

**PERCEPTIONS OF HIGHWAY
MAINTENANCE IN MONTANA IN
1998: THE RESULTS OF A
TELEPHONE SURVEY**

FINAL REPORT

**Prepared for the
STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION
RESEARCH, DEVELOPMENT, &
TECHNOLOGY TRANSFER PROGRAM
in cooperation with the
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION**

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EXECUTIVE SUMMARY

Trained interviewers at the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings completed 1,005 interviews with randomly selected adult residents of Montana between October 10th and October 28th, 1998 for the purposes of obtaining the perceptions the respondents held about the maintenance of interstate and state highways in Montana and comparing those perceptions to perceptions held by the respondents to a 1996 survey on the same topic.

For the purposes of the survey, highway maintenance was divided into eight categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road conditions reports.

When respondents were asked to rate the current state of each of these activities on a 1 to 4 scale where 1 = poor, 2 = fair, 3 = good and 4 = excellent, signage was rated highest with a mean of 3.02, winter roadway information was rated second at 2.86, rest stop maintenance third at 2.81, striping fourth at 2.78, debris removal and winter maintenance fifth at 2.72 and 2.71, roadside maintenance sixth at 2.67 and smoothness of road surfaces last at 2.31. There was a significant change in only one of these ratings from 1996 to 1998: the rating of surface smoothness decreased from 2.40 to 2.31.

When respondents were asked how important each of these activities were to them on a scale of 1 to 4 where 1 = not important, 2 = somewhat important, 3 = important, and 4 = very important, winter maintenance was rated most important with a mean importance rating of 3.55, followed by striping maintenance (3.44), winter roadway information (3.37), surface smoothness (3.34), debris removal and signage (3.31), rest stop maintenance (3.20) and roadside maintenance (3.00). The importance ratings for winter maintenance, winter roadway information, and debris removal decreased significantly from 1996 to 1998 while the importance rating for roadside maintenance increased significantly.

When respondents were asked to think about the allocation of MDT resources and assign a resource priority of low (1), medium (2), moderately high (3), or very high (4) to each activity, winter maintenance received the highest resource priority rating (3.53) followed by winter roadway information and striping (3.32), surface smoothness (3.17), debris removal (3.08), rest stop maintenance (3.06), signage (3.03) and roadside maintenance (2.66). The resource priorities assigned to striping, surface smoothness, rest stop maintenance, signage, and roadside maintenance all increased significantly from 1996 to 1998.

Finally, these ratings were combined into a composite variable for each of the maintenance activities. The composite variable provides an indication of the level of attention and resources the respondents believed each maintenance activity should receive from MDT. The values of the composite variables as well as the rating of the components of each variable are summarized in the following table.

**COMPOSITE VARIABLE MEAN BY RANK OF
RATING, IMPORTANCE, AND PRIORITY**

	Composite	Rating	Importance	Priority
	<u>Mean</u>	<u>Rank</u>	<u>Rank</u>	<u>Rank</u>
Winter Maint	9.10	5*	1	1
Surface Smoothness	9.07	7	4	3
Striping	8.87	4	2	2*
Debris Removal	8.56	5*	5	4*
Signage	8.24	1	6	5
Winter Road Info	7.98	2	3	2*
Roadside Maint.	7.82	6	8	6
Rest Stop Maint.	7.69	3	7	4*

Note: * Indicates tied ranks

According to the respondents, MDT should now pay attention and provide resources to maintenance activities on interstates and state highways in Montana in the following order: winter maintenance, surface smoothness, highway striping, debris removal, highway signage, winter roadway information, roadside maintenance and rest stop maintenance.

This represent a change from the order of composite variables resulting from the 1996 survey which was: winter maintenance, surface smoothness and highway striping, debris removal, winter roadway information and highway signage, rest top maintenance, and roadside maintenance. Increases in the composite variables for surface smoothness, signage, and roadside maintenance from 1996 to 1998 were statistically significant.

TABLE OF CONTENTS

Table of Tables	xi
Table of Figures	xii
Introduction	1
Methodology	1
Findings	2
Who Are the Respondents	2
Demographic Characteristics	2
County and Administrative District of Residence	4
Travel Characteristics	6
General Perception of Montana Highways and Interstates	8
Rating of Montana Highway Maintenance	8
Statistically Significant Relationships Between General Rating of Montana Highway Maintenance and Demographic/Travel Variables	10
Comparison of 1996 and 1998 General Rating of Montana Highway Maintenance	11
Respondents' Opinion of the Personal Importance of Highway Maintenance	11
Statistically Significant Relationship Between Importance of Highway Maintenance and Demographic/Travel Variables	11
Comparison of 1996 and 1998 Importance of Montana Highway Maintenance Rating	12
General Comparison of Montana Highways with Highways in Other States	12
Statistically Significant Relationships Between Comparison of Montana Highway Maintenance and Highway Maintenance in Other States and Demographic/Travel Variables	12
Comparison of Montana Winter Maintenance with Winter Maintenance in Other States	13
Statistically Significant Relationships Between Comparison of Winter Maintenance and Demographic/Travel Variables	13
Comparison of Montana Rest Area Maintenance and Rest Area	

Maintenance in Other States	13
Statistically Significant Relationship Between Rest Area Maintenance Comparison and Demographic/Travel Variables	13
Respondents Rating of Eight Maintenance Activities	14
Statistically Significant Relationships Between Rating of Maintenance Activities and Administrative District	15
Statistically Significant Relationships Between Rating of Signage and Demographic/Travel Variables	15
Statistically Significant Relationships Between Rating of Winter Roadway Information and Demographic/Travel Variables	15
Statistically Significant Relationships Between Rating of Rest Stop Maintenance and Demographic/Travel Variables	15
Statistically Significant Relationships Between Rating of Highway Striping and Demographic/Travel Variables	15
Statistically Significant Relationships Between Rating of Debris Removal and Demographic/Travel Variables	16
Statistically Significant Relationships Between Winter Maintenance and Demographic/Travel Variables	16
Statistically Significant Relationships Between Rating of Roadside Maintenance and Demographic/Travel Variables	16
Statistically Significant Relationships Between Rating of Surface Smoothness and Demographic/Travel Variables	16
Comparison of 1996 and 1998 Ratings of the Eight Maintenance Activities	16
Importance of Highway Maintenance Activities to the Respondents	17
Statistically Significant Relationships Between Importance of Maintenance Activities and Administrative District	18
Statistically Significant Relationships Between Importance of Winter Maintenance and Demographic/Travel Variables	18
Statistically Significant Relationships Between Importance of Highway Striping and Demographic/Travel Variables	18

Statistically Significant Relationships Between Importance of Winter Roadway Information and Demographic/Travel Variables	18
Statistically Significant Relationships Between Importance of Surface Smoothness and Demographic/Travel Variables	18
Statistically Significant Relationships Between Importance of Debris Removal and Demographic/Travel Variables	18
Statistically Significant Relationships Between Importance of Highway Signage and Demographic/Travel Variables	19
Statistically Significant Relationships Between Importance of Rest Stop Maintenance and Demographic/Travel Variables	19
Statistically Significant Relationships Between Importance of Roadside Maintenance and Demographic/Travel Variables	19
Comparison of 1996 and 1998 Importance Rating for Eight Maintenance Activities	19
Respondents' Perception of the Resource Priority Which Should Be Attached to Each Maintenance Activity	20
Statistically Significant Relationships Between Resource Priorities Assigned to Maintenance Activities and Administrative District	21
Statistically Significant Relationships Between Resource Priority Assigned Winter Maintenance and Demographic/Travel Variables	21
Statistically Significant Relationships Between Resource Priority Assigned Winter Roadway Information and Demographic/Travel Variables	21
Statistically Significant Relationships Between Resource Priority Assigned Roadway Striping and Demographic/Travel Variables	21
Statistically Significant Relationships Between Resource Priority Assigned Surface Smoothness and Demographic/Travel Variables	22
Statistically Significant Relationships Between Resource Priority Assigned Debris Removal and Demographic/Travel Variables	22
Statistically Significant Relationships Between Resource Priority Assigned Rest Stop Maintenance and Demographic/Travel Variables	22

Statistically Significant Relationships Between Resource Priority Assigned to Signage and Demographic/Travel Variables	22
Statistically Significant Relationships Between Resource Priority Assigned Roadside Maintenance and Demographic/Travel Variables	22
Comparison of 1996 and 1998 Priorities Assigned to the Eight Maintenance Activities	23
Composite Variables for Each Maintenance Activity	23
Statistically Significant Relationships Between Composite Variables and Administrative District	26
Statistically Significant Relationships Between Scores on Winter Maintenance Composite Variable and Demographic/Transportation Variables	26
Statistically Significant Relationships Between Scores on Surface Smoothness Composite Variable and Demographic/Travel Variables	26
Statistically Significant Relationships Between Scores on Striping Composite Variable and Demographic/ Travel Variables	27
Statistically Significant Relationships Between Scores on Debris Removal Composite Variable and Demographic/ Travel Variables	27
Statistically Significant Relationships Between Scores on Signage Composite Variable and Demographic/ Travel Variables	27
Statistically Significant Relationships Between Scores on Winter Roadway Information Composite Variable and Demographic/ Travel Variables	27
Statistically Significant Relationships Between Scores on Roadside Maintenance Composite Variable and Demographic/ Travel Variables	27

Statistically Significant Relationships Between Scores on Rest Stop Maintenance Composite Variable and Demographic/ Travel Variables	28
Comparison of 1998 and 1998 Composite Variable Means for the Eight Maintenance Activities	28
Respondents Perception of How the Montana Department of Transportation Could Do Better In the Area of Highway Maintenance ...	29
In What Maintenance Activities Does the Department of Transportation Currently Do a Good Job	29
Willingness to Participate in a Follow Up Study	30
Summary	31
The Respondents	31
General Perception of Highway Maintenance	31
Comparison of Highway Maintenance in Montana With Other States	32
Respondent Perception of Eight Maintenance Activities	33
Winter Maintenance	34
Highway Surface Smoothness	34
Highway Striping	35
Debris Removal	35
Highway Signage	35
Winter Roadway Information	35
Roadside Maintenance	36
Rest Stop Maintenance	36
1996 to 1998 Differences	37
Conclusions and Implementation	37
References	39
Appendix One: Map Showing MDT Administrative Districts and Montana Counties	40
Appendix Two: Transportation Survey Questions	42

TABLE OF TABLES

Table One: Disposition of All Telephone Calls	2
Table Two: Location of Respondents' Residences	4
Table Three: Rating of Maintenance Activities	15
Table Four: Importance of Maintenance Activities	17
Table Five: Resource Priorities	21
Table Six: Values of Composite Variables	24
Table Seven: Composite Variable Mean by Rank of Rating, Importance and Priority	25
Table Eight: What Could the Transportation Department Do Better in Terms of Maintenance	29
Table Nine: Maintenance Activities That Meet or Exceed Respondent's Expectations	30

TABLE OF FIGURES

Figure One: Demographic Characteristics of the Respondents	3
Figure Two: Administrative District	6
Figure Three: Respondents' Travel Characteristics	7
Figure Four: General Perception of Montana Roadways	8
Figure Five: Comparison of 1996 and 1998 General Rating of Montana Highway Maintenance	11
Figure Six: Comparison of 1996 and 1998 Importance of Montana Highway Maintenance Rating	12
Figure Seven: Comparison of 1996 and 1998 Ratings of Maintenance Activities ...	17
Figure Eight: Comparison of 1996 and 1998 Perceptions of Importance of Maintenance Activities	20
Figure Nine: Comparison of 1996 and 1998 Resource Priorities	23
Figure Ten: Comparison of 1996 and 1998 Composite Variable Means	28
Figure Eleven: Willingness to Participate in Follow Up Study	30

INTRODUCTION

This report summarizes the procedures and findings of a telephone survey conducted for the Montana Department of Transportation (MDT) by the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings. This survey was a replication of a nearly identical survey conducted in September of 1996. The purposes of this survey were to determine the perceptions of the maintenance of state highways and interstates in Montana held by adult Montanans and to determine if those perceptions had changed in the last 2 years. The survey was conducted from October 10th to October 28th, 1998.

METHODOLOGY

The survey was conducted by trained interviewers from the Computer Assisted Telephone Interviewing Laboratory (CATI Lab) at Montana State University, Billings. A random digit dialing sample was purchased from Genesys Sampling Systems (Ft. Washington, PA.) Telephone numbers were called back up to five times in an attempt to complete interviews. A total of 1005 interviews were completed, in an average of 12 minutes, requiring 5,884 telephone calls to 4,205 numbers. Interviewers actually spoke to 1,671 eligible potential respondents and 1,005 or 59.9% of these potential respondents were successfully interviewed. Table One summarizes the disposition of each of all calls.

Upon completion of all interviewing, the data was electronically transferred from the CATI computer system to the VAX 4000 computer system at Montana State University, Billings. The computer program Statistical Package for the Social Sciences (SPSS) was used to analyze the data.

The results of the survey have a margin of error of about $\pm 3\%$ when generalized to the entire state. The MDT has divided the state in five administrative districts, and the margins of error within these districts vary from $\pm 6\%$ in the Missoula District to $\pm 10\%$ in the Glendive District (see Appendix One for map of districts).

The only differences between the questions asked in 1996 and the questions asked in 1998 were: in 1998 respondents were asked to consider their experiences in the last two years in answering the questions; the 1998 respondents were asked if they would consider participating in a follow up study within the next two years; and if they said yes, they were asked to provide their name, address, and telephone number. The results of the 1996 survey are contained in *Perceptions of Highway Maintenance in Montana: The Results of a Telephone Survey*.

TABLE ONE
DISPOSITION OF ALL TELEPHONE CALLS

No Answer	1,233	21.0%
Non Working Number	961	16.3%
Complete	1,005	17.1%
Answering Machine	874	14.9%
Refused	664	11.3%
Busy	469	8.0%
Call Back	225	3.8%
Non Residential Number	223	3.8%
Fax or Computer	175	3.0%
Wrong Category	29	0.5%
Hearing Problem	13	0.2%
Language Problem	2	0.1%
Incompetent Respondent	8	0.1%
Hung Up or Argumentative	3	0.1%
TOTAL	5,884	100.0%

FINDINGS

Who Are the Respondents

Demographic Characteristics

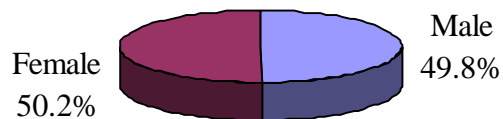
Figure One summarizes the basic characteristics of the 1,005 respondents. Figure One shows that about half the respondents were male and about half were female. The mean age of the respondents was 47.1; 24.6% of the respondents were thirty five years old or less, 28.8% were 56 or over and the remainder of 46.6% were between 36 and 55.

The mean educational attainment of the respondents was 13.8 years of education; 4.9% had not completed high school while 37.4% had completed just high school, 29.1% had completed some college and 28.2% had at least a college degree.

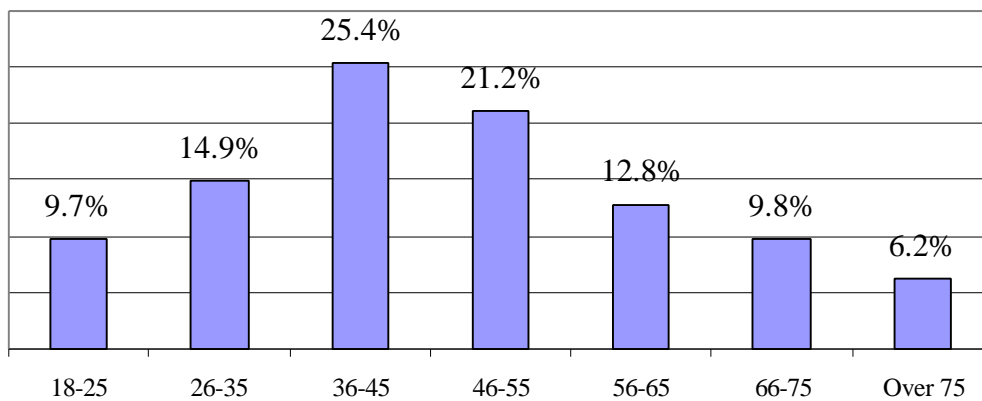
The mean length of time respondents had been in Montana was 32.5 years; 49.8% of the respondents reported they had lived in Montana over 30 years while 13.1% indicated they had been in Montana for 5 or less years.

FIGURE 1
DEMOGRAPHIC CHARACTERISTICS OF
THE RESPONDENTS

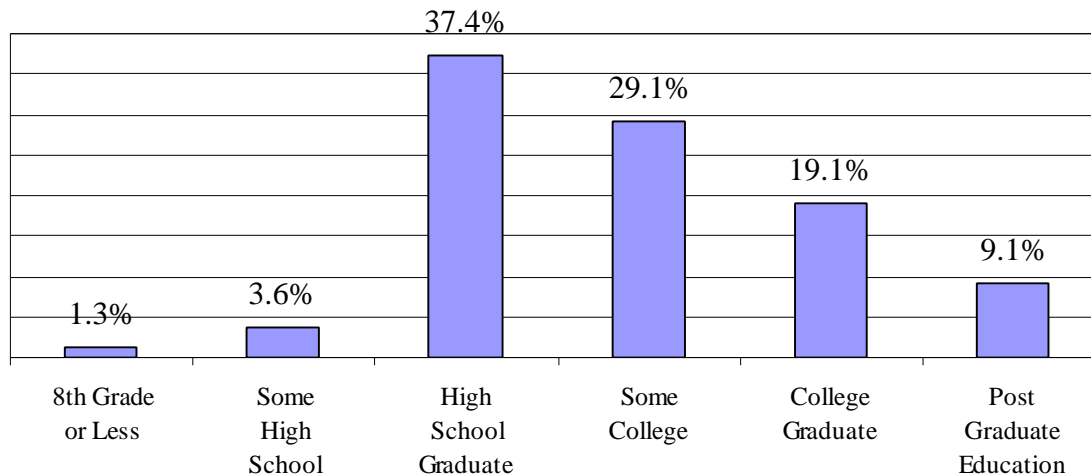
Gender



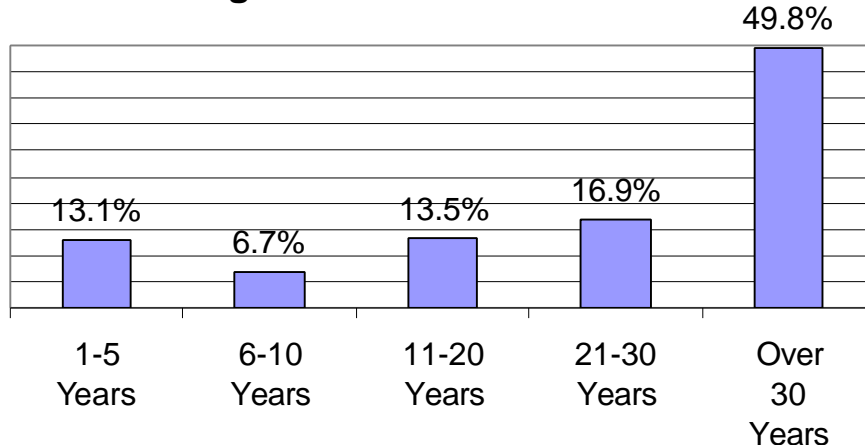
Age



Educational Attainment



Length of Montana Residence



There were no significant differences between the 1996 respondents and the 1998 respondents with respect to sex, educational attainment or length of residence in Montana. However, there was a statistically significant difference ($p=.016$) between the mean age of the 1998 respondents (47.12) and the 1996 respondents (45.38). Therefore, the 1998 respondents were significantly older than the 1996 respondents.

County and Administrative District of Residence

Table Two summarizes the respondents' county of residence, which was obtained by converting telephone prefixes. It was not possible to place 2 telephone numbers into counties. Table Two shows that respondents lived in 54 of Montana's 56 counties. About 14% of the respondents lived in Yellowstone County, 10.5% lived in Missoula County, 9.1% lived in Flathead County, 8.4% lived in Cascade County, 6.3% lived in Gallatin County and 6.1% lived in Lewis and Clark County. Discrepancies between the percentages of the sample that reside in each county as compared with the percentage of the population of Montana in that county can be explained by a number of factors such as: differences in percentages of households with telephones, self selection biases that differ by county, and changes in actual population figures since the last measurement of such figures.

Figure Two shows that 31.4% of the respondents lived in District 1, Missoula; 17.7% lived in 2, Butte; 20.0% in District 3, Great Falls; 9.1% in District 4, Glendive; and 20.8% District 5, Billings. A map showing the MDT Administrative Districts is included in this report as Appendix One.

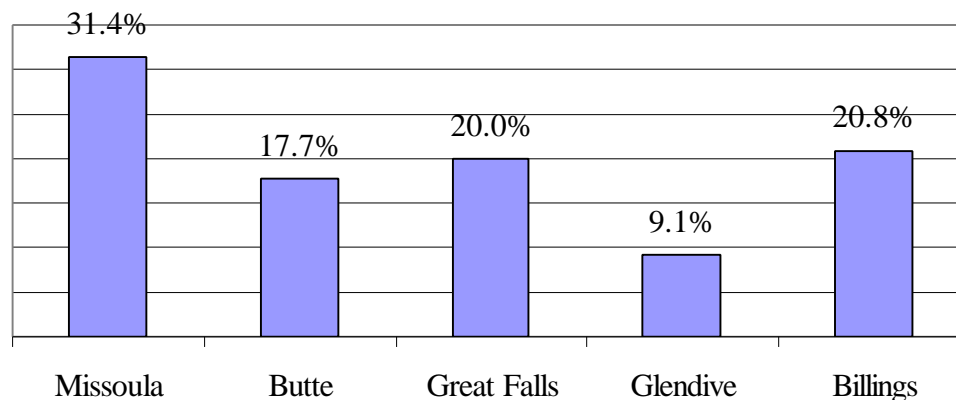
This survey was conducted by county line, as close to the Administrative Districts as possible. However, some counties are split between administrative districts, please refer to Appendix One.

TABLE TWO
LOCATION OF RESPONDENTS' RESIDENCES

County of Location		
Beaverhead	14	1.4%
Big Horn	9	0.9%
Blaine	5	0.5%
Broadwater	10	1.0%
Carbon	13	1.3%
Carter	1	0.1%
Cascade	84	8.4%
Chouteau	8	0.8%
Custer	13	1.3%
Daniels	1	0.1%
Dawson	8	0.8%
Deer Lodge	9	0.9%
Fallon	6	0.6%
Fergus	16	1.6%
Flathead	91	9.1%
Gallatin	63	6.3%
Glacier	15	1.5%
Golden Valley	3	0.3%
Granite	3	0.3%
Hill	15	1.5%
Jefferson	7	0.7%
Judith Basin	1	0.1%
Lake	28	2.8%
Lewis and Clark	61	6.1%
Liberty	1	0.1%
Lincoln	15	1.5%
McCone	7	0.7%
Madison	10	1.0%
Meagher	1	0.1%
Mineral	7	0.7%
Missoula	105	10.5%
Musselshell	6	0.6%
Park	20	2.0%
Petroleum	3	0.3%
Phillips	7	0.7%
Pondera	6	0.6%
Powder River	1	0.1%
Powell	7	0.7%
Prairie	2	0.2%
Ravalli	43	4.3%
Richland	13	1.3%

Roosevelt	9	0.9%
Rosebud	9	0.9%
Sanders	16	1.6%
Sheridan	5	0.5%
Silver Bow	44	4.4%
Stillwater	11	1.1%
Sweetgrass	4	0.4%
Teton	8	0.8%
Toole	7	0.7%
Treasure	2	0.2%
Valley	9	0.9%
Wheatland	3	0.3%
Yellowstone	138	13.8%
TOTAL	1005	100.0%

FIGURE 2
ADMINISTRATIVE DISTRICT

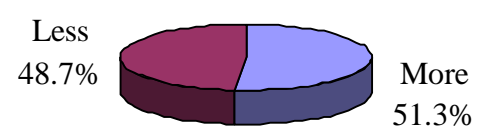


Travel Characteristics

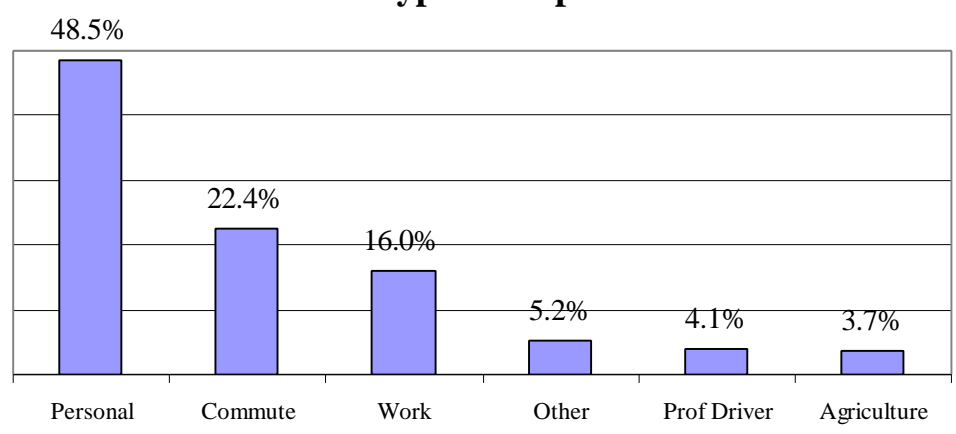
The respondents were asked several questions about their vehicle travel patterns. Figure Three summarizes the results of these questions. Figure Three shows that 51.3% of the respondents indicated they drive more than 15,000 miles per year while 48.7% drove less than 15,000 miles. The most common trips made by respondents were personal or family errands (48.5%), followed by commuting (22.4%) and then work related trips (16.0%).

FIGURE 3 RESPONDENTS' TRAVEL CHARACTERISTICS

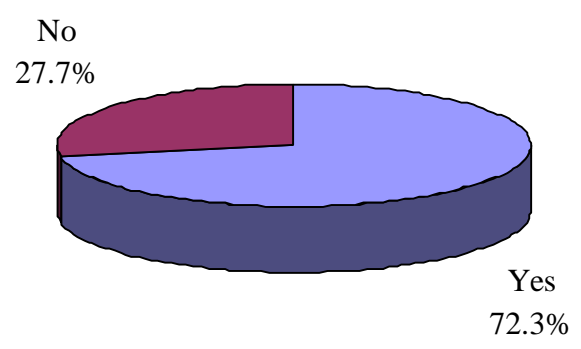
Drive More or Less Than 15,000 Miles Per



Typical Trip



Driven in Other States in Last Twelve Months

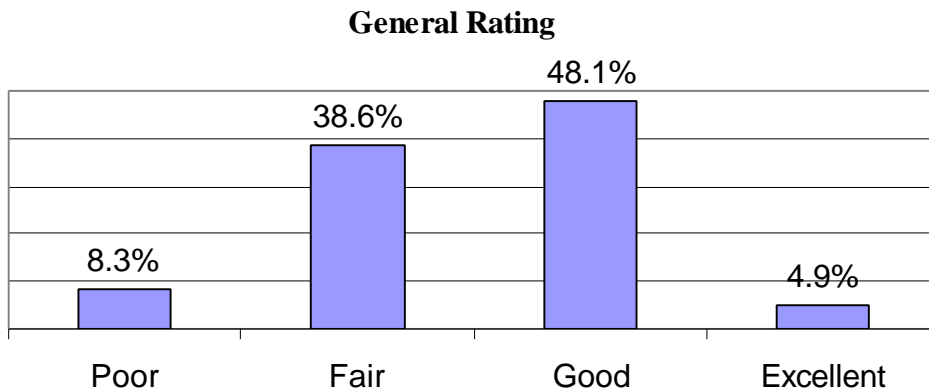


General Perception of Montana Highways and Interstates

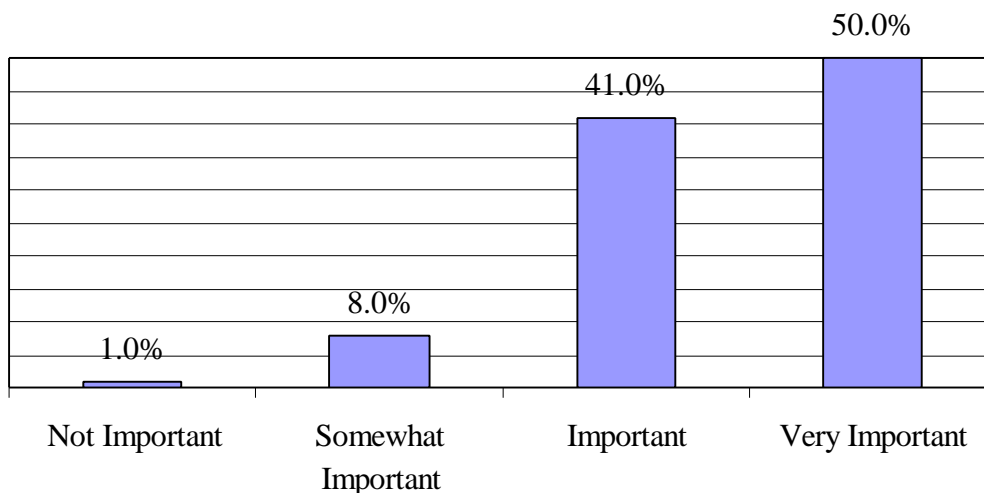
Rating of Montana Highway Maintenance

The respondents were asked to rate overall interstate and state highway maintenance in Montana using the responses poor, fair, good and excellent. Figure Four shows that 8.3% of the respondents rated overall maintenance as poor while 38.6% rated maintenance fair, 48.1% rated maintenance good and 4.9% rated maintenance excellent. The mean overall rating of maintenance on a 1 to 4 scale where 1 is poor, 2 is fair, 3 is good and 4 is excellent was 2.50.

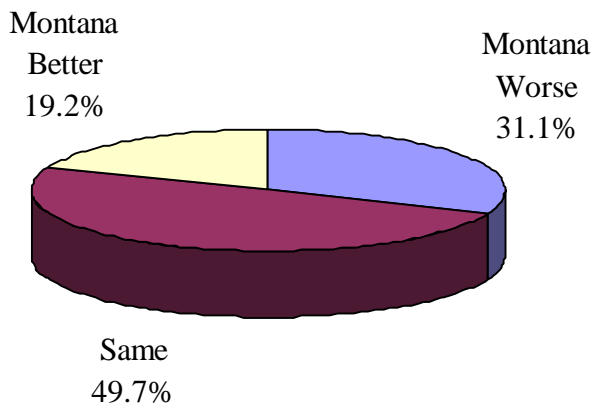
**FIGURE 4
GENERAL PERCEPTIONS OF MONTANA
ROADWAYS**



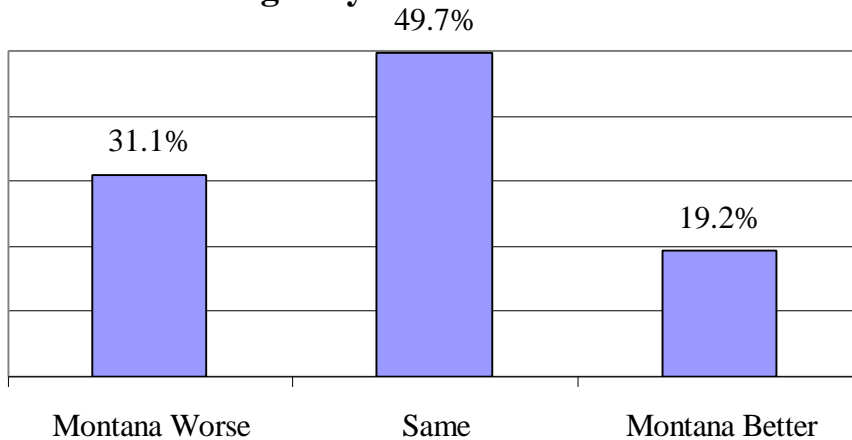
Importance of Highway Maintenance



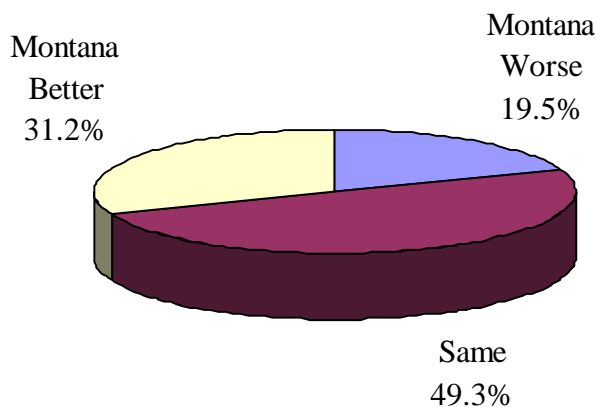
Comparison of Montana Highways with Highways in Other States



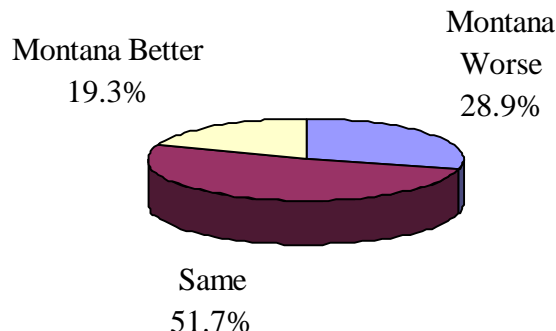
Comparison of Montana Highways with Highways in Other States



Comparison of Montana Winter Maintenance with Winter Maintenance in Other States



Comparison of Rest Area Maintenance in Montana with Rest Area Maintenance in Other States



Statistically Significant Relationships Between General Rating of Montana Highway Maintenance and Demographic/Travel Variables

To further investigate the perceptions of the respondents, all rating questions were crosstabulated with Administrative District, sex, age, educational attainment, length of Montana residence, the respondent's typical trip, whether the respondent had driven more or less than 15,000 miles, and whether or not the respondent had driven in other states within the last 12 months. A statistically significant relationship was deemed to exist when the probability of getting the observed outcome by chance was less than 5%. Only statistically significant relationships are reported in this report.

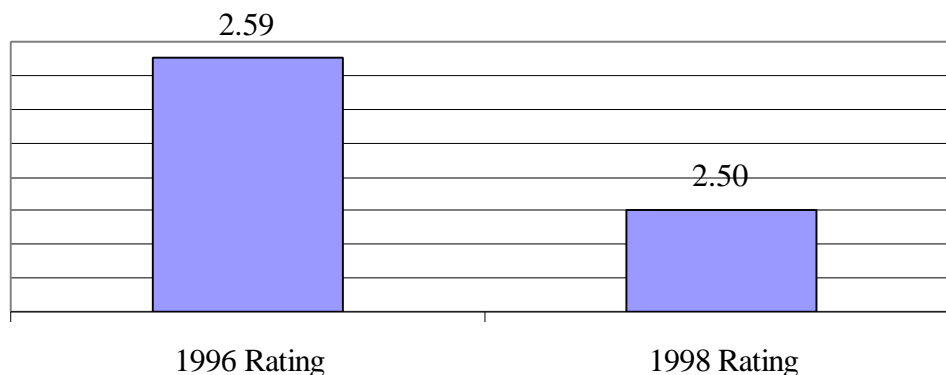
Statistically significant relationships were found between the respondents general rating of highway maintenance and typical trip and whether or not the respondent had driven more or less than 15,000 miles in the last year

- Respondents who reported they were professional drivers rated maintenance the lowest while those who said their typical trip was agricultural rated maintenance the highest.
- Respondents who had driven more than 15,000 miles in the last year rated general maintenance lower than those who had driven less than 15,000 miles in the last year.

Comparison of 1996 and 1998 General Rating of Montana Highway Maintenance

Figure Five provides a comparison of the 1996 and 1998 General Rating of Montana Highway Maintenance. Figure Five shows a decrease in the general rating from 2.59 in 1996 to 2.50 in 1998. This difference in rating was statistically significant.

FIGURE 5
COMPARISON OF 1996 AND 1998 GENERAL
RATING OF MONTANA HIGHWAY MAINTENANCE



Respondents' Opinion of the Personal Importance of Highway Maintenance

The respondents were also asked generally how important highway maintenance was to them and asked to answer with not important, somewhat important, important or very important. Figure Four shows that 50% of the respondents said very important, 41.0% said important, 8.0% said somewhat important, and only 1.0% said not important.

Statistically Significant Relationships Between Importance of Highway Maintenance and Demographic/Travel Variables

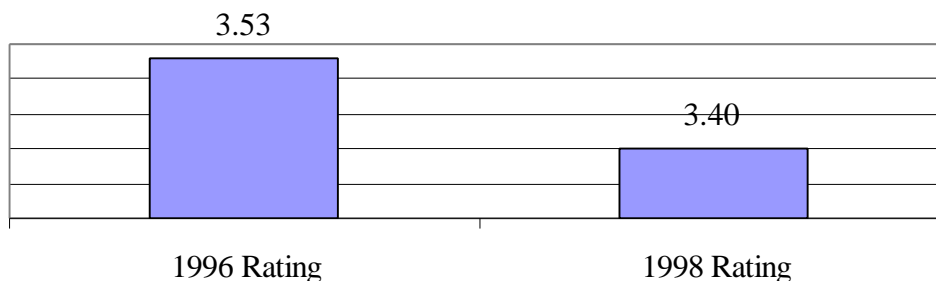
- General highway maintenance was more important to women than to men.
- General highway maintenance was most important to respondents reporting their typical trip was work related or who were professional drivers and it was least important to respondents who indicated their most common trip was agricultural.
- General highway maintenance was most important to respondents who had been in Montana over 30 years and was least important to respondents who had only been in Montana for 1 to 5 years.

- General highway maintenance was most important to respondents between 46 and 55 and was least important to respondents between 18 and 25.

Comparison of 1996 and 1998 Importance of Montana Highway Maintenance Rating

Figure Six provides a comparison of the 1996 and 1998 Importance of Montana Highway Maintenance rating. Figure Six shows a decrease in the rating of the rating of the importance of Montana highway maintenance from 3.53 in 1996 to 3.40 in 1998. This difference in rating was statistically significant.

FIGURE 6
COMPARISON OF 1996 AND 1998 IMPORTANCE
OF MONTANA HIGHWAY MAINTENANCE
RATING



General Comparison of Montana Highways with Highways in Other States

The respondents who had driven in other states in the last 12 months were asked to compare the general condition of Montana highways and interstates to those in the states they had driven. Figure Four shows that 49.7% of these respondents said the highways and interstates of Montana were about the same as those in the other states in which they had driven, 31.1% felt the roads in Montana were worse and 19.2% felt the roads in Montana were better.

Statistically Significant Relationships Between Comparison of Montana Highway Maintenance with Highway Maintenance in Other States and Demographic/Travel Variables

- Respondents who said they had lived in Montana from 6 to 10 years were more likely than other respondents to say Montana roads were better while respondents who had lived in Montana over 30 years were more likely than other respondents to say that Montana roads were worse.
- Respondents who reported driving more than 15,000 miles per year were more likely to say that Montana roads were worse than other states but they were also more likely to say that Montana roads were better than other states while respondents reporting they drove less than 15,000 miles per year were more likely to say that Montana roads were about the same as those in other states.

Comparison of Montana Winter Maintenance with Winter Maintenance in Other States

The respondents who had driven in other states in the last 12 months were also asked to compare winter maintenance in Montana to winter maintenance in other states. Figure Four shows 49.3% of these respondents, who had an opinion, believed winter maintenance was about the same in Montana as in other states while 31.2% believed winter maintenance was better in Montana and 19.5% believed winter maintenance was worse in Montana.

Statistically Significant Relationships Between Comparison of Winter Maintenance and Demographic/Travel Variables

- Respondents who reported driving more than 15,000 miles in the last year rated Montana winter maintenance both worse and better than other states while respondents who reported driving less than 15,000 miles in the last year were more likely to rate Montana winter maintenance about the same as in other states.
- Respondents with postgraduate education and respondents with only a grade school education were more likely than others to say Montana winter maintenance was worse in Montana than in other states.
- Respondents over 65 were more likely than younger respondents to say that winter maintenance in Montana was about the same as in other states while respondents between 26 and 36 were more likely than respondents of other ages to say Montana had better winter maintenance and respondents from 46 to 55 were more likely than respondents of other ages to say that Montana winter maintenance was worse than in other states.

Comparison of Montana Rest Area Maintenance and Rest Area Maintenance in Other States

The respondents who had driven in other states within the last 12 months were also asked to compare rest area maintenance in Montana with rest area maintenance in the other states in which they had driven. Figure Four shows that 51.7% of respondents who had an opinion felt rest area maintenance was about the same in Montana as in other states, while 28.9% said rest stop area maintenance was worse in Montana and 19.3% said it was better in Montana.

Statistically Significant Relationships Between Rest Area Maintenance Comparison and Demographic/Travel Variables

- Respondents in the Great Falls District were the most likely to say that Montana rest stop maintenance was worse than in other states, respondents in the Butte District were the most likely to say Montana rest stop maintenance was better than in other states while respondents in the remaining districts were the most likely to say Montana rest stop maintenance was about the same as in other states.

- Respondents who had been in Montana for 21 to 30 years were more likely to say Montana rest stop maintenance was worse than other states while respondents who had been in Montana for 6 to 10 years were more likely to say Montana rest stop maintenance was better than other states and respondents who had been in Montana for 1 to 5 years, 11 to 20 years and over 30 years were more likely to say the Montana rest stop maintenance was about the same as in other states.
- Respondents with a college degree or more were more likely than respondents with less education to say that rest stop maintenance was worse in Montana than in other states.

Respondents Rating of Eight Maintenance Activities

For the purposes of this survey, highway maintenance activities were divided into 8 categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road condition reports. The respondents were asked to rate each of these activities with the responses poor, fair, good, very good and excellent. Table Three summarizes the results of that rating. The ordering of the activities in Table Three is provided by the mean score for each item on a 1 to 4 scale where 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Also reported in Table Three are the standard deviation (SD) of the distribution of rating for each activity and the standard error of the mean (SE) for the ratings of each activity. While it is not possible to indicate what constitutes a statistically significant difference between means because each mean represents a separate variable, the standard deviation and standard error of the ratings should assist in making any additional interpretations. The largest standard of error is 0.029 resulting in a 95% confidence interval of $\pm .057$. This means that if the difference between two means is greater than 0.11, each mean is outside of the 95% confidence interval of the other. Therefore a difference between means greater than 0.11 should be considered a real difference.

Table Three shows that the maintenance of highway signs is rated highest (3.02) followed by winter road information (2.86), rest stop maintenance (2.81), striping (2.78) debris removal (2.72), winter maintenance (2.71), roadside maintenance (2.67), and highway surface maintenance (2.31). These ratings show that the maintenance of signs is rated highest followed by winter road information, rest stop maintenance, and striping. Debris removal and winter maintenance are rated about the same, followed by roadsides. Finally, highway surface maintenance is clearly rated the lowest of all maintenance activities.

TABLE THREE
RATING OF MAINTENANCE ACTIVITIES

<u>Activity</u>	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Excellent</u>	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>SE</u>
Signage	2.1%	11.3%	68.6%	18.0%	994	3.02	0.614	0.019
Information	5.8%	19.9%	56.5%	17.8%	821	2.86	0.769	0.027
Rest Stop Maint.	8.5%	19.2%	55.4%	16.9%	812	2.81	0.815	0.029
Striping	6.2%	20.6%	61.7%	11.4%	996	2.78	0.723	0.023
Debris Removal	8.9%	24.3%	52.3%	14.5%	988	2.72	0.817	0.026
Winter Maint.	9.4%	22.7%	55.4%	12.6%	948	2.71	0.803	0.026
Roadsides	8.2%	25.5%	57.1%	9.1%	975	2.67	0.753	0.024
Surfaces	17.1%	37.5%	42.5%	2.9%	993	2.31	0.785	0.025

Statistically Significant Relationships Between Rating of Maintenance Activities
and Administrative District

- Respondents in the Butte District rated winter maintenance higher than did other respondents while the respondent in the Glendive District rated winter maintenance lower than did other respondents. Respondents in the Great Falls District rated rest stop maintenance lower than did respondents in other districts. Respondents in the Billings District rated highway surfaces lower than did other respondents.

Statistically Significant Relationships Between Rating of Signage
and Demographic/Travel Variables

- No statistically significant relationships were found between rating signage and demographic/travel variables.

Statistically Significant Relationships Between Rating of Winter Roadway Information
and Demographic/Travel Variables

- No statistically significant relationships were found between rating of winter roadway information and any demographic or travel variable.

Statistically Significant Relationships Between Rating of Rest Stop Maintenance
and Demographic/Travel Variables

- Respondents who had been in Montana less than 10 years rated rest stop maintenance higher than did any other respondents.

Statistically Significant Relationships Between Rating of Highway Striping
and Demographic/Travel Variables

- Respondents 55 years of age and older rated highway striping higher than did respondents who were less than 55.

Statistically Significant Relationships Between Rating of Debris Removal
and Demographic/Travel Variables

- Respondents between 26 and 35 rated debris removal lower than did respondents of other ages while the oldest respondents who were over 75 rated debris removal the highest.

Statistically Significant Relationships Between Winter Maintenance
and Demographic/Travel Variables

- Respondents who were between 65 and 75 rated winter maintenance higher than did other respondents while respondents between 26 and 35 rated winter maintenance lower than did other respondents. Males rated winter maintenance higher than did females.

Statistically Significant Relationships Between Rating of Roadside Maintenance
and Demographic/Travel Variables

- Respondents who had been in Montana for only 1 to 5 years rated roadside maintenance higher than did other respondents while respondents who had been in Montana for over 30 years rated roadside maintenance lower than did other respondents.

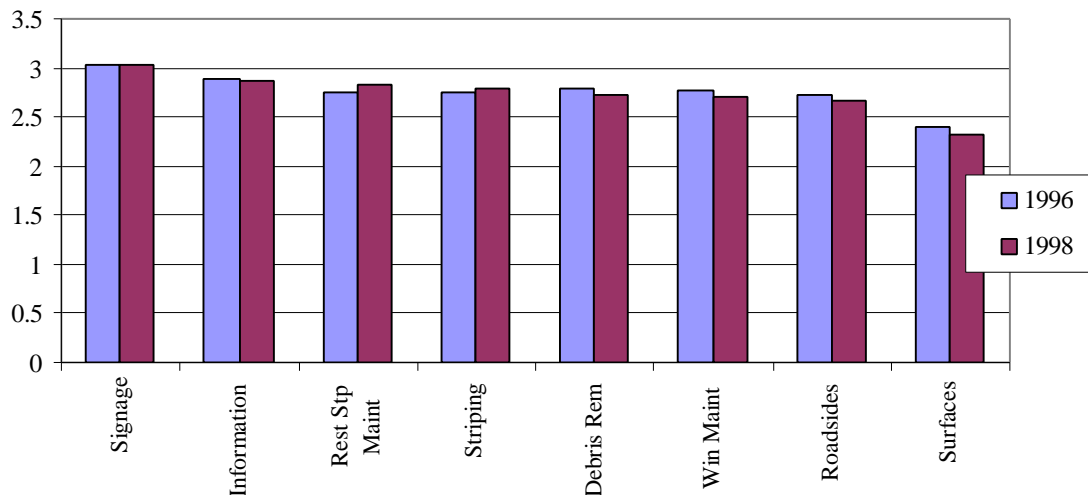
Statistically Significant Relationships Between Rating of Surface Smoothness
and Demographic/Travel Variables

- Professional drivers rated surface smoothness lower than did other respondents.
- Respondents who had been in Montana from 1 to 5 years rated surface smoothness higher than did other respondents.
- Respondents who drove more than 15,000 miles per year rated highway surfaces lower than did respondents who drove less than 15,000 miles per year.

Comparison of 1996 and 1998 Ratings of the Eight Maintenance Activities

Figure Seven provides a comparison of 1996 and 1998 ratings of the eight maintenance activities. The only rating which showed a statistically significant change from 1996 to 1998 was the rating of surfaces which decreased from 2.40 in 1996 to 2.31 in 1998.

FIGURE 7
COMPARISON OF 1996 AND 1998 RATINGS OF
MAINTENANCE ACTIVITIES



Importance of Highway Maintenance Activities to the Respondents

The respondents were asked how important each of the eight maintenance activities were to them. They were asked to respond with not important, somewhat important, important and very important. Table Four summarizes the respondents' perception of the importance of these different activities. The ordering of activities in Table Four is provided by the mean score of each activity on a 1 to 4 scale where 1 = not important, 2 = somewhat important, 3 = important and 4 = very important.

TABLE FOUR
IMPORTANCE OF MAINTENANCE ACTIVITIES

<u>Activity</u>	<u>Not</u> <u>Important</u>	<u>Smwhat</u> <u>Import.</u>	<u>Very</u> <u>Import.</u>	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>SE</u>
Winter Maint.	0.5%	4.8%	33.8%	971	3.55	0.613	0.020
Striping	.9%	5.3%	42.4%	995	3.44	0.639	0.020
Information	2.8%	7.4%	40.4%	852	3.37	0.741	0.025
Surfaces	1.1%	7.7%	47.3%	998	3.34	0.667	0.021
Debris Removal	1.4%	7.5%	49.5%	989	3.31	0.671	0.021
Signage	1.9%	6.8%	49.6%	998	3.31	0.682	0.022
Rest Stop Maint.	3.5%	10.5%	48.7%	836	3.20	0.761	0.026
Roadsides	6.1%	14.3%	53.2%	977	3.00	0.808	0.026

Table Four shows that winter maintenance is the most important maintenance activity to respondents with a mean of 3.55 followed by striping (3.44), winter roadway

information (3.37), surfaces (3.34), debris removal (3.31), signage (3.31), rest stop maintenance (3.20) and roadside maintenance (3.00). The standard deviation and standard error of the mean are presented for the importance ratings of each activity. The largest standard error is 0.026 with a resulting 95% confidence interval of ± 0.051 meaning that any difference between means greater than 0.10 can be considered a real difference. With this figure in mind, winter maintenance is clearly the most important to respondents followed by striping. However striping cannot be differentiated from winter roadway information or surfaces, and winter roadway information surfaces, debris removal and signage are within the .10 figure so they cannot be statistically differentiated. Rest stop maintenance and roadside maintenance are clearly lower than the others in terms of importance and can be differentiated from each other.

Statistically Significant Relationships Between Importance of Maintenance Activities and Administrative District

- Respondents in the Great Falls and Glendive Districts rated the importance of roadside maintenance higher than did respondents in other districts.

Statistically Significant Relationships Between Importance of Winter Maintenance and Demographic/Travel Variables

- Females rated the importance of winter maintenance higher than did males.

Statistically Significant Relationships Between Highway Striping and Demographic/Travel Variables

- Females rated the importance of highway striping higher than did males.

Statistically Significant Relationships Between Importance of Winter Roadway Information and Demographic/Travel Variables

- Females rated the importance of winter roadway information higher than did males.

Statistically Significant Relationships Between Importance of Smooth Surfaces and Demographic/Travel Variables

- No statistically significant relationships were found between the importance of smooth surfaces and the demographic or travel variables.

Statistically Significant Relationships Between Importance of Debris Removal and Demographic/Travel Variables

- No statistically significant relationships were found between the importance of debris removal and the demographic or travel variables.

Statistically Significant Relationships Between Importance of Highway Signage
and Demographic/Travel Variables

- No statistically significant relationships were found between the respondents' perception of the importance of highway signage and any of the demographic or travel variables.

Statistically Significant Relationships Between Importance of Rest Stop Maintenance
and Demographic/Travel Variables

- Females believed rest stop maintenance to be more important than males did.
- The importance of rest stop maintenance was rated higher by respondents between 65 and 75 than it was by respondents in any other age group and the importance of rest stop maintenance was rated lower by respondents under 35 than it was by any other age groups.

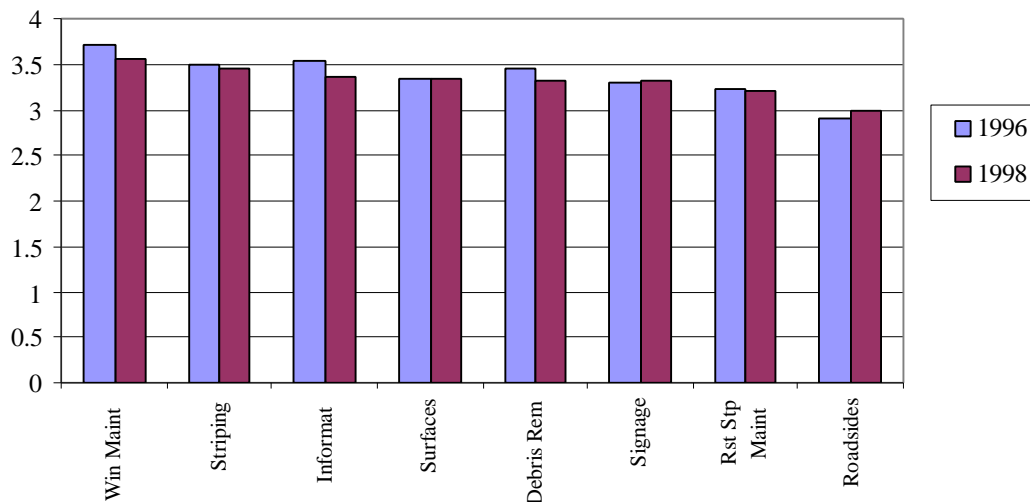
Statistically Significant Relationships Between Importance of Roadside Maintenance
and Demographic/Travel Variables

- Respondents who had not driven in other states in the last year rated the maintenance of highway roadsides to be more important than those who had driven in other states.
- Respondents over 75 rated the maintenance of highway roadsides more important than did respondents who were younger while respondents between the ages of 26 and 35 rated the importance of maintaining highway roadsides lower than did other respondents.

Comparison of 1996 and 1998 Importance Rating for Eight Maintenance Activities

Figure Eight provides a comparison of the 1996 and 1998 importance ratings for the eight maintenance activities. The 1996 to 1998 changes in importance ratings of winter maintenance, winter roadway information, debris removal, and roadside maintenance were statistically significant. For winter maintenance (3.72 to 3.55), winter roadway information (3.53 to 3.37), and debris removal (3.44 to 3.31), the change from 1996 to 1998 was a decrease in perceived importance. However, for roadside maintenance (2.90 to 3.00), the change involved an increase in perceived importance.

FIGURE 8
COMPARISON OF 1996 AND 1998
PERCEPTIONS OF IMPORTANCE OF
MAINTENANCE ACTIVITIES



**Respondents' Perception of the Resource Priority
Which Should Be Attached to Each Maintenance Activity**

The respondents were asked to think about the allocation of Department of Transportation resources and assign a resource priority of low, medium, moderately high, or very high to each of the maintenance activities. Table Five summarizes the results of the respondents' assignment of resource priorities. The ordering of activities in Table Five is provided by the mean resource priority score for each item on a scale where 1 = low, 2 = medium, 3 = moderately high and 4 = high. As Table Five shows, respondents awarded the highest resource priority to winter maintenance (3.53) followed by information about winter road conditions (3.32) and highway striping (3.22), smoothness of roadway surface (3.17), debris removal (3.08), rest stop maintenance (3.06), signage (3.03) and roadside maintenance (2.66). The standard deviation and standard error of the mean are presented for each activity's resource priority mean. The largest standard error is 0.029 producing a 95% confidence interval of ± 0.57 . Therefore a difference between means greater than 0.11 is a real difference. With this figure in mind, the highest priority goes to winter maintenance followed by a tie between winter roadway information and striping, then surfaces, and then a three way tie between debris removal, rest stop maintenance and signage, and then roadside maintenance which clearly has the lowest priority.

**TABLE FIVE
RESOURCE PRIORITIES**

<u>Activity</u>	<u>Low</u>	<u>Medium</u>	Moderately	Very	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>SE</u>
			<u>High</u>	<u>High</u>				
Winter Maint.	0.7%	08.5%	28.2%	62.6%	984	3.53	0.681	0.022
Information	3.1%	13.0%	32.9%	50.9%	953	3.32	0.816	0.026
Striping	2.4%	14.7%	31.4%	51.4%	980	3.32	0.811	0.026
Surface	1.8%	17.2%	43.0%	37.9%	975	3.17	0.773	0.025
Debris Removal	5.0%	20.4%	35.9%	38.7%	983	3.08	0.886	0.028
Rest Stop Maint.	4.9%	20.1%	39.0%	36.0%	925	3.06	0.868	0.029
Signage	6.4%	20.8%	36.3%	36.5%	981	3.03	0.911	0.029
Roadsides	9.9%	33.0%	38.6%	18.6%	980	2.66	0.892	0.028

Statistically Significant Relationships Between Resource Priorities Assigned to
Maintenance Activities and Administrative District

- Respondents in the Great Falls and Glendive Districts gave roadside maintenance a higher priority than did respondents in other districts.
- Respondents in the Great Falls and Glendive Districts also gave rest stop maintenance a higher priority than did respondents in other areas while respondents in the Missoula District gave rest stop maintenance a lower priority than did respondents in other districts.

Statistically Significant Relationships Between Resource Priority Assigned to Winter
Maintenance and Demographic/Travel Variables

- Females assigned a higher resource priority to winter maintenance than did males.
- Respondents who had driven in other states assigned a higher priority to winter maintenance than did respondents who had not driven in other states.
- Respondents between the ages of 56 and 65 assigned a higher priority to winter maintenance than did older or younger respondents while respondents over 75 assigned a lower priority to winter maintenance than did younger respondents.

Statistically Significant Relationships Between Resource Priority Assigned to Winter
Roadway Information and Demographic/Travel Variables

- Females assigned a higher resource priority to winter roadway information than did males.

Statistically Significant Relationships Between Resource Priority Assigned to Roadway
Striping and Demographic/Travel Variables

- Respondents between the ages of 46 and 55 assigned a higher priority to roadway striping than did younger or older respondents.

Statistically Significant Relationships Between Resource Priority Assigned to Surface Smoothness and Demographic/Travel Variables

- Females assigned a higher priority to road surfaces than did males.

Statistically Significant Relationships Between Resource Priority Assigned to Debris Removal and Demographic/Travel Variables

- No statistically significant relationships were found between the priority assigned debris removal and any demographic or travel variable.

Statistically Significant Relationships Between Resource Priority Assigned to Rest Stop Maintenance and Demographic/Travel Variables

- Females assigned a higher priority to rest stop maintenance than did males.
- Respondents between the ages of 46 and 65 assigned a higher priority to rest stop maintenance than did younger or older respondents.

Statistically Significant Relationships Between Resource Priority Assigned to Signage and Demographic/Travel Variables

- Respondent 25 or less in age assigned a lower priority to signage than did older respondents.

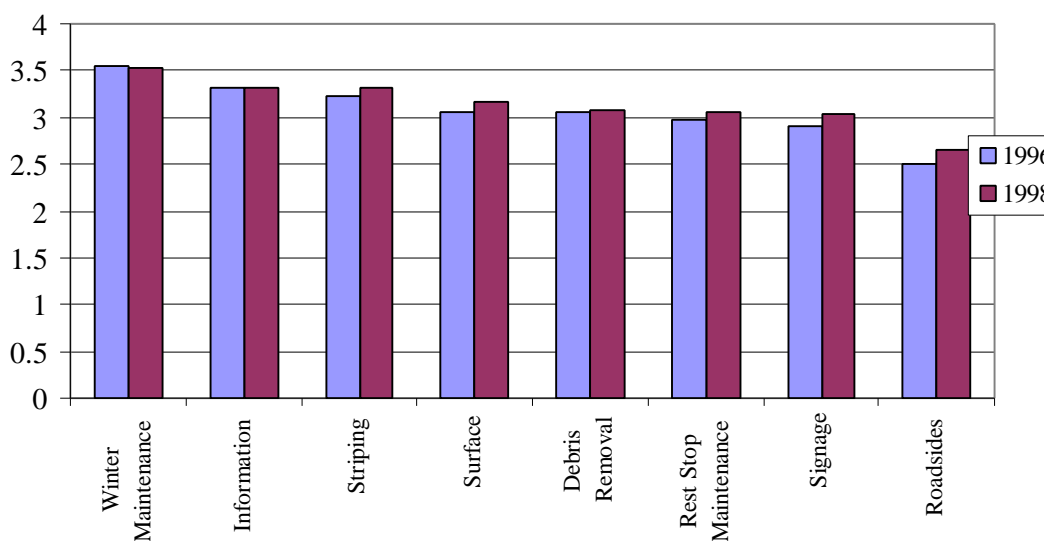
Statistically Significant Relationships Between Resource Priority Assigned Roadside Maintenance and Demographic/Travel Variables

- Respondents who had not driven in other states in the last year assigned a higher priority to roadside maintenance than did respondents who had driven in other states.
- Respondents who reported driving less than 15,000 miles in the last year assigned a higher priority to roadside maintenance than did respondents who had driven more than 15,000 miles.
- Commuters and respondents reporting their typical trip was agriculturally related assigned a higher priority to roadside maintenance than did respondents indicating a different typical trip while professional drivers assigned roadside maintenance a lower priority than did drivers indicating a non professional driving typical trip.
- Respondents who had lived in Montana over 30 years assigned a higher priority to roadside maintenance than did respondents who had lived in Montana for less time while respondents who had only been in Montana for less than 5 years assigned a lower priority to roadside maintenance than did respondents who had been in Montana longer.

Comparison of 1996 and 1998 Priorities Assigned to the Eight Maintenance Activities

Figure Nine provides a comparison of the 1996 and 1998 assignment of priorities to the eight maintenance activities. The increases from 1996 to 1998 in the priorities assigned to striping (3.22 to 3.32), surface smoothness (3.05 to 3.17), rest stop maintenance (2.97 to 3.06), signage (2.90 to 3.03), and roadside maintenance (2.51 to 2.66) were all statistically significant.

FIGURE 9
COMPARISON OF 1996 AND 1998 RESOURCE PRIORITIES



Composite Variables for Each Maintenance Activity

To better understand the perceptions of the respondents toward each maintenance activity, a composite variable was constructed for each maintenance activity by combining the answers to the rating, importance, and resource priority questions. The first step in constructing these variables, was to reverse the values assigned to the responses to the rating of each maintenance activity. After reversal, an excellent rating = 1, a good rating = 2, a fair rating = 3, and a poor rating = 4. Then, the composite variable for each maintenance activity was created by adding this reversed value for rating, the score on the importance question (1 = not important, 2 = somewhat important, 3 = important and 4 = very important) and the score on the resource priority question (1 = low, 2 = medium, 3 = moderately high, and 4 = high).

If a respondent had answered all three of the questions about a maintenance activity, the scores on the composite variable for that activity would range from 3 to 12. If the value of the composite variable were a 3, it would indicate an excellent rating of the activity, an answer of not important on the importance question and of low priority on the resource priority question. A score of 12 would indicate a poor rating, very important and

a high resource priority. A score of less than 3 is possible if the respondent did not answer each question about a particular maintenance activity.

The higher the score on this composite variable, the lower the rating, the more important the activity is considered, and the higher the resource priority assigned to the activity. Thus, the higher the score on the composite variable, the more attention respondents believe should be paid to the maintenance activity.

Table Six summarizes the values of the composite variable created for each maintenance activity. Each of the eight composite variables of Winter Maintenance, Surface Smoothness, Striping, Debris Removal, Winter Road Information, Signage, Rest Stop Maintenance and Road Side Maintenance occupies a column in Table Six. The ordering of columns in Table Six is based upon the mean score for each composite variable and ranges from Winter Maintenance with a mean score of 9.10 to Rest Stop Maintenance with a mean score of 7.69. The standard deviation and standard error of the mean are presented for each composite variable. The largest standard error is 0.077 producing a 95% confidence interval of ± 0.1509 . Therefore, a difference between means of greater than .3 represents a real difference. Clearly Winter Maintenance and Surface Smoothness have the highest scores with Striping next, followed by Debris Removal, Signage, Winter Road Information, Road Side Maintenance, and then Rest Stop Maintenance.

**TABLE SIX
VALUES OF COMPOSITE VARIABLES**

<u>Value</u>	<u>Winter Maint</u>	<u>Surface Smthness</u>	<u>Striping</u>	<u>Debris Removal</u>	<u>Signage</u>	<u>Wtr Rd Informat</u>	<u>Rd Side Maint</u>	<u>Reststop Maint</u>
1	0.0%	0.0%	0.0%	0.2%	0.0%	0.5%	0.2%	1.1%
2	0.3%	0.2%	0.1%	0.2%	0.1%	2.2%	0.6%	2.6%
3	0.9%	0.2%	0.2%	0.5%	.3%	5.1%	1.1%	5.0%
4	2.3%	0.1%	0.5%	0.7%	1.0%	6.2%	2.4%	4.7%
5	.5%	2.7%	2.4%	1.8%	2.7%	2.8%	4.3%	3.8%
6	1.2%	2.1%	3.2%	5.9%	7.0%	3.9%	11.9%	6.8%
7	5.8%	8.1%	9.2%	11.8%	16.1%	8.8%	18.7%	11.0%
8	15.6%	21.2%	19.6%	24.1%	27.0%	16.9%	24.3%	22.5%
9	30.6%	26.2%	29.0%	29.1%	27.6%	27.4%	21.9%	23.4%
10	27.4%	20.1%	24.7%	16.4%	14.8%	18.4%	9.1%	11.7%
11	11.2%	13.2%	8.3%	6.7%	2.7%	5.9%	3.9%	5.3%
12	4.2%	5.9%	2.6%	2.6%	.7%	1.9%	1.4%	2.2%
N	998	1003	1001	1000	1000	975	998	948
Mean	9.10	9.07	8.87	8.56	8.24	7.98	7.82	7.69
SD	1.649	1.614	1.510	1.607	1.457	2.376	1.777	2.372
SE	0.052	0.051	0.048	0.051	0.046	0.076	0.056	0.077

In order to better explain the meaning of these composite variables as well as the respondents' perceptions of the eight maintenance activities, Table Seven shows the mean score of the composite variable for each activity as well as the relative position of each

activity in the respondents' rating of how well each activity is currently being accomplished, the respondents' feeling on the importance each activity, and the resource priority assigned by the respondents to each maintenance activity.

TABLE SEVEN
COMPOSITE VARIABLE MEAN BY RANK OF
RATING, IMPORTANCE, AND PRIORITY

	Composite <u>Mean</u>	Rating <u>Rank</u>	Importance <u>Rank</u>	Priority <u>Rank</u>
Winter Maint	9.10	5*	1	1
Surface Smoothness	9.07	7	4	3
Striping	8.87	4	2	2*
Debris Removal	8.56	5*	5	4*
Signage	8.24	1	6	5
Winter Road Info	7.98	2	3	2*
Roadside Maint.	7.82	6	8	6
Rest Stop Maint.	7.69	3	7	4*

Note: * Indicates tied ranks

The mean composite score for Winter Maintenance is the highest of all the composite variables because it is rated the most important maintenance activity by the respondents and is assigned the highest resource priority by the respondents.

Surface Smoothness is rated the next highest on the composite variable not because of its importance and resource priority, which fall in the middle of the rating for all maintenance activities, but because of the rating of the current condition of surface smoothness. Respondents rated Surface Smoothness last as compared with other maintenance activities.

Striping ranks third in terms of mean composite variable score because it is in the upper middle importance and resource priority ranking and about the middle for rating of current condition.

Debris Removal rates fourth in terms of its composite variable because it is in about the middle of the rankings for rating of current condition, importance and resource priority.

The Signage composite variable is fifth because it is ranked toward the bottom of the eight maintenance activities in terms of importance and priority and because the current condition highways signs is rated higher than any other maintenance activity.

Winter Roadway Information is rated sixth in terms of composite variable means, not because it is considered unimportant nor because it is not given a high resource priority value by the respondents, but because respondents currently rate it as being done well.

Road Side Maintenance is rated seventh because it is ranked dead last in terms of importance and resource priority.

Rest Stop Maintenance is rated last in terms of composite variable means because it is rated next to last in Importance, about middle in terms of resource priority, but third in terms of how well it is currently being done.

Statistically Significant Relationships Between Composite Variables
and Administrative District

- The scores on the composite variable Road Side Maintenance were higher for respondents living in the Great Falls and Glendive Districts than they were for respondents living in other districts, while the scores on Road Side Maintenance were lower for respondents living in the Billings and Butte Districts than they were for respondents living in other areas.
- The scores on the composite variable for Rest Stop Maintenance were higher for respondents in the Great Falls District than respondents living in other districts and were lower for respondents in the Billings District than for respondents living in any other districts.

Statistically Significant Relationships Between Scores on Winter Maintenance Composite
Variable and Demographic/Travel Variables

- Respondents who reported driving more than 15,000 miles in the last 12 months scored higher on the Winter Maintenance composite variable than did respondents who drove less than 15,000 miles.
- Respondents over 65 scored lower on the Winter Maintenance composite variable than did younger respondents.
- Respondents who had been in Montana for five or less years scored lower on the Winter Maintenance composite variable than did respondents who had been in Montana longer.

Statistically Significant Relationships Between Scores on Surface Smoothness Composite
Variable and Demographic/Travel Variables

- Females scored higher than males on the Surface Smoothness composite variable.
- Respondents from 36 to 45 scored higher on the Surface Smoothness composite variable than did respondents who were younger or older while respondents over 75 scored lower on this composite variable than younger respondents did.
- Respondents who had been in Montana for 5 or less years scored lower on the Surface Smoothness composite variable than did respondents who had been in Montana longer.
- Respondents who were professional drivers scored higher on the Surface Smoothness composite variable than did respondents who indicated any other type of typical trip.

Statistically Significant Relationships Between Scores on Striping Composite Variable and Demographic/Travel Variables

- Females scored higher than males on the Striping composite variable.
- Respondents who reported they had driven in other states in the last year scored higher on the Striping composite variable than did respondents who had not driven in other states.

Statistically Significant Relationships Between Scores on Debris Removal Composite Variable and Demographic/Travel Variables

- Respondents who reported driving more than 15,000 miles in the last year scored higher on the Debris Removal composite variable than did respondents who had driven less than 15,000 miles.

Statistically Significant Relationships Between Scores on Signage Composite Variable and Demographic/Travel Variables

- Respondents with a college degree and respondents with a high school diploma scored higher on the Signage composite variable than did respondents with other levels of education attainment while respondents with some high school scored lower than respondents with other levels of education attainment on this composite variable.

Statistically Significant Relationships Between Scores on Winter Roadway Information Composite Variable and Demographic/Travel Variables

- Females scored higher on the Winter Roadway Information composite variable than did males.
- Respondents between the ages of 36 and 55 scored higher on the Winter Roadway Information composite variable than did older or younger respondents while respondents between 56 and 65 scored the lowest on this composite variable.
- Respondents who had been in Montana for over 30 years scored higher on the Winter Roadway Information composite variable than did respondents who had been in Montana for less time while respondents who had been in Montana for 5 or less years scored the lowest on this composite variable.

Statistically Significant Relationships Between Scores on Roadside Maintenance Composite Variable and Demographic/Travel Variables

- Respondents who had not driven in other states in the last 12 months scored higher on the Roadside Maintenance composite variable than did respondents who had driven in other states.
- Respondent with a college degree or higher scored lower on the composite variable for Roadside Maintenance than did respondents with less education.
- Respondents who had been in Montana for over 30 years scored higher on the Roadside Maintenance composite variable than did respondents who had been in

Montana for less time while respondents who had been in Montana for 5 or less years scored lower on this composite variable than respondents who had been in Montana longer.

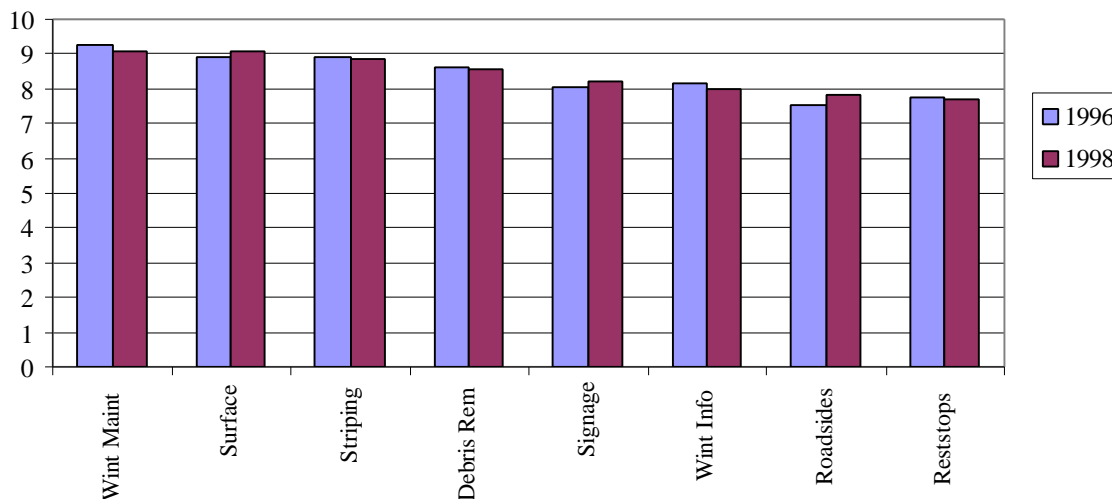
Statistically Significant Relationships Between Scores on Rest Stop Maintenance Composite Variable and Demographic/Travel Variables

- Respondents who had driven in other states in the last year scored higher on the Rest Stop Maintenance composite variable than did respondents who had not driven in other states.
- Respondents between 46 and 55 scored higher than younger or older respondents on the Rest Stop Maintenance composite variable while respondents over 75 scored lower than younger respondents on this composite variable.

Comparison of the 1996 and 1998 Composite Variable Means for the Eight Maintenance Activities

Figure Ten provides a comparison of the 1996 and 1998 composite variable means for the eight maintenance activities. The 1996 to 1998 increases in the composite variable means for surface smoothness (8.92 to 9.07), signage (8.07 to 8.24), and roadside maintenance (7.53 to 7.82) were statistically significant.

**FIGURE 10
COMPARISON OF 1996 AND 1998 COMPOSITE
VARIABLE MEANS**



Respondents Perception of How The Montana Department of Transportation Could Do Better in the Area of Highway Maintenance

The respondents were asked in the form of an open ended question, what the Department of Transportation could do better in terms of maintenance. The responses were categorized. Table Eight presents a general summary of the categorized answers.

**TABLE EIGHT
WHAT COULD THE TRANSPORTATION DEPARTMENT DO BETTER IN
TERMS OF MAINTENANCE**

Make Surfaces Smoother	144	17.3%
Winter Maintenance	107	12.9%
Rest Area Maintenance	97	11.7%
More/Better Maintenance	74	8.9%
Debris Removal/Roadsides	72	8.7%
Striping	60	7.2%
Make Repairs Faster	47	5.7%
Slow lanes/More lanes	42	5.0%
Construction	41	4.9%
Signage	30	3.6%
Use Better Materials	26	3.1%
Safety	25	3.0%
Spray Weeds	24	2.6%
Reinstate Speed Limit	23	2.8%
Improve MDT	20	2.4%
More Personnel	15	1.8%
Make Roads Better	7	0.8%
TOTAL	830	100.0%

Table Eight shows the three areas most often singled out as needing improvement were highway surfaces, winter maintenance, and rest area maintenance.

In What Maintenance Activities Does the Department of Transportation Currently Do a Good Job

The respondents were also asked in an open ended question what maintenance activities done by the MDT met or exceeded the respondents expectations. These answers were also categorized. Table Nine summarizes the answers to this question.

**TABLE NINE
MAINTENANCE ACTIVITIES THAT MEET OR EXCEED
RESPONDENTS' EXPECTATIONS**

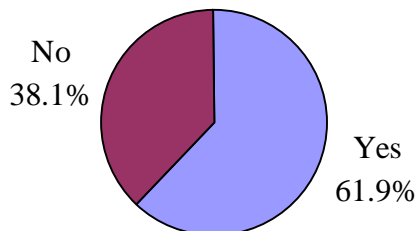
Winter Maintenance	133	26.2%
Doing a good job	117	23.0%
General Maintenance	78	15.3%
Surface Smoothness	31	6.1%
Signage	25	4.9%
Best they can with resources	21	4.1%
Debris Removal	18	3.5%
Rest Areas	16	3.1%
Striping	15	2.9%
Roadside Maintenance	11	2.2%
Construction	13	2.6%
Mowing	9	1.8%
Winter Roadway Information	7	1.4%
Adequate job	7	1.4%
They try	7	1.4%
TOTAL	508	100%

Table Nine shows the respondents think winter maintenance is the area in which the Department of Transportation meets or exceeds respondent expectation.

Willingness to Participate in a Follow Up Study

Finally, the respondents were asked if they would be willing to participate in a follow up study. Figure Eleven shows that 61.9% of the respondents indicated they would be willing to participate in a follow up study while 38.1% said they would not be.

**FIGURE 11
Willingness to Participate in Follow-up
Study**



The respondents who agreed to participate in a follow up study were then asked for their name, address and telephone number.

SUMMARY

Trained interviewers at the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings completed 1,005 interviews with randomly selected adult residents of Montana between October 10th, 1998 and October 28th, 1998. The purposes of this telephone survey were to obtain the perceptions the respondents held about the maintenance of interstate and state highways in Montana, and to determine what if any changes have occurred in these perceptions since a similar telephone survey was conducted in the fall of 1996.

The Respondents

About half the respondents were male and half were female. The mean age of the respondents was 47.1 with 24.6% of the respondents thirty five years old or less, 28.8% were 56 or over, and the remainder of 46.6% between 36 and 55. The mean age of the 1998 respondents was nearly two years older than the mean age of the 1996 respondents, a statistically significant difference.

The mean educational attainment of the respondents was 13.8 years of education, 4.9% had not completed high school, 37.4% had completed just high school, 29.1% had completed some college, and 28.3% had at least a college degree.

The mean length of time respondents had been in Montana was 32.5 years and 49.8% of the respondents reported they had lived in Montana over 30 years, while 13.1% indicated they had been in Montana for 5 or less years.

About 31% of the respondents lived in the Missoula District, 17.7% lived in the Butte District, 20.0% in the Great Falls District, 9.1% in the Glendive District, and 20.8% in the Billings District. Fifty-one percent of the respondents indicated they drive more than 15,000 miles per year, while 48.7% drove less than 15,000 miles. The most common trip made by respondents were personal or family errands (48.5%), followed by commuting (22.4%) and then work related trips (16.0%). Seventy-two percent of the respondents indicated they had driven in other states within the last 12 months.

General Perception of Highway Maintenance

When asked to rate overall highway maintenance, 8.3% of the respondents rated overall maintenance as poor while 38.6% said fair, 48.1% said good and 4.9% said excellent. Respondents who reported they were professional drivers rated maintenance the lowest, while those who said their typical trip was agriculturally related rated maintenance the highest. Respondents driving less than 15,000 miles per year rated general maintenance higher than did respondents driving over 15,000 miles per year. There was a statistically significant change in the mean rating, on a 1 to 4 scale labeled as poor, fair, good and excellent, of overall highway maintenance from 2.59 in 1996 to 2.50 in 1998

When asked to rate the importance of highway maintenance to them, 50.0% of the respondents said very important, 41.0% said important, 8.0% said somewhat important, and only 1.0% said not important. General highway maintenance was more important to females than males. General highway maintenance was more important for respondents who indicated they were professional drivers than it was for respondents indicating a different type of typical trip and general highway maintenance was less important to respondents who reported their typical trip was agriculturally related than it was to respondents reporting different typical trips. General highway maintenance was more important to respondents who had been in Montana for over 30 years than it was to respondents who had been here for less time and it was less important to respondents who had been in Montana for 5 years or less than it was to respondents who had been here longer. Respondents between the ages of 46 and 55 rated highway maintenance more important than did older or younger respondents while respondent between 18 and 25 rated highway maintenance less important than did older respondents.

On a 1 to 4 scale labeled as not important, somewhat important, important and very important, the mean importance rating for general highway maintenance decreased significantly from 3.53 in 1996 to 3.40 in 1998.

Comparison of Highway Maintenance in Montana with Other States

About fifty percent of the respondents who had driven in other states within the last 12 months said the highways and interstates of Montana were about the same as the highways and interstates in the other states in which they had driven, while 31.1% felt the roads in Montana were worse and 19.2% felt the roads in Montana were better. Respondents who had lived in Montana for between 6 and 10 years were more likely than other respondents to think Montana roads were better while respondents who had lived in Montana for more than 30 years were more likely than respondents who had been here less time to think Montana roads were worse than roads in other states. Respondents who drove more than 15,000 miles in the last 12 months were more likely than respondents who had not to think that Montana roads were both better and worse than in other states while respondents who reported driving less than 15,000 were more likely to think Montana roads were about the same as those in other states.

Forty-nine percent of the respondents who had driven in other states and who had an opinion believed winter maintenance was about the same in Montana as in other states, while 31.2% believed winter maintenance was better in Montana and 19.5% believed winter maintenance was worse in Montana. Respondents who reported driving more than 15,000 miles in the last year rated Montana winter maintenance both worse and better than other states while respondents who reported driving less than 15,000 miles in the last year were more likely to rate Montana winter maintenance about the same as in other states. Respondents with post graduate education and respondents with only a grade school education were more likely than other respondents to think that winter maintenance was worse in Montana than in other states. Respondents over 65 were more likely than younger respondents to say that winter maintenance in Montana was about the same as in other states while respondents between 26 and 36 were more likely than respondents of other ages to say Montana had better winter maintenance and respondents from 46 to 55

were more likely than respondents of other ages to say that Montana winter maintenance was worse than in other states.

Slightly more than half the respondents who had driven in other states in the last 12 months and who had an opinion, felt rest area maintenance was about the same in Montana as in other states, while 28.9% said rest stop area maintenance was worse in Montana and 19.3% said it was better in Montana. Respondents in the Great Falls District were the most likely to say that Montana rest stop maintenance was worse than in other states, respondents in the Butte District were the most likely to say Montana rest stop maintenance was better than in other states while respondents in the remaining districts were the most likely to say Montana rest stop maintenance was about the same as in other states. Respondents who had been in Montana for 21 to 30 years were more likely to say Montana rest stop maintenance was worse than other states while respondents who had been in Montana for 6 to 10 years were more likely to say Montana rest stop maintenance was better than other states and respondents who had been in Montana for 1 to 5 years, 11 to 20 years and over 30 years were more likely to say the Montana rest stop maintenance was about the same as in other states. Respondents with a college degree or more were more likely than respondents with less education to say that rest stop maintenance was worse in Montana than in other states.

Respondent Perception of the Eight Maintenance Activities

For the purposes of this survey, highway maintenance activities were divided into 8 categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road condition reports. The respondents were asked three different questions about each of these eight maintenance activities. First they were asked how good a job the Montana Department of Transportation (MDT) was doing with each of the eight maintenance activities and to respond with poor, fair, good, or excellent. Then they were asked how important each of the maintenance activities were to them and to respond with not important, somewhat important, important, or very important. Finally, the respondents were asked to think of the allocation of resources to each of the maintenance activities by the MDT and assign a resource priority of low, medium, moderately high, or very high to each of the eight maintenance activities.

A composite variable was then constructed for each of the maintenance activities by combining the answers to the three different questions asked about that activity. To construct these variables, the first step was to reverse the values assigned to the responses to the rating of each maintenance activity. After reversal, an excellent rating = 1, a good rating = 2, a fair rating = 3, and a poor rating = 4. Then the composite variable for each maintenance activity was created by adding this reversed value for rating, the score on the importance question (1 = not important, 2 = somewhat important, 3 = important and 4 = very important), and the score on the resource priority question (1 = low, 2 = medium, 3 = moderately high, and 4 = high).

If a respondent had answered all three of the questions about a maintenance activity, the range of scores on the composite variable for that activity would be from 3 to 12. If the value of the composite variable was a 3, it would indicate an excellent rating of the

activity, an answer of not important on the importance question and of low priority on the resource priority question. A score of 12 would indicate a poor rating, very important and a high resource priority. A score of less than 3 is possible if the respondent did not answer each question about a particular maintenance activity.

The higher the score on this composite variable, the lower the rating, the more important the activity is considered, and the higher the resource priority assigned to the activity. Thus, the higher the score on the composite variable, the more attention respondents believe should be paid to the maintenance activity.

The overall mean scores for each of the composite variables are: Winter Maintenance, 9.10; Smoothness of Surface, 9.07, Highway Striping, 8.87; Debris Removal, 8.56; Highway Signage, 8.24; Winter Roadway Information, 7.98; Roadside Maintenance, 7.82; and Rest Stop Maintenance, 7.69. In 1996 the mean scores on the composite variables were: Winter Maintenance 9.24; Smoothness of Surface, 8.92; Highway Striping, 8.91, Debris Removal, 8.64; Winter Roadway Information, 8.16; Highway Signage, 8.07; Rest Stop Maintenance, 7.76; and Roadside Maintenance, 7.53.

Only three of the composite variable changes from 1996 to 1998 were statistically significant and all involved an increase of value from 1996 to 1998: Surface Smoothness from 8.92 to 9.06, Signage from 8.07 to 8.24, and Roadside Maintenance from 7.53 to 7.82.

Further comparison of the 1996 and the 1998 means of composite variables shows the highest four to be the same in both years though values of the means for Winter Maintenance, Striping and Debris removal decreased from 1996 to 1998 while the mean of the composite variable for Surface Smoothness increased. In 1998, the mean value of the Signage composite variable replaced Winter Roadway Information in fifth place, and Rest Stop Maintenance switched places with Road Side Maintenance.

Winter Maintenance

The mean composite score for winter maintenance is the highest of all the composite variables because it is rated the most important maintenance activity by the respondents and is assigned the highest resource priority by the respondents. Respondents who reported driving more than 15,000 miles in the last 12 months scored higher on the Winter Maintenance composite variable than did respondents who drove less than 15,000 miles. Respondents over 65 scored lower on the Winter Maintenance composite variable than did younger respondents. Respondents who had been in Montana for 5 or less years scored lower on the Winter Maintenance composite variable than did respondents who had been in Montana longer.

Highway Surface Smoothness

Smoothness of highway surface is rated the next highest on the composite variable, not because of its importance and resource priority which fall near the middle of the ratings for all maintenance activities, but because of the rating of the current condition of highway surfaces. Respondents rated highway surface smoothness last as compared with other

maintenance activities. The composite variable mean for surface smoothness increased significantly from 8.92 in 1996 to 9.06 in 1998. Females scored higher than males on the Surface Smoothness composite variable. Respondents from 36 to 45 scored higher on the Surface Smoothness composite variable than did respondents who were younger or older while respondents over 75 scored lower on this composite variable than younger respondents did. Respondents who had been in Montana for 5 or less years scored lower on the Surface Smoothness composite variable than did respondents who had been in Montana longer. Respondents who were professional drivers scored higher on the Surface Smoothness composite variable than did respondents who indicated any other type of typical trip.

Highway Striping

Striping received a mean composite variable score placing it in third position. Striping was tied for second for both importance and resource priority and was in about the middle for rating of current condition. Females scored higher than males on the Striping composite variable. Respondents who reported they had driven in other states in the last year scored higher on the Striping composite variable than did respondents who had not driven in other states.

Debris Removal

Debris removal is in the middle of the composite variable ratings because it is in about the middle of the rankings for rating of current condition, importance and resource priority. Respondents who drove more than 15,000 miles per year scored higher than did respondents who drove less than 15,000 miles per year.

Highway Signage

The Signage composite variable is fifth because it is ranked toward the bottom of the eight maintenance activities in terms of importance and priority and because the current condition highways signs is rated higher than any other maintenance activity. The mean score for Signage composite variable increased significantly from 1996 to 1998. Respondents with a college degree and respondents with a high school diploma scored higher on the Signage composite variable than did respondents with other levels of education attainment while respondents with some high school scored lower than respondents with other levels of education attainment on this composite variable.

Winter Roadway Information

Winter roadway information is rated fifth in terms of composite variable means, not because it is considered unimportant nor because it is not given a high resource priority

value by the respondents, but because it is currently rated as being done well by respondents. Females scored higher on the Winter Roadway Information composite variable than did males. Respondents between the ages of 36 and 55 scored higher on the Winter Roadway Information composite variable than did older or younger respondents while respondents between 56 and 65 scored the lowest on this composite variable. Respondents who had been in Montana for over 30 years scored higher on the Winter Roadway Information composite variable than did respondents who had been in Montana for less time while respondents who had been in Montana for 5 or less years scored the lowest on this composite variable.

Roadside Maintenance

Road side maintenance is seventh in terms of composite variable means because it is ranked dead last in terms of importance and resource priority. The mean score on the composite variable for Roadside Maintenance increased significantly from 1996 to 1998. The scores on the composite variable Road Side Maintenance were higher for respondents living in the Great Falls and Glendive Districts than they were for respondents living in other districts, while the scores on Road Side Maintenance were lower for respondents living in the Billings and Butte Districts than they were for respondents living in other areas. Respondents who had not driven in other states in the last 12 months scored higher on the Roadside Maintenance composite variable than did respondents who had driven in other states. Respondent with a college degree or higher scored lower on the composite variable for Roadside Maintenance than did respondents with less education. Respondents who had been in Montana for over 30 years scored higher on the Roadside Maintenance composite variable than did respondents who had been in Montana for less time while respondents who had been in Montana for 5 or less years scored lower on this composite variable than respondents who had been in Montana longer.

Rest Stop Maintenance

Rest stop maintenance is last place in terms of composite variable means because it is rated next to last in importance and about middle in terms of resource priority, but third in terms of how well it is currently being done. The scores on the composite variable for Rest Stop Maintenance were higher for respondents in the Great Falls District than respondents living in other districts and were lower for respondents in the Billings District than for respondents living in any other districts. Respondents who had driven in other states in the last year scored higher on the Rest Stop Maintenance composite variable than did respondents who had not driven in other states. Respondents between 46 and 55 scored higher than younger or older respondents on the Rest Stop Maintenance composite variable while respondents over 75 scored the lower than younger respondents on this composite variable.

1996 to 1998 Differences

The following statistically significant differences were observed when comparing 1996 and 1998 data:

- The mean age of respondents increased from 45.4 in 1996 to 47.1 in 1998
- The general rating of Montana highway maintenance decreased from 2.59 in 1996 to 2.50 in 1998.
- The rating of importance of Montana highway maintenance decrease from 3.53 in 1996 to 3.40 in 1998.
- The rating for Surface Smoothness decreased from 2.40 in 1996 to 2.31 in 1998.
- The importance of Winter Maintenance decreased from 3.72 in 1996 to 3.55 in 1998
- The importance of Winter Roadway Information decreased from 3.53 in 1996 to 3.36 in 1998.
- The importance of Debris Removal decreased from 3.44 in 1996 to 3.31 in 1998.
- The importance of Roadside Maintenance increased from 2.90 in 1996 to 3.00 in 1998.
- The resource priority for Striping increased from 3.22 in 1996 to 3.32 in 1998.
- The resource priority for Surface Smoothness increased from 3.06 in 1996 to 3.17 in 1998.
- The resource priority for Rest Stop Maintenance increased from 2.97 in 1996 to 3.06 in 1998.
- The resource priority for Signage increased from 2.90 in 1996 to 3.03 in 1998.
- The resource priority for Roadsides increased from 2.51 in 1996 to 2.66 in 1998.
- The composite variable for Surface Smoothness increased from 8.92 in 1996 to 9.06 in 1998.
- The composite variable for Signage increased from 8.07 in 1996 to 8.24 in 1998.
- The composite variable for Roadside Maintenance increased from 7.53 in 1996 to 7.82 in 1998.

CONCLUSIONS AND IMPLEMENTATION

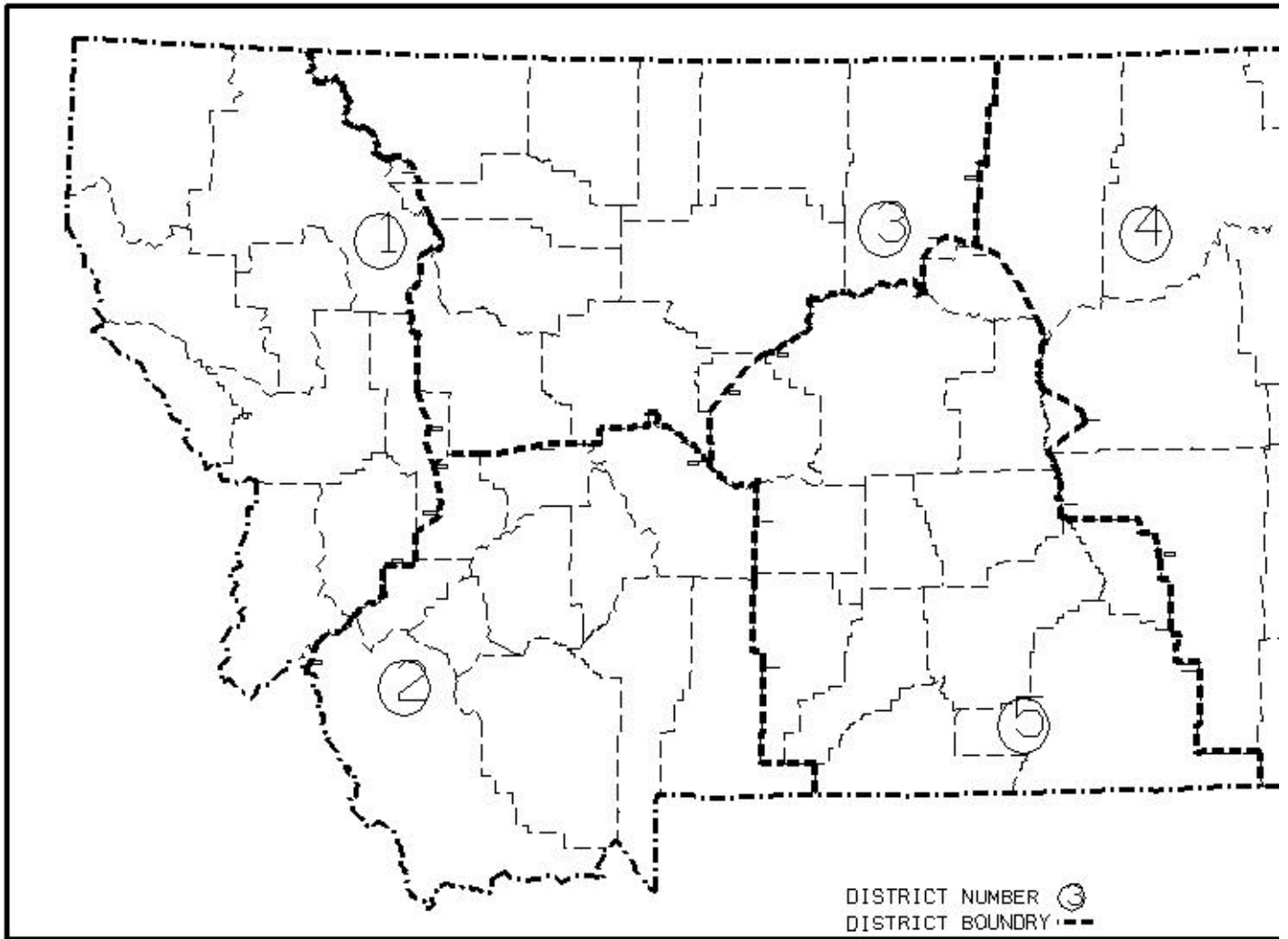
According to the respondents to this survey, the Montana Department of Transportation should now pay attention and provide resources to maintenance activities on interstate and state highways in Montana in the following order:

- Winter Maintenance
- Surface Smoothness
- Highway Striping
- Debris Removal
- Highway Signage
- Winter Roadway Information
- Roadside Maintenance
- Rest Stop Maintenance

REFERENCES

Floyd, J.W. (1996), *Perceptions of Highway Maintenance in Montana: The Results of a Telephone Survey. Final Report.* FHWA/MT-96/8136A, Montana Department of Transportation, Helena, MT.

APPENDIX ONE:
MAP SHOWING MDT ADMINISTRATIVE DISTRICTS AND
MONTANA COUNTIES



APPENDIX TWO:
TRANSPORTATION SURVEY QUESTIONS

Hello

Hello, my name is _____ and I am calling from Montana State University, Billings. We are conducting a survey on attitudes and opinions of highway maintenance for the Montana Department of Transportation. The Department of Transportation wants the opinions of citizens of Montana about the condition of our roadways. Your participation in this survey will assist the department in establishing future priorities and enable the maintenance program to better use available resources. In order to interview the right person, I need to speak to the member of your household who is at home, over 18, and has had the most recent birthday. Would that be you? CTRL-END OR 3 DIGITS

Intruct

Before I ask the first question, let me explain that this survey deals only with maintenance of highways. Maintenance includes such things as maintaining the established roadway surface, snow and ice removal, removal of debris and litter, maintaining roadsides, repairing signs, re-painting roadway stripes and rest area maintenance. This survey does not deal with the construction of new highways nor construction of new rest stops. This survey only deals with interstates and state highways in Montana. We are not asking you about city streets or county roads, just interstates and state highways. Also, we are only interested in opinions based on your experiences with interstates and state highways in Montana in the last two years.

Finally, your household was randomly selected by a computer and all your answers will remain anonymous.
PRESS ANY KEY TO CONTINUE

RateAll

How would you rate overall interstate and state highway maintenance in Montana?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpAll

How important would you say interstate and state highway maintenance in Montana is to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateWint

How would you rate winter maintenance of interstates and state highways in Montana? By winter maintenance, I mean snow and ice control including plowing, sanding, de-icing, and preventing drifting.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpWint

How important would you say interstate and state highway winter maintenance is to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSurf

How would you rate the surface of Montana's interstates and state highways. In making this rating, consider ride quality which is affected by potholes, ruts, bumps, cracks, etc.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSurf

How important is the smoothness of Montana's interstates and state highways to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSide

How would you rate the management of interstate and state highway roadsides in Montana? Roadside management includes mowing shoulders and eliminating unwanted vegetation.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSide

How important is interstate and state highway roadside management in Montana to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSign

How would you rate the condition of interstate and state highway signs in Montana?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSign

How important is the condition of interstate and state highway signs to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateRemv

How would you rate the removal of debris such as litter, roadkill, and fallen rocks, on Montana's interstates and state highways?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpRemv

How important is the removal of debris on interstates and state highways in Montana to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateRest

How would you rate the maintenance of rest areas on Montana interstates and state highways. Rest area maintenance includes cleaning rest areas and keeping rest areas in working order.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpRest

How important is interstate and state highway rest area maintenance to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateStrp

How would you rate the condition of striping (lines) on Montana's interstates and state highways? Striping and lines include the middle lines, no-passing lines, left turn lanes, and shoulder lines.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpStrp

How important is interstate and state highway striping to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateInfo

How would you rate winter roadway information and the way it is provided by the Montana Department of Transportation? Roadway information is provided by a statewide 800 telephone number, highway advisory radio, and changeable message signs.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpInfo

How important is up to date winter interstate and state highway information to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

PriWint

Now I am going to go back through the list of maintenance activities. This time, I want you to think about allocation of resources to each of the activities. For each activity, please tell me if you think it warrants a low, medium, moderately high, or very high resource priority when deciding how state highway maintenance resources should be utilized. Remember, we are only dealing with interstates and state maintained roadways.

What resource priority should be placed on interstate and state highway winter maintenance in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSurf

What resource priority should be placed on smooth pavement on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSide

What resource priority should be placed on interstate and state highway roadside management in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSign

What resource priority should be placed on repairing and replacing signs on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriRemv

What resource priority should be placed on debris removal on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriRest

What resource priority should be placed on rest area cleanliness and maintenance on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriStrp

What resource priority should be placed on roadway striping on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriInfo

What resource priority should be placed providing accurate and up to date information about the current condition of state maintained highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

OthState

Just a couple of more questions about interstate and state highway maintenance.

Have you driven on roadways in states other than Montana in the last 12 months?

1. Yes
2. No
3. DK or NR

GenComp

How would you compare general roadway conditions of Montana's state maintained roadways with the general roadway conditions of state maintained roadways in other states? IF THEY SAY THEY HAVE BEEN IN MORE THAN ONE STATE, ASK FOR A GENERAL COMPARISON. IF THEY CANNOT DO THAT, HAVE THEM COMPARE WITH THE STATE THEY DROVE IN MOST RECENTLY.

1. Montana roadways worse
2. About the same
3. Montana better
4. DK or NR

WintComp

How would you compare winter maintenance of Montana's state maintained roadways with winter maintenance of state maintained highways in other states?

1. Montana winter maintenance worse
2. About the same
3. Montana better
4. DK or NR

RestComp

How would you compare rest area cleanliness and maintenance in Montana with rest area cleanliness and maintenance in other states?

1. Montana rest areas worse
2. About the same
3. Montana better
4. DK or NR

Better

The Department of Transportation is striving to improve maintenance operations. In your opinion what could the department do better?

TYPE IN ANSWER AND THEN PRESS ENTER. YOU HAVE 3 LINES.

GoodNow

What is the department doing that meets or exceeds your expectations?

TYPE IN RESPONSE AND THEN PRESS ENTER. YOU HAVE 3 LINES.

Trips

As you probably know different types of people have different types of opinions. The following questions are for statistical purposes only.

Which of the following types of trips would you say is most typical of your driving?

1. Commuting to and from work
2. Work related trips, that is trips that are made as a part of work activities.
3. Personal and family errands or trips
4. Agriculture related trips
5. Professional driving
6. Other
7. DK or NR

HowFar

Would you say you drive more or less than 15,000 miles per year?

1. More
2. Less
3. DK or NR

Age

How old are you?

TYPE IN THEIR AGE AND PRESS ENTER USE 100 FOR 100 OR OLDER AND 101 FOR DK OR NR.

Educ

What is the highest level of education you have completed?

TYPE IN ANSWER AND PRESS ENTER. 12 IS HIGH SCHOOL GRADUATE,
16 IS COLLEGE GRADUATE, 18 IS MASTERS DEGREE AND 20 IS
DOCTORATE. USE 21 FOR DK OR NR

InMT

How long have you lived in Montana?

TYPE IN THEIR ANSWER AND PRESS ENTER USE 100 FOR 100 OR MORE
AND 101 FOR DK OR NR.

Sex

RESPONDENTS SEX (DO NOT ASK)

1. MALE
2. FEMALE
3. CANNOT TELL

Followup

The Montana Department of Transportation may make changes in the
way it allocates resources based on the results of this study.
Would you be willing to participate in a follow up study so
that we can see if your opinions of highway maintenance change
in the next two years?

1. Yes
2. No
3. DK or NR

Address

In order to include you in the follow up study, I will need your name, address and telephone number.

ENTER NAME ON ONE LINE; STREET ADDRESS ON THE NEXT LINE; CITY, STATE, AND ZIP CODE ON THE THIRD LINE; AND TELEPHONE NUMBER ON THE FOURTH LINE. PLEASE USE APPROPRIATE CAPITALIZATION AND SPELLING. YOU HAVE AN EXTRA LINE FOR ANY STRANGE THINGS IN THE ADDRESS.

Bye

That was the last question. Thank you very much for taking the time to answer these questions. Good bye and have a nice day (or evening).