COLORADO
Department of Transportation

2017
State of Colorado
RURAL
Seat Belt Survey

Colorado Department of Transportation

SEAT BELT STUDY

Colorado State University
COLLEGE OF BUSINESS
Institute of Transportation Management

COLORADO
Department of Transportation

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PREFACE

This report presents the results of a rural seat belt usage study conducted for the Colorado Department of Transportation (CDOT), Office of Transportation Safety (OTS). The primary objective of this study was to provide an estimate of the seat belt usage rate for rural counties in the State of Colorado in 2017.

This objective was accomplished by conducting a comprehensive rural seat belt usage survey at selected observation sites throughout the State. A team of observers was trained to make direct observations of traffic to properly collect and record data during a period of two consecutive weeks (June 18 through July 1, 2017) in order to determine actual seat belt usage among Colorado drivers and outboard front seat passengers. With the data and analyses emanating from this study, CDOT, Office of Transportation Safety will have current and accurate information upon which to base future transportation safety program decisions.

The Institute of Transportation Management (ITM) is pleased to have had the opportunity to work with the Office of Transportation Safety in the conduct of the 2017 Colorado Rural Seat Belt Survey. The design of this study made use of 16 counties from the Statewide Study plus four other rural counties. As this research focused upon rural, local traffic only, primary roads were not included in the surveys. With the submission of this report, the project objectives have been completed within the time parameters and budget agreed to by CDOT and ITM. The data and the analyses that are submitted to CDOT/OTS are, to the best of my knowledge, accurate and complete.

G. James Francis
Principal Investigator
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EXECUTIVE SUMMARY

The Institute of Transportation Management (ITM) at Colorado State University conducted a seat belt usage study in 20 rural counties in the State of Colorado from June 18 through July 1, 2017. Trained staff observed vehicles at 20 sites per county for a total of 400 sites. A total of 43,428 vehicles were observed including cars, vans, sport utility vehicles (SUVs), pickup trucks, and select commercial vehicles (10,000 pounds and under). Drivers and front seat outboard passengers of the eligible vehicles were observed for seat belt usage at predetermined observation sites within the 20 counties.

Dr. G.J. Francis served as Principal Investigator and Burt Deines as Project Coordinator. Todd Tuell of Atelior served as the lead statistician in the analysis of the data.

Field observers and supervisors were trained by the ITM team in observation and recording methods in order to properly conduct the field survey and collect data. The need for consistency and accuracy in the process of data collection was emphasized in the training and pre-survey phase of the study. Each observer was supplied with data collection sheets, maps, and site locations, as well as safety vests and hard hats.

As in previous seat belt usage surveys conducted by the Institute of Transportation Management, retired Colorado State Highway Patrol Officers were used as observers whenever possible. Because of their familiarity with interstate and state highways, as well as local and county roads and safety procedures, many potential location and safety problems were minimized. The retired patrol officers have proven to be very conscientious and reliable and have helped strengthen the validity of the results. This staffing arrangement worked very well and the continued use of the patrol officers is planned for future studies. By using independent contractors, the Institute has taken measures to ensure the integrity of the survey and analyses while involving people in the study who have the most relevant skills.

The data collected through the observations were recorded, summarized, and entered into appropriate categories for analyses. Analyses of the data yielded the following seat belt usage results among the various vehicle types:

Vehicle Type	Usage	Standard Error
Cars	86.8%	1.0%
SUVs	89.7%	0.8%
Vans	91.0%	1.1%
Trucks	76.1%	1.4%
Commercial	77.0%	2.4%
All Vehicle Types	84.6%	1.0%

The overall seat belt usage rate in the 20 counties improved from 84.4% in 2016 to 84.6% in 2017. However, the only vehicle type that had an increase in usage was SUVs. When compared to the 2017

Statewide Study, all vehicle types, except for trucks, were slightly higher in usage rates. Trucks were essentially the same in both studies with a statewide usage rate of 76.5 and a rural rate of 76.1.

Comparison of Rural Usage Rates

Vehicle Type	2017	2016
Cars	86.8%	87.0%
SUVs	89.7%	87.3%
Vans	91.0%	92.2%
Trucks	76.1%	77.9%
Commercial	77.0%	79.3%
All Vehicle Types	**84.6%**	**84.4%**

County usage rates, speed of vehicles, and road classification data will be presented under the "Results" section of this report. A conclusion section will provide an overall summary of the study followed by Appendices which contain examples of the forms and processes used during the survey stage of the study.

SURVEY DESIGN AND METHODOLOGY

The 2017 Colorado Rural Seat Belt Usage Survey has been designed to meet all of the requirements established by the Uniform Criteria for State Observational Surveys of Seat Belt Use issued by the National Highway Traffic Safety Administration (NHTSA) Final Rule, Federal Register, Vol. 76, No. 63, April 1, 2011.

For the statewide seat belt study conducted during the first two weeks of June, it is required by the "Final Rule" that counties accounting for 85% of the crash-related fatalities in the State are to be included in the survey sample. As shown in Appendix 1, 31 of the 64 counties accounted for 85.3% of the fatalities for the period of 2010 to 2014. For this study, focusing upon rural counties, there were only four (4) counties not included in the 31 aforementioned counties: Washington, Logan, Huerfano, and Teller. The other 16 counties comprising the sample were part of the Statewide Study as they fell within the 85% guideline. All 20 counties were used as strata for sampling road segments.

Road segments were selected systematically with probability proportional to size (PPS) from all segments in the stratified counties. The road segments were serpentine sorted by latitude and longitude within counties, which makes the sampling spatially more uniform within counties. The research design therefore involves a stratified system PPS sample of data collection sites.

Roads within the counties were grouped according to the secondary and local classifications. Primary roads were not included in the sample frame as the objective was to focus upon local traffic in rural areas of the state. Classifications are determined by the length of the road and the volume of traffic. All road segments in the sample counties were identified, and a sample of these segments was selected for observation. Definitions for road segments are provided in Appendix 2, and the selected road segments within each county are listed in Appendix 3. Appendix 4 illustrates the weights of the segments within each county that were used in the calculation of the estimate of the statewide seat belt usage

Sample Size

A total of 400 sites (road segments) of secondary and local roads was determined to be a representative sample. Sample size determination was, in large measure, governed by time constraints and the precision requirement of the study since NHTSA requires the standard error to be <2.5%. A decision as to how many roadways to select and assign for observation during the observation period required a balance between issues of statistical reliability and observer productivity. There was a practical need to select an optimal number of road segments for study so that observers would not spend inordinate amounts of time traveling from site to site. With all of those issues given consideration as well as the NHTSA requirements and needs of the contracting organizations, a total sample of 400 observational time periods and sites were selected.

Data Collection and Analysis

Observers and quality control monitors were trained in the appropriate procedures for observing seat belt usage and recording data. Scheduling, site locations, and internal operational protocol were included in the training syllabus which also gives an overview of the topics covered during the session (Appendix 5).

For the purposes of this study, an observational site was defined as a specific road intersection where observations take place. Observations were conducted at each site for 40 minutes of each hour between the hours of 7:00 a.m. and 6:00 p.m. during a period of two consecutive weeks (June 18 through July 1, 2017). Twenty minutes were allowed for recording data and moving to the next observation site. Start times and days were staggered in order to have a representative sample from both peak and non-peak traffic. When possible, traffic was observed for safety reasons from inside the sample road segment at or near the point where the traffic was leaving the segment.

Drivers and front seat outboard passengers were observed in cars, vans, pickup trucks, SUVs, and select commercial vehicles (10,000 pounds and under). Observers generally chose one lane of traffic traveling in one direction to observe seat belt usage. The data were recorded as "yes," "no," or "non-observable" for the driver and front seat outboard passenger.

The data were transferred from the field summary sheets to forms placing the data in specific categories for analysis. To maintain continuity with results from prior years, the SAS code from past studies was translated into ratio estimates computed by the R Survey package. The R code was then applied to 2016 data to ensure similar estimates were produced. The overall usage estimate (percentage) and usage estimates by vehicle type were then calculated for the 2017 data using the svyratio function. For the usage estimates by the various domains (vehicle speed, road class, and county) the svyby function was used. Both the svyratio and svyby functions take into account the design used in selecting the sample. The cv and coef functions were employed to calculate the coefficients of variation and 95% confidence interval limits for the estimates.

Using this procedure, seat belt usage rates in the 20 rural counties were estimated along with a determination of the standard errors and coefficients of variation. The survey sample size was large enough to allow estimates of usage rates for various domains of counties, vehicle types, speed, and road class.

In summary, the research design included the following elements that were critical to this study:

1. Samples were probability-based from the population of road segments within each county, yielding unbiased estimates of seat belt usage for the State's driver and outboard front seat passenger population for vehicles falling within the parameters of this study.

2. The sample data were collected through direct observation of seat belt usage at the pre-determined sites by qualified and trained observers. Observation times were assigned and rescheduled if weather interfered or other conditions existed which made observations at a particular site unsafe or unproductive.

3. The population of interest was the driver and outboard front seat passenger of cars, vans, SUVs, light trucks, and select commercial vehicles (10,000 pounds and under).

4. Observations were conducted in daylight hours from June 18 through July 1, 2017 between the hours of 7:00 AM and 6:00 PM.

5. Observation start times were staggered in order to obtain a representative sample from rush hour (peak traffic) and non-rush hour (non-peak traffic) time frames.

6. Observational data were recorded on counting sheets and summarized (See Appendix 6). The data were then transcribed to create a digital record and entered onto field summary forms, which served as input into the R survey package for data reduction.

RESULTS

Rural Survey Results

The 2017 Colorado Rural Seat Belt Usage Survey was designed to meet, as closely as possible, all the requirements established by the Uniform Criteria for State Observational Surveys of Seat Belt Use issued by the National Highway Traffic Safety Administration (NHTSA) Final Rule, Federal Register, Vol. 76, No. 63, April 1, 2011. The exception, because of the need to sample only rural counties, was the inclusion of four counties outside the 85% guideline mentioned earlier in this report.

The rural survey collected data at 400 sites as a multistage, stratified, random sample. As shown in Table 1, the 2017 rural seat belt usage estimate for Colorado (cars, SUVs, vans, pickup trucks, and select commercial vehicles 10,000 pounds and under) over the sampling period was 84.6%. A 95% confidence interval constructed with regard to the overall seat belt usage rate is from 82.6% to 86.5%.

Vans and SUVs had the highest seat belt usage rates of 91.0% and 89.7%, respectively. Trucks (76.1) and commercial vehicles (77.0) were slightly lower in 2017 than 2016. Commercial vehicles were also somewhat lower at 77.0%.

Table 1: 2017 Rural Seat Belt Usage Rates for Colorado

Obs	VehicleType	Percent	StdErr	LowerCL	UpperCL
1	Overall for All Vehicles	84.6	1.0	82.6	86.5
2	Cars	86.8	1.0	84.8	88.9
3	SUV	89.7	0.8	88.2	91.3
4	Vans	91.0	1.1	88.9	93.0
5	Trucks	76.1	1.4	73.3	78.9
6	Commercial	77.0	2.4	72.3	81.6

Unlike other CDOT/ITM seat belt surveys, the results for the rural study demonstrate rather mixed data regarding the usual correlation between speed and seat belt usage. There are several hypotheses as to why this phenomenon exists, including the influence of a "rural" culture, but none have been tested and cannot be associated with this data. In other studies, higher speeds translated into drivers/passengers being more likely to use their seat belts. None of the various vehicle types demonstrate the usual consistency in the correlation of seat belt usage and speed of the vehicles. One of the variables involved is the fact that no primary roads (where speeds are higher) were included in this study. Beyond that the phenomenon of higher seat belt usage at lower speeds is a result that is unique to this rural study.

Table 2: 2017 Seat Belt Usage Rates by Speed

	VehicleType	Speed	Percent	StdErr	LowerCL	UpperCL
1	All Vehicles	0-30	85.7	1.0	83.7	87.7
2	All Vehicles	31-50	83.9	1.9	80.1	87.6
3	All Vehicles	>50	82.4	2.3	77.9	86.9
4	Cars	0-30	87.2	1.0	85.2	89.2
5	Cars	31-50	86.2	2.2	81.9	90.4
6	Cars	>50	88.6	2.4	83.9	93.3
7	SUVs	0-30	91.8	0.9	90.0	93.7
8	SUVs	31-50	88.0	1.6	84.9	91.1
9	SUVs	>50	88.6	2.5	83.7	93.4
10	Vans	0-30	92.9	1.5	90.1	95.8
11	Vans	31-50	89.7	1.6	86.5	92.9
12	Vans	>50	86.5	5.4	75.9	97.0
13	Trucks	0-30	77.4	1.8	73.8	81.0
14	Trucks	31-50	75.9	2.3	71.4	80.4
15	Trucks	>50	70.4	3.8	62.9	77.9
16	Commercial	0-30	69.2	3.4	62.5	75.9
17	Commercial	31-50	81.8	2.5	76.9	86.6
18	Commercial	>50	72.8	6.6	59.9	85.5

Seat belt usage by road class is displayed in Table 3. Because the objective of the study was to determine the seat belt usage rate of the rural population on local roads neither primary roads or interstate highways were included. Since the primary highways carry a large percentage of out of state tourist traffic during the summer months, the traffic is generally not representative of local, rural Colorado population.

Vans have the highest usage rate on both local roads (93.4%) and secondary roads (88.8%). SUVs are second in both categories with 92.4% on local roads and 86.7% on secondary roads. When considering all vehicles, the usage rate on local roads and streets is higher (86.5%) than on the secondary roads (82.5%).

Table 3: 2017 Seat Belt Usage Rates by Road Class

Obs	VehicleType	MTFCC	Percent	StdErr	LowerCL	UpperCL
1	All Vehicles	S1200	82.5	2.1	78.4	86.6
2	All Vehicles	S1400	86.5	0.8	85.0	88.1
3	Cars	S1200	85.0	2.4	80.3	89.7
4	Cars	S1400	88.5	0.9	96.7	90.2
5	SUVs	S1200	86.7	1.8	83.3	90.2
6	SUVs	S1400	92.4	0.8	90.8	93.9
7	Vans	S1200	88.8	1.6	85.7	91.8
8	Vans	S1400	93.4	1.5	90.4	96.3
9	Trucks	S1200	74.4	2.5	69.5	79.3
10	Trucks	S1400	77.7	1.6	74.7	80.8
11	Commercial	S1200	79.9	2.7	74.6	85.2
12	Commercial	S1400	71.9	3.2	65.7	78.2

S1200 = Secondary Road
S1400 = Local Neighborhood Road, Rural Road, City Street

Table 4 displays individual county results for the rural seat belt survey for all vehicle types. Morgan had the highest seat belt usage rate at 94.9% with Huerfano (91.2%), Mesa (90.5%) and Weld (90.4%) being second through fourth. Montrose had the lowest seat belt usage at 67.2%. La Plata County was the next to lowest with 70.6%. Only two counties, Cheyenne and Delta, had standard errors above the 3.0% level.

Table 4: County Results for 2017 Colorado Rural Seat Belt Survey

Obs	VehicleType	County	Percent	StdErr	LowerCL	UpperCL
1	All Vehicles	Cheyenne	76.5	3.7	69.3	83.7
2	All Vehicles	Delta	76.0	4.3	67.6	84.3
3	All Vehicles	Eagle	81.0	1.0	79.0	83.0
4	All Vehicles	Fremont	83.6	0.9	81.8	85.4
5	All Vehicles	Garfield	83.0	1.5	79.9	86.0
6	All Vehicles	Gunnison	75.9	1.9	72.2	79.6
7	All Vehicles	Huerfano	91.2	1.1	89.1	93.3
8	All Vehicles	La Plata	70.6	2.6	65.5	75.7
9	All Vehicles	Las Animas	81.7	2.4	77.1	86.3
10	All Vehicles	Lincoln	82.2	2.2	77.9	86.6
11	All Vehicles	Logan	74.1	1.3	71.5	76.7
12	All Vehicles	Mesa	90.5	0.8	88.9	92.1
13	All Vehicles	Montezuma	74.1	2.5	69.3	78.9
14	All Vehicles	Montrose	67.2	1.6	64.0	70.3
15	All Vehicles	Morgan	94.9	0.6	93.8	96.0
16	All Vehicles	Park	86.9	1.7	83.5	90.3
17	All Vehicles	Summit	87.3	0.8	85.6	88.9
18	All Vehicles	Teller	79.4	1.9	75.6	83.1
19	All Vehicles	Washington	71.6	2.9	66.0	77.2
20	All Vehicles	Weld	90.4	1.7	87.0	93.8
21	Cars	Cheyenne	87.7	2.8	82.2	93.2
22	Cars	Delta	78.6	2.7	73.4	83.8
23	Cars	Eagle	79.8	1.8	76.2	83.4
24	Cars	Fremont	81.4	1.5	78.4	84.4
25	Cars	Garfield	81.2	2.1	77.1	85.4
26	Cars	Gunnison	74.8	1.8	71.3	78.3
27	Cars	Huerfano	93.3	0.9	91.5	95.1
28	Cars	La Plata	68.1	2.4	63.3	72.9
29	Cars	Las Animas	83.1	2.9	77.4	88.8
30	Cars	Lincoln	82.7	2.8	77.1	88.3
31	Cars	Logan	72.4	1.9	68.7	76.1

Obs	VehicleType	County	Percent	StdErr	LowerCL	UpperCL
32	Cars	Mesa	88.7	1.4	86.0	91.4
33	Cars	Montezuma	78.2	1.9	74.4	82.0
34	Cars	Montrose	69.6	1.8	66.1	73.2
35	Cars	Morgan	98.8	0.4	98.1	99.6
36	Cars	Park	87.3	1.7	84.1	90.6
37	Cars	Summit	90.0	1.4	87.3	92.7
38	Cars	Teller	84.3	2.2	79.9	88.7
39	Cars	Washington	76.8	4.8	67.4	86.3
40	Cars	Weld	94.1	1.3	91.5	96.7
41	SUVs	Cheyenne	87.4	2.9	81.7	93.0
42	SUVs	Delta	82.7	3.6	75.6	89.8
43	SUVs	Eagle	83.2	1.2	81.0	85.5
44	SUVs	Fremont	88.5	1.3	86.0	91.0
45	SUVs	Garfield	84.9	1.9	81.1	88.7
46	SUVs	Gunnison	80.3	2.4	75.7	85.0
47	SUVs	Huerfano	94.9	0.9	93.3	96.6
48	SUVs	La Plata	76.1	3.4	69.5	82.7
49	SUVs	Las Animas	89.2	2.3	84.7	93.7
50	SUVs	Lincoln	90.2	1.9	86.5	93.9
51	SUVs	Logan	85.3	1.6	82.2	88.4
52	SUVs	Mesa	96.3	0.9	94.4	98.1
53	SUVs	Montezuma	80.2	2.3	75.8	84.6
54	SUVs	Montrose	73.8	1.8	70.3	77.2
55	SUVs	Morgan	99.6	0.2	99.1	100.0
56	SUVs	Park	91.2	1.6	88.1	94.4
57	SUVs	Summit	88.7	1.2	86.3	91.1
58	SUVs	Teller	83.3	1.9	79.6	87.0
59	SUVs	Washington	84.4	2.4	79.7	89.0
60	SUVs	Weld	95.7	0.9	93.9	97.6
61	Vans	Cheyenne	95.5	2.7	90.2	100.7
62	Vans	Delta	84.2	4.6	75.1	94.0
63	Vans	Eagle	84.5	2.1	80.4	88.6
64	Vans	Fremont	88.2	2.1	84.1	92.3

Obs	VehicleType	County	Percent	StdErr	LowerCL	UpperCL
65	Vans	Garfield	85.0	1.8	81.5	88.6
66	Vans	Gunnison	81.4	2.4	76.7	86.0
67	Vans	Huerfano	96.6	1.0	94.6	98.6
68	Vans	La Plata	81.5	2.8	76.0	87.0
69	Vans	Las Animas	94.7	2.1	90.5	98.9
70	Vans	Lincoln	89.1	2.8	83.6	94.7
71	Vans	Logan	90.9	3.3	84.5	97.4
72	Vans	Mesa	94.6	1.9	90.8	98.3
73	Vans	Montezuma	87.2	3.1	81.2	93.2
74	Vans	Montrose	84.6	2.5	79.7	89.5
75	Vans	Morgan	97.6	1.0	95.6	99.7
76	Vans	Park	92.1	3.0	86.1	98.0
77	Vans	Summit	90.3	2.4	85.6	95.1
78	Vans	Teller	86.1	3.6	78.9	93.2
79	Vans	Washington	78.5	6.4	65.8	91.1
80	Vans	Weld	97.6	1.8	94.1	101.1
81	Trucks	Cheyenne	62.3	5.2	52.1	72.6
82	Trucks	Delta	67.1	6.1	55.2	79.0
83	Trucks	Eagle	83.1	2.0	79.1	87.0
84	Trucks	Fremont	80.0	1.4	77.2	82.8
85	Trucks	Garfield	81.8	2.0	77.9	85.7
86	Trucks	Gunnison	71.0	2.7	65.7	76.3
87	Trucks	Huerfano	85.4	1.9	81.7	89.2
88	Trucks	La Plata	63.9	3.0	58.1	69.7
89	Trucks	Las Animas	74.4	3.3	67.9	80.8
90	Trucks	Lincoln	74.5	3.3	68.0	81.0
91	Trucks	Logan	61.8	2.1	57.7	66.0
92	Trucks	Mesa	85.7	1.9	81.9	89.4
93	Trucks	Montezuma	61.5	3.5	54.6	68.5
94	Trucks	Montrose	56.9	2.1	52.7	61.1
95	Trucks	Morgan	88.4	1.3	85.9	90.9
96	Trucks	Park	78.8	2.9	73.1	84.6
97	Trucks	Summit	79.3	2.0	75.4	83.2

Obs	VehicleType	County	Percent	StdErr	LowerCL	UpperCL
98	Trucks	Teller	70.9	2.8	65.4	76.5
99	Trucks	Washington	56.9	3.7	49.7	64.2
100	Trucks	Weld	81.5	3.1	75.4	87.6
101	Commercial	Cheyenne	45.6	6.1	33.7	57.6
102	Commercial	Delta	72.9	6.5	60.2	85.7
103	Commercial	Eagle	68.8	4.8	59.5	78.1
104	Commercial	Fremont	72.8	2.9	67.1	78.5
105	Commercial	Garfield	84.4	4.0	76.6	92.3
106	Commercial	Gunnison	72.8	4.9	63.1	82.5
107	Commercial	Huerfano	72.8	4.3	64.3	81.2
108	Commercial	La Plata	69.3	2.8	63.9	74.8
109	Commercial	Las Animas	72.8	5.4	62.2	83.4
110	Commercial	Lincoln	63.6	8.0	47.9	79.4
111	Commercial	Logan	68.1	6.8	54.8	81.4
112	Commercial	Mesa	60.7	9.8	41.4	80.0
113	Commercial	Montezuma	77.4	3.2	71.1	83.8
114	Commercial	Montrose	68.9	3.0	63.0	74.7
115	Commercial	Morgan	86.0	2.6	80.9	91.2
116	Commercial	Park	87.0	6.4	74.4	99.5
117	Commercial	Summit	80.2	2.9	74.6	85.9
118	Commercial	Teller	59.7	7.6	44.8	74.6
119	Commercial	Washington	64.0	10.4	43.7	84.3
120	Commercial	Weld	83.5	3.2	77.3	89.8

Non-Observables: The non-observable rate of 4.3% for the study was well below the 10% limit established by NHTSA. Overall, there were 2,513 individuals for whom the use of seat belts could not be determined. Tinted windows, sun reflection, height of some trucks and commercial vehicles, and color of clothing/seat belts were among the reasons for the non-observable designation. Below are the non-observable rates by vehicle types:

Vehicle Type	Non-Observable Individuals	% Non-Observable
Car	590	4.2%
Van	77	1.8%
SUV	755	3.9%
Truck	1002	5.9%
Commercial	89	2.6%
Overall	2513	4.3%

Given the low non-observable rate and the exceptionally low standard error of 1.0% for the study, the overall seat belt usage rate of 84.6% appears, statistically, to be quite sound.

Successes: While it is difficult to track the impact of any one specific program or effort, the following list of possible explanations undoubtedly worked in concert to maintain the relatively high levels of seat belt usage in the State of Colorado.

1. The success of the educational efforts of CDOT and the Department of Public Health and Environment to inform the public of the dangers of not using seat belts.
2. An improvement in the general knowledge of the public of the need for the use of seat belts by vehicle operators and front seat passengers.
3. The "Click It or Ticket" program may have impacted drivers and front seat occupants enough to improve usage rates.
4. Enforcement efforts have impacted drivers and vehicle passengers and caused more awareness of the need to use seat belts.

Travel Variables: The following findings demonstrate the differences in seat belt usage when considering some of the variables involved in travel. From a road classification standpoint, seat belt usage was higher on local roads (86.5%) than on secondary roads (82.5%). While this difference in the road class usage rates would generally be attributed to the average speed on the roads, the corollary data on the speed variable does not support this attribution. Unlike previous studies, seat belts are not used more consistently at higher speeds than at lower speeds on rural Colorado streets and roads (see below). In this respect, the data for the “speed” variable is somewhat unique when compared to the results of other studies. Seat belt usage is the highest at low speeds (85.7%) while seat belt usage at speeds over 50 mph is 3.3% lower at 82.4%.

- Road Class*: Secondary 82.5%
  Local 86.5%

  *Definitions of road classes are included in Appendix 2.

- Speed observations: 0-30 mph 85.7%
  31-50 mph 83.9%
  50+ mph 82.4%

CONCLUSIONS

The 400 observation sites included in this study were surveyed during the two-week period from June 18 through July 1, 2017. Total observations of 43,428 vehicles yielded an estimate of 84.6% for rural seat belt usage. This usage rate is slightly higher than last year's rate of 84.4% and the 83.8% result for the Statewide Study this year, but statistically, all are essentially the same.

Pickup trucks had a relatively high usage rate of 76.1% even though it dropped from 77.9% in 2016. This is still well below the rates for other vehicle types. In agricultural states, secondary and rural road traffic is likely to have more pickup trucks that travel at lower speeds on local roads which, in most cases, contribute to an overall lower seat belt usage rate. However, given the anomaly of higher seat belt usage at lower speeds in this study that conclusion cannot be supported.

As in previous seat belt studies, vans and SUVs had the highest seat belt usage at 91.0% and 89.7%, respectively. Cars were also above the overall rate at 86.8%.

Among the 20 counties, Morgan County (94.9%) and Huerfano County (91.2%) had the highest overall usage rates, and Montrose was the lowest at 67.2%. Two counties had usage rates within the confidence levels of the overall study (82.6%-86.5%), six were above, and 12 were below. Of those 12 counties, nine were below 80.0%.

This was the sixth year wherein "non-observables" were officially recorded in seat belt studies. By rule, if observers are not able to see whether or not a driver or front seat occupant is buckled up, it is to be recorded as "non-observable." The overall non-observable rate for the study was 4.3%. Given this low non-observable rate and a standard error of 1.0%, the overall results of 84.6% can be considered a representative estimate of the seat belt usage rate of the rural population of Colorado.

The challenges of maintaining this high seat belt usage rate in a secondary law state will likely continue, but the investments in education and enforcement are proving worthwhile. The value of the return on investment, in terms of lives saved and social and economic saving, makes the effort one of the most important endeavors for the State of Colorado.

APPENDICES

APPENDIX 1

Colorado Average Motor Vehicle Crash-Related Fatalities by County 2010-2014

FARS (2010-2014) State=Colorado				
State	County	Average fatality counts for 5 years	Fatality percentage within the state	Cumulative fatality percentage
Colorado	EL PASO	48.6	10	10
Colorado	WELD	41.2	8.5	18.5
Colorado	DENVER	38.2	7.9	26.4
Colorado	JEFFERSON	36.8	7.6	34
Colorado	ADAMS	30	6.2	40.2
Colorado	ARAPAHOE	25.2	5.2	45.4
Colorado	LARIMER	21	4.3	49.7
Colorado	PUEBLO	20.6	4.2	54
Colorado	BOULDER	18.2	3.8	57.7
Colorado	MESA	15.6	3.2	60.9
Colorado	DOUGLAS	13.8	2.8	63.8
Colorado	LA PLATA	10.2	2.1	65.9
Colorado	GARFIELD	8.4	1.7	67.6
Colorado	FREMONT	7.2	1.5	69.1
Colorado	DELTA	6.4	1.3	70.4
Colorado	MORGAN	6.2	1.3	71.7
Colorado	EAGLE	6	1.2	72.9
Colorado	MONTEZUMA	5.8	1.2	74.1
Colorado	LAS ANIMAS	5.2	1.1	75.2
Colorado	LINCOLN	5	1	76.3
Colorado	KIT CARSON	4.8	1	77.2
Colorado	PARK	4.6	0.9	78.2
Colorado	OTERO	4.2	0.9	79.1
Colorado	CHEYENNE	4	0.8	79.9
Colorado	SUMMIT	4	0.8	80.7
Colorado	ALAMOSA	3.8	0.8	81.5
Colorado	MONTROSE	3.8	0.8	82.3
Colorado	MOFFAT	3.8	0.8	83
Colorado	CHAFFEE	3.6	0.7	83.8
Colorado	GUNNISON	3.6	0.7	84.5
Colorado	CLEAR CREEK	3.5	0.7	85.3
Colorado	ELBERT	3.4	0.7	86
Colorado	WASHINGTON	3.4	0.7	86.7
Colorado	LOGAN	3.2	0.7	87.3
Colorado	BACA	3	0.6	87.9
Colorado	ROUTT	3	0.6	88.6
Colorado	HUERFANO	2.8	0.6	89.1
Colorado	PROWERS	2.8	0.6	89.7
Colorado	YUMA	2.8	0.6	90.3
Colorado	COSTILLA	2.5	0.5	90.8
Colorado	DOLORES	2.5	0.5	91.3
Colorado	SAGUACHE	2.5	0.5	91.8
Colorado	SAN MIGUEL	2.5	0.5	92.4
Colorado	BLOOMFIELD	2.4	0.5	92.8
Colorado	RIO GRANDE	2.4	0.5	93.3
Colorado	CONEJOS	2.3	0.5	93.8
Colorado	ARCHULETA	2.2	0.5	94.3
Colorado	GRAND	2.2	0.5	94.7
Colorado	TELLER	2.2	0.5	95.2
Colorado	LAKE	2	0.4	95.6
Colorado	PHILLIPS	2	0.4	96
Colorado	PITKIN	2	0.4	96.4
Colorado	RIO BLANCO	2	0.4	96.8
Colorado	SAN JUAN	2	0.4	97.2
Colorado	SEDGWICK	2	0.4	97.6

Colorado	CUSTER	1.8	0.4	98
Colorado	BENT	1.7	0.3	98.3
Colorado	KIOWA	1.5	0.3	98.7
Colorado	OURAY	1.5	0.3	99
Colorado	CROWLEY	1	0.2	99.2
Colorado	GILPIN	1	0.2	99.4
Colorado	HINSDALE	1	0.2	99.6
Colorado	JACKSON	1	0.2	99.8
Colorado	MINERAL	1	0.2	100

APPENDIX 2

Codes for Road Segment File

Code	Road Class	Definition
S1100	Primary Road	Primary roads are generally divided, limited-access highways within the interstate highway system or under state management, and are distinguished by the presence of interchanges. These highways are accessible by ramps and may include some toll highways.
S1200	Secondary Road	Secondary roads are main arteries, usually in the U.S. Highway, State Highway or County Highway system. These roads have one or more lanes of traffic in each direction, may or may not be divided, and usually have at-grade intersections with many other roads and driveways. They often have both a local name and a route number.
S1400	Local Neighborhood Road, Rural Road, City Street	These are generally paved non-arterial streets, roads, or byways that usually have a single lane of traffic in each direction. Roads in this feature class may be privately or publicly maintained. Scenic park roads would be included in this feature class, as would (depending on the region of the country) some unpaved roads.

APPENDIX 3

Number of Rural Segments Selected (n) by County and MTFCC

	MTFCC Code		
County	**S1200 (Secondary)**	**S1400 (Local)**	**Total**
Cheyenne	20	0	20
Delta	20	0	20
Eagle	20	0	20
Fremont	20	0	20
Garfield	20	0	20
Gunnison	20	0	20
Huerfano	20	0	20
La Plata	20	0	20
Las Animas	20	0	20
Lincoln	20	0	20
Logan	20	0	20
Mesa	1	19	20
Montezuma	20	0	20
Montrose	20	0	20
Morgan	20	0	20
Park	2	18	20
Summit	20	0	20
Teller	1	19	20
Washington	20	0	20
Weld	3	17	20
Total	**327**	**73**	**400**

APPENDIX 4

Weights for the Rural Seat Belt Usage Observational Survey

County	MTFCC	Sampling Weight	Selection Probability
Cheyenne	S1200	12	0.0855
Delta	S1200	30	0.0337
Eagle	S1200	20	0.0504
Fremont	S1200	20	0.0493
Garfield	S1200	22	0.0464
Gunnison	S1200	13	0.0778
Huerfano	S1200	5	0.1887
La Plata	S1200	43	0.0230
Las Animas	S1200	12	0.0820
Lincoln	S1200	5	0.1869
Logan	S1200	11	0.0881
Mesa	S1200/S1400	436	0.0023
Montezuma	S1200	63	0.0159
Montrose	S1200	23	0.0430
Morgan	S1200	7	0.1515
Park	S1200/S1400	414	0.0024
Summit	S1200	5	0.2000
Teller	S1200/S1400	181	0.0055
Washington	S1200	11	0.0952
Weld	S1200/S1400	616	0.0016

APPENDIX 5

Training Syllabus

Welcome and distribution of equipment

Survey overview

Data collection techniques
- Definitions of belt/booster seat use, passenger vehicles
- Observation protocol
- Weekday/weekend/rush hour/non-rush hour
- Weather conditions
- Duration at each site

Scheduling and rescheduling
- Site Assignment Sheet
- Daylight
- Temporary impediments such as weather
- Permanent impediments at data collection sites

Site locations
- Locating assigned sites
- Interstate ramps and surface streets
- Direction of travel/number of observed lanes
- Non-intersection requirement
- Alternate site selection

Data collection forms
- Cover sheet
- Recording observations
- Recording alternate site information

Assembling forms for shipment

Safety and security

Timesheet and expense reports

Field practice at ramps and surface streets

APPENDIX 6

Data Collection Form

Colorado Seat Belt Usage – Field Survey Form – Survey: _____

__ First Week __ Second Week Page ____ of ____

County No.:	County:		Site No:	Observer(s):	
# Lanes Available:	Weather 1 = clear 2 = rain 3 = snow 4 = fog	Speed 1 = 0-30 MPH 2 = 31-50 MPH 3 = >50 MPH	Site Location:	Date (Month/Day/Year):	Day of Week: Sun Mon Tues Wed Thurs Fri Sat
# Lanes Observed:				Start Time: a.m. p.m.	End Time: a.m. p.m.

Line #	CARS				VANS				SUVs				LIGHT TRUCKS				COMMERCIAL			
	Driver		Passenger		Driver		Passenger		Driver		Passenger		Driver		Passenger		Driver		Passenger	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
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Observ-ables	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**	**Total:**