoing operations once the railroad companies finished their lines. Train crews developed strategies and infrastructure systems for climbing and descending exceedingly long grades, and keeping tracks snow-free. The carriers also improved traffic control communications and signal systems to prevent conflict.

The mountain conditions presented business opportunities that stimulated engineering. In Clear Creek drainage, the CCRR integrated pavilions, services, and destinations into its system to enhance a growing tourist trade. The D&RGW invented observation cars to lure tourists onto its Colorado River line and used them as a basis for the California Zephyr train.

Overall, these and other improvements became contributions to railroading as engineers adapted them to other systems elsewhere.

Area of Significance: Industry: The corridor's railroads contributed in the area of *Industry* on local and statewide levels. The railroads provided their service areas with the first, inexpensive, all-season transportation capable of hauling heavy loads. In so doing, the railroads fostered the growth of industry, primarily mining, logging, and dependent businesses. When the railroads instituted service, the prices of goods decreased and the variety increased. This proved crucial for logging and mining for three reasons. First, operating costs fell. Second, large machinery and other forms of technology could be hauled in at affordable prices. Third and perhaps most important, the rates for shipping ore and forest products were substantially reduced. The result for mining was that outfits were now able to pursue lower grades of increasingly complex ore from greater depths, which was previously unprofitable. Similarly, logging companies were able to work in remote reaches of forests, mill lumber at sawmills near the rail lines, and ship their products to distant markets.

These trends are readily apparent in corridor history. The CCRR helped bring Clear Creek drainage into boom shortly after establishing its Floyd Hill railhead in 1873. The D&RG and DSP&P had the same effect in Summit County beginning in 1882. The D&RG Leadville to Glenwood Springs line boosted mining at Aspen during the late 1880s, and coal production in the Colorado River valley in the next decade. The line even supported steel smelting in Utah and Pueblo, Colorado. The railroad lines also fostered other industries such as farming, ranching, and tourism.

Besides supporting industrial growth in the corridor, the railroads were important because they were industries in themselves. The railroads employed hundreds, contracted with numerous service businesses, produced thousands of ties, and supported economies throughout the corridor.

<u>Area of Significance: Transportation:</u> In the area of *Transportation*, the railroads were significant because they were the corridor's principal carriers of people, freight, and money. By carrying freight and money, the railroads supported industry and settlement. Natural resources and other industrial products flowed out of the corridor, and supplies and domestic goods for industry and residence flowed in. By carrying people, the railroads supported settlement, tourism, and the migratory pattern characteristic of the mountain west.

The D&RG Leadville to Glenwood Springs and Dotsero Cutoff lines are significant on a national level as links in the only transcontinental routes through the Rocky Mountains. The lines tied portions of the nation east of the mountains to portions in the west. From the 1900s to present, the lines carried all manner of freight and passenger traffic between the western and eastern states. This was important in the broad movement of natural resources, manufactured goods, food, mail, the military, professionals, tourists, and people in residential transition.

<u>Area of Significance: Landscape Architecture:</u> When large in scale, railroad Property Types may be significant in the area of *Landscape Architecture* when they represent system design on a landscape level. Railroad companies purposefully altered the landscape when building routes negotiable by trains. Large-scale resources such as grades, bridges, and yards can impart a strong sense of railroad transportation and related engineering, which was the principal means of moving materials and people during the corridor's Period of Significance. The railroads not only were large-scale alterations in themselves, but also heavily influenced land use organization.

Railroad Property Type Registration Requirements

To qualify for the NRHP, railroad Property Types must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Railroad Property Types eligible under Criterion A must be associated with at least one listed area of significance. They also can be eligible when associated with events and trends important to their I-70 Mountain Corridor area, or parent railroad. Archival research may reveal additional historical associations not covered in Section E.

Criterion B: Resources may be eligible under Criterion B if an important person was physically engaged at the property on a sustained basis. Presence will probably be through employment, operations management, or construction. The resource must date to the same timeframe when the individual achieved significance, and retain physical integrity relative to the person's productive period of occupation. If significance is through the person's presence on-site and participation in operations or construction, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. A brief biography is necessary to explain the individual's significant contributions. Important people often invested in railroad companies or owned property, but did not personally occupy a site. Such an association does not meet Criterion B. The individual of note must have been present on-site.

Railroad grades have high potential for eligibility under Criterion B because most were personally surveyed and built by noteworthy engineers and construction contractors. Some tunnels, bridges, right-of-way features, and service facilities might qualify through a presence of important construction contractors. These Property Types were, however, rarely connected with prominent engineers on a physical level. Combination, passenger, and freight depots may qualify because they were workplaces where important individuals spent periods of time. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Railroad Property Types may be eligible under Criterion C when they clearly exemplify their specific category and possess integrity relative to their parent railroad's operating timeframe. Because most equipment and buildings were removed when a railroad ended service, integrity is usually on an archaeological level. A resource retains integrity on an archaeological level when the material evidence clearly conveys function, overall design, structures and equipment, operations, and timeframe. Intact buildings, structures, and machinery are rare and important, and may qualify individually as examples of engineering, technology, and architecture specific to mountain railroads. For a resource to be eligible, it should possess character defining attributes even if on an archaeological level.

Eligible *railroad grades* must possess a predominance of original aspects including surveyed route, bed surface, cuts and fills, and other adaptations to topography. Most of the corridor's railroad grades evolved since abandonment, and changes should be carefully identified and assessed. A grade may have been widened, curves straightened, cut-banks relaxed, and tracks rebuilt from narrow- to standard-gauge. Lengthy grade segments might represent adaptation of railroad design, planning, and construction methods to a challenging mountain environment. Small-scale features can be important contributing elements if they clearly convey aspects of railroad engineering. Examples include track, switches, and adaptation to natural features. Railroad grades may be eligible as representative works of master engineers or contractors. In such cases, the reason why the grade is an important work, and who the important individual was, must be explained.

Eligible *tunnels* and *bridges* convey design, engineering, construction methods, and relationship with the railroad. Tunnels must possess intact portals with original appearance and minimal alteration. Bridges should retain form, materials, and features of their superstructures and substructures. If a bridge has been dismantled, its remaining archaeological or engineering features can be eligible when they clearly convey specifics of the super- and substructure. Bridges and tunnels may be also eligible as representative works of master engineers or contractors.

Right-of-way structures and objects may be eligible when they reflect their resource type and convey its significance. Small-scale features such as signs and switching devices must be relatively complete and in place. Engineered systems, such as track signals and water tanks, should reflect design, construction, and integration into the railroad. When represented by archaeological evidence, systems or their components can be eligible if the remnants convey the above characteristics

Service facilities should represent the design, function, timeframe, and composition of their resource types. Buildings, engineered structures, and designed complexes such as yards need not be complete to be eligible. Resources can be eligible if well represented by archaeological features and artifacts. Material evidence must convey design, function, timeframe, and relationship to the railroad.

Depots may be eligible under Criterion C when they reflect one of the types and date to the parent railroad's operating timeframe. Preserved depots may reflect architectural styles, floor plans, and construction methods common to the railroad industry. They also could represent how railroad companies organized and facilitated a flow of passengers and freight through stations. If a depot has been dismantled, its remaining archaeological features can be eligible for the same reasons, provided that they clearly convey design, use, and timeframe.

Property Types may also be eligible if they are contributing elements of historic landscapes. When in an urban setting, nearby buildings and structures should be similar in age, and the Property Type should contribute to the community's historic feeling. When in a rural setting, the Property Type, or its archaeological remnants, should contribute to the feeling of railroads as the principal transportation in the mountains. If the resource is in an industrial setting, then it should convey the relationship between railroads, manufacturing, or natural resource extraction. Nearby historic resources must be compatible in timeframe and possess integrity.

<u>*Criterion D:*</u> Railroad Property Types may be eligible under Criterion D if they will yield important information upon further study. In general, the researcher must state the arena of inquiry, why it is important, and how the resource will address the questions. If a resource possesses structures and buildings, detailed examination may reveal how engineers adapted architectural, structural, and mechanical design to run and maintain

railroads in difficult, high-altitude conditions. Intensive inventories and analyses of artifact assemblages around service facilities and depots may enhance existing knowledge regarding railroad operations, maintenance, and behaviors of workers and travelers.

Eligible Property Types must possess physical integrity relative to the timeframe when its parent railroad operated. Because most buildings, structures, and engineered systems were dismantled when retired, integrity will probably be on an archaeological level. For archaeological remains to possess sufficient integrity, the material evidence should clearly convey the facility, its operation, and timeframe. Common features for the Property Types are at the section's end.

Most of the seven aspects of integrity defined by the NRHP apply to railroad Property Types. Intact buildings, structures, and machinery must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, the material remains, including archaeological features, must convey the facility's organization, planning, engineering, and integration with the railroad. To retain integrity of materials, the physical substance used in buildings, structures, and machinery should date to a railroad's timeframe. To retain the aspect of *setting,* the area surrounding the resource must not have changed a great degree from operational timeframe. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining or logging landscape, then the surrounding resources and industrial features should retain integrity at least on an archaeological level. If the site lies in an urban setting, then adjacent buildings and structures should appear to be similar in age. In terms of *feeling,* the resource should foster a perception of its function and relationship to the railroad from a historical perspective, and from today's standpoint. Integrity of *association* exists where buildings, structures, machinery, and archaeological features convey a strong sense of connectedness between the resource and a contemporary observer's ability to discern its historic function

PROPERTY TYPE: RURAL HISTORIC RAILROAD LANDSCAPE

Rural Historic Landscapes are large-scale cultural resources representing the history of an area's human occupation, life ways, and relationship with the land. In the I-70 Mountain Corridor, rural historic landscapes provide physical context for resources left by railroads. The extensive tracts of land traversed by the railroads, combined with natural features and smaller scale historic resources, represent the history, people, traditions of railroading, and its relationship with the rest of the region.

Historic landscapes possess defining characteristics organized by the National Park Service into 11 categories. The first four are a result of processes instrumental in shaping the land, and the last seven are physical attributes apparent on the land.[13] All are tangible evidence of the activities, values, and beliefs of the people who occupied, developed, used, and shaped the land to serve human needs. The categories as adapted to railroad landscapes include

1. *Land uses and activities:* Land use and related activities are among the principal human forces that left an imprint on the land. In the I-70 Mountain Corridor, railroads directly fostered certain land use patterns such as mining, logging,

[13] McClelland, et al., 1999:3.

agriculture, and settlement along routes. The railroads also used land in their own way, grading lines through negotiable topography, establishing facilities in open ground, and drawing from natural resources. The landscapes are in continuous use, and although most of the railroads have been abandoned, two lines still operate near Georgetown and along the Colorado River. Here, the tradition of railroading perpetuates in the landscape.

2. *Patterns of spatial organization:* When railroad companies graded a line through an area, they followed distinct patterns in land use, route choice, siting of facilities, and other physical manifestations. Those patterns conformed to railroad-specific spatial organization on a landscape level. Spatial organization for railroads was influenced primarily by a relationship between the technology of trains, distribution of industry and settlements, and major environmental conditions. Organization was also a function of politics, natural resource distribution, and cultural values. The above factors determined which areas the railroad companies served and the routes taken. Large-scale patterns characteristic of railroad geography may remain constant, while individual features such as buildings and bridges change over time.
3. *Response to the natural environment:* Major natural features such as mountains, valleys, and streams governed both the location and organization of railroad lines and related facilities. Climate and vegetation influenced the siting of individual buildings, as well as railroad service complexes. Marketable natural resources were important in several ways. Most of the railroad companies graded their lines specifically to serve natural resource industries. The companies also relied on natural resources for construction materials, fuel, and water. Distribution of customers and a railroad's own needs influenced route and facility planning.
4. *Cultural traditions:* In general, cultural traditions affect the way people used, occupied, and shaped the land. Religious beliefs, social customs, ethnic identities, and trades and skills may be evident today in both physical features and uses of the land. The railroads were conduits by which people brought their ethnic customs into the I-70 Mountain Corridor, which successive generations later perpetuated. Some customs such as the romance of trains originated with the railroads and evolved with continued occupation of the region after the industry's dissolution. The cultural groups interacted with the environment, manipulating and altering it for the railroads, and sometimes altered their traditions in response.

   Cultural traditions determined the configuration of railroads by influencing route choice, structural designs, and ways that the land was used. Traditional structural forms, methods of construction, and functional solutions to topographic problems evolved in the work of local individuals.
5. *Circulation networks:* Circulation networks are systems for transporting people, goods, and raw materials from one point to another. They range in scale from the railroad systems themselves to road networks built to access stations.
6. *Boundary demarcations:* Boundary demarcations separate different tracts of land, some intentionally and others inadvertently. Intentional boundaries such as fences, survey monuments, and railroad grades defined ownership and land tracts dedicated for specific use. Inadvertent boundaries like streams, slope changes, and rock outcrops influenced how railroad companies used and developed the land. Many types of boundaries still persist and influence traditional land use.

7. *Vegetation related to land use:* Vegetation, among the most dynamic aspects of a landscape, bears a direct relationship to land use. In forests, some indigenous trees may replace others cleared for a railroad line and yet conform in community to historic vegetation patterns. Vegetation can reflect poor land stewardship, such as the growth of weeds and thistles in abandoned rail-yards. Geometric patterns of grass, brush, and trees can mark historic boundaries, building and structure footprints, and transportation systems. Age of vegetation communities is also relevant. Older stands of trees may reflect uncut forests while young stands take over areas previously cut for use.
8. *Buildings, Structures, and Objects:* Buildings, structures, and objects served human needs related to occupation and use of land. Their function, materials, date, condition, construction, and location reflect the activities, customs, tastes, and skills of the people who built and used them. Railroad buildings and structures often exhibit patterns of design and construction that may be common to the industry or unique in the corridor. They may reflect the sophistication of an operation, its economic state, or skills of a construction contractor or engineer. The repeated use of methods, forms, and materials may indicate successful solutions to building needs, or demonstrate the unique skills, workmanship, or talent of a local individual.
9. *Clusters:* Groupings of buildings, railroad facilities, or other features can reflect function, social tradition, climate, or other influences, cultural or natural. The arrangement of clusters may reveal information about historical and continuing activities, as well as changing technologies and the preferences of particular generations. Repetition of similar clusters throughout a landscape may indicate vernacular patterns of siting, spatial organization, and land use. The location of clusters, such as service facilities in a community, may reflect broad patterns of a region's cultural geography.
10. *Archaeological sites:* The sites of service facilities, coal and water stops, and stations may be marked by foundations, ruins, changes in vegetation, and surface remains. They may provide information about land use, social history, transportation patterns, and settlement.
11. *Small-scale elements:* Examples of small-scale elements include tools, debris, signs, and abandoned railroad hardware. These elements add to the historic setting of a railroad landscape and may be remnants of larger components, such as a switch stand representing an earlier track junction.

The defining characteristics of a rural historic railroad landscape also can be described in terms of "landscape of work."[14] When railroad companies graded lines through the natural environment, they molded the landscape for efficiency, organization, and technology of trains. Landscapes of work for railroad transportation feature defining characteristics and patterns. The most common broad-scale pattern was a route along paths of least resistance while linking key communities and centers of industry. The railroad companies sited stations, freight yards, and service facilities in the communities and industrial areas. Within each complex, the buildings and facilities were often clustered for efficiency in materials-handling, loading, the movement of

[14] Messick, Denise P.; Joseph, J.W.; Adams, Natalie P. *Tilling the Earth: Georgia's Historic Agricultural Heritage, A Context* Stone Mountain, GA, New South Associates, 2001:62.

people, and ongoing operations. Circulation systems in the form of roads linked the stations and freight yards with centers of industry and population.

Although most railroad landscapes of work are no longer used for their original purpose, they offer evidence of associated cultural traditions. Railroading had tangible impacts on the I-70 Mountain Corridor by changing its vegetation, contributing to the development of road networks, and influencing patterns of settlement and industrial development. Railroad resources and aspects of the natural environment are interspersed, and both should be considered together as a whole.

Rural Historic Railroad Landscape Significance

Because railroad landscapes are large in scale, their significance as cultural resources can be assessed in a broad sense. The most relevant NRHP areas of significance include Architecture, Community Planning and Development, Economics, Engineering, Industry, and Transportation. Multiple NRHP areas and criteria are often applicable because railroad landscapes are diverse, complex, and offer numerous historic resources.

Period of Significance must be considered when determining the historical importance of rural historic landscapes. Although the Period applicable to the I-70 Mountain Corridor spans 1873 to present, the individual railroad lines were important only when they operated. Narrower timeframes of importance are more applicable when assessing landscapes in the corridor's drainages. The important periods of time by region are 1873 to 1940 in Clear Creek drainage, 1882 through 1937 in Summit County, and 1886 to present along the Eagle and Colorado rivers. Level of significance will be local, statewide, and national for transcontinental lines.

Area of Significance: Archaeology: Railroad landscapes are significant in the area of *Archaeology* when their historic resources have been reduced to archaeological sites. Most of the sites must retain integrity on an archaeological level, which is the ability of a site's features and artifacts to clearly convey timeframe, function, design, and other aspects. On the scale of a landscape, studies of archaeological sites in their natural setting may reveal important aspects of railroad transportation, its patterns, history, and people.

Area of Significance: Architecture: Those historic landscapes with standing buildings may be important in the area of *Architecture* for several reasons. Railroad engineers and contractors adapted previously established building forms, designs, and methods of construction to Rocky Mountain systems. In their adaptation, builders considered natural landscape features, local climate, available materials, cost, and integration with the railroad. Multiple buildings distributed in a landscape can represent the evolution of architecture specific to railroads.

Areas of Significance: Community Planning and Development: Railroad landscapes are important in the area of *Community Planning and Development*. They reflect the direct influence that rail service had on settlement, industry, and related land use patterns. The development of rail lines, trends in industrial growth and decline, and the effect on communities are often evident in the landscape.

Area of Significance: Economics: Railroads were conduits for the movement of raw materials, finished goods, people, and cash. Railroad landscapes reflect this flow of wealth through the corridor and to points at either end. Carriers shipped natural resources and products out of the corridor, where they were exchanged for cash and finished goods. The latter materials were then hauled into the corridor and distributed among residents and industry. Money changed hands with each transaction. The railroads also brought new wealth into the corridor in the form of capital investment. Financiers accustomed to comfort were more likely to assess investment potential in the corridor when they could travel by rail. Personal examination of an industry or area often increased confidence among financiers, who were then more willing to invest. The railroads themselves were economically important, investing in infrastructure and operations and distributing income along their routes. The infrastructure became a direct expression of wealth in the landscape.

Area of Significance: Engineering: Railroad landscapes represent the implementation of period transportation engineering in the central Rocky Mountains. Representation may be small-scale resources such as machinery or structures, as well as large-scale systems like railroad grades traversing an entire landscape. Small-scale elements may reflect an adaptation of railroad equipment and structure design, form, and construction to the mountain environment. Large-scale systems, especially grades, can convey how railroad engineering principals were molded to the unique topographical conditions of the mountains. The railroad companies also may have innovated new ways of solving problems posed by the land and its resources. Multiple structures arranged in a landscape can represent the evolution of engineering specific to railroads.

Area of Significance: Industry: The growth and decline of industry in the corridor was largely a function of railroads. They reduced transportation costs, increased the availability of industrial supplies, hauled in large pieces of machinery, and carried natural resources and other products to market. Industry boomed, expanded, exhausted available natural resources, and then contracted or disappeared altogether. These patterns are expressed in the evolution of land use. The railroads were an important industry in itself, using the land in their own way and creating systems landscape in scale.

Area of Significance: Transportation: Railroads were important transportation systems that underwrote how the corridor's landscapes were shaped. They influenced patterns of industrial and community development, and other forms of land use such as agriculture and tourism. Railroad landscapes are expressions of the most important form of period transportation and its impacts on the natural environment.

Agricultural Rural Historic Landscape Registration Requirements

To qualify for the NRHP, a railroad landscape must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: To be eligible under Criterion A, landscapes relevant to the theme of railroad transportation must be associated with broad events and trends of importance. Examples include, but are not limited to, the areas of significance noted above.

Criterion B: Large-scale landscapes may be eligible under Criterion B provided that they were occupied by an important person for an extended period of time. A railroad grade, for example, may have been personally built by a prominent contractor. Small-scale landscapes such as service yards may be eligible through residence, employment, or other relationship by a significant individual. The associated resource must retain physical integrity relative to that person's occupation during the person's productive period of time. Further, the resource must date to the same timeframe as when the individual achieved significance. If an individual can be connected with the landscape, then the researcher must explain the significant contributions in a brief biography. Important people invested in railroad companies or owned land but did not occupy the property. Such an association does not meet Criterion B. The individual of note must have been present on the ground. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Historic landscapes may be eligible under Criterion C if buildings, structures, and landscape features represent a railroad and its relationship with associated industry and communities. Because landscapes were occupied for extended periods of time, the patterns can be expected to reflect the evolution of land use. Intact buildings may be significant representations of architecture specific to railroads in the central mountains. Multiple buildings within a single landscape may represent transition in type, style, methods, workmanship, and materials. Similarly, structures may be significant representations of engineering specific to railroads, and multiple structures within a single landscape may represent evolution of function, design, methods, workmanship, and materials. Buildings and structures may also exemplify characteristics distinct to the corridor. Natural features are contributing elements.

Criterion D: Buildings, structures, and land modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents land use patterns, then the landscape retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should represent the general layout of individual complexes, as well as their relationships to industry, communities, and the land. If archaeological features and artifacts offer important information regarding land use, community development, the application of engineering, or railroad operations, then the landscape may qualify under Criterion D.

If complexes within the landscape possess building platforms, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography of the occupants. When the results from multiple complexes are compared, regional patterns may become apparent. Important areas of inquiry include but are not limited to diet, health, and substance abuse. Other areas of inquiry relate to the distribution of gender, families, ethnicities, professional occupation, and socioeconomic status.

Historic landscapes eligible for the NRHP must possess physical integrity relative to the timeframe when a railroad operated. According to the National Park Service: "Integrity requires that the various characteristics that shaped the land during the historic Period be present today in much the same way they were historically."[15] Continuity in occupation and use, however, changed railroad landscapes in the corridor to some degree. Occupation and use are compatible with integrity when they maintain the character and feeling of railroads and their relationship with the land. Forestry, logging, underground mining, and ongoing railroad operations are compatible, while modern intrusions should be few and unobtrusive. The presence of some landscape characteristics is more important to integrity than others. Railroad grades, historic industrial sites, natural features, and the types of small-scale features typical of railroads should be present.

Many of the seven aspects of historic integrity defined by the NRHP apply to railroad landscapes, although not all need be present. *Location* is the place where significant activities that shaped land took place. A landscape whose characteristics retain their historic place has integrity of location. For integrity of *design*, the landscape features, both manmade and natural, must convey aspects of railroad organization and planning. *Setting* is the physical environment within and surrounding a historic property. To retain integrity of setting, a landscape and bordering area must not have changed a great degree in overall character. Because corridor railroads traversed the natural environment, preserved forests, streams, and mountainsides should be present. For integrity of *feeling*, the landscape should convey railroad systems from a historical perspective and in the context of today's perceptions. Integrity of *association* exists where natural and manmade features convey a strong connectedness between the landscape and a contemporary observer's ability to discern historic railroad operations.

RAILROAD BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Railroad Grade Feature Types

Clinker Dump: Clinker is a dark, scorious residue byproduct of burning fuel coal in locomotives, and it had to be shoveled out of boiler fireboxes regularly. Often this was done in yards, on sidings, and when locomotives took on fuel and water. Over time, the repeated disposal created distinct dumps.

Ditch: Ditches flanked rail beds and diverted drainage water.

Grade: A grade is the rail bed and associated earthwork such as cuts, fills, and ditches. Grades were usually elevated berms with flattened surfaces, and paved with ballast such as gravel. Pitch rarely exceeded five percent, the traction limit of locomotives, and slope changes were gradual.

Main Line: A main line is the principal railroad track.

Rail Bed: A rail bed is the carefully leveled surface on a grade for the track.

Refuse Dump: When railroad companies conducted maintenance on their lines, they often threw unwanted refuse such as old ties, worn rails, stumps, and junk into piles.

Siding: A siding was a minor track parallel and adjacent to a main line, and it allowed trains to stop for fuel, water, and to wait for passing traffic.

Spur: A spur was a dead-end track that diverted off the main line, and it was used to park cars and load freight.

[15] McClelland, et al., 1999:21.

Switch: A switch was the union of two tracks.
Track, Narrow-Gauge: A track was the assemblage of rails and ties on a rail bed. Narrow-gauge tracks were 3 feet wide between rails.
Track, Standard-Gauge: Standard-gauge tracks were 4 feet 8½ inches wide between rails.
Track Remnant: When tracks were dismantled, often only the rails and spikes were removed, leaving the ties in place. The ties, impressions left by ties, and scraps of rail in place constitute the remnant.
Wye: A wye was a type of intersection that joined two tracks at oblique angles. The wye featured curved approaches to the oblique extension that allowed trains to sweep from one track onto the other without breaking.

Drainage Structure and Tunnel Feature Types

Bent: A bent was a vertical structure that supported a bridge span. Bents were assemblages of posts tied with cross-members and diagonal braces. The outside posts were usually set at a batter, leaning inward from the structure base.
Bridge Abutment: An abutment was the bulwark that supported the ends of a bridge. Where possible, bedrock was used to support the bridge's structural elements. When this was unavailable, platforms had to be created. In early years, logs and timbers retained benches of rock fill, and in later years, footings of stone masonry and concrete were constructed.
Bridge, Multi-Span: A multispan bridge featured segments supported by piers or bents.
Bridge, Single-Span: A single-span bridge featured one segment extending from abutment to abutment.
Culvert, Box: A box culvert consisted of a flat floor, vertical walls, and a flat ceiling buried by the railroad grade. Wood and concrete were the most common construction materials.
Culvert, Concrete: A concrete culvert usually featured a flat floor, vertical walls, and either an arched or flat ceiling. The size of the opening was significantly larger than that of a box culvert, and it usually featured headwalls.
Culvert, Masonry: A masonry culvert usually featured a flat floor and an arched ceiling made of stones.
Culvert, Pipe: A pipe culvert was little more than one or several pipes buried by railroad grade fill. Early pipes were wood or terracotta. By the 1890s, cast-iron pipes were common, and during the 1940s, corrugated iron and concrete pipes were popular.
Ditch: Ditches were excavated in minor drainages to direct runoff into and out of culverts.
Flume: A wooden, masonry, or concrete structure that carried water into or away from a culvert.
Tunnel: A tunnel was a bore through a rock obstruction. Tunnels had to be large enough to accommodate a steam locomotive.
Tunnel Portal: The entry into a tunnel was known as a portal, and it was usually finished with timber, rock masonry, or concrete facing.
Waste Rock Dump: Waste rock was the material generated by boring a tunnel. The waste rock was usually dumped at the tunnel mouth, where it formed a broad fan or lobe.

Right-of-Way Structure and Object Feature Types

Bumper Stop: Dead-end rail spurs and sidings featured bumper stops to prevent locomotives and cars from rolling off the end of the track. Most bumper stops were custom-made and assembled from salvaged rails or timbers, and others were factory-made of steel and featured spring-loaded bumpers.
Cistern: Where railroad tracks passed steep mountainsides, cisterns provided water for steam locomotives instead of traditional elevated water tanks. The cistern was located above the track and the water conveyed to the locomotive via a pipe and hose. A cistern was usually square or rectangular, assembled with stone masonry or poured concrete, and featured a pipe at bottom.
Coal Bin: Steam locomotives consumed enormous tonnages of fuel coal and had to stop at strategic points to replenish their supplies. Coal bins contained the fuel, and they were sloped-floor structures with chutes that unloaded the coal directly into locomotive tenders. The bins were rectangular, substantial, and elevated on pilings.
Coal Bin Ruin/Platform: When a coal bin was dismantled, it left archaeological evidence in the form of pilings, rock foundations, and an earthen footprint usually blanketed with bituminous coal.

Coal Dock: Coal docks were a smaller, less expensive alternative to formal bins. Docks were open, flat-bottom structures with low sidewalls, and they were similar in elevation to station platforms. Workers manually shoveled the coal from the dock into the locomotive tender.

Coal Dock Ruin/Platform: When coal docks were dismantled, they left archaeological evidence similar to coal bins, only the assemblage of materials was simpler.

Fence, Right-of-Way: Railroad companies constructed fences in open areas to both define their rights-of-way and keep livestock off tracks. Initially, fences featured wooden posts, later replaced with steel posts.

Fence, Snow: In the mountains, windblown snow had the potential to form drifts that blocked tracks and impeded railroad traffic. In response, railroad companies erected fences to alter localized wind currents and cause the snow to collect off the tracks. Picket fences assembled with slats and baling wire were the most effective but also costly, and where the wind was not fierce, railroad companies substituted buck-and-rail and log fences.

Loading Dock: A loading dock was little more than an elevated plank platform that facilitated the transfer of freight into railroad cars.

Loading Dock Ruin: Ruins of loading docks can manifest as collapsed structures and outlines of pilings.

Mile Post: Mile posts usually stood at regular intervals along railroad lines and marked sequential distances from an important point such as a yard or station. Posts were either of wood or concrete and painted white with black numbering.

Pipeline: Pipelines conveyed water from collection points to places of use, usually a locomotive water tank. Collection points may have been springs, wells, or cisterns.

Pump: Pumps, mostly hand-operated, were anchored adjacent to locomotive water tanks, and they forced water up into the tank for storage.

Retaining Wall: In the mountains, retaining walls independent of the road grade were necessary on steep slopes to prevent loose material from rolling down onto the tracks. They ranged in construction from log cribbing to dry-laid masonry.

Road Crossing: Road crossings allowed wagons and automobiles to cross over railroad tracks. They featured ramp approaches, timber fillings between the rails, and occasionally warning signs.

Road Crossing Signal: Busy road crossings often featured electric signals that warned vehicles of approaching trains. The signals had electric lights, and occasionally audible warnings, signs, and gates.

Sand Bin: Railroad locomotives sprinkled sand on rails in front of the driving wheels to provide them with traction. The sand was stored in wooden bins alongside the tracks and shoveled into hoppers on the locomotive. The bins were similar to but smaller than coal docks.

Sand Bin Ruin/Platform: When sand bins were dismantled, they left structural evidence similar to that associated with coal docks, described above. Sand can be expected amid and around the ruin.

Sand House: Sand houses were sophisticated versions of the sand bins described above in the section on right-of-way structures. The typical structure included an enclosed bin elevated on piers so gravity could draw the sand into locomotives. In later years, a small conveyor lifted the sand into the bin.[16]

Snowshed: Railroad companies built snowsheds for two principal reasons. First was to protect rail lines from avalanches. In such cases, the sheds stood over tracks that crossed or passed below steep mountainsides. Second was to prevent snowdrifts from blocking rail lines. Avalanche snowsheds were robust, featured sloped roofs, stout walls, and presented a low profile. These characteristics bolstered the structures against the crushing forces of avalanches and allowed the snow to skim over the top. Snowsheds built for snowdrifts were not as stout and instead were lengthy frame buildings.

Snowshed Ruin: When collapsed, snowsheds left distinct archaeological evidence. Avalanche snowsheds tend to feature a heavily constructed upslope wall and structural debris on the downslope side for the length of the structure. Drift snowsheds offer light structural debris along their lengths, as well as timber footers.

Switching Device: A switching device consists of the mechanism and linkage that activated a track switch. For much of mountain railroad history, hand switches engaged with levers were common, and in later years, electric and pneumatic models were employed on main lines. The switch stand, where the controls were located, usually featured a sign.

Track Sign: Railroad companies installed signs at important points along tracks to convey information or warnings to train crews, maintenance employees, and the public. Examples include bridge and culvert numbers, derail points, highway signs, road crossings, road stop signs, section numbers, siding signs, slow points, snowplow posts, speed limits, station names, warning signs, whistle points, and yard limits.

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[16] Fraser, 1997:175.

Traffic Signal: Traffic signals, a twentieth century invention, helped different trains avoid conflict. By the 1910s, railroad companies installed signals with moveable arms that directed trains onto sidings or spurs. By the 1940s, signal lights became more common. The mechanical signals and light stands were parts of complex systems that were wired together, such that when one train was given the signal to proceed, trains in the opposite direction were directed to pull onto the nearest siding.
Traffic Signal Shed: The communications switches and wiring for traffic signal systems were enclosed in sheds alongside railroad tracks. The sheds were usually small frame structures or prefabricated sheet-iron boxes.
Utility Pole: Nearly all railroad tracks featured a series of utility poles off the road bed, and they carried wires for telephones, track signals, and occasionally electric power. Poles were typically logs with cross-members fitted with glass insulators, and some feature date nails.
Watchman's Cabin: Railroad companies employed watchmen who regularly surveyed sections of main lines for problems such as rockfall, fires, and bridge damage. They lived in small cabins at strategic points on the line where problems were most likely to occur. The cabins were simple, impermanent, one-room structures without facilities such as plumbing.
Watchman's Cabin Platform: When a watchman's cabin was removed, as most were, they left archaeological evidence in the form of cut-and-fill platforms with assemblages of domestic artifacts.
Water Tank: Steam locomotives consumed high volumes of water and had to replenish every five to ten miles in the mountains. Thus, railroad companies built tanks at various points along their lines. The typical tank was cylindrical, between 12 and 30 feet in diameter, elevated on pilings, and featured a hinged spout to direct water into a reservoir on the tender or locomotive. Nearly all tanks built prior to around 1900 consisted of wooden staves bound with steel hoops, and afterward, they were factory-made of sheet iron. Tanks required a source of water which, in the mountains, was usually piped from a spring or small reservoir. If the tank stood near a slope, then the pipe delivered the water directly into the top, and if not, then a worker operated a hand pump to lift the liquid.
Water Tank Platform: Railroad companies commonly relocated water tanks for use elsewhere, leaving evidence reflecting the tank's original placement. Remaining are concrete or stone footers for the pilings, an outline of the tank based on soil differentials, and structural debris, all adjacent to a rail bed.

Service Facility Feature Types

Service Buildings

Blacksmith Shop – Character-Defining Features

Blacksmiths manufactured hardware, sharpened tools such as picks, and repaired steel and iron parts. They did so in shops equipped with a forge, workbenches, hand tools, and mechanical appliances. The buildings were often vernacular in that they were designed by workers in the field to meet needs of blacksmithing, at little cost, with available materials. Shops were industrial in appearance and followed no architectural style.

- Core Plan: Rectangular, open interior.
- Stories: 1 or 1½
- Foundation: Timber footers, crude stone, or concrete on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Large-diameter stovepipe.
- Entry Door: Usually located in the front, broad, and made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Car Shed – Character-Defining Features

Car sheds were elongated buildings over one or two spur tracks, and they sheltered important railroad cars such as Pullman sleepers and snowplows. When building the sheds, the railroad company may have followed a standardized design or planned the building according to need, function, and budget.

- Core Plan: Rectangular, open interior.
- Stories: 1 but tall
- Foundation: Timber or concrete footers.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: None.
- Entry Door: Double doors usually located in both ends.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Carpentry Shop – Character-Defining Features

Carpenters were extremely important to railroad operations because they maintained rolling stock and fabricated fine woodwork. Carpentry shops were equipped with mechanical appliances powered by a central steam engine or later by electric motors. The shops tended to be substantial in size, sometimes large enough to fit a rail car, and based on a standardized design or planned according to need, function, and budget.

- Core Plan: Rectangular, open interior.
- Stories: 1 or 1½
- Foundation: Timber footers, crude stone, or concrete on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Large-diameter stovepipe.
- Entry Door: Usually located in the front, broad, and made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Engine House – Character-Defining Features

Engine houses were rare in the I-70 Mountain Corridor, and those that may have existed were similar to enlarged barns. Known as square houses, they were rectangular in footprint, large enough for one or two locomotives, and stood over an equal number of spur tracks. The interiors were usually open and floored with earth, concrete, or asphalt.[17] The design may have been standardized for the railroad industry or produced by the company engineer.

- Core Plan: Rectangular, open interior.
- Stories: 1 but tall, with clerestory
- Foundation: Masonry or concrete footers.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Louvered cupolas.
- Entry Door: Double doors usually located in both ends.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Machine Shop – Character-Defining Features

Machine shops were among the most important railroad facilities because they serviced and fabricated parts for railroad equipment. Machine shops were equipped with mechanical appliances such as lathes, trip hammers, and threaders. Early shops were powered by a central steam engine and later by electric motors. The shops tended to be substantial in size, sometimes large enough to fit a rail car, and based on a standardized design or planned according to need, function, and budget.

[17] Fraser, 1997:167.

- Core Plan: Rectangular or L-shaped, sometimes divided into rooms.
- Stories: 1 or 1½
- Foundation: Timber footers, crude stone, or concrete on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Large-diameter stovepipe.
- Entry Door: Double doors made of planks usually located in front, and broad side-door made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Oil House – Character-Defining Features

Oil houses were storage sheds for petroleum products such diesel fuel, gasoline, and lubricating oil. Fuels were usually stored in tanks plumbed to spigots and hoses, and lubricants were in barrels and cans. The structures were small, of frame construction, and sided with fireproof materials. In design, they may have been based on standardized plans or constructed as needed. Even when emptied of goods, tanks and petroleum stains are distinguishing characteristics.

- Core Plan: Rectangular or square.
- Stories: 1 or 1½
- Foundation: Timber footers or concrete on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, or shed, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: None.
- Entry Door: Vertical plank door in front.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Powerhouse – Character-Defining Features

Power houses enclosed equipment that generated power for mechanical appliances in maintenance and switchyards. Prior to the 1910s, when steam drove most machinery, the buildings enclosed a boiler, a coal bin, a water tank for the boiler, plumbing, and possibly a pump. By the 1910s, electricity became popular, and small generators with steam drive engines were included. Powerhouses tended to be substantial in size and based on a standardized design or planned according to need, function, and budget.

- Core Plan: Rectangular or L-shaped, divided into engine and boiler rooms.
- Stories: 1
- Foundation: Timber footers, crude stone, or concrete on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: Boiler smokestack.
- Entry Door: Double doors made of planks usually located in front, and broad side-door made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

Privy –Character Defining Features

- Core Plan: Rectangular or square.
- Size: 3x4 to 5x8 feet in plan.
- Foundation: Log or timber posts, log footers, or corner rocks around open pit.
- Walls: Post-and-girt frame, or corner posts with cross-members, sided with planks or sheet iron on the exterior.
- Roof: Front- or side-gabled, or shed, with plank decking, and rolled asphalt, asphalt shingles, or smooth or corrugated metal. Decking may span the walls or be fastened to 2x wood rafters.
- Entry Door: Entries were usually vertical plank doors, sometimes opening onto a plank deck.

<u>*Storehouse – Character-Defining Features*</u>

Storehouses were buildings for railroad materials and supplies. The buildings were rectangular, single-story, with gabled roofs and open interiors. Small storehouses stood on timber footers or concrete foundations, while large versions were elevated on pilings or fill pads alongside railroad tracks. Windows were few and doorways broad. Railroad companies may have followed a standardized design or planned the building as needed.

- Core Plan: Rectangular, open interior.
- Stories: 1 or 1½
- Foundation: Timber footers, crude stone, or concrete. Pilings when adjacent to railroad track.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: None.
- Entry Door: Double doors or sliding doors made of planks usually located in front, and broad side-door made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

<u>*Warehouse – Character-Defining Features*</u>

Freight was an economic mainstay of railroad companies, and they built warehouses at all principal points of commerce to receive and store goods. Small warehouses stood on timber footers or concrete foundations, while large versions were elevated on pilings or fill pads alongside railroad tracks. Windows were few and doorways broad. Railroad companies may have followed a standardized design or planned the building as needed.

- Core Plan: Rectangular, open interior.
- Stories: 1 or 1½
- Foundation: Timber footers, crude stone, or concrete. Pilings when adjacent to railroad track.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: None.
- Entry Door: Double doors or sliding doors made of planks usually located in front, and a broad side door made of vertical planks.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

<u>*Tool House – Character-Defining Features*</u>

Railroad companies built tool houses at almost every important node along a main line. The simple, frame buildings contained equipment and a hand car needed for regular maintenance work. The buildings were rectangular, single-story, rarely larger than 10x15' in plan, with shed or gabled roofs.

- Core Plan: Rectangular or square.
- Stories: 1
- Foundation: Timber footers on earthen platform.
- Walls: Frame sided on exterior with planks, sheet iron, or tarpaper.
- Roof: Front- or side-gabled, or shed, with rafters, plank decking, and sheet metal or shingle cladding. Corrugated sheet iron, rolled asphalt, or asphalt shingles were common by the 1900s.
- Chimney: None.
- Entry Door: Vertical plank door in front.
- Windows: Square or rectangular with frames made of 1x or 2x milled lumber.

<u>*Service Structures and Archaeological Features*</u>

<u>*Blacksmith Shop Platform:*</u> Blacksmith shops left distinct forms of archaeological evidence when dismantled. The building's footprint, usually on an earthen platform, is often readily apparent and

manifests as an outline of scorious dark clinker, which was residue created by burning coal in the forge. High portions of anthracite coal, clinker, and forge-cut iron scraps are characteristic artifacts.

Carpentry Shop Platform: Carpentry shops left distinct forms of archaeological evidence when dismantled, such as a footprint or an earthen platform, and an artifact assemblage of cut wood scraps, machine parts, and broken tools.

Clinker Dump: Clinker dumps can be found anywhere along railroad tracks, and they consist of the scorious residue left from burning coal, known as clinker. The dumps are created when the material is shoveled out of locomotive fireboxes.

Equipment Storage Area: Companies usually dedicated a small plot of ground near a rail spur to store ties, rails, supplies, and parts.

Fuel Tank: Diesel railroad engines and refrigerator cars needed to replenish fuel reserves en route across the mountains. Tanks at principal maintenance centers contained the fuel, and they were large steel cylindrical vessels on concrete foundations. Pipes directed the fuel to filling nozzles.

Fuel Tank Foundation: When removed, fuel tanks can be represented by circular or rectangular concrete pads, often stained with petroleum, and with plumbing.

Hoisting Derrick: A hoisting derrick was a primitive type of crane used to transfer heavy materials onto and off rail cars. The apparatus featured a timber boom, a mast, and a winch that pivoted on a small turntable bolted to a stout foundation. Derricks could be found on loading docks, in yards where pieces of equipment were stored, and near warehouses.

Hoisting Derrick Foundation: When dismantled, hoisting derricks left foundations of timbers, concrete blocks, or masonry pads studded with anchor bolts. The foundations should be located near a rail line.

Ice House: Prior to the widespread adoption of refrigeration, railroad companies kept tons of ice for three general purposes. The first two were company consumption among passengers and for shipping perishable goods in freight cars. The third was as a commercial commodity harvested in the mountains during winter, stored by railroad companies in ice houses, and distributed to urban areas as needed. Ice houses were relatively small, frame buildings insulated with sawdust, clinker, or sand, and often countersunk in the ground. Ventilation ports in the walls, fitted with coverings, prevented condensation in the interior.[18]

Ice House Ruin: Collapsed ice houses, which qualify as archaeological features, may be distinguished by their insulation-filled walls, countersunk arrangement, and ventilation ports.

Industrial Refuse Dump: Railroad workers often disposed of unwanted industrial debris in concentrated areas alongside railroad tracks and spurs, and around the fringes of yards. When substantial, the accumulation became a dump.

Loading Dock: Loading docks were traditional elevated plank platforms adjacent to rail lines, and they eased the transfer of freight and other materials into and out of rail cars.

Loading Dock Ruin/Platform: Loading docks, when dismantled, left archaeological evidence such as a footprint of debris, a raised earthen platform, or an outline of pilings.

Machine Shop Platform: Machine shops left distinct archaeological evidence when dismantled, such as a footprint or an earthen platform outlining the building, timber or concrete foundations for shop appliance, and metalwork debris.

Power House Foundation/Platform: When dismantled, powerhouses left characteristic archaeological features and artifacts. Foundations for the boiler, generator, drive engine, and coal bin lie within the building's footprint. The artifact assemblage includes a high portion of boiler clinker and small parts.

Privy Pit: The pit that underlay a privy. Privy pits are often less than 5 feet in diameter, feature a small pile of backdirt, and may be surrounded by refuse and ash. Footers for the privy building may be present.

Shop Dump: Shop employees threw debris generated by repair and fabrication work beside or behind shop buildings. When the accumulation became substantial, it became a dump.

Water Tank: Maintenance and service yards almost always featured a water tank for locomotives. The tanks were like those described above under right-of-way structures.

Yard, Freight: A freight yard was a set of features dedicated to receiving, storing, transferring, and shipping materials for customers. Freight yards often included a warehouse, hoisting derrick, loading dock, and storage area.

Yard, Maintenance: A maintenance yard was the entire collection of facilities dedicated to maintaining and servicing a railroad system and its equipment. Most of the features described above, as well as rail spurs, railroad grades, and workers' housing were usually located in such yards.

[18] Fraser, 1997:175.

Section F 6: Road Property Types and Registration Requirements

INTRODUCTION

The I-70 Corridor has matured into an engineered transportation feat whose topographic challenges rebuffed those who wanted to penetrate the mountainous frontier. Transportation in the corridor evolved from Native American trails into today's road and interstate system. Historic wagon routes, the basis for today's road network, allowed high country economies and communities to flourish through input of goods and supplies, output of products, and an exchange of people.

Most of the road network in existence was constructed over the original trails and wagon routes and then modified and enlarged. Few resources predating 1950 are expected to be complete and in original condition as a result. Segments of historic roads and trails, however, exist and may be represented by archaeological features and artifacts. Archaeological resources could be eligible for the NRHP when their material evidence clearly conveys a property type and its design, function, general timeframe, and significance.

Following are descriptions of the most common road property types in the corridor and the requirements for evaluating them in terms of the NRHP. It must be noted that the information provided below is a starting point for resource identification and evaluation. Additional archival research will be required for specific resources. The following Property Types are developed in this section:

Native American Trails
Pack Trails
Wagon Roads
Engineered Auto Roads
Engineered Depression-Era Roads and Highways
Tunnel

PROPERTY TYPE: NATIVE AMERICAN TRAIL

Native American trails comprise the earliest and most primitive version of an overland transportation system. Before Anglo-Americans arrived in Colorado, three Native American tribes principally inhabited the state: the Cheyenne, Arapaho, and Ute. While the Cheyenne and Arapaho lived primarily on the plains, the Ute Indian tribes inhabited the mountains during the summertime and spent winters at lower elevations. As hunters and gatherers, simple footpaths developed from repeated movement between regions. The routes often followed the path of least resistance such as broad valleys, open topography, and low mountain passes. Today's U.S. 24 and Tennessee Pass, for example, served as a well-known route for the Ute Indians for many years before later being used by Anglo-Americans. The trails reflect the settlement and migratory patterns among the tribes. Spanish explorers from Mexico brought with them horses, which the Ute tribes quickly adopted for ease of mobility. Several of the Ute trails became well-traveled horse and pedestrian routes between the eastern plains of Colorado and the high country that were used year after year. Other localized trails were little more than beaten footpaths between resources and campsites. Several of the Ute trails were known to early explorers and the fur trappers, who utilized these original trails. The routes of many trails were later enlarged into wagon roads by private toll companies during the mining era.[1] Some, however, remain today as hiking trails in Bureau of Land Management or U.S. Forest Service lands.

PROPERTY TYPE: PACK TRAIL

Pack trails were crude, narrow transportation avenues intended to accommodate pedestrians and pack animals. Many were intentionally graded; others evolved organically, and were in use beginning with the gold rush in Clear Creek County until automobiles became common by the 1920s.

Two general categories of pack trails are relevant, defined by destination and era. The first are early trails predating wagon roads, which allowed miners and settlers to move through the I-70 corridor's valleys. When the trails were built, an effort was made to choose the easiest routes with minimal climbing, shallowest stream crossings, and lowest mountain passes. In construction, the trails were one or several tracks constantly joining and separating, and cleared of principal obstacles. The trails were the earliest transportation routes used by miners and settlers and connected most of the principal drainages in the I-70 corridor. Those most heavily traveled eventually evolved into wagon and then auto roads, and so only short segments are likely to remain of the early routes.

In the second category, pack trails belonged to localized networks linking remote industrial or agricultural operations with settlements and transportation centers. Miners purposefully graded trails to difficult-to-reach mountain properties, logging traffic created trails into areas of timber harvest, and cowboys established paths to line camps. In most cases, the trails were one track wide, featured a level surface, and followed the shortest route. Steep ascents, switchbacks, and traverses across slopes were common. Intentionally created trails featured cut-and-fill construction on slopes, occasional retaining walls, relatively constant and steep pitches, and depressed tracks when on flat ground. These trails were in use from the 1860s through the 1910s, and sometimes as late as the 1930s.

PROPERTY TYPE: WAGON ROADS

Wagon roads were the first well-developed and formally planned transportation network in the I-70 corridor. The gold rush and its need for efficient transportation, particularly wagons and their carrying capacity, incentivized entrepreneurs to construct roads into the mountains during the early 1860s. In choosing routes negotiable by wagon, several toll road companies followed previously established Native American routes and gold rush pack trails. Initially, these toll roads were little more than wagon ruts cleared of the largest obstacles, but quality improved slightly after 1865 when the territorial legislature issued maintenance requirements.

Road builders employed rudimentary techniques in construction, creating roads capable of accommodating wagons, but rough and narrow enough to restrict travel. Routes were as straight and direct as possible, preferring open and well-drained ground, gradual ascents, and

[1] Norman, 2002: 10.

fewest natural obstacles. But such routes were limited in the mountains, forcing road builders to adapt to immediate conditions. They constructed the earliest roads by clearing avenues of trees, stumps, and large rocks, and filling the deepest gullies and depressions with cobbles.

As wagon traffic and load weight increased, entrepreneurs, stagecoach companies, and mining companies invested more capital and manpower in better roads. Grades were widened and their surfaces were improved and contoured across mountainsides on cut-and-fill beds. Pitches were usually steeper than the six percent defined for later automobile roads and rarely paved with any material. Occasionally, however, roads were surfaced with small stones, screened gravel, and waste rock removed from mines.

Heavy rainstorms and spring snowmelt wreaked havoc on roads by washing away edges, eroding surfaces, and creating mud bogs in low areas. To combat washouts and erosion, road builders excavated primitive drainage control ditches and constructed dry-laid rock walls to retain cut-banks and roadbed. Planks covered perpetually muddy segments, although more often small trees or branches were laid across for a corduroy surface.

Stream crossings were largely unimproved because most waterways in the I-70 corridor could be easily forded. But principal streams such as Clear Creek and Ten Mile Creek were too deep, especially in spring, and required bridges. These structures typically consisted of logs spanning between gravel ramps retained by log cribbing or rock walls. If a river was too wide for a bridge, like the Eagle and Colorado, toll companies offered ferry crossings.

Wagon roads in the I-70 corridor evolved since the territorial legislature first supported their construction. Because it was common for roadbeds and/or structures to be later widened, rehabilitated, or replaced, no wagon roads are complete in entirety. Instead, the original road system is presently represented by scattered segments.

PROPERTY TYPE: ENGINEERED AUTO ROAD

As natural resource industries faded in the I-70 corridor during the late 1910s, automobile tourism began replacing the economic loss. Wealthy tourists recognized that automobiles offered more freedom, mobility, and autonomy when exploring the mountains than did railroads. Automobile owners insisted that existing wagon roads were inadequate, and the characteristic steep grades, sharp turns, wheel ruts, and unimproved roadbeds were among a long list of grievances.

Momentum for change picked up during the late 1910s and early 1920s due to several factors. First, automobiles and trucks increased in popularity and saw greater applications. The owners, many of whom were wealthy individuals and businesses, demanded improvements and exerted influence. Second, roads changed ownership from private to public, and were now available for improvements. Third, federal and state money became available for some projects. Last, roadway engineering became a field of expertise in itself.

State roadway engineers implemented design standards that surveyors and contractors were obliged to follow. Three practices that marked a change in road building underscore this: route, surfacing materials, and drainage. Engineering surveys were completed prior to construction of roads, and plows and scrapers were used for most earthwork. Later, road construction was mechanized with rock crushers, trailer graders, tractors, and dump trucks. Under new design standards, eleven and twelve percent ascents were replaced with a maximum six percent grade to better accommodate early automobiles. They were underpowered, had gravity fuel systems, and commonly overheated. During steep ascents or descents, oil would pool at either the front or the back of the crankcase, and fuel stopped flowing.[2]

For the first time, surface and drainage played a key role in road improvements, and the early engineered roads were consistently smooth and hard as a result. Trained engineers required culverts, ditches, and swales along with roadbeds. Road bases and surfaces then retained structural integrity from proper drainage. Also, a seemingly minor height difference between the centerline and edge of pavement, called a crown, meant that storm water ran off to the shoulder of the road instead of pooling on the bed. The swales, ditches, culverts kept road surfaces dry and free from flooding. Early culverts were like those used for railroads and included corrugated steel, cast iron, wood, or concrete pipes. Federal standards required a headwall to be constructed to prevent soil erosion.

Surfacing materials such as gravel and macadam (stone), bituminous cement, brick, gravel, or asphalt, provided hard and stable road surfaces. Macadam was broken rock that held its form as the angular clasts interlocked, resisted compression by traffic, and kept the roadbed dry. A mixture of dust and water was applied to the roadbed to fill in space between the rocks, forming a smooth surface. Early macadam relied on automobile traffic for compaction, but emerging technologies employed heavy, steam rollers. As the number of automobiles and their travel speeds increased, dust became a greater issue. Tar-based fill was applied in place of the water and dust mixture and compacted with a steam roller. Another surfacing practice included a foundation of crushed rock a few inches thick and surfaced with bituminous cement, also spread and compressed with steam rollers. Concrete was more durable than any crushed gravel surface and would be found on features constructed between the 1910s and 1930s. The concrete consisted of cement, fine aggregate, coarse aggregate, and water. The Bureau of Public Roads required that concrete roads be 18 feet wide, 6 inches deep at the edge of pavement, 7½ inches deep at center, and include joints every 30 feet to allow settling and expansion.[3]

In addition to grade and roadbed, route designation and road names were another improvement. Initially, roads were known by their destinations, and highway associations later designated routes and developed markers to direct tourists. Different associations made little effort to coordinate terminology, and multiple direction signs on overlapping routes confused drivers. To remedy this, the federal government mandated a uniform highway numbering system for interstate roads in 1923, and from this point forward, directional signs became a standard feature. Signs designating Colorado State Highways were painted on utility poles along the side of the road, with the highway number painted in black over an orange background.[4]

PROPERTY TYPE: ENGINEERED DEPRESSION-ERA ROADS AND HIGHWAYS

Out of the Great Depression and government programs of the 1930s came standardized and modern highways in Colorado. During the New Deal era, the Works Progress Administration (WPA) improved Colorado's infrastructure, including roads. In roadway buildings and structures, the WPA generally employed a National Parks System rustic style craftsmanship, utilizing local resources for construction. The Office of Archaeology and Historical Preservation defines this style as combining aesthetics with function to effectively

[2] The Frontenac Motor Company, 2011.
[3] Autobee, et al. 2003: E-56.
[4] Associated Cultural Resource Experts, 2002: 9-7.

eliminate the lines of demarcation between nature and built materials.[5] This is especially evident in many retaining walls or tunnels, which were constructed with masonry based on local rock type. The WPA built most of its 1930s roads and associated infrastructure by hand labor, which affected the patterns of masonry.[6]

As more drivers took to roads at higher speeds, the number of car accidents increased, and the Colorado Highway Department prioritized safety in response. Engineers increased roadway width beyond the typical 18-foot wide sections, reconstructed curves that were unsafe, and improved sight distances where feasible. In areas with sharp curves or steep slopes below the roadway, the highway department installed guard rails. Early guardrails consisted of rail and post fences, post and cable systems, steel pipes, post and planks, or stone. Beginning in the late 1930s, the Colorado Highway Department required guardrails that were designed to deflect automobiles back onto the roadway because earlier guardrails resulted in injury. This revised design was first used on Mount Vernon Canyon Road.[7] However, the routes remained the same.

Between the 1930s and 1940s, asphalt replaced concrete as the Colorado Highway Department's choice for road surfacing. Additionally, in 1937, the American Association of State Highway Officials (AASHTO) published its first annual edition of roadway design guidelines, called *A Policy on Geometric Design of Highways and Streets.* From this point forward, the Colorado Department of Transportation adhered to these AASHTO specifications for roadway engineering.

For information on bridges, consult the *Highway Bridges in Colorado: Multiple Property Submission*.[8] Note that common transportation-related buildings are mentioned in this context's Section E 10 on architecture.

ROAD PROPERTY TYPE SIGNIFICANCE

The Property Types above were components of local, regional, and statewide road transportation systems. Some corridor highways, including U.S. 6 and I-70, are vital segments of the nation's east-west system. Roads and pack trails fulfilled numerous functions important on local, statewide, and national levels. Early roads facilitated a flow of industry and settlers into the I-70 corridor and provided the exchange of money and supplies for their permanent presence. Roads and pack trails also served local transportation needs, allowing an expansion of industry, communities, and other land uses. Eventually, the corridor's road network became links in statewide and national systems.

Early roads in the mountains were primitive, largely impassable during some winter months, and restricted the volume and timeliness of traffic. Better-engineered roads accommodated heavier vehicles, faster travel rates, and were in service most of the year. As road construction practices evolved, the roads themselves expressed improvements in design that increasingly considered drainage, surfacing materials, curvature, and grade. As the automobile emerged as the dominant transportation mode, traffic control signs, directional signs, and safety components also became important features.

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[5] History Colorado, 2011.
[6] History Colorado, 2011.
[7] Autobee, et al.2003: E-62.
[8] Clayton, 2000.

Although the Property Types differ in era, they share the same general functions and historic trends. Thus, their registration requirements are similar. The Property Types were important in a number of NRHP areas of significance, including Community Planning, Commerce and Economics, Engineering, and Transportation.

Period of Significance must be considered when assessing the historical importance of roads. In general, the Period 1859 to present covers road transportation as a theme throughout the corridor. But the individual roads and trails were important only when they operated, thus narrower timeframes of importance are more applicable when assessing resource significance. The important periods of time by region are 1859 to present in Clear Creek drainage, 1859 to present in Summit County, and 1870 to present along the Eagle and Colorado rivers. Native American trails must be considered individually. Level of significance will be local, statewide, and national for federal highways.

Area of Significance: Community Planning: Many of the roads were significant in the area of *Community Planning* because they influenced settlement patterns and were even the reason for the existence of some corridor communities. For example, the ski industry flourished in Eagle County because Vail Pass provided access to the Eagle River valley, which saw the growth of Vail, Avon, Eagle, Edwards, and other ski-related towns. In Clear Creek and Summit counties, roads facilitated the settlement and growth of mining communities and their adaptation to alternate economies when mining collapsed. In contrast, those settlements without automobile-worthy roads were unable to adapt and were then abandoned.

Areas of Significance: Commerce and Economics: Roads were significant in the areas of *Commerce* and *Economics* on local and statewide levels because they were a conduit for trade, adaptation to changing economies, and the movement of cash.

Roads and pack trails initially opened the Clear Creek and Blue River drainage basins to placer mining and facilitated the output of gold to Denver and Golden. Later, roads and pack trails supported the development hardrock mining through input of needed supplies and output of metals to market. Money then flowed into the I-70 corridor. Railroads altered but did not eliminate the economic impact of travel corridors. Mining outfits used roads and pack trails to haul ore to the railroad or nearby mills and supplies from the railroad or commercial centers to places of need. Logging and agriculture followed similar patterns.

Roads facilitated the transition from natural resource extraction to tourism-based economies. Early tourists preferred automobiles for traveling the mountains and accessing resorts and vacation destinations. Highways over Berthoud, Loveland, and Vail passes facilitated the growth of the nascent ski industry and ultimately the development of tourism-based resort towns. In later years, as trucking matured into a viable shipping industry, roads assumed a principal role over railroads in supporting commerce.

Area of Significance: Engineering: The corridor's roads and highways are significant in the area of *Engineering* as components of larger transportation networks. Levels range from local to national. Builders in the I-70 corridor overcame topographic and climatic obstacles when they constructed roads through the mountains. Many road features exhibit engineering principles common to the era in which they were constructed, and other types serve as superlative engineering examples. Early road builders adapted route, width, curvature, and roadbed to the existing topography of the mountains and canyons. Later road builders, in contrast, modified the mountain topography to better suit the roads. Ultimately, some road segments in the corridor received national recognition for their engineering in overcoming topographic constraints.

Area of Significance: Transportation: In the area of *Transportation*, roads were significant because they were the first constructed overland transportation system in the I-70 corridor. The road property types in the corridor reflect transportation trends of their respective era, place, and environment. The initial mining boom, adaptations in economies, permanent settlement, and a national transportation network were impossible without roads. The early roads supported the ebb and flow of supplies, products, and people through the I-70 corridor during the nineteenth and early twentieth centuries. By carrying people and supplies, the roads supported settlement, tourism, and the migratory pattern characteristic of the mountain west. Many of the corridor's later roads were manifestations of an effort to develop a national interstate highway system. The nation has come to depend on its state and national highway systems for the movement of goods and people and even aspects of modern identity.

Road Property Type Registration Requirements

To qualify for the NRHP, road Property Types must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Road Property Types eligible under Criterion A must be associated with at least one listed area of significance. They also can be eligible when associated with events and trends important to their I-70 corridor area. Archival research may reveal additional historical associations not covered in Section E.

Criterion B: Resources may be eligible under Criterion B if an important person was physically engaged at the property on a sustained basis. Presence will probably be through employment in construction, operations management, or regular and repeated use. The resource must date to the same timeframe when the individual achieved significance, and retain physical integrity relative to the individual's productive period of occupation. If significance is through the person's presence on-site and participation in operations or construction, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. A brief biography is necessary to explain the individual's significant contributions. Important people often invested in wagon road companies or owned transportation companies, but did not personally occupy a site. Such an association does not meet Criterion B.

Early roads have low potential for eligibility under Criterion B because few were personally surveyed or built by noteworthy engineers and construction contractors. Later generations of roads have greater potential for being associated with an important person. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Road Property Types may be eligible under Criterion C when they clearly exemplify or embody the distinctive characteristics of a type, period, or method of construction. The characteristics are described in the Property Types above. Roads can also be eligible if they are the work of a master engineer or contractor, possess high artistic values, or represent a significant and distinguishable entity whose components lack individual distinction. The last remaining segment of a previously larger road is an example.

Eligible roads and trails must possess a predominance of original aspects including surveyed route, roadbed, surface materials, cuts and fills, and other adaptations to a challenging mountain environment. Most of the corridor's main roads have remained in use but have been widened, regraded, curves straightened, cut-and-fill slopes relaxed, and retaining walls updated. Such roads may not possess sufficient integrity for eligibility. Long-abandoned roads, overgrown and eroded in places, frequently manifest as archaeological resources. A road or trail retains integrity on an archaeological level when the roadbed conveys function, overall design, type, and timeframe.

Eligible tunnels, retaining walls, and drainage facilities convey design, engineering, construction methods, and integration with the road. Tunnels must possess intact portals with original appearance and minimal alteration. Retaining walls should convey form, materials, and features of their structures. Drainage structures must be fairly intact, possess original components, and impart their design and function.

Small-scale features can be important contributing elements if they clearly convey their type, function, relationship with the road, and timeframe. Signs, mile posts, guardrails, streetlights, and similar small aspects must be relatively complete and in place.

Road Property Types may also be eligible if they are contributing elements of historic landscapes. When in an urban setting, the streetscape should be similar in age, and the Property Type should contribute to the community's historic feeling. When in a rural setting, the Property Type, or its archaeological remnants, should contribute to the feeling of roads as the principal transportation in the mountains. If the resource is in a mining or logged setting, then it should convey the relationship between the industry and transportation. Nearby historic resources must be compatible in timeframe and possess integrity.

Criterion D: Road Property Types may be eligible under Criterion D if they will yield important information upon further study. In general, the researcher must state the area of inquiry, why it is important, and how the resource will address the questions. If a resource possesses structures, detailed examination may reveal how engineers adapted architectural or structural design to construct and operate roads through challenging topographic and climatic constraints. Intensive inventories and analyses of artifact assemblages may enhance existing knowledge regarding road construction and operations, maintenance, and behaviors of workers and travelers.

Eligible road Property Types must possess physical integrity relative to the timeframe when the road operated. Most of the principal routes have been continually in use and heavily modified through widening, resurfacing, regrading of cut-and fill-banks, and improved drainage. Heavily altered roads usually lack sufficient integrity for eligibility. Segments of local roads may appear largely unchanged, and segments of early auto roads and pack trails may possess integrity on an archaeological level. For archaeological remains to possess sufficient integrity, the material evidence should clearly convey the road or trail, its design and construction, and its timeframe.

Most of the seven aspects of integrity defined by the NRHP apply to road Property Types. Intact structures and small-scale features must be in their original places of use to retain integrity of *location*. For a resource to retain the aspect of *design*, the material remains, including archaeological features, must convey the road's organization, planning, engineering, and use. To retain integrity of materials, the physical substance used in structures should date to a road's timeframe. To retain the aspect of *setting*, the area surrounding the resource must not have changed a great degree from its operational timeframe. If the resource is isolated, then the natural landscape should be preserved. If the resource lies in a mining or tourism landscape, then the surrounding resources and mining or tourism features should retain integrity at least on an archaeological level. If the road lies in an urban setting, then the streetscape should appear as it did when the road was in use. In terms of *feeling,* the road and associated aspects should foster a perception of period transportation from a historical perspective and from today's standpoint. Integrity of *association* exists where a road or trail conveys a strong sense of connectedness between the resource and a contemporary observer's ability to discern historic transportation.

Section F 7: Tourism and Recreation Property Types and Registration Requirements

INTRODUCTION

Section F provides descriptions of and registration requirements for the historic Property Types associated with tourism and outdoor recreation in the I-70 Mountain Corridor. The Property Types as described reflect only those common in the corridor. Itemized descriptions of archaeological, structural, and architectural features have been added to the section's end to refine the interpretation of historic resources.

The following property types and subtypes are developed in this section:

- Ski Area
- Destination Resort
- Outdoor Recreation Site
  - Fishing Camp
  - Hunting Camp
  - Campground
  - Picnic Ground
  - Trailhead

PROPERTY TYPE: SKI AREA

A ski area is a large tract of ground, often an entire mountainside, where the natural environment has been modified for alpine skiing, also known as downhill style. Private interests developed the earliest ski areas in the I-70 Mountain Corridor during the mid-1930s and continued through the 1980s. Although individual attributes evolved over time, the basic template remained largely constant. A developer, local ski clubs at first and corporations later, cut ski runs through forest by felling trees so skiers could enjoy an unbroken descent. Most runs began at the top of a slope and ended at a base area at bottom.

Between the mid-1930s and 1960s, the runs tended to be narrow, short, fairly straight, and on unaltered topography. By the 1960s, developers and industry experts began planning runs for increased numbers of skiers, faster speeds, and improved ability. Runs became wider, longer, curved, and traversed varied topography. Developers also planned the runs in groups designed to funnel skiers down to the base area.

The base area was a collection of skier facilities at the bottom of the runs. At most early resorts, the base area was little more than a heated building known as a warming hut, with nearby outhouse or toilet, and parking. Warming huts were frame or log cabins with open interior, bench seats, and tables. Ski area operators improved base areas during the 1950s and 1960s to attract greater numbers of skiers. Lodges with bathrooms, waiting rooms, offices, and even food and rental service replaced warming huts. Over time, operators added individual buildings for equipment, ski patrol, instructors, generators, and compressors for snow-making systems.

The method of moving skiers to the top of a run is a distinguishing characteristic of era. Prior to the late 1940s, skiers had to walk at primitive areas, while tow ropes dragged them up at company-run operations. A tow rope consisted of an endless cable loop passing around pulleys at the top and bottom of a run, and skiers held a handle or sat on a seat attached to the cable. A gasoline engine powered the system. By the 1950s, ski area developers began installing chairlifts that levitated the skiers up to the top. Based on the Hallidie aerial tramway used for mining, the lift featured a series of seats suspended from an endless cable loop, which passed around large sheave wheels in top and bottom terminals (see Section E on mining technology). A motor kept the loop in constant motion, and a skier quickly sat on a seat as it passed around the wheel for the trip up to the top. The operator controls were originally in the open, and by the 1950s, in booths at the top and bottom terminals.

Ski Area Significance

As historic resources, ski areas participated in and were associated with a variety of important trends and historical patterns. These are summarized as the NRHP areas of significance below, and include Commerce and Economics, Conservation, Landscape Architecture, Politics/Government, and Entertainment/Recreation.

Period of Significance is relevant to ski area significance. In general, the Period 1860 to present covers skiing as a form of recreation in the I-70 Mountain Corridor. But the development of skiing in the corridor was not a uniform movement, and narrower timeframes of importance may be more applicable in specific regions. The important periods of time by region are 1860 to present in Clear Creek drainage, 1878 to present in Summit County, and 1887 to present along the Eagle and Colorado rivers. Some, if not all, the areas of significance below were applicable to skiing during these timeframes. Level of significance was local and statewide.

Areas of Significance: Commerce and Economics: The sport of skiing, and ski areas in particular, was significant in the areas of *Commerce* and *Economics* on local and statewide levels. Skiing and ski areas had a substantial local impact in several ways. They were mechanisms that drew money from distant sources and funneled it into mountain communities. Tourists came from elsewhere in Colorado, the nation, and even the world and spent money on food, lodging, ski area and event tickets, and other services. Also, ski area investors provided additional money as capital for property acquisitions and development, and ski area operations.

Ski areas were important commercial anchors and employers that not only contributed to their host communities, but also to neighboring towns. They were a foundation of general tourism, commercial growth, increased property values, and real estate development. One of the most important contributions was moderation of otherwise seasonal economies, which previously peaked with tourism and natural resource extraction during snow-free months.

On a statewide level, ski areas were part of and contributed to complex regional and statewide commercial and economic systems. Ski area operators often acquired machinery and other goods from suppliers in Denver and outside of Colorado, and European firms often provided chairlifts and the trained experts needed for their engineering. Similarly skiers came from within Colorado, elsewhere in the nation, and even Europe, spending money on travel, communications, food, and retail. Given this, ski areas supported economic systems that extended outside of their host communities.

Areas of Significance: Conservation and Politics/Government: Skiing contributed to the rise of *Conservation* and related *Politics/Government* in Colorado. Ski areas in particular were a vehicle that helped public land agencies transition from an emphasis on natural resource production to recreation. Ski areas depended on large acreages of mountain terrain, most of which in the I-70 Mountain Corridor was owned by the Forest Service. At first, the Forest Service examined land under its jurisdiction for suitable sites in an effort to promote skiing and associated economic benefits. When a ski industry took form, the Forest Service became a partner in area planning, process, and land use for winter recreation in general. This trend applied to cross-country skiing, as well. As skiing grew in importance, Forest Service policy and culture gradually shifted farther toward managing land for recreation as much as other uses. Due to contributions of skiing, the Forest Service now considers recreation the primary use of its land in Colorado.

Skiing also factored into the development of conservation policies. Heavy recreational use and the development of ski areas impacted public land and the quality of its natural environment. In response, the Forest Service developed its own conservation policies and began to implement other federal policies such as the National Environmental Protection Act for recreational development. Application of the policies ranged in geography from individual districts, to National Forests, to the Rocky Mountain region. In parallel, county governments also devised their own conservation policies due in part to ski areas and related development, applicable to local public land.

Area of Significance: Landscape Architecture: Ski areas and cross-country trail systems are significant in the area of *Landscape Architecture* because they represent the molding of entire mountains for recreation. Ski industry planners purposefully altered the landscape with systems of trails, ski runs, infrastructure, and skier services. No longer a simple sport by the 1950s, skiing came to depend on large-scale landscape design, engineering, and mechanical systems.

Area of Significance: Entertainment/Recreation: In the area of *Entertainment/Recreation*, skiing evolved from a practical form of winter transportation to an important means of enjoyment, socializing, and developing a relationship with the natural environment. Colorado's early settlers skied out of necessity, but established an activity that mountain communities adopted for recreation within a short time. Between 1880 and 1920, skiing became an important predicate for social events, fitness, and enjoyment of nature. By the 1950s, leisure-driven American culture accepted the sport as a mainstream form of recreation, which then exerted an influence on a culture that increasingly valued outdoor activities.

Ski Area Registration Requirements

To qualify for the NRHP, ski areas must meet at least one of the Criteria listed below and possess related physical integrity.

Criterion A: Skiing-related resources eligible under Criterion A must be associated with at least one area of significance noted above, and possess related physical integrity. They can also be associated with important events, and broad trends. If the association is through architecture or engineering, then Criterion C applies instead of Criterion A.

<u>*Criterion B:*</u> Ski areas may be eligible under Criterion B if an important person was physically present on the property in a meaningful way and for a sustained time. Presence will most likely be through on-site management, employment, or services. The associated resource must retain physical integrity relative to that person's productive period of occupation and when they achieved significance. If the significance is through the person's presence on-site and their participation in operations, then Criterion B applies. If the association is through design and engineering, then Criterion C applies. A brief biography of the individual is necessary to explain their significant contributions and involvement with the property. In some cases, important people established or invested in ski areas but did not occupy the property. Also, important people such as famous cultural figures and leaders visited ski areas. Such associations do not meet Criterion B. The individual of note must have been present on-site for a sustained period of time. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

<u>*Criterion C:*</u> Ski areas may be eligible under Criterion C if the buildings are good representative examples of significant architecture adapted to skiing as recreation. Similarly, a ski area may be eligible if its structures and objects are good examples of significant recreational engineering types or designs. The overall assemblage of buildings, structures, and environmental modifications may also be a sound example of design and land use specific to skiing. Character defining attributes must be evident, even if on an archaeological level. The ski runs, lift system if any existed, base area, associated buildings, and other facilities should be discernable

Ski areas may be eligible under Criterion C if they are a product of an important architect, planner, or builder. The buildings and structures, or the entire complex itself, may be an example of the individual's skills, style, interpretations, and vision for skiing.

Ski areas may be eligible if they are historic recreational landscapes. Similarly, buildings and structures may be eligible if they are contributing elements of recreational landscapes. Even when a building or structure appears unimportant individually, it may provide context or belong to a greater body of nearby resources representing an area's recreational history.

<u>*Criterion D:*</u> Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents a ski area during an important timeframe, then the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the ski area and characteristic land use patterns. If archaeological features and artifacts offer important information regarding ski area design and operation, or skiing as recreation, then the site may qualify under Criterion D.

Eligible ski areas must possess physical integrity relative to the Period of Significance outlined in Section E. Those ski areas presently in operation may appear similar to when initially established because of continuous use, but with some modifications such as additional runs, lifts, and other structures. Such ski areas represent evolution and changes in the operation, as well as skier preferences. Some ski areas have been abandoned and their buildings and structures dismantled, leaving telltale archaeological features. For archaeological remains to possess sufficient integrity, the material evidence should permit the virtual reconstruction of the ski area, its operation, and timeframe.

Many of the NRHP aspects of historic integrity apply to ski areas. To retain integrity of *location*, a structure or building should be in a location of functional use at the ski area. For a resource to retain integrity of *design*, the ski area's material remains must convey the organization and planning of the run network, chairlifts, support facilities, and base area. To retain *setting*, the ski area and the surrounding mountainside must not have changed a great degree from its period of use. In terms of *feeling*, the resource should convey skiing from a historical perspective and in the context of land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between the operation of a ski area and a contemporary observer's ability to discern the historic activity that occurred at the location.

PROPERTY TYPE: DESTINATION RESORT

Destination resorts were businesses specializing in lodging, dining, and recreation for vacationing tourists. Although this resource category existed in the corridor between 1866 and 1941, it saw peak popularity from 1878 until 1920. Most destination resorts of the era were quality hotels and restaurants where tourists specifically came for periods of time. At a minimum, the enterprises included a hotel building, carriage house, storehouse, privies, and manicured gardens when land was available.

The hotel itself was a large building designed to accommodate numerous guests in private quarters and provide them with expected services. Most if not all the hotels were architect-designed, but basic if not simple in overall form. They were usually stately, two stories in height, rectangular or L-plan, with front massing and porches intending to impart a sense of importance and permanence. Roofs were side- or front-gabled, sometimes hipped, with dormers, and the walls were brick masonry or frame construction sided with clapboards or lapped planks. Ornate trim and established architectural style of the era conveyed elegance and set the building apart from lesser neighbors.

Carriage houses, usually to one side or behind the hotel, housed buggies, tack hardware, supplies, and sometimes staff. The buildings ranged widely in form, construction, appearance, and origin. Simple versions were vernacular, planned on the grounds by the contractor for function, and unadorned in appearance. They were front- or side-gabled, rectangular, one to one and one-half stories in height, with barn doors. Luxury hotels had professionally designed carriage houses rectangular or L in plan, one to two stories high, with gabled roofs, multiple doorways, and an architectural style compatible with the hotel.

One of the most important roles of a destination resort was a base from which guests enjoyed recreational activities, either at the resort or elsewhere in the region. In fulfillment of the latter, resorts were usually located near areas of interest and connected guests with services for outdoor excursions. Inclusive resorts themselves often provided the services, such as box meals, guides, and transportation on horses or buggies. Stables, carriage houses, and small corrals were usually somewhere close to such hotels.

Large resorts built their own facilities and amenities for outdoor recreation on or near the grounds. Gardens and maintained landscapes were common at those resorts with available land and were planted with important and native varieties tolerant of local climate. Indigenous trees were thinned and some left in place, with fruit trees, shrubs, and ornamentals capable of surviving drought and freezes added. Gazebos, pavilions, and outdoor benches were not only built in gardens, but also at nearby vantage points, streams, and meadows. Resorts at or near lakes, such as Green Lakes above Georgetown took advantage of their lacustrine environment and featured docks, skiffs, and fishing platforms.

Resorts in Idaho Springs and east of Glenwood Springs drew tourists specifically interested hot springs. Of all the destination resorts, those involving hot springs were the most elaborate, luxurious, and complex. In addition to the buildings and grounds described above, they also had facilities celebrating their heated and mineralized water, used for both bathing and drinking. Hot springs resorts featured steam rooms, bathhouses, indoor and outdoor pools, and ornamental and drinking fountains. Infrastructure such as wells, developed springs, channels, and pipes tapped water from the ground, blended it to tolerable temperatures, and shunted it to points of use.

When examining destination resort sites today, researchers should look for evidence of all the above aspects, which will probably manifest as archaeological features and vestiges of landscaping. Other support facilities may be present at isolated resorts, such as fresh water cisterns or wells upslope, privy pits behind, and sewer outlets and refuse dumps downslope.

Destination Resort Significance

Destination resorts, a cornerstone of tourism and recreation in the I-70 Mountain Corridor, were associated with and participated in important trends and historical patterns. These are summarized below as the NRHP areas of significance, and they include Architecture, Commerce and Economics, Historical Archaeology, and Entertainment/Recreation.

Period of Significance must be considered when assessing importance of destination resorts. Although the general Period applicable to recreation as a broad theme in the I-70 Mountain Corridor spans 1860 to present, destination resorts were important during a smaller portion of this timeframe. Further, each corridor segment had slightly different years. The relevant period of time in Clear Creek County spanned 1866 to 1941, and in the Blue River drainage from 1882 through 1920. Along the Eagle and Colorado rivers, destination resorts were important from 1887 until 1893. Some, if not all, the areas of significance below were applicable to resort tourism during these timeframes. Level of significance will be mostly local, although statewide in some cases.

> *Area of Significance: Architecture:* As a property type, destination resorts were important in the area of *Architecture* for several reasons. Tourist-oriented hotels in corridor towns were among the earliest large-scale architectural pieces. They were important at the time of construction, and many continued to be architectural icons during a community's timeframe of significance. The hotels contributed to the introduction and evolution of urban architecture in mountain communities through their design, construction, function, and overall appearance. Further, the hotels conveyed architectural style and occasionally set local precedent through their structural features, trim, and accents. In many cases, constraints in funding and available materials influenced how architects adapted designs and construction for tourist-oriented hotels in the mountains.
>
> Inclusive resorts, especially those involving hot springs, participated in and expressed an adaptation of professionally designed commercial architecture to period recreation in the mountains. In planning these resorts, architects molded then-current design, form, and construction to local conditions, materials, and perceived needs of mountain tourism as a business. Influential conditions included capital, topography, natural landscape features, local climate, and available building materials. One result

was resorts with identifiable architectural attributes and style, but unique elements specifically for recreational function, aesthetics, and tourist comfort.

Areas of Significance: Commerce and Economics: Resort tourism began commercial significance by contributing to the economies of mountain communities during their initial development. When tourists stayed in hotels, dined, and used local services, their demand directly supported the growth of nonindustrial businesses such as lodging and food suppliers. Also, the tourists brought money from the outside and spread it through the community. In so doing, tourists fostered mountain commerce and contributed to the growing complexity of regional economies.

By the 1880s, resort tourism became one of the most stabile forms of commerce in the mountains. Mining and logging, the principal industries, were foundations for regional economies and populations. But because these industries were based on resource extraction, they underwent cycles of boom and bust, which created instability. Resort tourism, by contrast, depended on patrons from distant cities and towns unaffected by local and even statewide economic cycles. Tourists continued to come during local economic downturns, which translated into greater stability. Further, resort tourism was sustainable as long as resorts and the natural environment existed.

Area of Significance: Historic Archaeology: Archival sources and popular literature provide some coverage of the tourism movement, associated demography, and specific resorts. But our understanding is limited because historic documentation is incomplete. Studies of destination resort sites and their archaeological remnants can fill in numerous data gaps. Examination of building foundations, abandoned gardens, aspects of infrastructure, and other features may enhance current knowledge of resort content, design, amenities, and ancillary facilities. Analysis of surface artifacts, and testing and excavation of buried deposits, may reveal much about the demography and behavior of tourists and resort staff. Subjects not well documented in the past include socioeconomic status, gender, ethnicity, cultural traditions, diet, health, and substance abuse.

Area of Significance: Entertainment/Recreation: Destination resorts are important in the area of *Entertainment/Recreation* in several ways. They were places of enjoyment, relaxation, entertainment, and health for thousands of people over many decades. People used resorts to temporarily escape their daily routines, urban settings, and stress of then-modern life.

Resorts also provided structure and a safe environment for the act of recreation, which was relatively new during the nineteenth century. At the time, recreation was perceived as an activity primarily among the wealthy. But with the support of affordable resorts, recreation gradually became a cultural norm and even a rite among a growing middle class. This movement developed and evolved from the 1860s through the 1930s.

Destination resorts were platforms by which the dominant culture increasingly valued the natural environment and outdoor activities. Tourists came to resorts and hotels in the corridor specifically to enjoy the natural environment of the Rocky Mountains. By hiking, picnicking, fishing, and enjoying excursions, tourists learned to appreciate nature for its various qualities, and even developed lifelong relationships with the environment. Over time, thousands of nature-based tourists influenced the dominant culture by disseminating their experiences and their changing attitudes.

Destination Resort Registration Requirements

To qualify for the NRHP, a destination resort must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Resorts eligible under Criterion A must be associated with at least one area of significance noted above, as well as events and trends that were important in their host segment of the I-70 Mountain Corridor. If the trends involve architecture or engineering, then Criterion C applies instead of Criterion A.

Criterion B: Resorts may be eligible under Criterion B if an important person was physically present on the property for a substantial span of time. Presence will most likely be through residence, employment, or other involvement with the tourist operation. The resource must date to the same timeframe when the individual achieved significance and retain physical integrity relative to that person's productive period of occupation. The researcher must explain who the individual was and the significant contributions in a brief biography. In some cases, important people established or invested in hotels and resorts but did not occupy the property. Also, important people such as famous cultural figures and leaders vacationed at resorts. Such associations do not meet Criterion B. The individual of note must have been present on-site for a sustained period of time. In general, applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Resorts may be eligible under Criterion C if the buildings are good representative examples of significant architecture. Similarly, a resort may be eligible if its structures and objects are good period examples of types or designs specific to resorts. The overall assemblage of buildings, structures, and environmental modifications may also be a sound example of design and land use specific to resort tourism. Character-defining attributes must be evident, even if on an archaeological level. The hotel, ancillary buildings, grounds, and other facilities should be discernable, even if on an archaeological level.

Destination resorts may be eligible under Criterion C if they are a product of an important architect, planner, or builder. The principal resort buildings, or the entire complex itself, may be an example of the individual's skills, style, interpretations, and vision for recreational resorts.

Destination resorts may be eligible under Criterion C if they are historic recreational landscapes. Similarly, buildings and structures may be eligible if they are contributing elements of recreational landscapes. Even when a building or structure appears unimportant individually, it may provide context or belong to a greater body of nearby resources representing an area's recreational history.

Criterion D: Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents a resort during an important timeframe, then the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the resort and characteristic land use patterns. If archaeological features and artifacts offer important information regarding resort design and operation, or aspects of resort-based recreation, then the site may qualify under Criterion D. The property can also qualify if its surface artifacts or buried archaeological deposits are capable of addressing important research questions. The demography and behavior of tourists and resort staff are rich areas of inquiry not well documented in the past. Narrower fields include socioeconomic status, gender, ethnicity, cultural traditions, diet, health, and substance abuse.

Recreation resources must possess physical integrity relative to one of the timeframes of significance outlined in Section E. Few intact resorts and hotels will appear as they did when initially established, having been occupied for extended periods and modified over time. Such resorts and hotels could represent evolution and changes in the operation, tourist preferences, and transportation. Most resorts in the corridor were abandoned and their buildings and structures collapsed or removed. Integrity in these instances will probably be on an archaeological level. For archaeological remains to possess sufficient integrity, the material evidence should permit the virtual reconstruction of the resort, its operation, and timeframe.

Many of the NRHP aspects of historic integrity apply to resorts. To retain integrity of *location*, a structure or building should be in a place of functional use at the resort. For a resort complex to retain integrity of *design*, the material remains must convey the complex's planning including its grounds, support facilities, and ancillary buildings. Individual buildings retain integrity of design when their period footprint, form, and architectural features are evident. Rural resorts retain *setting* when the surrounding land appears today as during the historic period of occupation. Similarly, hotels in communities retain setting when the streetscape is largely unchanged. In terms of *feeling*, the resource should convey resort recreation from a historical perspective and in the context of land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between the historic resort and a contemporary observer's ability to perceive the activities that occurred at the property.

PROPERTY TYPE: OUTDOOR RECREATION SITES

Outdoor recreation sites are a category of resources that people created either intentionally or inadvertently when using and enjoying the natural environment. The category only includes those types of clearly identifiable recreation-related resources common in the I-70 Mountain Corridor. The resources are related primarily through an emphasis on outdoor activities, a purposeful experience with nature, and resultant constructs, land use modifications, and other tangible evidence. Property Subtypes, outlined below, include Fishing Camps, Hunting Camps, Campgrounds, Picnic Grounds, and Trailheads.

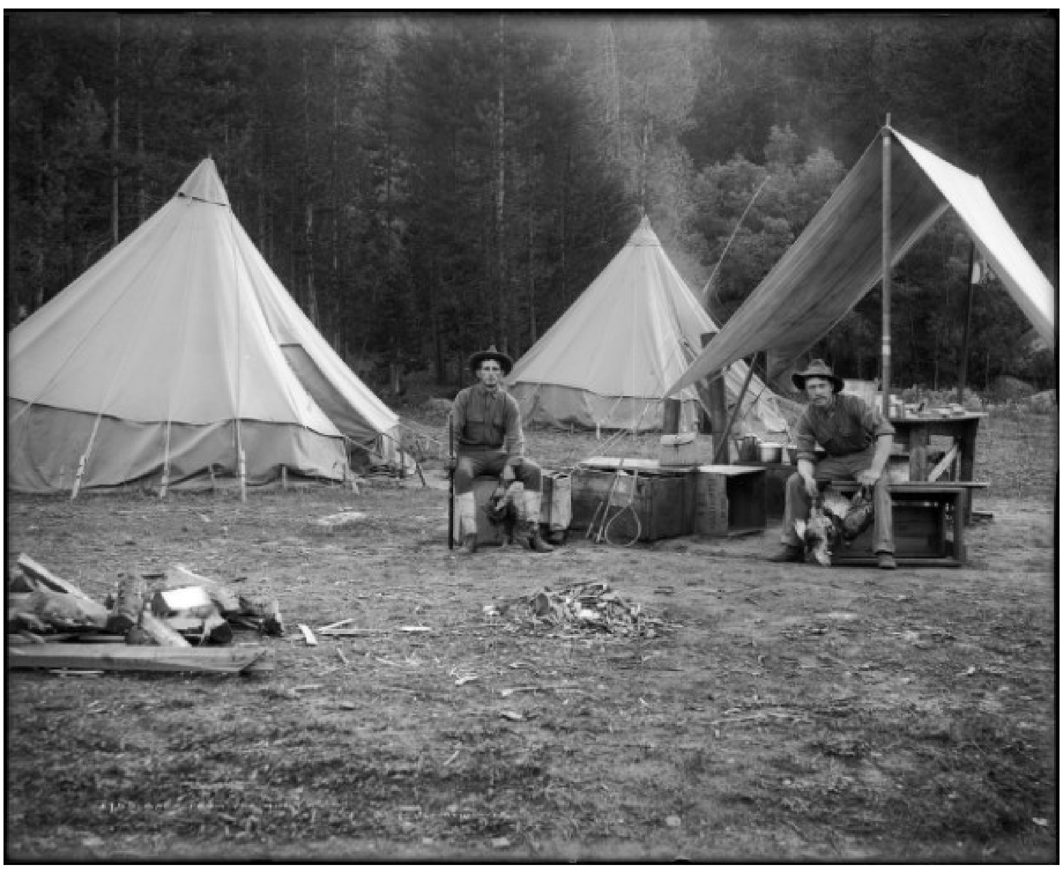
Outdoor Recreation Property Subtypes

Property Subtype: Fishing Camp: A fishing camp was a temporary base of operations where people camped while fishing, primarily on a recreational basis. Although camps ranged in origin, size, and sophistication, all were in or on the edge of trees near fishable streams and lakes.

When occupied, the smallest and most primitive camps involved one or two wall tents, a fire ring, activity area, and little else. Anglers often pitched their tents on cut-and-fill earthen platforms featuring baling wire loops at the corners and rocks or logs retaining the fill. The fire ring, a focal point of the camp, was used for cooking, warmth, and entertainment at night. To serve these functions, most rings were 2 to 4 feet in diameter with high walls of stacked cobbles. Frequently used camps sometimes had rectangular, mortared masonry fireplaces fitted with grills. The activity area, nearby for convenience, was a heavily trampled plot used for food preparation, readying fishing equipment, and chopping wood. Although anglers occasionally provided their own tables, large rocks and downed logs sufficed. An impoundment for storing catch was a distinguishing characteristic of fishing camps. Impoundments were alignments of cobbles and small boulders in a stream or lakeshore nook, which prevented fish from washing away but tallowed water to circulate. Because the shore environment is unstable, most impoundments have been destroyed, and only those well constructed of boulders might still exist.

Fishing camps maintained by packers, guides, and resort operators tended to offer better facilities for angler comfort. Frame and log cabins were alternative to wall tents, and privies provided comfort and sanitation. Masonry fireplaces were substituted for crude fire rings, and activity areas featured picnic tables and logs for seating.

Because fishing camps were temporary, seasonal in use, and consisted of impermanent constructs, most if not all are now represented by archaeological features. The tent platforms, fire rings, fireplaces, and activity areas may be evident but are likely overgrown and eroded. The artifact assemblage is important for site identification and interpretation and should include fishing hardware.



This 1900s hunting camp near Norris is typical, with several tents, table under a shelter, and sheet iron stove. Fishing camps were similar. Courtesy of Denver Public Library, MCC-1755.

Property Subtype: Hunting Camp: Hunting camps were similar in content and configuration to fishing camps, but were distinguished by several differences. In location, hunting camps were not restricted to major streams and lakes and instead were established in environments historically favored by game. Hunters chose valleys, meadows, and fringe ecosystems in the mountains, but rarely deep forest or extreme topography. A game rack used to hang quarry was among the defining characteristics of a hunting camp. The typical rack consisted of one or two thin logs nailed at least 5 feet above the ground between trees. Usually reduced to archaeological features, hunting camps can be identified by an artifact assemblage with numerous cartridge casings, dressing hardware, and bones.

Property Subtype: Campground: Recreational campgrounds existed in the I-70 Mountain Corridor as early as the 1870s but did not become popular until the 1920s, when automobiles granted tourists autonomy and a means of carrying equipment. Early campgrounds differed in form and content from those designed to accommodate auto tourists. Originally, campgrounds were located in roadless areas because packers used draft animals to bring tourists and their camping equipment to a site. The preferred environment was flat ground at the edge of a clearing, near water, vistas, or interesting natural features. Most of the early campgrounds identifiable today were used regularly by packers and guides and were even maintained by resort operators. Because campgrounds were center to group excursions, they were fairly well developed. Many featured multiple wall tent platforms, large fire rings or masonry fireplaces, and logs for seating. Campgrounds used by professional packers and guide services may have included a privy, foot hutches, a cooking hearth, and shelter.

Campgrounds changed in configuration to accommodate auto tourists. Auto-friendly camps, built by the Forest Service and private interests, had to be near a road and provide enough flat land for multiple parties and their automobiles. Typically, a drive led from a main road to the campground, and a circulation road or large open area allowed the tourists to park by individual campsites. On level or gently sloped ground, the campsites offered a tent pad, table, masonry fireplace, and food hutch. Centrally located were privies, a wood supply, water, and often a pavilion with fire ring and station building.

Federal and state agencies began campground construction programs during the 1930s and continued through the 1960s. Most of the agency-built campgrounds were professionally planned for aesthetics, privacy, and managing traffic and impact. The types of amenities and facilities were largely the same as previous decades, although water systems and trash service were more common. Campgrounds did change, however, in size and layout. They were larger and had multiple circuits and loops with more campsites. Amenities were well built with natural materials for longevity and an organic appearance. Tables consisted of thick planks, and fireplaces were stone masonry with grills, hinged shrouds, and chimneys. Station buildings and pavilions were also constructed with natural materials, often combining stone, logs, and lumber. Faucets provided running water, and outhouses offered toilets. The small-scale structures changed by the 1970s and were increasingly assembled from prefabricated materials or were factory-made, such as free-standing fire pans. But in form, campgrounds remained largely the same.

Property Subtype: Picnic Ground: In overall content, small-scale structures, and environmental setting, picnic grounds were similar to campgrounds. Further, many picnic grounds previously were campgrounds but were redesignated due to maintenance and use issues. The two resource types, as designed specifically for their functions, can be differentiated by several distinguishing characteristics. First, picnic grounds usually featured table sites in a perimeter around a parking lot or pull-through drive. Second, the table sites were generally closer together with less privacy than campgrounds. As a result, picnic grounds were smaller and more compact. Third, the table sites lacked tent platforms, with the ground around the picnic table and fireplace the only level area. Fourth, primitive picnic grounds often lacked running water and flush toilets. Last, picnic grounds, however small, were often associated with trailheads and fishing areas.

Property Subtype: Trailhead: Hiking has been a popular recreational activity in the I-70 Mountain Corridor almost continually since the 1870s. Few trails were purposefully constructed for recreational hiking from this time through around 1900, and tourists generally walked wagon roads, paths along streams, logging trails, and packtrails established by miners. The routes lacked formal trailheads, way markers, and distance and destination signs. From the early 1900s through the 1910s, the Colorado Mountain Club, Forest Service, Denver Mountain Parks, and private groups began building recreational trails and added to a growing system during the next five decades. The trails were graded specifically for hiking and horse-packing, starting from a defined trailhead and ending at a destination chosen for its natural attributes. En route, the trails passed through a variety of topography, scenery, and ecosystems for enjoyment and an intimate experience with the environment. Trailheads were in open areas and featured parking, signs, and gateway improvements denoting the actual trail, usually well beaten. The most popular also offered several picnic tables, trash service, privies, and later vault toilets. Gateway improvements could have been split-rail fences, gates, cairns, boulders, and multiple signposts with the trail names, destinations, distances, and information panels. Early signs were wood planks with incised figures, those dating from the 1930s through 1950s were sheet steel with cutout or painted lettering, and recently factory-painted sheet steel with stickers and reflective tape. Signs, cairns, and blazes on trees served as route markers farther long the trail.

Outdoor Recreation Site Property Type Significance

The fishing and hunting camps, picnic and campgrounds, and trailheads described above as individual Property Types were manifestations of the outdoor recreation movement. From the 1870s to present, tourists came to the I-70 Mountain Corridor specifically to enjoy the natural environment on a personal level. They did so on the premise of fishing, hunting, camping, and hiking, often combining several of these activities in a single outing or vacation. Popularity of these activities changed over time, with camping and hiking increasing during the 1920s when automobiles became common among the middle class. The trend is reflected in type and timeframe of outdoor recreation sites in the corridor. Most date to the 1930s and later, with trails and campgrounds in particular exhibiting evidence of evolution since then. Although small-scale aspects have been removed or replaced within recent decades, many sites retain their original form, design, and configuration.

Outdoor recreation sites were important in several NRHP areas of significance, including Entertainment/Recreation, Landscape Architecture, Conservation, and Politics/Government. As manifestations of the overall outdoor recreation movement, the Property Subtypes share the same general registration requirements.

Period of Significance must be considered when assessing the historical importance of the Property Subtypes. In general, the Period 1860 to present covers outdoor recreation as a theme throughout the entire corridor. But the theme's history was not uniform in geography, and narrower timeframes of importance may be more applicable to specific regions. The regions and important periods of time are: 1860 to present in Clear Creek drainage, 1878 to present in Summit County, and 1887 to present along the Eagle and Colorado rivers. Level of significance will be primarily local, and possibly statewide in some cases.

Area of Significance: Entertainment/Recreation: Outdoor recreation sites are important in the area of *Entertainment/Recreation* in several ways. They were places of enjoyment, relaxation, entertainment, and growth for thousands of people and more than100 years. People fished, hunted, camped, and hiked to temporarily escape their daily routines, urban settings, and stress of then-modern life. They also developed personal relationships with nature and improved physical fitness.

Picnic grounds and the various types of camps were platforms by which the dominant culture increasingly valued the natural environment and outdoor activities. This was particularly important during the nineteenth century, when the dominant culture emphasized recreation either indoors or in controlled, outdoor settings. Tourists came to the corridor specifically to enjoy the natural Rocky Mountain environment, and picnic grounds and the various types of camps provided them with safe and predictable places for an intimate experience. By hiking, picnicking, fishing, and camping, tourists learned to appreciate nature for its various qualities and even developed lifelong relationships with the environment. Over time, thousands of nature-based tourists influenced the dominant culture by disseminating their experiences and their changing values. With the support of organized picnic grounds and camps, outdoor recreation gradually became a cultural norm and even a rite among a growing middle class. By the 1950s, American culture accepted outdoor activities as a mainstream form of recreation, which in turn further influenced a culture that increasingly valued outdoor activities.

Area of Significance: Landscape Architecture: In the area of *Landscape Architecture*, picnic and campgrounds and trail systems represent the adaptation of designed constructs to the natural environment for recreation. Outdoor interests and planners purposefully designed picnic and campgrounds, some hunting and fishing camps, and trails to fit within natural features, topography, and ecosystems for an intimate experience with the outdoors. Further, some planners and government agencies considered impacts to the natural environment in their designs, with an interest in preserving the environment for its own sake. These trends differed from urban and industrial planning, where the built environment was central and emphasized functionality and economics with little thought of the natural environment. In general, landscape architecture for outdoor recreation reflects changing cultural values toward preservation, appreciation, and relationship with nature.

Areas of Significance: Conservation and Politics/Government: Through its dependence on the natural environment, outdoor recreation contributed to the rise of *Conservation* and related *Politics/Government* in Colorado. Trails, and picnic and campgrounds, were vehicles that helped public land agencies transition from an emphasis on natural resource production to recreation. Camping, hiking, and picnicking required large areas of land retaining natural appearance, and fishing and hunting were only viable with clean water, fish, and game. In the I-70 Mountain Corridor, the Forest Service owned most of the land with these qualities, but that agency managed the land primarily for industrial uses. During the 1900s and 1910s, natural resource extraction declined in influence, and outdoor recreation increased in importance. Also, hunters and anglers demanded preservation of waterways, fish, game, and a suitable environment. Forest Service policy and culture then gradually shifted toward managing land for recreation as much as other uses. By the 1930s, the Forest Service partnered with other federal and state agencies in promoting outdoor recreation and purposefully planned trails, fishing areas, and picnic and campgrounds. The programs continued into the 1970s, when heavy recreational use and development began to impact public land and the quality of its natural environment. In response, the Forest Service developed its own conservation policies and implemented other federal policies such as the National Environmental Protection Act for recreational development. Interpretation and application ranged in level from individual districts, to National Forests, to the Rocky Mountain region. Due to a century of use by hunters, anglers, campers, and hikers, the Forest Service now considers recreation the primary use of its land in Colorado.

Outdoor Recreation Site Registration Requirements

To qualify for the NRHP, an outdoor recreation site must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Sites eligible under Criterion A must be associated with at least one area of significance noted above. They may also be associated with important events in their host segment of the I-70 Mountain Corridor, or important historical trends. If the trends involve landscape architecture or design specific to recreation, then Criterion C applies instead of Criterion A.

Criterion B: Recreation sites may be eligible under Criterion B if an important person was physically present on the property for a substantial span of time. Presence will most likely be through residence, caretaking, or regular visits and use. The site must appear today as it did during the individual's productive period of occupation and date to when the individual achieved significance. The researcher must explain who the individual was and the significant contributions in a brief biography. In some cases, important people were involved with establishing camps but did not occupy the property. Also, important people such as famous cultural figures and leaders vacationed at camps. Such associations do not meet Criterion B. The individual of note must have been present on-site for a sustained period of time. If involvement is through design, then Criterion C applies. In general, Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Camps and picnic grounds may be eligible under Criterion C if their buildings are good representative examples of significant architecture. Similarly, a camp or picnic ground may be eligible if its structures and objects are good examples of period types or designs specific to outdoor recreation sites. The overall assemblage of buildings, structures, and environmental modifications may also be a sound example of design and land use specific to outdoor recreation. For a site to be eligible, it should possess character-defining attributes even if on an archaeological level.

At *fishing and hunting camps*, the tent platforms, cabin locations, fire rings and hearths, and activity areas should be discernable from intact components or their archaeological manifestations. Game racks should be interpretable at hunting camps.

At *campgrounds predating 1920*, the tent platforms, fireplaces or rings, seating and activity areas, and other facilities must be evident.

Campgrounds postdating 1920 should feature individual campsites, the drive or pull-through, and support facilities such as privy pits or a pavilion. All the campsites need not be identifiable, but a representative sample should be evident.

Picnic grounds should feature table sites, a drive or pull-through, and support facilities such as privy pits or a pavilion. All the table sites need not be identifiable, but a representative sample should be evident.

Eligible *trailheads* must offer a parking area, the trail, and gateway improvements. Resources consisting only of a parking area and trail with no improvements or evidence of early development are too general for eligibility.

Outdoor recreation sites may be eligible under Criterion C if they are a product of an important architect, planner, or builder. The buildings and structures, or the entire complex itself, may be an example of the individual's skills, style, interpretations, and vision for recreational sites.

Outdoor recreation sites may be eligible if they are historic recreational landscapes. Similarly, small-scale camps, buildings, and structures may be eligible if they are contributing elements of larger recreational landscapes. Even when a building or structure appears unimportant individually, it may provide context or belong to a greater body of nearby resources representing an area's recreational history.

<u>*Criterion D:*</u> Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. When this evidence clearly represents a camp or picnic ground, then the site retains integrity on an archaeological level. For archaeological remains to constitute integrity, the material evidence should permit the virtual reconstruction of the site and characteristic land use patterns. If archaeological features and artifacts offer important information regarding camp or picnic ground design and use, then the site may qualify under Criterion D. The property can also qualify if its surface artifacts or buried archaeological deposits are capable of addressing important research questions. The demography and behavior of tourists in the outdoors are rich areas of inquiry not well documented in the past. Narrower fields include socioeconomic status, gender, ethnicity, cultural traditions, diet, health, and substance abuse.

Outdoor recreation sites must possess physical integrity relative to one of the timeframes of significance outlined in Section E. Because intact resources have been used for extended periods and modified over time, few will appear as they did when initially established. In such cases, they can represent evolution and changes in recreational activities, traditions, and preferences. Most early fishing and hunting camps, and campgrounds were abandoned and their buildings and structures collapsed or removed. Integrity in these instances will probably be on an archaeological level. For archaeological remains to possess sufficient integrity, the material evidence should permit the virtual reconstruction of the camp and timeframe. Many picnic and campgrounds are still in use, and they are expected to feature a combination of original and replacement buildings and small-scale structures. Integrity requires that most of the original buildings and structures be present. Although still in use, picnic and campgrounds often conform to their original design and layout, retaining integrity of design. Common features for the Property Subtypes are at the section's end.

Many of the NRHP aspects of historic integrity apply to outdoor recreation sites. To retain integrity of *location*, a structure, building, or object should be in a place of functional use at the site. For a site to retain integrity of *design*, the material remains must convey the complex's planning including its grounds, support facilities, and land use modifications. Sites retain *setting* when the surrounding land appears today as during its period of occupation. This requires a preserved natural landscape in most cases. In terms of *feeling*, the resource should convey outdoor recreation from a historical perspective and in the context of land use today. Integrity of *association* exists where structures, buildings, and archaeological features convey a strong connectedness between the historic site and a contemporary observer's ability to perceive the patterns of recreation or land use that occurred at the property.

TOURISM AND RECREATION BUILDINGS, STRUCTURES, AND ARCHAEOLOGICAL FEATURES

Ski Area Feature Types

Ski Area Building Types

Compressor Station – Character-Defining Features

Dry winters with little snowfall presented ski area operators with the problem of a short ski season, and hence reduced income. By the 1970s, well-capitalized outfits solved this by artificially making snow. A compressor pressurized a plumbing system with frigid air, released through special nozzles strategically placed along ski runs. A trickle of water introduced into the nozzle blasted out under pressure and became snow. The compressor was usually a stationary unit at a compressor station on the mountain. A single building, prefabricated or designed for the purpose, enclosed the machinery.

- Core Plan: Rectangular, open interior.
- Stories: 1
- Foundation: Concrete footers or slab on earthen platform.
- Walls: Frame sided on exterior with planks and corrugated or ribbed sheet iron.
- Roof: Front- or side-gabled with rafters, plank decking and sheet iron. Often sheet iron on rafters for small buildings.
- Entry Door: Usually located in the front, broad, and made of planks or sheet metal.
- Windows: Square or rectangular with fixed frames.

Equipment Shed – Character -Defining Features

Ski area operators constructed buildings throughout a property to store equipment, materials, and large machinery. On the mountain, the buildings tended to be small, simple, and located near ski runs and chairlifts. Stored materials typically included fencing, signs, tools, and snow-making equipment. At the base area, the buildings were larger to accommodate machinery, snowmobiles, parts, and even vehicles. Some buildings were prefabricated, while others were planned in the field by developers and assembled with purchased materials.

- Core Plan: Rectangular, open interior.
- Stories: 1
- Foundation: Timber footers or concrete on earthen platform.

- Walls: Frame sided on exterior with planks, corrugated or ribbed sheet iron, or tarpaper.
- Roof: Front- or side-gabled, or shed, with rafters, plank decking and sheet metal. Often sheet metal on rafters for small buildings.
- Entry Door: Usually located in the front, broad, and made of planks or sheet metal.
- Windows: Square or rectangular with fixed frames.

Lodge – Character-Defining Features

Developers began building lodges at principal ski areas during the 1950s and at all areas by the 1960s. The purpose was to attract greater numbers of skiers, and especially families, by providing indoor amenities and a warm place to wait. The typical period lodge, center to the base area, featured a dining hall, waiting area, food service, restrooms, and ticket and administration offices. Usually professionally designed, each lodge was a unique expression of a ski area's available capital, popularity and status, and expectations in future growth. Given this, lodges ranged widely in size, footprint, roofline, and construction. Minor ski areas had small and simple buildings erected at little cost, while prominent areas featured large, complex, and sophisticated versions. Each lodge was also unique in appearance and rarely followed a particular architectural style.

Skier Services Building – Character-Defining Features

Ski areas had buildings for skier services and other functions not housed in the lodge. Ticket and administration offices, ski schools, and ski equipment rentals were built at some base areas. First aid and ski patrol stations could be anywhere in the ski area. Although most buildings were designed by an architect, they were utilitarian in appearance and ranged widely in construction, footprint, and size.

- Core Plan: Rectangular, L-shaped, or complex.
- Stories: 1 or 2
- Foundation: Concrete footers or slab, or cinderblock.
- Walls: Frame sided on exterior with paneling or planks over plywood. Cinderblock walls were common during the 1950s and 1960s.
- Roof: Front- or side-gabled with rafters, plank or plywood decking, and sheet iron or rolled asphalt cladding.
- Entry Door: Usually located in the front, factory-made steel or solid wood composite.
- Windows: Square or rectangular with steel, aluminum, or wood frames.

Warming Hut – Character-Defining Features

Prior to the 1950s, popular ski areas had buildings known as warming huts where skiers could eat, thaw, and wait for others. Warming huts preceded later base areas and were located at the bottom of the most heavily used ski runs. Although some of the buildings could have been designed by architects, most were planned in the field and constructed by the ski area organizer to fill expected need and at minimal cost. Further, the area organizer used available materials, primarily logs or locally cut lumber. In this sense, most warming huts were vernacular.

- Core Plan: Rectangular, L-shaped, or complex.
- Stories: 1
- Foundation: Cinderblock, or timber or log footers.
- Walls: Frame sided on exterior with planks, or logs.
- Roof: Front- or side-gabled with rafters, plank decking, and sheet iron or rolled asphalt cladding.
- Entry Door: Usually located in the front, factory-made panel or custom-made of planks.
- Windows: Square or rectangular with wood frames, often salvaged from elsewhere.

Ski Area Structures and Archaeological Features

Catwalk: A catwalk was a multipurpose path, usually a road, traversing across a mountainside and its ski runs. In summer, catwalks provided service vehicle access to important portions of the ski area. In winter, skiers used catwalks to move about the mountainside and shortcut or avoid difficult runs.
Chairlift: A chairlift, also known as a ski lift, carried skiers from the bottom to the top of a ski run. Area operators began installing chairlifts during the 1950s to attract greater numbers of skiers, who previously had to walk. The typical apparatus consisted of seats attached to an endless cable loop suspended from a series of towers. The bottom and top terminals had large-diameter sheave wheels for the cable, and they

were mounted in heavy frames. Although steel beams were standard by the 1950s, some early frames could have consisted of timbers. Short lifts had one drive-motor at the top terminal while long lifts had motors in both terminals. Originally, both terminals featured control panels in the open, and later in booths.

Chairlift Terminal: A chairlift terminal refers to the top and bottom end-points of a chairlift system. A terminal consists of a sheave wheel in a steel or timber frame, the structure's foundation, drive mechanism, and controls.

Chairlift Tower: A chairlift featured a series of towers supporting the endless cable loop and suspended chairs. A distinguishing characteristic of a lift, a typical tower consisted of a steel pole anchored to a substantial concrete footing. The crown featured a cross-member with idler pulleys for the cable, and telephone and electrical lines.

Light Pole: During the 1960s, some ski areas experimented with night skiing in hopes of extending hours and, hence, income. Powerful lights on tall poles lined ski runs designated for night skiing. Poles were steel or treated wood, crowned with spotlights, and spaced at regular intervals along the edges of a run.

Pipeline: By the 1970s, large ski areas featured compressed air and water plumbing systems for artificial snowmaking. The compressed air system consisted of a main extending from a compressor station up the mountain, and distribution pipes along ski runs. Connections for hoses and snow guns were at regular intervals. The water system featured a pipeline tapping a water source from above, and distribution lines paralleling the compressed air pipes.

Sign: A sign is a small-scale object and distinguishing characteristic of ski areas. Colorful, made of metal or wood, and with colloquial names, they marked ski runs for user navigation,

Ski Run: The most important aspect of an area, a ski run provided a line of descent down the mountain for skiing. Developers cut the runs through forest, clearing logs and stumps, and often using natural topography for variety. Early runs were narrow, short, and fairly straight but changed during the 1970s. Developers widened runs so greater numbers of skiers could go faster and lengthened them as improvements in lift technology allowed. Developers also thinned, but did not completely clear, swaths of forest for tree runs.

Ski Jump: Ski jumping, popular in the late nineteenth and early twentieth centuries, required ramps at the bottoms of long runs. The ramps consisted of snow piled over an earthen base, possibly retained with logs.

Ski Tow: Predecessor to the chairlift, ski tows dragged skiers from the bottom to the top of a run. In general design, tows consisted of an endless cable loop passing around sheave wheels in top and bottom terminals. Long circuits had poles in between with idler pulleys guiding the cable. Skiers grabbed hold of handles fixed to the cable and were tugged up the slope, although some versions offered sleds. In tows built in the 1930s and 1940s, structural elements were assembled from logs and timbers, and salvaged automobile engines provided power. Afterward, steel was used for structural elements, motors provided power, and skiers squatted over a bar fixed to the cable.

Destination Resort Feature Types

Destination Resort Building Types

Hotel and Resort Building – Character-Defining Features

The character-defining features applicable to hotels and principal resort buildings are covered in the section on Architecture. Large, custom-designed resort buildings are difficult to classify according to a common building typology because of their uniqueness. Each should be considered individually.

Cabin – Character-Defining Features

Resorts and campgrounds often had cabins for tourists interested in private, indoor accommodations. Cabin form and construction varied, and a typology can be found in the section on High-Altitude Agriculture.

Carriage House – Character-Defining Features

A carriage house was a building for storage of carriages, buggies, tack hardware, parts, and supplies. Occasionally, the buildings included resort staff quarters at the rear or in a loft above. In form, most buildings were rectangular, one to one and one-half stories high, covered by a front- or side-gabled roof, with open interior. The core plan was often modified with an enclosed shed-roofed storeroom at rear or on one side. Large carriage houses were L-shaped in footprint with a second story. Trim may have imparted stylistic elements compatible with the hotel or resort building.

- Core Plan: Rectangular or L-shaped
- Stories: 1 to 2
- Foundation: Some foundations were log or timber posts, or footers laid on an earthen platform. Others were made of coursed stone, later with concrete pargeting, or poured concrete.
- Walls: Horizontal planks, horizontal weatherboard, or board-and-batten siding over 1x wood sheathing and 2x wood framing.
- Roof: Front- or side-gabled, often covered with wood or asphalt shingles, or rolled asphalt over 1x plank decking fastened to 2x lumber rafters. Large carriage houses may have featured hipped roofs.
- Chimney: Brick chimney or stovepipe for forge, usually at one end of the building.
- Entry Door: Main entries are primarily barn doors, custom-made of planks, centered in the front. Secondary panel doors may be in the side or rear.
- Windows: Vertically oriented sash windows, often with 1/1 or 2/2 glazing patterns, in wood frames made of 1x or 2x milled lumber.

Garage – Character-Defining Features

A garage was a building for storage of automobiles, fuel, parts, and supplies. Early garages, pre-dating 1930, may have doubled as carriage houses. Occasionally, the buildings included resort staff quarters at the rear or in a loft above. In form, most buildings were rectangular, 20 feet wide for two vehicles, one to one and one-half stories high, covered by a front- or side-gabled roof, with open interior. Large garages were L-shaped in footprint with a second story.

- Core Plan: Rectangular, square, or L-shaped
- Stories: 1 to 2
- Foundation: Some foundations were footers laid on an earthen platform. Others were made of concrete pargeting, poured concrete, or cinderblocks.
- Walls: Horizontal planks, horizontal weatherboard, or rolled asphalt siding over 1x wood sheathing and 2x wood framing.
- Roof: Front- or side-gabled, often covered with asphalt shingles, or rolled asphalt over 1x plank decking fastened to 2x lumber rafters. Large garages may have featured hipped roofs.
- Chimney: Brick chimney or stovepipe for forge, usually at one end of the building.
- Entry Door: Main entries are primarily barn doors, custom-made of planks, centered in the front. Secondary panel doors may be in the side or rear.
- Windows: Vertically oriented sash windows, often with 1/1 or 2/2 glazing patterns, in wood frames made of 1x or 2x milled lumber.

Stable – Character-Defining Features

A stable was a building for horses, draft animals, tack, and feed. In form, most buildings were square or rectangular, one story high, covered by a front- or side-gabled roof, with interior divided into stalls. Tack and hardware may have been stored in a separate room, and feed in a loft. Trim may have imparted stylistic elements compatible with the hotel or resort building.

- Core Plan: Rectangular or square
- Stories: 1
- Foundation: Most foundations were log or timber posts, or footers laid on an earthen platform. Others were made of coursed stone.
- Walls: Horizontal planks, horizontal weatherboard, or board-and-batten siding over 1x wood sheathing and 2x wood framing.
- Roof: Front- or side-gabled, often covered with wood or asphalt shingles, or rolled asphalt over 1x plank decking fastened to 2x lumber rafters.
- Entry Door: Main entries are 3 to 4 feet wide and custom-made of planks. Secondary plank doors may be in the side or rear.
- Windows: Vertically oriented sash windows in wood frames made of 1x or 2x milled lumber. Also, open windows, no panes, with wood shutters.

Destination Resort Structures and Archaeological Features

The category includes structures, constructs, and archaeological features that are more likely at destination resorts than the other Property Types. The features described below under Outdoor Recreation Sites also may be encountered at resorts and should be reviewed.

Carriage House Foundation/Platform: Carriage houses stood on leveled earthen platforms similar in footprint to the building's plan. The platform may feature the timber, concrete, or masonry foundation footings that supported the building, and in such cases, should be recorded as a foundation. Discolored soil or vegetation patterns may outline the building's footprint, and the artifact assemblage will include draft animal hardware or vehicle parts.

Cistern: Resorts often had indoor plumbing pressurized by a water source somewhere upslope. Cisterns were the most common containment, and were large, rectangular tanks countersunk into the ground. Construction ranged from tongue-and-groove planks to concrete to stone masonry. An outlet pipe introduced water, and a drain drew it away.

Cistern Ruin: The collapsed, rubble-filled depression remaining from a cistern.

Garden: Gardens usually encircled the main resort building and featured orderly arrangements of indigenous and nonnative species, beds outlined with cobbles, open areas, and walkways. In abandoned gardens, native vegetation is likely but may follow historic planting patterns. Vestiges of introduced plantings are probably apparent and frequently include iris, rose, dogwood, and fruit trees. Remnants of decorative elements such as gazebos, ponds, and bird baths may be present.

Gazebo: Gazebos were small, freestanding structures in gardens, at vantage points, and near streams and lakes. They featured elevated plank floors, roofs supported by lathed columns, and railing around the perimeter.

Gazebo Remnant: The structural ruins of a gazebo.

Hotel Foundation/Platform: Because of their size and weight, most hotels stood on foundations of rock or brick masonry. A cellar and evidence of plumbing may be present. The foundation was usually built on a large earthen platform, which often had two or more terraces when on a slope. The artifact assemblage will likely include a high proportion of ornate domestic hardware, glass, and tableware.

Picnic Area: Picnic areas existed on resort grounds and may include picnic tables and benches, shelters, water pumps, and fire hearths.

Pond: Constructed ponds existed in hotel gardens and on or adjacent to nearby streams. An excavated pond is shallow and typically features a low dam and berms of backdirt.

Pool: Hot springs resorts featured pools for bathing, both indoors and outdoors. Pools range in size, are usually rectangular, 2 to 6 feet deep, and rock masonry or concrete in construction. An inlet channel or pipe is at the shallow end, an overflow outlet at the deep end, and a drain at bottom.

Pool Remnant: When abandoned, pool walls and rim typically crumble, leaving a depression filled with earth and rubble approximating the pool footprint.

Refuse Dump: At isolated resorts, hotel staff tended to throw refuse away from and behind the building. Over time, they created a concentrated deposit of general domestic rubbish, broken bottles, food cans, and tableware. Dumps can be important for their archaeological potential.

Stable Platform: Stables stood on leveled earthen platforms similar in footprint to the building's plan. Post holes and linear berms within the platform may outline stalls. Discolored, loose, and highly organic soil or vegetation patterns may outline the building's footprint, and the artifact assemblage will include draft animal hardware.

Walkway: Walkways were designed to direct foot traffic between important points at a resort and its grounds. Some were packed earth or sod, and many were flagstone, cobble, brick, or concrete.

Outdoor Recreation Site Structures and Archaeological Features

Bench: Benches are common to resort, picnic, and campgrounds, and trailheads. Heavy plank seats were fastened to stone masonry or angled timber legs. Concrete and steel were common by the 1960s.

Cabin Platform: Cabins usually stood on earthen platforms graded with cut-and-fill methods. Foundation footers and a high proportion of structural materials may distinguish a platform as that for a cabin instead of a wall tent. Because cabins were universal residential buildings, their association may be difficult to interpret without material evidence. Characteristic artifacts, location by a major stream or lake, or presence of a game rack, may confirm a cabin as that for fishing or hunting.

Cabin Ruin: Some frequently used hunting and fishing camps had cabins for lodging instead of tents. After abandonment, they often collapsed and became ruins.
Dam: Often, recreation interests raised the water level of ponds and lakes with dams to improve fish habitat. The dams, constructed with earth and rock rubble, were low and spanned the natural outflow channel. Rarely were they professionally engineered.
Dock: Ponds and lakes featured docks for fishing and mooring recreational skiffs. The docks were vernacular in that they were impermanent, simple designs built as needed. The structure consisted of plank decking nailed to timber stringers supported by log pilings.
Fence: Fences delineated boundaries around picnic and campgrounds, marked trailheads, and defined corrals at hunting camps and resorts. They usually consisted of natural materials for economy and aesthetics. Split rail, post, and buck-and-rail types were most common.
Fence Ruin: The collapsed remnants of a fence.
Fire Pan: Fire pans were factory-made, freestanding steel boxes for fires. Common at campground and picnic grounds by the 1970s.
Fireplaces: Fireplaces were popular for outdoor cooking, heating, and entertainment at resorts, camps, and picnic grounds. They ranged in size from 3 by 4 to 4 by 6 feet in area, were several feet high, with grills and hinged shrouds. Construction was mortared local stone.
Fire Ring: Fire rings served the same purposes as fireplaces and were common at primitive camps and picnic areas. They were circular, 2 to 4 feet in diameter, and consisted of stacked cobbles.
Food Hutch: To prevent wildlife from consuming food, picnic and campgrounds often featured plank lockers with hinged doors. Most stood on plank legs.
Game Racks: Hunting camps featured racks for hanging game above the ground. Most racks were several thin logs nailed between stout trees.
Hunting Blind: Hunters constructed barricades with natural materials for concealment while waiting for game. Blinds, still in use today, were usually tangled or stacked branches in a strategic location. Historic blinds will be partially collapsed and consist of highly weathered material.
Parking Area: Auto-friendly recreation sites required parking areas, which ranged from open ground to tracts defined by fences and traffic ways.
Pavilion: Pavilions were common for group activities at resorts and picnic and campgrounds. They consisted of a roof supported by four or more posts. The roof consisted of wood or asphalt shingles, rolled asphalt, or corrugated sheet-iron nailed to planks supported by lumber or log rafters. The posts may have been lumber, logs, or stone masonry. One side may have been defined by a wall, and the interior often featured benches or tables.
Picnic Table: Picnic tables are common to resorts, picnic and campgrounds, and trailheads. Heavy planks served for bench seats and tabletops and were fastened to stone masonry or angled timber legs. Concrete and steel were common by the 1960s.
Privy: A building that served as a toilet facility. Privies stood over pits, were around 4 by 8 feet in area, and featured a bench with cutouts as toilet seats.
Privy Ruin: The collapsed remnants of a privy building, often overlying a pit.
Privy Pit: Prior to indoor plumbing, hotel guests and staff relied on privies for personal use. When the pit became full, the building was moved and the pit capped with soil and rocks. Over time, the pit subsided into a depression. Domestic refuse, a berm of backdirt, and evidence of the privy foundation may remain.
Refuse Scatter: A refuse scatter is a disbursed, largely surficial deposit of domestic rubbish. Scatters are often common behind buildings and around camps and picnic areas.
Shelter: A shelter was a vernacular structure that provided temporary protection from the elements. In picnic and campgrounds, shelters may have been small versions of pavilions, with one or more open sides. They were rarely designed by architects and were built for the need with available materials. Trails and primitive camps featured crude shelters assembled from logs or stacked rocks, with roofs of branches, lumber, or sheet iron.
Shelter Ruin: Due to poor construction, most early shelters collapsed and are now in ruins.
Tent Platform: Most camps, regardless of era, featured leveled earthen pads for tents. At early camps, the platforms were usually graded with cut-and-fill methods and had rocks or a log retaining the fill material. Baling wire loops for guy lines may exist at the corners.
Trail: A trail was a well-beaten footpath for hiking or accessing outdoor recreation sites. Abandoned trails may be overgrown but defined by a concave tread, terrace across a slope, or avenue flanked by cobbles.
Trail Marker: Trails were marked by a variety of constructs and objects, including cairns, signs, log posts, and blazes cut into tree trunks.

Trash Receptacle: By the 1930s, recreational sites featured cans for refuse, usually chained to a timber post.
Water Fountain: From the 1890s through 1950s, well-developed outdoor sites, especially resort, picnic, and campgrounds featured fountains for drinking water. They ranged in construction from stone masonry pylons to free-standing porcelain basins.
Water Pump: Early picnic and campgrounds had hand-operated pumps for drinking water, either free-standing or in stone masonry pylons.
Water Spigot: A water spigot provided water for general use at picnic and campgrounds. It consisted of a faucet in a stone masonry pylon or on a pipe tied to a pole.

Section F 8: Common Architectural Property Types

INTRODUCTION

The I-70 Mountain Corridor includes numerous communities and towns. Most of those between Idaho Springs and Vail Pass began as mining centers, while others, farther west, from Vail Pass to Glenwood Springs, had their origins in agriculture. Over time, the communities adapted to changing economies, transportation systems, and broad-scale social movements. Emphasis on outdoor recreation, tourism, and automobile travel were among the adaptations. All of the communities are rich with architectural resources representing these and other broad trends, as well as local histories and cultural preferences.

This section of the context focuses on the principal types of historic buildings in the corridor's towns and unincorporated communities. When evaluating the significance of a building, researchers can consider it individually, as well as within the broader community. Although detailed histories of each community are not recited in this document, their general trends and patterns can be extracted from the themes in Section E. The themes most relevant to a specific community can be determined from its geographic location.

Three broad architectural property types are developed in this section: Domestic Residential Buildings, Commercial Buildings, and Cultural/Religious/Public Related Buildings. Within each of these broad categories, the buildings are further classified by subtypes, relating their specific functions and themes. Finally, under each subtype, as appropriate, a discussion of relevant architectural styles, forms, and materials is presented, including both those known to exist, and those considered likely.

The architectural terminology adheres closely to the online publication *Colorado's Historic Architecture and Engineering – Field Guide*[1] and its companion *Colorado's Historic Architecture and Engineering – Web Guide*.[2] These publications recognize that scholarship regarding Colorado's historic architecture is not static; thus, the online format allows for the introduction of newly-developed architectural styles, forms and materials, and the adaptation of existing ones. One example, which may prove useful to researchers, is the *Guidance on Vernacular Building Forms* added to the Office of Archaeology and Historic Preservation's (OAHP) lexicon in July 2010, with the intent that it will continue to be developed in the future. The *Field Guide to Colorado's Historic Architecture and Engineering* (hereafter referred to as the "*Field Guide*"), was published online in 2008. It is the third edition of *A Guide to Colorado Architecture*, originally written by Sarah J. Pearce and published by the Colorado Historical Society in 1983.

Towns along the I-70 Mountain Corridor developed chronologically from east to west. Idaho Springs, Georgetown, and Silver Plume, all in Clear Creek drainage, trace their origins to the Pikes Peak Gold Rush of 1859, the discovery of gold along Clear Creek, and the mining activity that ensued in the succeeding decades of the late 1800s and early 1900s. West of the Continental Divide, the Blue River Valley towns of Silverthorne, Dillon, and Frisco, also trace their roots to mining activity in the late 1870s. In time, however, Blue River Valley

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[1] "Field Guide to Colorado's Historic Architecture and Engineering." http://www.historycolorado.org/archaeologists/colorados-historic-architecture-engineering-field-guide.

[2] "Field Guide to Colorado's Historic Architecture and Engineering." http://www.historycolorado.org/oahp/colorados-historic-architecture-engineering-web-guide.

communities became important centers of agriculture. Farther west, towns in the Eagle and Colorado River valley began to appear in the 1870s and 1880s as support centers for the region's farms and ranches, as well as in association with the Denver and Rio Grande Western Railroad.

Historic architecture in the corridor's towns reflects this east-to-west settlement progression and the mining and agricultural-based economies. Similar to individual homesteads, farms, and ranches, initial building construction in the corridor's towns was haphazard and lacked a sense of permanence. Thus, few buildings from the early settlement periods remain. The basic physical characteristics of the earliest in-town dwellings, though, are consistent with the Log Cabin Homestead Dwellings and Wood Frame Homestead Dwellings property subtypes presented under the High Altitude Agriculture Property Types and Registration Requirements section of the context.

The greatest number of in-town buildings date from after the communities were platted, incorporated, or otherwise attained local governmental organization. As a result, the architectural characteristics, size, scale, and placement of buildings in town - relative to each other, and relative to natural features - follow discernable trends. Idaho Springs, for example, was platted north of Clear Creek with named streets running east-west, intersected at right angles by numbered avenues running north-south. Water and Idaho Streets, closest to Clear Creek, logically saw industrial development, with facilities such as the Sunshine Stamp Mill, the Clear Creek Foundry and Machine Company, and by the turn of the twentieth century, the Idaho Springs Electric Light Plant. Miner Street, one block north of Idaho Street, was platted as the town's main avenue with deep, narrow lots for stores and businesses. Early residential development in Idaho Springs was along Colorado and Virginia Streets, north of the commercial district, and well above the industries along Clear Creek.

As originally platted, residential lots were quite large, allowing for stately late Victorian-era homes, along with ancillary structures such as carriage houses, coal sheds, privies, and small barns. Houses were set well back from the street, while ancillary structures were sited for maximum convenience, but generally at the rear of a property or as otherwise dictated by the topography and other factors. In time, as automobiles replaced horses and buggies, carriage houses gave way to garages, while the need for coal sheds, privies, and other such structures dissipated as well. Partly as a consequence, and partly due to other socioeconomic factors, large residential lots were often later re-platted, or subdivided, to allow for greater residential density.

Multiple or temporary domiciles such as apartments, duplexes, boardinghouses, and hotels were typically located in transitional areas between commercial districts and residential neighborhoods. In Idaho Springs, for example, the Beebee Hotel, Club Hotel, and other places offering "furnished rooms" for lease, were concentrated along Colorado Street, one block north of Miner, the commercial main street. Other towns in the I-70 Mountain Corridor were similarly platted, generally following these basic parameters. Streets and avenues were aligned with the cardinal directions, with creeks and rivers, or existing rail lines. All plats anticipated and planned for residential, commercial, cultural, social, public, and industrial infrastructure, and the towns, for the most part, developed accordingly.

PROPERTY TYPE: DOMESTIC RESIDENTIAL BUILDINGS

Domestic Residential Buildings include all manner of dwellings where individuals and families spent a large share of their lives, sleeping, cooking, eating, attending to domestic duties, conducting personal business, and otherwise interacting as a member of a household. Subtypes of domestic residential buildings include Single Family Dwellings (houses), Multiple Dwellings (which housed more than one family or groups of unrelated individuals, such as duplexes, apartments, and boardinghouses), and Secondary Residential Buildings (support structures such as barns, carriage houses, garages, sheds, and privies).

Domestic Residential Buildings Subtypes:

Property Subtype: Single Family Dwelling: This property subtype, interchangeably referred to as a dwelling, house, home, and residence, is by far the most prevalent architectural resource type in I-70 Mountain Corridor towns. Dwellings may range in age from the first days of settlement to present time, and they reflect a correspondingly wide range of architectural materials, forms and styles. Following the *Field Guide'*s format, the architecture of dwellings in this section is based on a nomenclature of materials, forms, types, and styles. Some early dwellings are best identified by their primary building material (e.g. pioneer log); others are best identified by their form or basic shape and roof type (e.g. gabled-L plan); still others are best identified by recognized architectural types and styles. The architectural materials, forms, types, and styles discussed in this section represent those known to exist, and those thought likely to exist, in the I-70 Mountain Corridor. They should not, however, be regarded as comprehensive list of the corridor's extant domestic architecture.

Pioneer Log Cabins Architectural Forms: The earliest dwellings in the I-70 Mountain Corridor towns were small "pioneer log" cabins, followed by progressively more elaborate houses of wood frame construction.[3] Constructed primarily from local materials, pioneer log cabins featured horizontal log walls, typically with square, saddle, V-notched, or dovetailed corner joints. The logs were either left round or hewn square. In addition to their basic building material (log), these cabins are more specifically categorized by an architectural terminology pertaining to their core shape or plan, roof type, door and window placement, number of rooms, and ancillary features such as porches. Log cabins were usually rectangular in shape, with a gable roof, and containing either a single room (known as a "single pen" cabin) or two rooms (known as a "double pen" cabin). Some cabins, though, featured a more elaborate L-shaped or T-shaped plan covered by a cross-gable roof. These are termed "Gabled-L" and "Gabled-T" type cabins. Rectangular-shaped double pen cabins may be more specifically categorized as "Shotgun" type or "Hall and Parlor" plan. A Shotgun type dwelling featured a basic rectangular-shaped plan that was one room wide, and in the case of a double pen cabin, two rooms deep. It was covered by a front-gable roof, with the entry door in the gable end. There were no interior hallways, and the two rooms were divided by a log wall with an interior doorway. A dwelling with a Hall and Parlor plan was also rectangular in shape, but covered by a side-gable roof, with the entry door on the side elevation, beneath

[3] "Pioneer Log," as a character-defining architectural material, should not be confused with the "Rustic Style" of architecture which also often employed log construction, but which postdates the turn of the twentieth century.

the eave, rather than in the gable end. Hall and Parlor cabin dwellings contained two rooms, with one somewhat larger than the other. The entry door led into the larger of the two rooms which served as general living space and the kitchen, while the smaller room primarily served as a bedroom. Gabled-L and Gabled-T cabins were typically somewhat larger, and were usually 1½-stories with enough room in the upper half story to serve as sleeping quarters for some family members. Refer to the end of section F 3, High Altitude Agriculture Buildings, Structures and Archaeological Features, for a list of the character defining features of the following specific forms of pioneer log cabins:

- Single-Pen Log Cabin
- Double-Pen Log Cabin
- Shotgun Log Cabin
- Hall and Parlor Plan Log Cabin
- Gabled-L Plan Log Cabin
- Gabled-T Plan Log Cabin

Alice Post Office, Clear Creek County. Courtesy of Denver Public Library, X-6468.

Klack Placer Cabin, Breckenridge. Source: Carl McWilliams.

<u>*Wood Frame Dwellings Architectural Forms*</u>: Early dwellings of wood frame construction followed a similar evolutionary pattern, progressing from a basic one-story rectangular form to 1½-story Gabled-L and Gabled-T forms, and eventually to regionally or nationally identifiable forms, including the I-House, Foursquare, Bungalow, Hipped-Roof Box, Classic Cottage, and A-Frame. These houses were not architect designed, nor were they constructed by professional building contractors. Their construction, though, exhibited traditional influences, as they displayed the construction techniques, traditions, and cultural influences passed down through generations, brought west and adapted to Colorado's frontier towns. The houses were also influenced by the needs and visions of their owners, by economic factors, and in time by the dissemination of popular building materials, techniques, stylistic influences and architectural details. After commercial lumber became available, houses were predominantly built of wood frame construction, using manufactured lumber and other building supplies, delivered by the railroad and purchased from local retail suppliers. The houses also gradually began to display stylistic influences and ornamental details which reflected the builder's individual tastes and

traditions, and increasingly, the architectural fashions then in vogue. Fashions and ornamental details made popular by the nationwide diffusion of architectural pattern books and magazines. House plans became available through Sears, Roebuck and Company in the late 1890s, and by the turn of the twentieth century, a variety of plans and ornamental details were being promoted through popular magazines such as *House Beautiful* and *Ladies Home Journal*. At about the same time, architectural publications such as the *Craftsman*, *Western Architect* and *Architectural Record*, began to promote and distribute plans for specific types of houses, most notably the Craftsman Bungalow. The influence of such publications, and the availability of manufactured materials, was first seen in ornamental details such as porch rails, columns, brackets, and other decorative elements, which were applied to existing dwellings. Newly-built houses more fully reflected the latest architectural trends and styles; however, along the I-70 Mountain Corridor houses also continued to reflect vernacular and traditional influences well into the twentieth century. Refer to the end of section F 3, High Altitude Agriculture Buildings, Structures and Archaeological Features, for a list of the character defining features of the following specific forms of wood frame dwellings:

- Rectangular Plan Wood Frame Dwelling
- Shotgun House Wood Frame Dwelling
- Hall and Parlor House Wood Frame Dwelling
- I-House Wood Frame Dwelling
- Gabled-L Plan Wood Frame Dwelling
- Gabled-T Plan Wood Frame Dwelling
- Hipped-Roof Box Wood Frame Dwelling
- Pyramid Cottage Wood Frame Dwelling
- Foursquare Dwelling
- Classic Cottage Dwelling
- Bungalow Dwelling

In addition to these previously-discussed building types, two other, more recent, residential-related architectural forms are likely to exist within the I-70 Mountain Corridor. These are discussed below, followed by a detailed discussion of single family dwellings architectural styles.

A-Frame Dwelling – Character Defining Features: Easily recognizable from their A-shaped form, A-Frame buildings became popular in Colorado's mountain communities beginning in the 1960s. Residentially, they were built as modest vacation homes, guest houses, and ski huts. Although considered here as residences, A-Frame buildings were also constructed as commercial buildings, serving variously as fast-food restaurants, motels, gas stations, curio shops, and other small retail establishments. A-Frame buildings are defined by a steeply-pitched gable roof, with the roof eaves extending to grade and forming the walls on the two side elevations. Taking maximum advantage of limited space, A-Frames featured simple and open interior plans, with living, dining, and kitchen facilities in the lower level, and with a sleeping loft above. Dormer windows were occasionally used to illuminate the loft areas.

- Core Plan: Rectangular footprint; A-shaped profile
- Stories: 1 or 1½
- Foundation: Poured concrete or concrete block, with no basement level

- Roof/Walls: Steeply-pitched front-gabled roofs, with the roof eaves extending to grade and forming the two side elevations
- Dormer: Small dormers, utilized to illuminate the sleeping loft area, appear on some examples
- Entry Door: Horizontal sliding glass bypass doors appear on many examples. They let in ample light and do not take up interior space as a hinged door would when it is ajar
- Windows: Predominantly fixed-pane, horizontal sliding, and casement type windows, often with triangular- shaped fixed-pane windows in the upper gable ends.
- Porch Open wood decks are a common feature found in association with many A-Frame dwellings

A-Frame building, Lake City, Colorado. Courtesy of Office of Archaeology and Historic Preservation.

Neo Mansard building. Breckenridge. Source: Carl McWilliams.

<u>*Neo-Mansard Dwelling – Character Defining Features*</u>: Popular from the mid-1960s through the 1990s, Neo-Mansard dwellings represent an attempt to revert from modern influences back toward architectural styles based on traditional forms and details. In this sense, Neo-Mansard dwellings are faintly reminiscent of Second Empire style houses built during the 1860s and 1870s (discussed below). A faux Mansard roof, often covered with wood shake shingles, is the key defining feature. In addition to single-family residences, apartments, commercial establishments, and office buildings also all display Neo-Mansard design elements. Character design features of Neo-Mansard buildings include:

- A faux Mansard roof, typically with wood shake shingles, or another highly-visible, decorative, roofing material
- Recessed windows in the Mansard roof
- Employed on a variety of buildings with a wide array of shapes and sizes

Single Family Dwelling Architectural Styles: Recognized architectural styles described in this section include those known to exist, and those considered likely to exist, within communities in the I-70 mountain corridor. They are presented chronologically, beginning with the earliest stylistically influenced dwellings built during the settlement periods in the nineteenth century, and continuing through to architectural styles popular today early in the twenty-first century.

Greek Revival Style Dwelling – Character Defining Features: Dating from circa 1860 to the mid-1870s, Greek Revival style dwellings are exceptionally rare in Colorado. Examples exist within the I-70 Mountain Corridor, and primarily in the mining towns of Idaho Springs, Georgetown, and Silver Plume. Character defining features of Greek Revival style residences include:

- Modest size and scale
- Wood frame construction
- Pedimented wood lintels and architraves over and surrounding doors and windows
- Pilaster boards at the corners, often fluted, and particularly on the façade
- Engaged piers
- Transom and sidelights surrounding the primary entry
- Slim, refined, Tuscan or Doric porch columns
- Double-hung sash windows with multiple panes in both the upper and lower sashes
- Front gable or side gable roof, or less often a hipped roof

Greek Revival style dwelling, Georgetown. Courtesy of Denver Public Library, Z-9938.

Second Empire Style Dwelling – Character Defining Features: Dating in Colorado from circa 1860 to 1880, this style is also known as "French Second Empire" because it is descendant from styles inspired by French Renaissance traditions. A Mansard roof, often with concave sides and dormer windows, is the key distinguishing feature of a Second Empire style house. Although modest examples may exist, most Second Empire style residences are high style landmark buildings. Apart from its Mansard roof, this style shares many features with Italianate style residences built during roughly the same time period. Character defining features of Second Empire style residences include:

- Mansard roof, with concave or straight sides, and often with dormer windows
- A projecting bay or tower which extends above the roof line
- Pedimented windows, often with molded surrounds
- Quoining at the corners, particularly on the façade
- Roof cresting
- Bracketed cornices

Maxwell House, Second Empire style dwelling, Georgetown. Courtesy of Denver Public Library, X-1277.

Italianate Style Dwelling – Character Defining Features: Dating in Colorado from circa 1870 to 1900, Italianate style houses are primarily defined by their low-pitched hipped roofs and widely-overhanging eaves with paired decorative brackets. Most examples are substantial homes, two or two-and-a-half stories in height. Italianate style houses are differentiated from Second Empire style houses because they lack the Mansard roof; otherwise, the two styles share many common features. Character defining features of Italianate style residences include:

- Low-pitched hipped roof with widely-overhanging eaves
- Cornice with decorative paired brackets
- Tall, narrow, double-hung sash windows, with rounded or segmental arches and molded surrounds
- High style examples may also feature a cupola or tower, arcaded porches, quoins, roof cresting, and ornate detailing especially in association with the front porch and primary entrance.

Italianate style dwelling, Longmont, Colorado. Source: Carl McWilliams.

Italianate style dwelling, Loveland, Colorado. Source: Carl McWilliams.

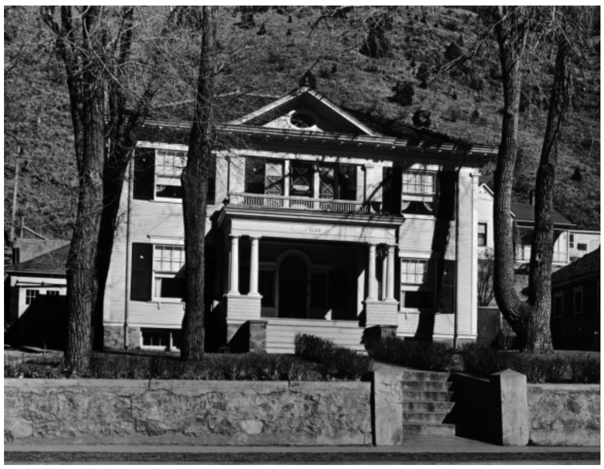
<u>*Queen Anne Style Dwelling – Character Defining Features*</u>: Dating in Colorado from circa 1875 to 1910, Queen Anne houses represent the most ornate style from the late Victorian era. Queen Anne style residences exhibit a vertical orientation, with asymmetrical massing, multiple roof forms and pitches, and contrasting wall materials including the use of both brick and wood. Relatively modest as well as richly-decorative high-style examples are known to exist within the I-70 mountain corridor. Character defining features of Queen Anne style residences include:

- Vertical orientation
- Asymmetrical massing
- Steeply-pitched roofs, with multiple intersecting forms and pitches
- Dormers
- Contrasting wall materials, often including the use of both brick and wood
- Use of contrasting colors
- Corner towers or turrets, often with conical roofs
- Prominent bay windows, often with bracketed cornices
- Prominent, richly-decorative, porches, with turned columns, porch railings with turned balusters and, spindle friezes
- Sunburst motifs over entry doors and in upper gable ends
- Gable ornaments
- Bargeboard
- Decorative shingles

Queen Anne style dwelling, Loveland, Colorado. Source: Carl McWilliams.

Colonial Revival Style Dwelling – Character Defining Features: Colonial Revival style houses in Colorado were constructed over a relatively long time period, between circa 1885 and 1945. They are based on seventeenth century Georgian, Adams, and Federal style buildings with Colonial or Classical details. Character defining features of Colonial Revival style residences include:

- Symmetrical façade
- 2 or 2½ stories
- Side-gabled roof, occasionally with dormers
- Broken pediments over primary entry door and windows
- Primary entry door features a fanlight and flanking sidelights
- Double-hung sash windows, often with 8-over-8 glazing pattern, and often with decorative shutters
- Portico
- Fluted Doric or Tuscan porch columns
- Decorative cornices with dentil courses



Courtney Riley Cooper House, Greek Revival style dwelling, Idaho Springs. Courtesy of Denver Public Library, X-63085.

Edwardian Style Dwelling – Character Defining Features: Edwardian style houses in Colorado represent a blend of late Victorian era styles, most notably the Queen Anne, and revival styles of the late nineteenth century and early twentieth century. They were most commonly built between circa 1900 and 1920. The form and massing of Edwardian style homes are similar to that of Queen Anne style houses; however, they are not as richly decorated, but instead feature Colonial and Classical detail elements. Character defining features of Edwardian style residences include:

- Predominantly brick construction
- Most often 2 or 2½ stories
- Asymmetrical massing
- Cross gabled roofs or hipped roofs with intersecting gables
- Wraparound porches
- Colonial or Classical details

Edwardian style dwelling, Loveland, Colorado. Source: Carl McWilliams.

Dutch Colonial Revival style dwelling, Steamboat Springs, Colorado. Source: Carl McWilliams.

Dutch Colonial Revival Style Dwelling – Character Defining Features: Dutch Colonial Revival style houses in Colorado were constructed between circa 1900 and 1925. They are primarily defined by a steeply-pitched gambrel roof, with the main entry on the side or end elevation. Character defining features of Colonial Revival style residences include:

- Steeply-pitched gambrel roof, with widely-overhanging eaves
- Dormers
- Prominent porches, often with Tuscan or Doric columns
- Colonial or Classical details
- Prominent fireplace chimneys
- Double-hung sash windows, often with 6-over-6 or 8-over-8 glazing patterns

Craftsman Style Dwelling – Character Defining Features: As discussed above under Bungalow type houses, the Craftsman style was inspired by the Arts and Crafts movement in America beginning in the late nineteenth century. While Bungalows represent the most prolific house type inspired by the Arts and Crafts movement, components of the Craftsman style were employed on a variety of residential building forms, including both single family homes and small apartment buildings. Character defining features of Craftsman style residences include:

- Brick or wood frame construction
- Widely overhanging eaves with exposed rafter ends
- Clipped gables
- False half-timbering
- Decorative purlins and ridgepoles with knee braces
- Battered porch pedestals and large, often tapered, columns
- Double-hung sash windows, with multiple (ribbon style) windows in the upper sashes

Craftsman style Dwelling, Loveland, Colorado. Source: Carl McWilliams.

Craftsman style Dwelling, Longmont, Colorado. Source: Carl McWilliams.

<u>*Rustic Style Dwelling – Character Defining Features*</u>: The Rustic architectural style represents a melding of pragmatic forms of pioneer building construction with stylistic principles of the Arts and Crafts movement. The Rustic style was embraced by the National Park Service and U.S. Forest Service during the early 1900s, and later adopted by private architects and builders. In Colorado, early examples appear in and around Rocky Mountain National Park, and mountainous areas in and adjacent to national forests. It was also used at dude ranches, tourist-related facilities, and limited numbers of houses. Designed to blend in with their natural setting, Rustic style buildings emphasized traditional building techniques and materials. The style was at its zenith during the 1930s, popularized by its use in Civilian Conservation Corps and Works Progress Administration projects of the Depression era. Character-defining features of the Rustic style include:

- Log walls; often stained natural brown manufactured horizontal half-log siding
- Stone foundation, or a concrete foundation faced with stone
- Battered lower walls
- Stone chimneys
- Small window panes
- Widely-overhanging eaves, often with stained natural brown exposed rafter ends
- Use of stone and log in porch floors, walls, and support elements

Rustic Style Dwelling, Loveland, Colorado. Source: Carl McWilliams.

Property Subtype: Multiple Family Dwelling: This property subtype refers to residences that were home to more than one family, or to groups of unrelated individuals. Specific types of multiple family dwellings include duplexes, apartment buildings, boardinghouses, and institutional housing related to a particular company or industry. Boardinghouses provided basic, inexpensive lodging mostly to single men, and hence were popularly known as bachelor halls. Often located in transitional areas between commercial, industrial, and residential neighborhoods, boardinghouses were typically larger two or two-and-a-half story buildings. Common architectural forms were Foursquare, Gabled-L, and Gabled-T plans, and styles included Italianate, Colonial Revival and Edwardian. Boardinghouses were often operated by women, often widowed or married to husbands engaged in other economic pursuits. Multiple dwellings, in a variety of forms and styles, were common during the Great Depression of the 1930s as families combined and took in boarders to supplement income. A number of formerly large single-family homes were converted into apartments during the 1930s, with most remaining multiple dwellings from that time forward.

Property Subtype: Secondary Residential Building: A variety of secondary buildings were associated with primary residential buildings along the I-70 Mountain Corridor. These ancillary utilitarian buildings reflect changing lifestyles, preferences, values, and technologies, from the 1870s well into the twentieth century. In function, early secondary buildings often supported basic domestic needs and self-sufficiency. Common buildings included carriage houses, small barns, chicken coops, coal or woodsheds, well houses, and privies. Due to technological advances such as indoor plumbing, and the availability of goods from nearby stores, the need for these types of buildings gradually decreased during the early 1900s. Moreover, with society's increased dependence on automobiles, garages eventually replaced barns and carriage houses as the most prevalent type of secondary residential building.

Nearly all secondary buildings were built with utility and economy in mind. They featured basic rectangular plans and were usually of wood frame construction, although some were built of logs or masonry. Substantial secondary buildings stood on low stone or poured concrete foundations, while temporary versions were simply built on wood footers. Poured concrete began replacing masonry as a common foundation material during the early 1900s. Initially, exterior walls were made of vertical wood planks or mill slabs, while later examples were typically clad with horizontal wood siding painted neutral shades of cream white or cream yellow. Framing members, including vertical studs, floor and ceiling joists, and rafters, were mostly dimensional 2x lumber spaced sixteen inches apart. Carriage houses and barns typically had gable or gambrel roofs, while garages and sheds had gable or shed roofs. All featured broad, vertical plank doors either hinged or sliding. Hinged doors could have been one piece or bi-fold, with X-bracing of milled 1x or 2x lumber. In some garages, plank doors were later replaced with overhead or rollup versions. Smaller buildings such as privies and woodsheds featured gable or shed roofs and single-entry, vertical plank doors. Square or rectangular 4-light windows, with painted wood frames, were a familiar feature on nearly all types of secondary buildings.

Domestic Residential Buildings Significance

Domestic residential buildings were associated with and participated in a variety of important trends. These are summarized as the areas of significance below, and they include Architecture, Commerce and Economics, Community Planning and Development, and Ethnic Heritage/European. Significance is local in most cases, although some trends are statewide. Period of Significance must be considered when determining historical importance of residential buildings. The Period applicable to the I-70 Mountain Corridor in entirety spans 1859 to 1970, and community development within the corridor was an important movement during this entire timeframe. But residential development did not occur simultaneously throughout the corridor, and instead varied in time by corridor segment. Thus, narrower timeframes of significance are more applicable in Clear Creek drainage, Summit County, and in the Eagle and Colorado River valley. The themes discussed Section E can provide better definition.

Area of Significance: Architecture: Residential buildings are architecturally significant because they manifest the building materials, building forms, and architectural styles of I-70 Mountain Corridor communities. The types, styles, materials, and construction methods reflect local, regional, and national trends, socioeconomic changes, and advances in technology. They also represent traditions, cultural preferences, values, community development, and the effect of transportation and industry. For example, architectural styles and ornamental detail elements were influenced by the nationwide diffusion of architectural pattern books and magazines. The railroad provided a ready supply of milled lumber and manufactured building materials for new styles and ornamentations. Indoor plumbing, the automobile, and other technological advancements impacted the styles and sizes of homes, and preferred secondary buildings. Lot sizes, how buildings were situated relative to each other, and placement relative to streets and other features were also impacted. Architecturally significant domestic buildings may display the distinctive characteristics of a type, period or method of construction, or high artistic value. They also may be the work of a master builder or architect.

Areas of Significance: Commerce and Economics: Dwellings may be significant in the areas of Commerce and Economics in several ways. First, they housed business owners and their employees, who made local and regional economies possible. Second, the construction of substantial houses and entire neighborhoods injected money into the local economy. Builders paid wages to construction workers and purchased materials from local businesses, with the money making its way through a community.

Area of Significance: Community Planning and Development: Residential buildings directly reflect how communities in the I-70 Mountain Corridor were planned and developed. Town founders filed plats and sold lots with the intent that different areas would see residential, commercial, and industrial development. They often also planned for public buildings such as courthouses, town halls, and schools, in specific areas. The built environment of each community correspondingly manifests the plats and planning efforts of the town's founders.

Area of Significance: Ethnic Heritage/European: Residential buildings in some communities may be significant for their associations with different European ethnicities. In large mining communities, for example, neighborhood enclaves developed in part along ethnic lines. The materials, types, styles, and construction techniques of residential buildings may provide significant insights into different European ethnicities within the corridor. Ethnicities that may be represented include Irish, Cornish, German, Italian, Slavic, Norwegian, Swedish, and Finnish.

Domestic Residential Buildings Registration Requirements

To qualify for the NRHP, Domestic Residential Buildings must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Domestic residential buildings eligible under Criterion A must be associated with at least one area of significance above, or important events or historic patterns in their communities.

Criterion B: Domestic residential buildings may be eligible under Criterion B if they are associated with the lives of significant persons. A building registered under Criterion B must also retain its physical integrity relative to that person's productive period of occupation. Further, the building's material manifestation must date to the same timeframe as when the individual achieved significance. If a person was significant, the researcher must explain their significant contributions in a brief biography. In some cases, significant people initially developed and owned properties, but did not actually live there and instead rented or leased the property. Such an association does not meet the requirements for Criterion B. The important individual must have been directly associated with the property during the time period of their significant productivity. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Domestic residential buildings may be eligible under Criterion C if they are good representative examples of a type, period, style, or method of construction. Similarly, a building may be eligible under Criterion C if it represents the work of a master builder or architect, or if it possesses high artistic values.

Criterion D: Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. A building lot may possess a standing dwelling, as well as archaeological features representing property developments, improvements, or domestic activities. Secondary building foundations or wells are examples. Such evidence may convey patterns of domestic residential settlement and community development during the Period of Significance. If archaeological features and artifacts yield important information regarding settlement patterns, property development and design, and domestic life, then the property may qualify under Criterion D.

If the property possesses building foundations, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography within individual communities. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, mode of employment.

Domestic residential buildings must possess physical integrity relative to the Period of Significance outlined above. Few residential buildings appear precisely as they did when initially established. Instead, they were modified over time as their residents adapted to ever-changing technologies, socioeconomic trends, values, and preferences. Such modifications to residential buildings can provide important insights into the development of their communities.

All seven aspects of historic integrity as defined by the NRHP – Location, Design, Setting, Materials, Workmanship, Feeling and Association - may apply to domestic residential buildings, although not all need be present for eligibility. The National Park Service provides the following language to provide guidance in understanding the seven aspects of integrity:[4]

Location: Location is the place where a historic dwelling was constructed and where associated events and trends occurred. A dwelling must be in its original place of use to retain integrity of location. Location is important for understanding the history of the dwelling, its occupants, and associated events and persons. Except in rare cases, integrity of location is lost when a dwelling is moved.

Design: Design is the combination of elements that create form, plan, space, structure, and style of a property. Design results from conscious decisions made during the original conception and planning of a property (or its significant alteration) and applies to activities as diverse as community planning, domestic engineering, architecture, and landscape architecture. Design elements include organization of space, proportion, scale, technology, ornamentation, and materials. A property's design reflects historic functions and technologies, as well as aesthetics. It includes considerations such as the structural system; massing; arrangement of spaces; pattern of fenestration; textures and colors of surface materials; type, amount, and style of ornamental detailing; and arrangement and type of plantings in a designed landscape.

Design can also apply to districts, whether they are important for historic association, architectural value, information potential, or a combination thereof. In districts, design concerns more than just individual buildings or structures located within the boundaries. It also applies to the way in which buildings, sites, or structures are related. Examples include spatial relationships between major features; visual rhythms in a streetscape or landscape plantings; the layout and materials of walkways and roads; and the relationship of other features such as statues, water fountains, and archeological sites.

Setting: Setting is the physical environment around a historic dwelling. Whereas location refers to the specific place where a dwelling was built, setting refers to the *character* of the place where the property played its historical role. It involves *how*, not just where, the property is situated and its relationship to surrounding features and open

[4] *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*: http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_8.htm#seven aspects

space. Setting often reflects the basic physical conditions where a dwelling was built and the functions it served. In addition, the way in which a property is positioned in its environment can reflect the builder's aesthetic preferences and perception of nature. The physical features constituting the setting can be either natural or manmade. Features and their relationships should be considered not only within the boundaries of a residential property, but also between the property and its surroundings. This is particularly important for districts.

Materials: Materials are the physical elements that were assembled or deposited in a particular pattern or configuration to form a historic property. The choice and combination of materials reveal the preferences of those who built the dwelling and indicate the availability of particular types of materials and technologies. Indigenous materials are often the focus of regional building traditions and thereby help define an area's sense of time and place. To retain integrity of materials, a dwelling must feature the key exterior elements dating from its period of significance. If the property has been rehabilitated in the recent past, then the historic materials and significant features must have been preserved.

Workmanship: Workmanship can apply to a dwelling as a whole or its individual components. Workmanship is the physical evidence of craft, method, labor, and skill in constructing or altering a building. It can be expressed in vernacular methods of construction and unadorned finishes, or in sophisticated configurations and ornamental detailing. Common traditions, innovative period techniques, technological practices, and aesthetic principles may be reflected in the workmanship of a dwelling.

Feeling: Feeling is a dwelling's expression of the aesthetic or historic sense of a particular period of time. It results from the presence of physical features that, taken together, convey the property's historic character.

Association: Association is the direct link between an important historic event or person and a historic property. A dwelling retains association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer. Like feeling, association requires the presence of physical features that convey a dwelling's historic character.

PROPERTY TYPE: COMMERCIAL BUILDINGS

Commercial buildings in the I-70 Mountain Corridor have been constructed from the beginning of settlement to present day. Commercial construction was initially haphazard and lacked a sense of permanence; thus, few early commercial buildings remain. The greatest number of commercial buildings post-date when communities were organized, and often when towns were incorporated or otherwise attained local government. The architectural characteristics, size, scale, and placement of commercial buildings follow discernable trends. Within each town, commercial buildings were primarily concentrated along a broad main street, and located on deep, narrow, lots designed to maximize storefronts along a block face. Twenty-five feet was the most common width for a commercial lot, with large buildings expected to span multiple lots. Constructed progressively of wood, stone, and brick, commercial buildings were most often one or two stories in height. They typically fronted directly onto wide board or sidewalks, and with the side walls of adjacent buildings abutting each other. Some stand-alone commercial buildings deviated from this pattern when automobiles became common. These buildings were usually associated with single retail uses, embraced new architectural trends, and were often set well back from the sidewalk to accommodate off-street parking.

The property subtypes and architectural styles discussed in this section are intended to comport with relevant sections of the *Field Guide to Colorado's Historic Architecture and Engineering* available online through the OAHP website. Presented chronologically, these property subtypes and styles include: False Front Commercial Buildings; Late 19th Century Commercial Buildings (including single storefronts, double storefronts, corner buildings, and commercial blocks); Twentieth Century Commercial Buildings; Automobile-Related Commercial Buildings (including motels, motor courts, gas stations, automobile dealerships, and automobile repair garages); and Entertainment/Recreation-Related Commercial Buildings.

Commercial Buildings Subtypes:

Property Subtype: False Front Commercial Building: False front commercial buildings are an easily-recognized unique symbol of Colorado's pioneer heritage. Constructed in mining, agricultural, and railroad-related communities throughout the I-70 Mountain Corridor, false front commercial buildings primarily date from before the turn of the twentieth century. However, examples from as late as the 1940s are likely. One to two stories in height, these buildings are typically of wood frame construction with a front gabled rectangular form. The façade wall of a false front commercial building, though, extends upward to conceal most if not all the roof. Historically, the name or nature of the business within the building was often painted on the false front, with the overall impression created by the large façade suggesting a stable and successful business. Moreover, a commercial block lined with multiple false front buildings helped create an illusion of a substantial, prosperous town. The façades of false front commercial buildings were built of a more substantial grade of lumber, relative to the side and rear elevation walls. Façade walls were also typically finished with painted horizontal wood siding, maintained in good repair, and often with a decorative bracketed cornice. Character-defining features include:

- Front gable roof
- Façade parapet extending above the roof line
- Wood frame construction (some rare log examples may exist)
- One to two stories
- Elaborate cornice, often with decorative brackets
- Rectangular plan

False Front Commercial building, Clear Creek County. Courtesty of Denver Public Library, X-8541.

Property Subtype: Nineteenth Century Commercial Building: Commercial buildings in the I-70 Mountain Corridor, constructed between 1865 and 1900, may be categorized as single storefronts, double storefronts, corner buildings, and commercial blocks. The businesses historically located in these buildings catered to the retail needs of the towns' citizens during the late nineteenth century. Common trade establishments included general stores, bakeries, meat markets, saloons, restaurants, confectioneries, dry goods, millineries, and pharmacies. Most towns also boasted one or more banks, livery stables, saddlery shops, and flour/feed mills in close proximity to their commercial cores.

Single storefronts were typically twenty-five feet across, occupying the width of a single commercial lot, with a single, centered, entry. Double storefronts were typically fifty feet across, spanning the width of two commercial lots, and with separate entrances for two adjacent stores, and often with another doorway leading to an interior staircase. Corner buildings often had angled corner entries, designed to attract pedestrian traffic from the sidewalks along two intersecting streets. Commercial blocks were larger, spanning multiple lots, were and were usually two or more stories in height.

Snetzer's Tailor Shop, Georgetown. Single Storefront commercial building. Courtesy of Denver Public Library, X-1303.

Bank Block, Idaho Springs, Double Storefront commercial building. Courtesy of Denver Public Library, AUR-981.

Retail stores occupied the street level of nineteenth century commercial buildings, while their second stories were used as hotel rooms, professional offices, and as meeting space for fraternal organizations. Early examples were of wood frame construction, and usually one or two stories in height; later examples were built of brick and stone masonry, as well as wood, and were two or more stories in height. Roofs were predominantly flat, or a very low-pitched shed roof.

Architecturally, these buildings may be regarded as representative of Italianate style due to their façade detail elements. Many, in fact, featured prefabricated cast iron facades with decorative elements such as kickplates, simulated columns, and cornices with parapets, recessed panels, and finials. A secondary cornice often separated the first and second stories, replicating the primary cornice at the top of the façade wall. Some cast iron facades were fabricated by local ironworks companies, while others were ordered from such companies as Mesker Bros. Iron Works of St. Louis, which shipped them in components by rail. The street levels of nineteenth century commercial buildings featured recessed entrances with transom lights over the entry door. Expanses of fixed-pane storefront display windows flanked the entryways. Second story windows were comparatively smaller, and were typically narrow double-hung sash type windows, with segmental or rounded brick arches, or flat sandstone lintels. Character-defining features of the Late Nineteenth Century Commercial style buildings include:

- Four basic plans: single storefront, double storefront, corner building, commercial block
- Kickplates
- Recessed entrances with transom lights over the primary entry door
- Fixed-pane storefront display windows
- Smaller, narrow, double-hung sash second story windows with segmental or rounded brick arches, or flat sandstone lintels
- Flat roofs
- Cast iron facades, variously with simulated columns, and decorative cornices with parapets, recessed panels, and finials
- Secondary cornices between first and second stories

Mahr Building in Telluride, Colorado, with 1892 Mesker Bros. cast iron façade. Source: Carl McWilliams.

Sopp and Truscott Bakery, Corner Commercial building, Silver Plume. Courtesy of Denver Public Library, AUR-962.

Early Twentieth Century Commercial Building: Commercial buildings in the I-70 Mountain Corridor dating from the early twentieth century are, for the most part, less ornate than their nineteenth century counterparts. They were primarily built of brick masonry, with lighter shades of blond and brown face bricks used on façade walls, and with common soft red brick used for side and rear walls. Commercial buildings during the early 1900s continued to feature rectangular plans with flat, or nearly flat, roofs, and were one or more stories in height. First stories continued to house retail establishments, while second stories continued to serve as office and meeting space, and increasingly as modest apartments. Decorative elements were often limited to corbelled brickwork and recessed brick panels along the upper façade wall. Some entry doors were flush with the façade wall, while others were deeply recessed or incorporated into angled first story façade walls. Second story windows typically featured flat lintels. Character-defining features of the Early Twentieth Century Commercial style buildings include:

- Brick wall construction, often with pressed blond or brown brick on the facade
- Flush, recessed, or angled entries
- Translucent window transoms
- Transom lights over entry doors and fixed-pane storefront display windows
- Decorative brickwork, including corbelled cornices and recessed brick panels
- Flat roofs
- Less ornamentation than late nineteenth century commercial buildings

Routt County National Bank, Early Twentieth Century Commercial building, Steamboat Springs, Colorado. Source: Carl McWilliams.

Skee Inn Cafe, Early Twentieth Century Commercial building, Steamboat Springs, Colorado. Source: Carl McWilliams.

Property Subtype: Automobile-Related Commercial Building: By the 1920s, many agricultural-based retail stores gave way to a new type of business, which capitalized in one way or another on the automobile. Liveries, saddle shops, blacksmith shops, and feed stores were greatly reduced in number, if not gone entirely - replaced by motels, motor courts, filling stations, automobile repair garages and dealerships, and new and larger restaurants and stores. The automobile changed not only the kinds of businesses, but also the physical form and styles of their buildings, as well as where they were located and sited on commercial lots. Gas stations, motels, motor courts, and even restaurants moved to the edge of town, seeking to be among the first to attract arriving travelers. In addition to food, rest, and gasoline, automobile travelers also required places to park. Partly as a result, automobile-related businesses were often set back from the street, designed and sited in non-traditional ways, with ample off street parking. Automobile-related establishments, and advancing technologies, gradually gave rise to new forms of advertising, including colorful, eye-catching signage, neon lighting, and buildings with unique, oddly-shaped, roofs.

In keeping with this spirit, A-Frame, and Neo-Mansard type buildings became popular in Colorado’s mountain communities during the post World-War II era. Because these building types were also constructed as residences, they are discussed in greater detail under Domestic Residential Buildings property types. Three specific types of gas stations have been identified in Colorado, including in the I-70 Mountain Corridor: the Cottage Gas Station, the House with Canopy Gas Station, and the Oblong Box Gas Station. These three specialized building forms are discussed in this section, along with two other architectural styles: the House with a Commercial Addition, and Googie.

Cottage Gas Station Character Defining Features: Cottage gas station buildings were erected by oil companies primarily in the 1920s. They featured English-Norman Cottage or modest Tudor-Revival stylistic elements, and were designed to blend in with residential neighborhoods. Some examples included an attached or separate service bay, built either as part of the original construction or as an addition.

- Small square or rectangular plan office
- Steeply-pitched side-gabled roof, with closed eaves or minimal overhang
- Steeply-pitched gable over entrance
- Multi-paned windows
- Located at intersections or along well traveled roads

Cottage Gas Station with attached service bay, Longmont, Colorado.
Source: Carl McWilliams.

House with Canopy Gas Station Character Defining Features: Primarily dating from the 1910s and 1920s, House with Canopy gas stations are among the earliest automobile-related buildings. They were located at intersections and along well-traveled roads in the I-70 Mountain Corridor. The basic plan featured a small square or rectangular office, with a low-pitched hip or gable roof which extended to cover a poured concrete pull-through driveway where the gas pumps were located. Some examples featured two canopy roof extensions forming an L-shaped plan over intersecting driveways.

- Small square or rectangular plan office
- Low-pitched roof extends to cover a pull-through driveway and gas pumps
- Roof canopy supported by a single center post or by twin posts at either end
- Located at intersections or along well-traveled roads

House with Canopy Gas Station, Denver. Courtesy of Denver Public Library, X-23806.

<u>*Oblong Box Gas Station Character Defining Features*</u>: House with Canopy gas stations were commonly known as "filling stations." Accordingly, their business was limited to filling customers' gas tanks and sales of motor oil and a limited line of auto parts and accessories. Some operators, however, wanted to offer auto repair services but lacked necessary interior space. The operators, therefore, had to locate service areas behind or beside the main building. Grease pits, short ramps, or crank lifts provided mechanics with access to the underside of vehicles. The expansion into vehicle repair and maintenance began a shift in gas station form and function from "filling station" to "service station."

In the 1930s, oil company executives and their architectural designers embraced new concepts in industrial design. To enhance the presentation of products and services, they gave consideration to a service station building's overall shape, interior layout, company logos and symbols, color, texture, sounds, and displays. One result was the Oblong Box type gas station, commonly built through the 1970s. Architecturally, these buildings embraced Art Deco, Streamline Moderne, and Industrial style elements. Most stations featured basic rectangular, flat-roofed plans, but some examples were built with butterfly, shed, gable, and neo-Mansard roof forms. Interior space was divided into a small sales room/office, a storeroom at rear, and one or two service bays to one side. The service bays had metal or wood-paneled rollaway doors, and hydraulic lifts to raise and service autos. Men's and women's restrooms were usually located in the rear corner of the building and behind the sales/office area, entered through doors in the rear of the side elevation. In some designs, however, the women's restroom was accessed from within the sales room for safety. In the 1970s, Oblong Box gas stations gave way to the convenience store type service station, which dominates at present. Many Oblong Box gas station buildings remain in the I-70 Mountain Corridor, either for autos or other retail uses.

- Rectangular plan
- Most commonly with a flat roof
- Minimalist streamlined decorative elements
- Corner sales room/office
- One or two service bays
- Men's and women's restrooms

Enco/Humble Oblong Box Gas Station, Denver. Courtesy of Denver Public Library, MCD-19.

Texaco Oblong Box Gas Station, Ignacio, Colorado. Courtesy of Denver Public Library, X-17788.

House with Commercial Addition Character Defining Features: In the I-70 Mountain Corridor and elsewhere, the automobile age gave rise to new types of businesses that often catered to auto tourists. Curio shops, small cafes, and other retail establishments informally known as "mom and pop" businesses grew in residential and mixed use neighborhoods. Rather than buying or leasing separate retail space, some business owners built commercial additions on their existing homes. Although the size and style of house varied, commercial additions were architecturally distinct additions. Most were typically one story in height with a flat roof, and wood frame, brick, stucco, or concrete block construction. The additions were built directly on the original house's façade or side elevation, or wrapped around both. In any case, commercial additions were highly-visible, often extending to the front sidewalk or near the curb.

- One-story commercial addition directly abuts the original dwelling
- Addition may be directly to the façade, or to a side elevation, or wrap around to cover portions of the façade and a side elevation
- Majority of house retains key aspects of its physical integrity
- Commercial addition has its own entry

Googie Style Character Defining Features: Popular culture suggests that Yale professor Douglas Haskell first used the name "Googie" in 1949 when he happened upon the newly-built Googies Restaurant, designed by architect John Lautner, at the corner of Sunset Boulevard and Crescent Heights in Los Angeles. Also known variously as Doo Wop, Coffee Shop Modern, Populux, Jet Age, and Space Age architecture, the Googie style broke with traditional customs of building construction and design. Steel and concrete were used innovatively while new materials, including plastic, asbestos, glass block, Masonite, and flagcrete (faux rock) were incorporated into revolutionary designs. Featuring eye-catching shapes, colors, and contrasting materials, a Googie style building was the primary advertisement for the retail business within. Often associated with restaurants and other automobile-related businesses, Googie style spread from southern California to other regions in the West during the 1950s, and peaked in the early 1960s. The style began waning in the mid-1960s in favor of more traditional architectural designs and themes. Reasons for its demise range from corporate preference for traditional standardized architecture to broader social forces occurring in the 1960s.[5]

- Dramatic roof forms, including butterfly (inverted-V), cantilevers, angled overhangs, and exposed trusses
- Use of modern, contrasting, modern materials
- Neon lights
- Bright colors
- Tall neon signs or integrated sign pylon
- Large and tall plate glass windows, dramatized by the roof forms
- Blurring of distinction between interior and exterior spaces through the innovative designs of materials, lighting, windows, and landscaping

[5] See "Googie Architecture Online." http://www.spaceagecity.com/googie/

Googie Style Colorado Cafe, 601 E. Colfax Ave., Denver. Courtesy of Denver Public Library, Z-10645.

Googie Space Station Gas sign in Steamboat Springs, Colorado. Source: Carl McWilliams.

Property Subtype: Entertainment/Recreation-Related Commercial Buildings, Structures and Objects: Specific types of entertainment/recreation-related resources are likely to exist within the I-70 mountain corridor. These types of properties may include roller skating rinks, bowling alleys, motion picture theaters, performance halls, fairgrounds, sporting and athletic facilities, sculptures and other works of art, and historical monuments and markers. Motor courts, motels, restaurants, and other tourist-related resources (previously discussed under automobile-related property types) may also be regarded as entertainment/recreation properties. Resources within this subtype are typically readily-recognized, stand-alone, facilities that served specialized functions.

Commercial Building Significance

Commercial buildings in the I-70 Mountain Corridor were associated with and participated in a variety of important trends. These are summarized below as the Architecture, Commerce and Economics, and Community Planning and Development areas of significance. Significance is local in most cases, although some trends are statewide. Period of Significance must be considered when determining the historical importance of commercial buildings. The period applicable to the I-70 Mountain Corridor spans 1860 to 1970, and commercial development within the corridor's towns and communities was an important movement during this entire timeframe. But the important periods of commercial development varied slightly for each community, which had its own history and economy.

Area of Significance: Architecture: Commercial buildings are architecturally significant because they represent the materials, forms, and styles of the buildings where goods and services were bought and sold. The types, styles, materials, and construction methods reflect local, regional, and national trends, socioeconomic changes, and advances in technology. They also represent traditions, cultural preferences, values, community development, and the effect of transportation and industry. For example, architectural styles and ornamental detail elements were influenced by the nationwide diffusion of architectural pattern books and magazines. The railroad provided a ready supply of milled lumber and manufactured building materials for new styles and ornamentations. Indoor plumbing, electric lighting, central heat, the automobile, and other technological advancements impacted the styles and sizes of commercial buildings. Lot sizes, how buildings were situated relative to each other, and placement relative to streets and other features were also impacted. Architecturally significant commercial buildings may display the distinctive characteristics of a type, period or method of construction, or high artistic value. They also may be the work of a master builder or architect.

Areas of Significance: Commerce and Economics: Commercial buildings may be significant in the areas of Commerce and Economics in several ways. First, they were a foundation for local economies. The buildings were places where goods and services were bought and sold, and where people worked, shopped, and conducted most other forms of business. As such, nearly all commercial buildings were directly associated with events that made important contributions to broad patterns of the corridor's history. Second, the construction of individual buildings and entire business districts injected money into the local economy. Builders paid wages to construction workers and purchased materials from local businesses, with the money making its way through a community.

Area of Significance: Community Planning and Development: Commercial buildings directly reflect how communities in the I-70 mountain corridor were planned and developed. Town founders filed plats and sold lots on the premise that different areas would see residential, industrial, and public uses. They also planned for commercial buildings and even business districts in specific areas. As a result, the early built environment of each town correspondingly manifests the plats and planning efforts of the town's founders. Automobile-related commercial buildings, erected during the twentieth century, reflect community evolution away from their historic central business districts and toward businesses scattered along highways.

Commercial Building Registration Requirements

To qualify for the NRHP, Commercial Buildings must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Commercial buildings eligible under Criterion A must be associated with at least one area of significance above, or important events or historic patterns in their communities.

Criterion B: Commercial buildings may be eligible under Criterion B if they are associated with the lives of significant persons. A building registered under Criterion B must retain its physical integrity relative to that person's productive period of occupation. Further, the building's material manifestation must date to the same timeframe as when the individual achieved significance. If a person was significant, the researcher must explain their significant contributions in a brief biography. The important individual must have been directly associated with the property during the time period of their significant productivity. If significance is through occupation of the building, then Criterion B applies. If significance is through design, then Criterion C is relevant. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Commercial buildings may be eligible under Criterion C if the buildings are good representative examples of a type, period, style, or method of construction. Similarly, a commercial building may be eligible under Criterion C if it represents the work of a master builder or architect, if it possesses high artistic values.

Criterion D: Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. A building lot may possess a commercial enterprise, as well as archaeological features representing other property developments, improvements, or domestic activities. Secondary building foundations or cellars are examples. Such evidence may convey patterns of commerical and community development during the Period of Significance. If archaeological features and artifacts yield important information regarding settlement patterns, property development and design, and domestic life, then the property may qualify under Criterion D.

If the property possesses building foundations, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography within individual communities. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, mode of employment.

Commercial buildings must possess physical integrity relative to the Period of Significance outlined above. Few commercial buildings appear precisely as they did when initially established. Instead, they were modified over time to accommodate new retail uses and ever-changing technological and socioeconomic trends, values, and preferences. Such modifications to commercial buildings can provide important insights into the development of their communities.

All seven aspects of historic integrity as defined by the NRHP – Location, Design, Setting, Materials, Workmanship, Feeling and Association - may apply to commercial buildings, although not all need be present for a property to qualify for NRHP designation. The National

Park Service provides the following language to provide guidance in understanding the seven aspects of integrity:[6]

> *Location:* Location is the physical place where the historic commercial building was constructed and where events occurred associated with its businesses, retail functions, and other occupants. A commercial building must be in its original place of construction and use to retain integrity of location. Location is important for understanding the history of the building, its commercial businesses, and associated events and persons. Except in rare cases, integrity of location is lost when a commercial building is moved.
>
> *Design:* Design is the combination of elements that create a commercial building's form, plan, space, structure, and style. Design results from conscious decisions made during the original conception and planning of the building and its related features. It applies to activities as diverse as community planning, domestic engineering, architecture, and landscape architecture. Design elements include organization of space, proportion, scale, technology, ornamentation, and materials. A commercial building's design reflects its historic functions and technologies, as well as aesthetics. A commercial building's structural system, massing, arrangement of spaces, pattern of fenestration, textures and colors of surface materials, and type, amount, and style of ornamental detailing, are all elements of its design. Other design considerations include setback from the sidewalk or curb, number of stories, and proximity to adjacent commercial buildings.
>
> Design can also apply to districts, whether they are important for historic association, architectural value, information potential, or a combination thereof. In districts, design concerns more than just individual buildings located within a commercial district's boundaries. It also applies to the way in which buildings, sites, or structures are related. Examples include spatial relationships between major features; visual rhythms in a streetscape or landscape plantings; the layout and materials of walkways and roads; and the relationship of other features such as statues, water fountains, and archeological sites.
>
> *Setting:* Setting is the commercial building's surrounding physical environment. Whereas location refers to the specific place where the commercial building was erected, setting refers to the *character* of the place where it was built and played its historical role. It involves *how*, not just where, the building is situated and its relationship to other commercial buildings, surrounding features and open space. Setting often reflects the basic physical conditions under which a commercial building was constructed and the primarily business-related functions it served. In addition, the way in which a building is positioned in its environment may reflect how the designer intended to enhance its commercial success. The physical features that constitute the setting of a historic commercial building can be either natural or manmade. Features and their relationships should be examined not only within the exact boundaries of the building's commercial lot, but also between the property and its *surroundings*. This is particularly important for districts.

[6] *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*: http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_8.htm#seven aspects

Materials: Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. The choice and combination of materials reveal the preferences of those who created the commercial building and indicate the availability of particular types of materials and technologies. Indigenous materials are often the focus of regional building traditions and thereby help define an area's sense of time and place. To retain integrity of materials, a commercial building must feature the key exterior materials dating from its period of significance. If the building has been rehabilitated in the recent past, then the historic materials and significant features must have been preserved.

Workmanship: Workmanship can apply to a commercial building as a whole or to its individual components. Workmanship is the physical evidence of craft, method, labor, and skill in constructing or altering a building. It can be expressed in vernacular methods of construction and unadorned finishes, or in sophisticated configurations and ornamental detailing. Common traditions, innovative period techniques, technological practices, and aesthetic principles may be reflected in the workmanship of a commercial building.

Feeling: Feeling is a commercial building's expression of the aesthetic or historic sense of a particular period of time. It results from the presence of physical features that, taken together, convey the building's historic character.

Association: Association is the direct link between an important event or person and a historic property. A commercial building retains integrity of association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer. Like feeling, association requires the presence of physical features that convey a building’s historic character.

PROPERTY TYPE: CULTURAL, RELIGIOUS, AND PUBLIC BUILDINGS

Buildings under this property type within the I-70 Mountain Corridor are those that served, or were associated with, governmental, social, and, religious functions. Specific kinds of resources include courthouses in Georgetown and Eagle, town halls, libraries, museums, schools, fire stations, post offices, jails, fraternal halls, churches, parsonages and rectories. This property type category also includes buildings at public works facilities within towns, such as water treatment plants. Because these resource types served community-wide functions, they are likely to be relatively few in number but architecturally significant. Architectural types and styles which may be represented under this property type include Art Deco, Bungalow, Carpenter Gothic, Colonial Revival, Gothic Revival Mission, Renaissance Revival, WPA Moderne and WPA Rustic. Older resources within this property type may also represent several wood frame building forms, most notably wood frame front gable and wood frame false front buildings. For organizational purposes, resources within this property type section are divided into four subtypes: cultural/social-related buildings, government buildings, religious buildings and features, and public works facilities.

Section F 8: Common Architectural Property Types

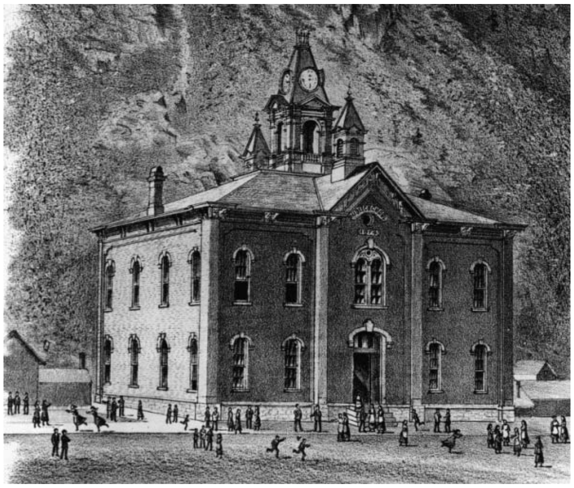
Cultural, Religious and Public Buildings Subtypes:

Property Subtype: Cultural/Social Building: Some resources within this subtype category may be quasi-governmental buildings, but because they served community-wide, social functions, they are discussed here. Properties within this subtype include fraternal halls, museums, schools, libraries, along with resources such as parks, playgrounds, picnic shelters, bandstands, public monuments and works of art.

Fraternal Organization Related Building: Fraternal organizations, including the Freemasons, International Order of Odd Fellows, Knights of Columbus, and Woodmen of the World, played an important role in the social fabric of communities within the I-70 Mountain Corridor. Many of these organizations convened regularly in upstairs meeting rooms in late nineteenth or early twentieth century commercial buildings. In time, though, some fraternal organizations erected their own buildings, used specifically by their members. Further, a few fraternal organizations saved the financial resources for the construction of a commercial building that the organization then owned. Members would meet on the second or third floors, while the ground floor was leased to retail tenants. Office space may have been leased as well. Apart from such commercial buildings, no predominant architectural form, type, or style is known to be specifically associated with fraternal organizations in the I-70 Mountain Corridor.

Schools: A limited number of school buildings are known to exist within the corridor's towns. Two architecturally significant Romanesque Revival style schools are located in Georgetown and Silver Plume. Small, early, schoolhouses are known in Frisco, Lawson, and in other communities. These are typically rectangular-shaped wood frame buildings with one or two rooms. They most often have moderately-pitched front gable roofs, symmetrically-arranged double-hung windows along the side elevations, and an entry door in the gable end. Many such schools also featured a bell tower above the entry as a notable architectural feature. Nearly all one or two room schoolhouses have been converted to other uses such as museums.

Libraries: The Renaissance Revival style Carnegie Library in Idaho Springs is among the I-70 Mountain Corridor's most architecturally and historically significant libraries. Other Carnegie libraries may exist, however, because nearly 1700 were built nation-wide during the 1880s and into the 1920s. Their construction was funded through grants from Andrew Carnegie, a prominent Scottish-American businessman and philanthropist. Towns were required to meet four criteria to obtain a library grant: demonstrate need; dedicate a building site; provide ten percent of the construction cost, annually, in support of the library's operation, and agree to free services for all. Other, non-Carnegie, libraries are likely to exist within the I-70 Mountain Corridor, including some in Bungalow or Craftsman style buildings.



Georgetown School (reproduction of ink drawing), Courtsey of Denver Public Library, X-11393.

Silver Plume School. Courtesy of Denver Public Library, X-2162.

Museums: Small museum-related buildings exist in Eagle, Frisco, Georgetown, Idaho Springs, and likely elsewhere within the corridor. Some museums are located in old schoolhouses, and in late nineteenth century and early twentieth century commercial buildings.

Property Subtype: Government/Administrative Building: Specific resources associated with this property subtype include courthouses, town halls and other local government office buildings, jails and other law enforcement-related buildings, fire stations, and post offices.

Courthouse: Courthouses are few and can be considered individually. The Eagle County Courthouse in Eagle exhibits elements of Art Deco style, and thus is likely architecturally significant. Constructed in the 1970s, the Clear Creek County Courthouse in Georgetown is also located within the I-70 Mountain Corridor. The Summit County Courthouse is outside the corridor, in Breckenridge.

Town Hall: Buildings that historically served as town halls, or in present use, are located in communities throughout the corridor. In Silver Plume, Frisco, and Eagle, town halls have been located in late nineteenth century, wood frame, false front commercial buildings and in early twentieth century brick commercial buildings.

Jail: Late nineteenth century jails, typically of heavy stone construction, are known to exist in Georgetown and Silver Plume. Jails may exist in other towns as well, probably in association with early town hall buildings. All can be characterized and evaluated for significance individually.

Silver Plume Town Hall, Courtesy of Denver Public Library, X-2209.

Silver Plume Jail, Courtesy of Denver Public Library, X-2181.

Post Office: Historic as well as modern post office buildings exist in all communities within the I-70 Mountain Corridor. They represent various building forms, types and styles. The historic Frisco Post Office, built in 1882, is a 2½-story wood frame front gabled building listed on the National Register of Historic Places. Erected in the 1970s, the Georgetown Post Office exhibits Colonial Revival style elements.

Firehouse: Historic firehouses, including some with distinctive hose towers, represent a notable property type in Idaho Springs, Georgetown, and Silver Plume, and perhaps in other communities. Known historically as "Hook and Ladder Companies" and "Hose Companies," two such facilities in Georgetown and Silver Plume were later utilized as town halls. Firehouses are few in number and can be evaluated individually.

Star Hook and Ladder Firehouse, Georgetown. Courtesy of Denver Public Library, X-1299.

Alpine House Company No. 2, Georgetown. Courtesy of Denver Public Library, X-1048.

Property Subtype: Religious Building: Representing several denominations, churches are the dominant type of religious buildings within the I-70 mountain corridor. Architecturally, most churches are representative of the Gothic Revival and Carpenter Gothic styles. Churches may also exist as Mission Revival style buildings, as well as rectangular-shaped wood frame front gable buildings. Church-related residences, including parsonages and rectories, may be found in association with some churches. They are not known to be associated with a specific form, type, or style of domestic architecture.

Gothic Revival Style Churches Character Defining Features: Gothic Revival style churches are primarily defined by their pointed arch windows. Predominantly of stone or brick masonry construction, Gothic Revival style churches are also likely to feature prominent corner towers, steeply-pitched roofs, buttresses, and deeply-recessed entrances. Towers are typically square, with flat or spired roofs, and they often contain the church vestibule. Some examples have twin towers flanking the front entry, while others have a single tower at one corner.

- Pointed arch windows
- Prominent towers
- Buttresses
- Deeply recessed entrance
- Steeply-pitched roof
- Brick and stone construction

Carpenter Gothic style church, Gypsum, Colorado. Courtesy of Denver Public Library, 3424.

Carpenter Gothic style church, Georgetown. Courtesy of Denver Public Library, X-4134.

Carpenter Gothic Style Churches Character Defining Features: Carpenter Gothic churches are wood frame buildings with Gothic Revival style architectural features. They are relatively simplistic in form, though, as they usually lack the corner tower, buttresses, and a deeply-recessed entry. They do retain the pointed arch windows, however. Other Carpenter Gothic features include a rectangular plan, a steeply-pitched roof, clapboard siding, and decorative vergeboard in the façade's upper gable end. Many Carpenter Gothic churches also feature a bell tower

- Pointed arch windows
- Decorative vergeboard
- Clapboard siding
- Rectangular plan
- Steeply-pitched gable roof
- Wood frame construction

Mission Revival Style Churches Character Defining Features: A limited number of Mission Revival style churches may exist within the I-70 Mountain Corridor. Primarily defined by curvilinear-shaped gables or parapets, Mission style buildings also typically featured smooth stucco or plaster exterior walls, clay tile roofs, and rounded arch doors and windows. The style was inspired by Spanish missions built in California during the late eighteenth and early nineteenth century. Mission Revival style buildings became popular during the early 1900s, especially after the Santa Fe and Southern Pacific Railroads adopted the style for its depots and hotels.

- Curvilinear-shaped gables and parapets
- Tile roof
- Rounded arches over door and window openings
- Stucco or plaster exterior wall finish

Property Subtype: Public Works Building: Public Works Buildings are associated with the production of public utilities and other services such as waterworks and sewage treatment plants. Electric powerplants, a quasi-public utility, are discussed elsewhere in this context. A limited number of public works buildings and complexes exist within the I-70 Mountain Corridor, and some may have been constructed as part of Depression era Works Progress Administration (WPA) projects. Those buildings, to the extent they exist, are likely in WPA Rustic and perhaps the WPA Moderne architectural styles. Information pertaining to the Rustic style is presented above under the Domestic Residential Buildings Property Types. WPA Moderne buildings common in eastern Colorado and along the Front Range, are rare in the I-70 Mountain Corridor, if any exist at all. Perhaps displaying evidence of the use of hand tools and labor, WPA Moderne buildings feature streamlined plans, flat or barrel roofs, rounded corners, and a horizontal emphasis. They are likely to lack of ornamentation other that a grooved horizontal band or belt course, on an otherwise smooth exterior wall surface.

Cultural, Religious and Public Buildings Significance

Buildings associated with cultural, religious, and public themes in the I-70 Mountain Corridor may be significant under several themes. These include Architecture, Community Planning and Development, Education, Industry, Politics/Government, Religion, and Social History. These areas of significance, and the property types and subtypes associated with them, are discussed in greater detail below. Significance is local in most cases, although some trends are statewide. Period of Significance must be considered when determining the historical importance of commercial buildings. The period applicable to the I-70 Mountain Corridor spans 1860 to 1970, and cultural and religious functions were an important movement during this entire timeframe. But the important periods of development varied slightly for each community, which had its own history and economy.

Area of Significance: Architecture: Resources within the property type are architecturally significant because they comprise many of the corridor's prominent and visually impressive buildings and structures. From Romanesque Revival schools, to a Renaissance Revival library, to an Art Deco courthouse, these buildings represent diverse types, periods and methods of construction. Some are also the work of master builders or architects, and some may possess high artistic value. The forms, types and styles of buildings within this subtype reflect local, regional, and national trends, socioeconomic changes, and advances in technology. They also represent traditions, cultural preferences, values, community development, and the effect of transportation and industry.

Area of Significance: Community Planning and Development: Cultural, Religious and Public buildings reflect how I-70 Mountain Corridor communities were planned and developed. Town founders filed plats and sold lots with the intent that different areas would see residential, commercial, and industrial development. They often also planned for the construction of public buildings such as courthouses, town halls, and schools, in specific areas. As a result, the early built environment of each town correspondingly manifests the plats and planning efforts of the town's founders.

Area of Significance: Education: Schools, Libraries, and Museums all played important roles relative to the theme of education. Children in the I-70 Mountain Corridor received their basic education and interacted with peers in schools. Libraries and museums provided further education for children and adults alike. These institutions not only helped people learn to read and write, but introduced them to new concepts, cultures, and places outside of their communities.

Area of Significance: Industry: Buildings constructed as part of public works projects may be significant in the area of industry. A water plant dating from the early twentieth century, for example, may provide important insights into the design, construction, and operations of such facilities regionally and perhaps nationally, from the time of its construction through its period of original use.

Area of Significance: Politics/Government: Courthouses, town halls, jails, post offices, fire stations, and other community buildings within the corridor may possess significance relative to the theme of politics and government. These buildings facilitated and supported a variety of civic, legal, and administrative functions necessary for order, law enforcement, and community development, among other governmental duties.

Area of Significance: Religion: Churches, parsonages, rectories, and related features may possess significance relative to the theme of religion. Places of worship, and related buildings and features, played a central role in the social fabric of all towns within the I-70 Mountain Corridor.

Area of Significance: Social History: Fraternal halls and the meeting places of other organizations may possess significance relative to the theme of social history. The institutions that met regularly in these buildings were important in the lives of their members, and often to labor movements. Considered as a whole, the members, in turn, played influential roles in the social development of their communities.

Cultural, Religious and Public Buildings Registration Requirements

To qualify for the NRHP, buildings under the property type must meet at least one of the Criteria listed below, and possess related physical integrity.

Criterion A: Cultural, Religious, and Public buildings eligible under Criterion A must be associated with at least one area of significance above, or important events or historic patterns in their communities.

Criterion B: Cultural, religious, and public buildings may be eligible under Criterion B if they are associated with the lives of significant persons. A building registered under Criterion B must retain its physical integrity relative to that person's productive period of occupation. Further, the building's material manifestation must date to the same timeframe as when the individual achieved significance. If a person was significant, the researcher must explain their significant contributions in a brief biography. The important individual must have been directly associated with the property during the time period of their significant productivity. Applying Criterion B is complex, and *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* can provide further guidance.

Criterion C: Cultural, Religious and Public buildings may be eligible under Criterion C if they are good representative examples of a type, period, style, or method of construction. Similarly, they may be eligible under Criterion C if they represent the work of a master builder or architect, or possess high artistic values.

Criterion D: Buildings, structures, and land use modifications often left archaeological evidence when removed or abandoned. A property may possess a standing building in combination with archaeological features representing other development, improvements, or activities. Secondary building foundations or wells are examples. Such evidence may convey patterns of community development and public functions during the Period of Significance. If archaeological features and artifacts yield important information regarding development and design of public property and the community, then the property may qualify under Criterion D.

If the property possesses building foundations, privy pits, and refuse dumps, testing and excavation of these buried archaeological deposits may reveal important information regarding lifestyle and demography within individual communities. Areas of inquiry may include but are not limited to diet, health, gender and family, ethnicity and cultural practices, socioeconomic status, mode of employment.

Cultural, Religious, and Public buildings must possess physical integrity relative to the Period of Significance outlined in above. Some buildings within this category will not appear precisely as originally built. Instead, they will have been modified over time to accommodate new uses. One such example is some early schoolhouses have been adaptively reused as museums.

All seven aspects of historic integrity as defined by the NRHP – Location, Design, Setting, Materials, Workmanship, Feeling and Association - may apply to buildings within this property type category, although not all need be present for a property to qualify for NRHP designation. The National Park Service provides the following language to provide guidance in understanding the seven aspects of integrity:[7]

Location: Location is the place where the cultural, religious, or public building was constructed and where associated historic events and trends occurred. A building within this property type must be in its original place of use to retain integrity of location. Location is important for understanding the history of the building, and its associated persons, institutions, organizations, and events. Except in rare cases, integrity of location is lost when a cultural, religious or public building is moved.

Design: Design is the combination of elements that create form, plan, space, structure, and style of a property. Design results from conscious decisions made during the original conception and planning of a building (or its significant alteration) and applies to activities as diverse as community planning, engineering, architecture, and landscape architecture. Design elements include organization of space, proportion, scale, technology, ornamentation, and materials. A property's design reflects historic functions and technologies, as well as aesthetics. It includes considerations such as the structural system; massing; arrangement of spaces; pattern of fenestration; textures and colors of surface materials; type, amount, and style of ornamental detailing; and arrangement and type of plantings in a designed landscape.

Design can also apply to districts, whether they are important for historic association, architectural value, information potential, or a combination thereof. In districts, design concerns more than just individual buildings or structures located within the boundaries. It also applies to the way in which buildings, sites, or structures are related. Examples include spatial relationships between major features; visual rhythms in a streetscape or landscape plantings; the layout and materials of walkways and roads; and the relationship of other features such as statues, water fountains, and archeological sites.

Setting: Setting is the physical environment around a historic cultural, religious or public building. Whereas location refers to the specific place where a building was constructed, setting refers to the *character* of the place where it played its historical role. Setting involves *how*, not just where, the building is situated and its relationship to surrounding features and open space. Setting often reflects the basic physical conditions where a

[7] *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*: http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_8.htm#seven aspects

building was erected and its cultural, religious or public functions. Moreover, the way in which a building is positioned in its environment can provide insight into the builder's aesthetic preferences and perception of nature. Physical features which comprise the setting can be either natural or manmade. Features and their relationships should be considered not only within the boundaries of a cultural, religious, or public property, but also between the property and its surroundings. This is particularly important for districts.

Materials: Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. The choice and combination of materials reveal the preferences of those who created a cultural, religious or public building. Materials also indicate the availability of particular types of resources and technologies. Indigenous materials are often the focus of regional building traditions and thereby help define an area's sense of time and place. To retain integrity of materials, a building must feature the key exterior materials dating from its period of significance. If the building has been rehabilitated in the recent past, then the historic materials and significant features must have been preserved.

Workmanship: Workmanship can apply to a cultural, religious or public building as a whole or to its individual components. Workmanship is the physical evidence of craft, method, labor, and skill in constructing or altering a building. It can be expressed in vernacular methods of construction and unadorned finishes, or in sophisticated configurations and ornamental detailing. Common traditions, innovative period techniques, technological practices, and aesthetic principles may be reflected in the workmanship of a cultural, religious or public building.

Feeling: Feeling is a building's expression of the aesthetic or historic sense of a particular period of time. It results from the presence of physical features that, taken together, convey the building's historic character.

Association: Association is the direct link between an important historic event or person and a historic property. A cultural, religious or public building retains integrity of association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer. Like feeling, association requires the presence of physical features that convey a building's historic character.

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