

Off-highway Motorcycle and Off-road Vehicle Use and Gasoline Consumption in Minnesota

Prepared for:

Minnesota Departments of
Natural Resources, Revenue, and Transportation

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February 28, 1994

— Pursuant to 1993 Minn. Laws Chap. 311
Art. 1 Sec. 16 —

— Pursuant to 1993 Minn. Laws Chap. 311
Art. 2 Sec. 16 —

— Consultant's Report —

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INTRODUCTION

A commonly held belief among resource managers and off-road motorized recreational users in Minnesota is that the number of off-highway motorcycle riders and off-road vehicle drivers is increasing. Little is known about who these users are. In a 1991 study of recreational trail use (Minnesota Department of Natural Resources, Trails and Waterways Unit, 1992) it was estimated that 613,212 Minnesotans participate in driving or riding off-road vehicles for recreational use and, that approximately 214,624 Minnesotans participate in recreational off-road motorcycle riding. That study identified the high end threshold of participation within the state and clearly showed that as much as 20 percent of the population engages in recreational off-road vehicle use and 7 percent in recreational off-road motorcycle use. It also clearly demonstrated the need to take a closer look at these recreational user groups. This study attempts to take this closer look.

In 1993 the Minnesota legislature passed an act relating to off-highway motorcycle use and off-road vehicle use. Among other things, the act called for:

"The commissioners of natural resources, revenue, and transportation shall jointly determine the amount of unrefunded gasoline tax attributable to off-highway motorcycle use in the state..."

and,

"The commissioners of natural resources, revenue, and transportation shall jointly determine the amount of unrefunded gasoline tax attributable to off-road vehicle use..."

(1993 Minn. Laws Ch. 311, art. 1, sec. 16 and art. 2, sec. 16).

For purposes of this study, **off-highway motorcycle** refers to two-wheeled, off-highway vehicles capable of traveling on trails or unimproved terrain. **Off-road vehicle** refers to recreational vehicles capable of cross-country travel on natural terrain without benefit of a road or trail. Four-wheel drive trucks or 4x4's are off-road vehicles included in this definition. Off-road vehicles do not include snowmobiles, all-terrain vehicles, or motorcycles. **Off-road** means on trails or nonpublic roads or for cross-country travel on natural terrain. **Nonpublic roads** include state forest roads, county forest roads and other roads or trails not operated by a public road authority. (Minn. Stat. §§ 87.787 and 87.797, 1992 and Supp. 1993.)

The purpose of this study is to determine:

- a) the number of Minnesota households owning one or more motorcycles or four-wheel drive (4x4) vehicles;
- b) the number of these types of vehicles in use for recreational purposes in Minnesota;
- c) the total number of days each of these types of vehicles is used on trails and in nonroaded areas for recreational purposes;
- d) the amount of gasoline consumed by these types of vehicles in the course of recreational outings;
- e) the total number of gallons of gasoline consumed by these vehicles per year; and,
- f) the percent of the total annual gasoline consumed in Minnesota by off-road motorcycles and four-wheel drive vehicles used for recreational purposes.

METHODOLOGY

To determine gasoline consumed by off-highway motorcycle and off-road vehicle users a two phase study was conducted. In the first phase of the study the number of target vehicles was determined, while in the second phase the annual gasoline consumption per vehicle was determined. When the results of the first phase are multiplied by the results of the second phase, the annual gasoline consumption by the target vehicles is obtained.

Phase 1: Number of Target Vehicles in Minnesota

The first phase of the study identified the number of target vehicles engaged in off-highway, recreational activities. A "prescreening" survey was administered to 20,000 randomly selected Minnesota households. Names and addresses of the sample population were provided by Survey Sampling, Inc. of Fairfield, Connecticut. These 20,000 households were mailed a postcard that asked them to provide the number of off-highway motorcycles and off-road vehicles they owned and operated, and whether they used these vehicles for recreational purposes on trails or in nonroaded areas in Minnesota (Appendix A).

The initial postcard was mailed November 3, 1993. After 3 weeks a second postcard was sent to those who had not yet responded. Of the 20,000 postcards originally mailed, 1,384 (6.9 percent) were returned as undeliverable. The adjusted sample size was 18,616. The number of usable postcards returned was 8,431, or 45.3 percent of the adjusted sample size (Table 1). From the postcards returned, a total of 772 households (9.2 percent) indicated they owned and operated for off-highway recreation either one or more off-highway motorcycles and/or off-road vehicles.

The study team believed that a person might be more likely to respond to the postcard if he or she owned and operated an off-road vehicle rather than someone who did not own one of these types of vehicles. If this was true, a bias would exist in favor of vehicle owners. This bias would result in a tendency to overestimate the number of off-road recreation vehicles owned and operated in the state and to overestimate the total volume of gasoline consumed by this user group. To overcome this potential bias, a telephone survey was conducted of a randomly selected number of households not responding to the postcard. Of the 954 households telephoned, 295 (30.9 percent) could not be contacted (no answer or invalid telephone numbers). Of the 659 households contacted by telephone, 503 (76.3 percent) responded and 156 (23.7 percent) were not available during the study or refused to participate (Table 1).

The postcard results were used to represent the 45.3 percent of the population that responded to the postcard survey, while the telephone survey results represented the balance of the population (54.7 percent).

Table 1. Return Rates for Phase 1 Off-highway Recreation Study, 1993.

Survey Instrument	Number of Surveys Conducted	Adjusted Sample Size ¹	Number of Useable Responses	Percent Return Rate	Percent of Minnesota Population Represented
Postcard mailing	20,000	18,616	8,431	45.3	45.3
Phone survey	954	659	503	76.3	54.7

¹The sample size for each portion of the survey was adjusted for undeliverable and unusable responses.

Phase 2: Annual Gasoline Consumption for Off-highway Recreation per Vehicle

In the second phase of the study, an off-road recreational vehicle use survey was designed and mailed out to the 772 households who had indicated in the first phase that they owned and operated one or more off-highway motorcycles or off-road vehicles (Appendix B). The initial mail survey for this phase of the study was sent December 27, 1993, with follow-ups mailed January 18 and February 7, 1994. A telephone survey follow-up was conducted February 16 through 21 to increase the response rate. For the telephone survey, only the first page of the survey was completed. The overall response rate for the second phase was 93.9 percent. Of the 772 persons contacted, 267 (34.6 percent) were either unavailable (surveys returned as undeliverable, incorrect telephone numbers, or respondent could not be contacted) or unsuitable (not a valid vehicle owner/operator) for inclusion in the second phase of the study. Results of the Phase 1 postcard survey were changed to reflect those respondents found to be unsuitable for Phase 2. The adjusted sample size for Phase 2 was 505 (Table 2).

Table 2. Return Rates for Phase 2 Off-road Recreation Study, 1993.

Survey Instrument	Number of Surveys Conducted	Adjusted Sample Size ¹	Number of Useable Responses	Percent Return Rate
Questionnaire mailing with phone survey follow-up	772	505	474 ²	93.9

¹The sample size was adjusted for undeliverable and unusable responses.

²370 by mail, 104 by telephone

Phase 2 did not determine whether the gasoline was consumed in Minnesota or elsewhere. There are undoubtedly movements of these vehicles across state lines both into and out of Minnesota. The assumption was made in this study that the net effects of these into and out of Minnesota movements are negligible. Thus, determining consumption by Minnesota vehicles, which is what was done in Phase 2, provides all the information needed for this study.

RESULTS

Number of Target Vehicles in Minnesota (from Phase 1)

In Phase 1 the postcard and telephone surveys were used to estimate the number of households in Minnesota with off-highway motorcycles, off-road vehicles and the number of each type of these vehicles each household owned (Table 3).

Table 3. Target Vehicle Ownership by Minnesota Households, 1993.

Target vehicle Survey instrument	Motorcycle		Off-road Vehicle	
	Mail	Phone	Mail	Phone
Number of usable responses	8431	503	8431	503
Number of usable responses with target vehicles ¹	239	19	354	43
Percent with target vehicles	2.83	3.78	4.20	8.55
Number of target vehicles per household owning target vehicles	1.44	1.63	1.13	1.09
Proportion of population represented by sample	.453	.547	.453	.547
	(combined)		(combined)	
Number of households in state ²	1,688,050		1,688,050	
Percent with target vehicle	3.35 ± 1.28^3		6.58 ± 1.86	
Number of households with target vehicles	$56,556 \pm 21,644$		$111,043 \pm 31,418$	
Number of target vehicles per household owning target vehicles	$1.56 \pm .30$		$1.10 \pm .05$	
Number of target vehicles in MN ⁴	$88,108 \pm 31,922$		$122,649 \pm 26,469$	

¹Number determined through Phase 1 and adjusted by results of Phase 2. If in the questions used in Phase 2, it was determined that respondent included non-target vehicles, results in Phase 1 were adjusted.

²State Demographer estimate for 1992, the latest available.

³The \pm figure is the 95 percent confidence interval.

⁴Due to rounding in the preceding two figures, this figure will not tabulate exactly.

When the postcard survey and the telephone bias check were combine 3.35 ± 1.28 percent of households used motorcycles for off-highway recreation and 6.58 ± 1.86 percent of households used off-road vehicles for off-highway recreation. (The \pm figure used here and in subsequent occurrences is the 95 percent confidence interval.) Given the state demographer's estimate of 1,688,050 households in 1992, these percents translate into $56,556 \pm 21,644$ households using motorcycles and $111,043 \pm 31,418$ households using off-road vehicles for off-highway recreation.

In Minnesota, the average number of off-road motorcycles per household is $1.56 \pm .30$. The number of motorcycles owned and operated for trail and nonroad recreation is $88,108 \pm 31,922$. The average number of off-road vehicles per household is $1.10 \pm .05$ and the number of off-road vehicles owned and operated for trail and nonroad recreation is $122,649 \pm 26,469$ (Table 3).

Annual Gasoline Consumption for Off-highway Recreation per Vehicle (from Phase 2)

In Phase 2, the mailback questionnaire and the telephone follow-up were used to estimate the annual amount of fuel used by each vehicle that was driven off-highway. Respondents were asked to report for each vehicle the number of times the vehicle was used off-highway in the last 12 months and the average number of gallons of gasoline consumed each time the vehicle was used off-highway. Respondents were instructed not to include the fuel used for traveling on public roads to and from off-road recreation locations. To derive annual gasoline consumption per vehicle, the number of times a vehicle was used in the last 12 months was multiplied by the average gasoline consumption per time.

There was a wide distribution among respondents in the number of gallons of gasoline consumed annually by each vehicle (Table 4). Annual consumption ranged from no use in the last 12 months (the 0s in Table 4), to moderate use, to those who claimed to used their vehicles a large amount. Some of the extremely high consumption values may be real and some are probably due to overstatements or failures to understand the questions asked. These extreme values have a large effect on the average value. Given that some of these values are suspect, we would recommend the use of the median value to represent annual vehicle consumption. The median represents the amount of consumption near where most people were reporting.

Table 4. Annual Gasoline Consumption for Off-highway Recreation by Type of Vehicle, 1993.

Gallons per Year	Motorcycles	Off-road Vehicles
	(Percent of responses)	(Percent of responses)
0	15.8	11.0
0.1 - 5.0	20.7	7.1
5.1 - 10.0	7.9	7.7
10.1 - 20.0	16.2	13.3
20.1 - 30.0	7.5	9.9
30.1 - 40.0	3.0	6.9
40.1 - 50.0	6.0	5.1
50.1 - 75.0	6.4	5.6
75.1 - 100.0	3.4	7.1
100.1 - 200.0	6.8	10.2
200.1 - 300.0	2.3	3.8
300.1 - 400.0	.7	2.6
400.1 - 500.0	.7	2.0
500 +	2.6	7.7
Total	100.0	100.0
Median gallons per year	13.25	34.00
Average gallons per year	102.63	1142.03
Number of surveys in sample	179	323
Number of vehicles in sample	266	392

Total Annual Gasoline Consumption for Off-road Recreation

To derive the total annual gasoline consumption for off-highway motorcycles and off-road vehicles the number of target vehicles in Minnesota from Table 3 was multiplied by the median annual gasoline consumption from Table 4. Table 5 shows the total annual gallons of gasoline consumed in Minnesota by motorcycles and off-road vehicles for off-highway recreational purposes.

Table 5. Total annual gasoline consumption for off-highway recreational use, 1993.

Vehicle type	Number of target vehicles in Minnesota	Median annual gallons of gasoline consumed for off-highway recreation per vehicle	Total annual gallons of gasoline consumed for off-highway recreation per year
Motorcycles	88,108	13.25	1,167,431
Off-road vehicles	122,649	34.00	4,170,066

Department of Revenue figures indicate that the total consumption of taxable gasoline and gasohol in 1993 was 2,033,500,000 gallons. Of this total consumption the recreational consumption by off-highway motorcycles was 0.057 percent and the recreational consumption by off-road vehicles was 0.205 percent.

CONCLUSIONS

At the onset of the survey, respondents were given a definition of **off-road** use that meant traveling on trails or in nonroaded areas or traveling cross-country. This definition of off-road use does NOT include travel on state and county forest roads. The Legislature has already determined, based on previous studies, that 0.116 percent of gasoline and special fuels gallons are used on state and county forest roads, and that an amount equal to this percent of gasoline and special fuels revenues should be considered to be unrefunded gasoline tax revenues which can be used for forestry road purposes. Because of this, fuel consumed on forest roads should not be included in calculations for this study. If they were, these gallons would be "counted twice" for purposes of unrefunded gasoline tax calculations. To accurately assess the volume of gas consumed for off-road use, the amount of use on forest roads should not be included in the calculation.

However, it is not clear whether respondents in this survey accurately identified where they traveled, whether on forest roads or trails. The study team believes there may have been some use of forest roads by the survey respondents. How much forest road use occurred is unclear. Given this uncertainty, the question of how to appropriately reduce the estimated total annual gallons of gasoline consumed for off-highway recreation per year to take into account gallons consumed on forest roads is an issue the Minnesota Department of Transportation and the Minnesota Department of Natural Resources should address.

Future studies should determine forest road use on a vehicle-type basis so that the amount of use by off-road vehicles and off-highway motorcycles could be identified and removed from appropriate calculations for figuring refundable gas tax monies.

Appendix A - Phase 1 Survey



ST. PAUL MN 55155-9901
 BOX 10, 500 LAFAYETTE RD.
 MN DEPT. OF NATURAL RESOURCES
 OUTDOOR RECREATION RESEARCH TEAM



POSTAGE WILL BE PAID BY ADDRESSEE

BUSINESS REPLY MAIL
 FIRST CLASS PERMIT NO. 171 ST. PAUL, MN

NO POSTAGE
 NECESSARY
 IF MAILED
 IN THE
 UNITED STATES



After you have completed this survey, please fold so our address shows on the outside and drop in any mailbox. Postage has been paid for you.

	Motorcycle	ATV	4X4	Bicycle
How many of each vehicle do you own?				
How many of each vehicle do you ride on trails or in nonroad areas for recreation?				
Would you support the MN DNR setting aside land for off-road vehicle use? (Circle one for each vehicle.)	Yes No	Yes No	Yes No	Yes No

Appendix B - Phase 2 Survey

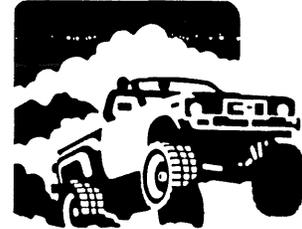
December, 1993

Dear Minnesota Off-Road Recreational Vehicle User,

Recently you responded to a short survey and indicated you owned one or more vehicles that were used for off-road recreation. In 1993 the state legislature directed the Department of Natural Resources to conduct a study about Minnesotans' interest in trail and other off-road recreational opportunities. The information you provide will give us valuable information about planning, developing, and managing off-road recreational opportunities in the future. Additionally, it will help us determine the most efficient way to advise you of new offerings or information that might interest you.



This survey is being sent to a limited number of Minnesotans who indicated they use motorcycles or 4x4s in off-road areas for recreational purposes. Due to the nature of our sample, we need to receive as many completed questionnaires as possible. Your cooperation is very important. We need to know more about Minnesotans' use of off-road recreational vehicles.



The survey will take about 5 minutes of your time. Your participation is completely voluntary. Your completed and returned survey will be a valuable part of our decision making. If you have any questions, please feel free to contact us at 612-296-6157 or 1-800-766-6000.

Thank you for your assistance!

Sincerely,

Dennis Asmussen

Dennis Asmussen, Director
Trails and Waterways
Department of Natural Resources

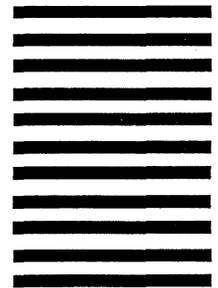
Survey # _____

FOLD HERE

After you have completed the questionnaire, seal it closed using this peel-off tab and drop it in any mailbox. Postage is pre-paid.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 171 ST. PAUL, MN

POSTAGE WILL BE PAID BY ADDRESSEE

OUTDOOR RECREATION RESEARCH TEAM
MN DEPT. OF NATURAL RESOURCES
BOX 10, 500 LAFAYETTE ROAD
ST. PAUL, MN 55155-9902



Off-Road Recreational Vehicle Use Survey

By OFF-ROAD use we mean traveling on trails or in non-roaded areas, or traveling cross-country.
This does not include use on state and county forest roads.

1. Please list the make and model of EACH motorcycle or 4x4 in your household that is ridden **OFF-ROAD** by you or anyone else. (Do **NOT** list 3-wheel and 4-wheel ATVs.)

Vehicle			Type of vehicle (circle one)	Years owned vehicle	Age of primary user of vehicle
Make	Model	Year			
Vehicle #1:			motorcycle 4x4		
Vehicle #2:			motorcycle 4x4		
Vehicle #3:			motorcycle 4x4		
Vehicle #4:			motorcycle 4x4		
Vehicle #5:			motorcycle 4x4		

2. Please complete the following table by answering the questions for each of the vehicles you listed above.

	Vehicle #1	Vehicle #2	Vehicle #3	Vehicle #4	Vehicle #5
About how many TOTAL TIMES IN THE LAST 12 MONTHS was this vehicle used either on road or off road by you or anyone else?	_____ total times in last 12 months				
How many of these total times were for OFF-ROAD RECREATION on trails or in non-roaded areas, or traveling cross country?	_____ off-road times				
How many of these off-road times were IN MINNESOTA ?	_____ off-road times in MN				
On average, how many gallons of fuel were used EACH TIME this vehicle was driven off-road on trails or in non-roaded areas, or traveling cross country? (DO NOT include fuel used for traveling on public roads to and from off-road recreation locations.)	_____ gallons used EACH off-road time				

3. Please describe the primary off-road recreational use for your household's vehicle(s)?

	primary off-road recreational use
motorcycle(s)	
4x4(s)	

4. How far from home do you or anyone else in your household typically travel to use this vehicle(s) for off-road recreation? (Check **one** response for each type of vehicle.)

	less than 25 miles	between 25 & 50 miles	over 50 miles	don't know
motorcycle(s)				
4x4(s)				

5. In Minnesota, how easy is it to find places to legally ride off-road recreational vehicle(s) on trails or in non-roaded areas, or to travel cross country? (Check **one** response for each type of vehicle.)

	easy	difficult	almost impossible	don't know
motorcycle(s)				
4x4(s)				

6. How undesirable or desirable do you think the following landscape features are for off-road vehicle recreational activities? (Circle response.)

Landscape Feature	Very Undesirable	Undesirable	Neutral	Desirable	Very Desirable
contains forested areas	VU	U	N	D	VD
contains mostly flat terrain	VU	U	N	D	VD
ground is mostly sand	VU	U	N	D	VD
contains open fields and meadows	VU	U	N	D	VD
contains rugged terrain, including steep hills	VU	U	N	D	VD
contains swampy areas	VU	U	N	D	VD
contains primarily gentle, rolling hills	VU	U	N	D	VD
contains a lot of mud and mud holes	VU	U	N	D	VD

7. Do you obtain information about DNR programs and services from any of the following sources? (Circle response)

	<u>YES</u>	<u>NO</u>
newspaper articles	Y	N
<i>Volunteer</i> magazine	Y	N
DNR publications (brochures, pamphlets, posters, etc.)	Y	N
at the Minnesota State Fair	Y	N
by telephoning DNR central office in St. Paul	Y	N
by telephoning a DNR office other than the central office in St. Paul	Y	N
special events such as county fairs, sport shows	Y	N
citizens groups such as sportsmen or conservation organizations	Y	N
radio	Y	N
television	Y	N
billboards	Y	N
state parks	Y	N

8. In the past 12 months have you participated in the following activities? (Circle response)

	<u>YES</u>	<u>NO</u>
fishing	Y	N
hunting	Y	N
non-motorized boating, such as canoeing or sailing	Y	N
motorized boating	Y	N
camping	Y	N
snowmobiling	Y	N
cross-country skiing	Y	N
hiking/backpacking	Y	N
bicycling	Y	N
nature observing	Y	N
ATV riding	Y	N
in-line skating	Y	N

9. Any other comments or suggestions about off-road recreation opportunities are welcome. Please use the following space for any additional comments you would like to make.

THANK YOU!

Please fold the completed survey so our address shows on the outside, seal it closed, and drop it in any mailbox. The postage has been paid for you.