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Quantification of motorboat fuel use in Montana

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A QUANTIFICATION OF MOTORBOAT FUEL USE IN MONTANA

By

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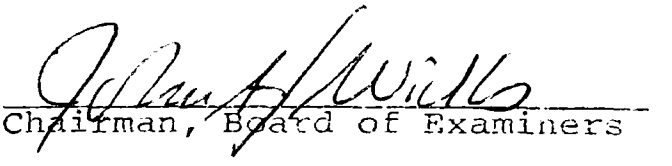

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The Montana legislature designates six-tenths of one percent of all monies collected under the Distributor's Gasoline License Tax Act to the state park account. This account is earmarked solely for improving, creating, or maintaining Montana's state parks where motorboating occurs. This allocation assumes that not less than six-tenths of one percent of all fuel sold in Montana is for use in motorboats.

This study tests the propriety of the present level of money diversion to the state park account by quantifying the total fuel usage attributable to motorboat activity in Montana during 1976. Three methods were utilized to quantify the gallonage of fuel for each of the questionnaire recipients. The first method computed gallons of fuel use based on an average gallonage usage per week. The second method was the yearly usage of fuel estimated by each questionnaire recipient. The third method involved translating hours of boat use into gallons of fuel use based on the engine horsepower and the speed at which the engine was operated.

A total of 1400 registered Montana boat owners and 14 boat rental agencies were sampled.

Based on the questionnaires returned, approximately 46 percent, the total gallonages of fuel consumed in Montana during 1976 which are attributable to boat usage are 2,143,086, 1,791,017, and 4,946,551. These represent .44 percent, .37 percent, and 1.01 percent of the total gallonage of fuel existing under the Distributor's Gasoline License Tax Act.

The figure of 1.01 percent does not accurately reflect the true percentage of fuel use in motorboats due to several problems in reporting error and difficulties in calculating the gallons of fuel use from hours of fuel use. The present allocation of .6 percent to the state park account is justified in that .44 percent and .37 percent do not significantly differ from the present level of appropriation.

TABLE OF CONTENTS

	Page
Abstract	ii
List of Tables	iv
Chapter	
I. Introduction	1
II. Rationale for Employing the Highway User Tax: Motor Fuel Tax	4
III. Comparative Survey of State Motorboat Fuel Tax Allocations	7
Historical Overview	7
Montana Fish and Game Survey	8
Independent Survey of Fuel Tax Allocations	9
IV. Data Discussion	20
V. Conclusions	28
Bibliography	33
Tables 1 - 14	36
Appendix A	50
Appendix B	54

LIST OF TABLES

1. States Reporting Allocation of Motor Fuel Taxes for Recreation in 1976

2. An Examination of State Allocations for Motorboat Programs

3. Registered Montana Boat Owners

4. Total Gallonage of Fuel Consumed by Registered Montana Boats, 1976

5. Total Gallonage of Fuel: Rental Boat Use Only, 1976

6. Total Motorboat Fuel Use in Montana: 1976

7. Total Gallonage of Motorboat Fuel Expressed as A Percentage of Gallonage Existing Under Distributor's Gasoline License Tax Act

8. Representative Boating Year Data

9. Cloud Cover Conditions: May - October (Percent)

10. Cloud Cover Conditions: May - October (Mean)

11. Cloud Cover Conditions: June - August

12. Precipitation Departures from Normal

13. Temperature Departures from Normal

14. Weekend Maximum Temperature Departures from Normal

A. Motorboat Fuel Consumption by Horsepower: Trolling Speeds

B. Motorboat Fuel Consumption by Horsepower: Cruising Speeds

C. Motorboat Fuel Consumption by Horsepower: Full Throttle Speeds

Chapter I

INTRODUCTION

Montana's waterways provide a multitude of recreational opportunities for the various user groups who frequent them. Access to the waterways is possible through state and local park programs. Park programs create, maintain, and improve the recreational facilities benefiting Montana boat owners. For example, park programs allow for the building of docks and access roads for various bodies of water. Associated with the provision of waterfront parks are costs borne by the state government. In Montana, fuel use taxes partially finance the park programs. These taxes directly associate fuel use with certain activities. Presently, the only tax in Montana associating fuel use with recreational activities is the motorboat fuel use tax.

This study attempts to test empirically the propriety of the present level of fuel tax money diversion to the state park account. To accomplish this, boat owners were surveyed to quantify the gallonage of fuel attributable to motorboat use during 1976.

Revenue for the park programs originates from the payment of license taxes existing under the Distributor's Gasoline License Tax Act. Montana law provides that six-tenths of one percent of all monies collected go into the state park account. Specifically, section 32-2601, chapter

26, of the 1975 Supplement to the Revised Codes of Montana states:

> "Money credited to the state park account in the earmarked revenue fund shall be used only for the creation, improvement, and maintenance of state parks where motorboating is allowed. The legislature hereby finds as a fact that of all the fuel sold in the state for consumption in internal combustion engines, not less than six-tenths of one percent (.6%) is used for propelling boats on the waterways of this state."

Accordingly, the law stipulates that six-tenths of one percent of all the Distributor's Gasoline License Tax Act revenue is to go to the state park account in the earmarked revenue fund. The fund is subject to a provision existing under section 79-410.[1]

Failure to interpret the societal preferences for any given resource may result in misallocating that resource. Empirical observation of motorboat fuel use offers a rough approximation of the society's preference for waterway improvement programs and related activities benefiting boat owners.

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[1] Revised Codes of Montana, 1975 Cumulative Supplement, Section 32-2601, pp 157-158, "All money received in payment of license taxes under the Distributor's Gasoline License Tax Act, except those amounts paid out of the department of revenue's suspense account for gasoline tax refund, shall be used and expended as provided in this section. So much of that money on hand at any time as may be needed to pay highway bonds and interest thereon when due and to accumulate and maintain a reserve therefore, as provided in the laws and in resolutions of the state board of examiners authorizing such bonds, shall be deposited in the highway bond account in the sinking fund established by section 79-410."

The advantage of empirical observation in determining resource allocation, as opposed to arbitrarily designating levels of fund diversion, is the closer approximation to reality which it provides. As a rough measure of reality, empirical measurement serves as an argumentive basis for maintaining, lowering, or increasing the existing levels of money appropriation.

Chapter II

RATIONALE FOR EMPLOYING THE HIGHWAY USER TAX: MOTOR FUEL TAX

Implementing user charges or a tax relating directly to the use of a service may finance any governmental service providing at least partial direct benefits. Appropriating motorboat fuel use taxes to state parks finances a governmental service providing such direct benefits. This chapter discusses the rationale behind charging users of a service and the rationale of implementing the tax method of financing the service.

Given that the government provides facilities to aid motorboat use, several considerations determine whether the financing of the service should be from a charge or a tax in lieu of a charge. The first consideration involves the usefulness of a charge in facilitating optimal output and the extent to which it prevents waste of the service. When charges are made for the service, output can adjust automatically to the amount the users of the service will buy at the given prices. Only individuals willing to pay for the service or facility will use them. The more elastic the demand for a service and the higher the level of its marginal cost, the more waste that charge can avoid.

If the demand for motorboat facilities such as docks

toll systems. The user is taxed upon some action which is related to the gaining of the benefits from the service. This tax must approximate the use of the service for which the fee is collected.

Gasoline fuel taxes are equitable in that little justification exists for making the general taxpayer pay for a service yielding direct and immediate benefits to certain individuals. This holds true if the user charge for a good or service does not result in an unacceptable burden on the lower income groups. Gasoline fuel taxes are also advantageous in that the administrative cost of collecting a charge for motorboat fuel use approaches zero since the tax is collected for all gasoline sold regardless of use.

Chapter III

A COMPARATIVE SURVEY OF STATE MOTORBOAT FUEL TAX ALLOCATIONS

Historical Overview of Motorboat Fuel Tax Allocations

The history of motorboat fuel tax allocations for Montana originates in 1963 when the legislative assembly designated one percent of all fuel tax revenue to parks where motorboating occurs. According to the Montana Fish and Game Department, the basis of the allocation was the result of a motorboat fuel study conducted by the Canyon Ferry Boat Owners Association. The gasoline tax law, section 84-1812, chapter 223, Revised Codes of Montana, 1947, was enacted in 1963, but no appropriations were made until 1965. At this time the Montana Fish and Game Commission assumed responsibility for state parks and recreation. A highway contractors association challenged the law contesting the basis for determining that one percent of all gasoline consumed is used as motorboat fuel. The challenge by the contractors association was successful, and the law was declared unconstitutional. In 1967, the Fish and Game Commission presented a bill to appropriate six-tenths of one percent of all fuel tax revenue to parks where motorboating is permitted. A study by the Outboard Boating Club of America served as the basis for the appropriation. This

law was passed, and in 1968 the Supreme Court reviewed the 1965 court decision and decided that the original law was constitutional. The motorboat fuel appropriations to parks allowing motorboat activity have remained at six-tenths of one percent since 1967.[2]

Montana Fish and Game Department Survey of State Fuel Tax Allocations

An examination of fuel tax allocations in other states serves as a supplemental basis in examining the fuel tax law presently used in Montana. States vary not only in the amount of appropriations to boating programs, but also in the source of revenue from which these funds come. The amount of money diversion to the state parks may not be refuted or substantiated on the basis of other state allocations. All states are characterized by different recreational opportunities, fuel tax rates, tax bases, etc., which make interstate comparisons difficult.

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[2]The history of the distribution and use of the proceeds from the gasoline dealers' license tax originates with the 39th Legislative Assembly, Laws of Montana, 1965, Chapter 197, Part III, Section 4-301, p. 541. The law has been amended five times since it was first enacted.

(a) Laws of Montana, Fortieth Session, 1967, Vol. II, Section 1, Ch. 251, pp 756-757.
(b) _____, 1971, Vol. II, Section 6, Ch. 356, pp 1357-1359.
(c) _____, 1973, Vol. I, Section 13, Ch. 100, pp 156-157.
(d) _____, 1974, Vol. I, Section 94, Ch. 316, pp 902-903.
(e) _____, 1975, Vol. II, Section 8, Ch. 477, pp 1247-1248.

In 1976, the Montana Fish and Game Department surveyed fifty states and five territories to examine the similarities and differences between states in allocating fuel tax revenue for recreational purposes. Some of the information is subject to reporting error. Individuals providing the information may not have been familiar with the state laws concerning money amounts to defray the cost of park programs.

The results of the Montana Fish and Game Department survey demonstrate that 53 percent of the responding states report tax allocations for recreational purposes. Forty-three out of fifty states responded to the survey. The average allocation to motorboat programs is .4 percent of all motor fuel tax collected. Table 1 shows the amounts allotted for recreational purposes on a state by state basis.[3]

Independent Survey of State Fuel Tax Allocations

To supplement the Montana Fish and Game Department survey, the author undertook an independent study concerning existing laws on motorboat fuel tax allocations. Table 2 summarizes the results of the survey.

All state codes were examined for fuel tax allocations to motorboat programs. The examination showed that twenty-three states have statutory expenditure programs to aid

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[3]Montana Fish and Game Department, Recreation and Parks Division, "State Survey of Motor Fuel Tax Allocations for Recreation," Sept., 1976, pp 2-3.

boating programs. Eleven of these states have expenditures directly derived from fuel taxes on motorboat fuel. Twelve of the states finance boating programs from sources other than marine fuel taxes. The states expending monies derived from motorboat fuel taxes are Iowa, Indiana, Minnesota, New Mexico, Virginia, South Dakota, Nevada, Maine, Utah, Texas, and Washington.

According to the Iowa Codes Annotated, all monies from the excise tax on the sale of motor fuel used in watercraft go into the Marine Fuel Tax Fund. This fund finances the renovating and dredging of lakes, the acquisition, development, and maintenance of access to public waters, and navigational aids. The Legislative Service Bureau of Iowa conducts a study every four years to determine the percentage of total motor fuel tax collected which is attributable to motor fuel use in watercraft. The legislature then determines the amount of the fuel tax to be credited to the Marine Fuel Tax Fund.[4]

The Indiana statute concerning motor fuel tax allocations designates any monies accumulated from the sale of motor fuels used in motorboats to the Indiana Department of Conservation, Fish, and Game Fund. The fund is earmarked to "further the patrol, aid to navigation, and improvement of

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[4]Iowa Codes Annotated, Vol. 16, Section 324.79 and 324.83, "Use of Revenue" and "Study by Legislative Service Bureau," pp 47-49.

Indiana waterways." The amount of the appropriation is determined on September 30 and at the end of each quarter thereafter.[5]

Minnesota places monies from unrefunded taxes paid on motorboat fuel into the state treasury. One-third of the unrefunded taxes go into the Fish and Game Fund. These monies aid the Division of Game and Fish and the Department of Natural Resources in acquiring, improving, and developing sites for access to public waters. Another 33.3 percent of the state treasury money goes to a general fund for boat and water safety programs.[6]

New Mexico allocates .2 percent of all tax paid on gasoline into a Motorboat Fuel Tax Fund. These taxes are from the Gasoline Tax Act existing in New Mexico.[7]

The State of Washington delegates authority to the director of motor vehicles to conduct a study every four years to determine the amount or proportion of monies received as motor vehicle fuel tax on marine fuel. Monies

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[5]Burn's Indiana Statues, Vol. 8, Part III, Section 47-1556, "Use of Funds Collected - Revolving Fund - Motor Vehicle Highway Account," p. 180.

[6]Minnesota States Annotated, Vol. 19A, Section 291-299, Subdivision 4, 296.421, p. 360.

[7]Laws of New Mexico, 1971, Ch. 207, "Distribution of Tax," 72-27-9, pp 664-665.

from the Marine Fuel Tax Account cover the costs of the study.[8]

Virginia has an appropriation system for fuel taxes also. One and one half cents per gallon on motorboat fuel go to the Game Protection Fund. This amount is available to the Commission of Game and Inland Fisheries to cover expenses for "activities and purposes of direct benefit and interest to the boating public."[9]

South Dakota allocates .9 percent of collections from the tax on motor fuel for the purpose of improving boat facilities throughout the state.[10]

Texas determines the number of gallons used in motorboats on a monthly basis. Seventy-five percent of all unclaimed refunds remaining from taxes paid on motor fuel used in motorboats go into the state treasury as the Land and Water Recreation and Safety Fund. This money is for enforcing the Texas Water Safety Act.[11]

Nevada reviews annually the amount of excise taxes

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[8]Washington Laws, Section 1, Section 3, Ch. 5, Laws of 1965 as Amended by Section 1, Ch. 74, Laws of 1969 ex. sess., p. 204.

[9]Code of Virginia, Section 58-730.3, "Refund on Tax on Fuel Used in Boats, etc., Use of Remainder of Such Tax," pp 303-304.

[10]South Dakota Compiled Laws 1967, Titles 10, 11, Vol. 4, "Legislative Finding and Policy with Respect to Motorboats," pp 539-540.

[11]Vernon's Civil Statutes of the State of Texas Annotated, Vol. 20A, Article 9.13, pp 280-281.

paid on motorboat fuel by using a three step formula. The total number of boats registered in Nevada for the previous calendar year is multiplied by 220.76 gallons. The average fuel use per boat is assumed to be 220.76 gallons. An additional 566,771 gallons accounts for fuel purchased by out-of-state boaters. Fuel use by out-of-state boaters was derived by a study conducted during 1969-1970 by the Division of Agricultural and Resource Economics, University of Nevada, Reno. The total figure so far derived is then multiplied by the excise tax rates. It is the responsibility of the Nevada Department of Fish and Game to carry out this procedure. Each fiscal year, 30 percent of the funds determined by the three step formula go to the Nevada Department of Fish and Game. These monies are for improving boat facilities in Nevada. The remaining 70 percent of the money goes to the State Department of Conservation and Natural Resources. If the Department of Fish and Game has any money in excess of its immediate requirements, the money goes into a separate fund under the State Department of Conservation and Natural Resources. The State Department of Conservation and Natural Resources expends this money, along with the 70 percent of the money obtained by using the formula, for improving boat facilities and other outdoor recreational facilities associated with boating.[12]

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[12]Nevada Revised Statutes, Vol. 13, Title 32, Ch. 360, 377, pp 12179-12180.

Utah designates fuel taxes paid from motorboat activity for improving and operating state-owned boating facilities. Costs of enforcing and administering the State Boating Act are also covered by the fuel taxes.[13]

Maine has a Boating Facilities Fund existing under the Maine State Park and Recreation Commission. This fund obtains 3.5 cents per gallon of the taxes paid on fuel used in pleasure boats.[14]

In summary, eleven states have specific laws governing the distribution of monies collected from taxes paid on motorboat fuel. Only a few of these states designate explicit amounts of money diversion to boating programs. New Mexico appropriates .2 percent and South Dakota allocates .9 percent of all monies collected from taxes paid on marine fuel. Most of these states have laws allowing for the periodic review of the amount of fuel use attributable to motorboat activity. Iowa, for example, conducts a study once every four years to determine the percentage of total motor fuel tax associated with boating activity. Likewise, Indiana determines the amount of taxes paid on motorboat fuel quarterly. Washington tests the existing level of fund diversion to boating programs with a study every four years. Texas is the most rigorous of the states surveyed

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[13] Utah Codes Annotated, Vol. 5A, Titles 39-46, 41-11-11, pp 347-348.

[14] Maine Revised Statutes Annotated, Titles 36-39, Vol. 16, pp 520-521.

in testing the level of money diversion for programs benefiting boat owners. A study reviews the appropriation on a monthly basis. Every year Nevada computes the total gallonage of fuel used in motorboats by utilizing a formula. This formula multiplies the total number of registered boat owners times an average gallonage use per boat. Adding to this product the gallonage of fuel consumed by out-of-state boat users, the total gallonage of fuel attributable to motorboats is obtained. Montana law, like New Mexico law and South Dakota law, designates a specific percentage of fuel tax collected to be diverted to the state park account but does not allow for the periodic review of this percentage.

Twelve states earmark funds from other taxes associated with watercraft usage to boating programs. These states are Idaho, North Carolina, California, Illinois, Nebraska, Kansas, Massachusetts, Connecticut, Florida, Ohio, Alabama, and West Virginia.

Idaho deposits 75 percent of the revenue collected from boat license fees to a Waterways Fund. Idaho law requires that the money be used and expended by the board of county commissioners exclusively for the purpose of maintaining and improving the navigable lakes and waterways within each particular county.[15]

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[15]Idaho Code, Vol. 9, 49-221, p. 52.

Similarly, North Carolina allocates all revenue collected from fees associated with the numbering provisions for boats to a special account known as the Wildlife Resources Fund. This money is specifically for educational activities relating to boating safety, acquiring land, and providing facilities for access to navigable waters.[16]

California has a Harbors and Watercraft Revolving Fund which supports local boating safety and enforcement programs. The revenue originates from boat license fees and other fees.[17]

Illinois designates all revenue from registration fees, fines, or other income, to the State Boating Act Fund. Monies in this fund are for boating safety programs and for constructing and improving boating facilities, access areas, and launching sites.[18]

Nebraska, Kansas, and Massachusetts all allocate monies received from fees associated with registering motorboats. The funds are the State Game Fund, State Forestry, Fish, and Game Commission Fee Fund, and the Recreational Vehicle Fund, respectively. All programs promote the development of

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[16]General Statutes of North Carolina, Ch. 75A, 75A-3, p. 194.

[17]West's Annotated California Codes, Div. 3.5, 9863, p. 458.

[18]Smith-Hurd Illinois Annotated Statutes, Ch. 95½, 320-1, p. 290.

boating safety programs and the development and maintenance of boat access sites.[19]

Connecticut allows for money appropriations to go directly to municipalities seeking revenue for boating programs. The revenue comes from fees collected for the numbering and registering of motorboats in Connecticut. Any town in Connecticut may apply for money to the commissioner of environmental protection to support boating programs of safety, dock maintenance, etc. The commissioner may appropriate an amount not exceeding $2,000 per town per year.[20]

In Florida, the Department of Banking and Finance deposit fees from the registering of boats into the Motorboat Revolving Trust Fund. At least $2.00 from each registration certificate tax is for aquatic weed research and control. The Florida Salt Water Products Promotion Trust Fund receives its revenue from the total increase in license fees from commercial vessels. Fifty percent of this fund is for law enforcement and quality control programs. The remaining 50 percent of the fund is for aquatic plant research and control. Monies existing in the Motorboat

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[19] Revised Statutes of Nebraska, Vol. 5, 81-815.20, p. 741. Kansas Statutes Annotated, Vol. 6, 82A-818, p. 770. Annotated Laws of Massachusetts, Ch. 84-90D, 16, p. 517.

[20] Connecticut General Statutes Annotated, Title 15, p. 62.

Revolving Trust Fund are subject to discretionary legislative decisions based on needs for recreational channel making, public launching facilities, and aquatic weed control.[21]

Ohio collects its revenue for boating programs from appropriations by the general assembly, plus an additional amount derived from rental boat fees, registration fees, and other charges associated with boating activities. Decisions regarding the construction, maintenance, repair, and operations of harbors, as well as all other decisions concerning boating activities, are subject to the approval of the Waterways Safety Council. This council consists of five members appointed by the governor.[22]

Maryland has a Waterways Improvement Fund for allocating monies to boating safety programs. Not more than $100,000 can be spent for boating safety programs, and not more than $225,000 may be expended in any fiscal year unless legislative approval is granted.[23]

Alabama uses Inland Waterways Improvement Bonds to finance expenditures for boating programs. The governor is empowered to execute the sale of the bonds. The bonds

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[21] West's Florida Statutes Annotated, Vol. 14, Ch. 371, Title 26, p. 180.

[22] Page's Ohio Code Annotated, Section 1547.72, Section 1547.73, pp 152-153.

[23] Annotated Codes of Maryland, 8-709, p. 19.

are not to exceed the sum of $3,000,000. The bonds are issued with 10 and 50-year maturities, in denominations of $1,000 and multiples of $1,000.[24]

West Virginia does not have a fund for boating programs. However, this state law calls for the refunding of tax-paid gasoline when consumed in motorboats and purchased in quantities of twenty-five gallons or more.[25]

This chapter has examined the similarities and differences between states in obtaining and appropriating revenues earmarked for boating programs. Florida, Connecticut, North Carolina, and Idaho have programs whose revenues are generated from the registering of motorboats. Other states, including Ohio, Massachusetts, Kansas, California, Nebraska, and Illinois generate revenue for boating programs from all fees associated with boating, such as fines and rental boat fees. The various state appropriation procedures, as well as their dollar amounts, serve as examples and not necessarily as comparative guidelines for money diversion policies. All states have different recreational opportunities, tax bases, fuel tax rates, etc., which make interstate comparisons difficult.

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[24]Code of Alabama, Vol. 9, Title 38, pp 531-538.

[25]West Virginia Codes, Vol. 4, Ch. 11, p. 269.

Chapter IV

DATA DISCUSSION

This study attempts to quantify the total gallonage of fuel attributable to motorboat activity in Montana during 1976. To accomplish this, questionnaires were mailed to 1,400 registered Montana boat owners and 14 rental boat agencies in Montana. Refer to the appendix for copies of both questionnaires.

Systematic sampling was used to obtain the 1,400 boat owners for the sample population. The name and address of every twentieth registered Montana boat owner was recorded from the motor vehicle registration files in Deer Lodge. Various chambers of commerce in Montana and telephone books provided the names of rental boat agencies.

Rental boat use accounts for fuel use attributable to non-registered Montana boat users and out-of-state users renting boats in Montana. This study made no attempt to quantify those gallons of motorboat fuel attributable to out-of-state users bringing their own boats into Montana.

The questionnaire supplies three different techniques to obtain an average gallonage of fuel use for the sample of 1,400 boat owners. The first method involves multiplying the respondents' gallonage fuel use per week times the weeks per year the boat engines are in use. Referring to

the questionnaire, this procedure utilizes questions 2, 4, and 6. Question 8 attempts to obtain a yearly gallonage estimate from each respondent.

The third method to quantify fuel consumption translates hours of boat use into gallons of fuel use. Fuel consumption in boat engines basically depends upon the amount of time the engine is operating, the horsepower, and the engine speed at which the user operates the boat. This study categorizes hourly engine fuel use by the horsepower of the engine into three throttle speeds: trolling, cruising, and full throttle speeds.

Tables A, B, and C in the appendix demonstrate this categorization. Depending upon the horsepower of the engine, hours of use, and the engine speed, it is then possible to determine gallons of fuel use from hours of engine use. The third procedure involves questions 1, 3, 4, 6, and 9 from the questionnaire, in conjunction with Tables A, B, and C in the appendix.

To insure accurate fuel consumption figures for the third method, an adjustment was made for all engines with a date of manufacture prior to 1970. An adjustment is necessary because engines built prior to 1970 use about 30 percent more fuel than engines built after 1970. Tables A, B, and C base gallons of fuel use for motorboat engines on 1975-1976 test results. Therefore, these tables do not apply to engines built prior to 1970 since these engines

consume more fuel than the tables indicate. If Tables A, B, and C were used for all engines regardless of the year of manufacture, fuel use would be underestimated. Fifty-four percent of all the engines with the dates of manufacture given in the sample were built prior to 1970. Therefore, fuel consumption in engines built prior to 1970 was adjusted for 30 percent poorer fuel economy than those engines built after 1970.

All estimates of fuel consumption are more apt to be understated than overstated in relation to the actual gallonage use of motorboat fuel. This is a function of three factors. Many questionnaire respondents offered ranges instead of discreet numbers in quantifying their fuel consumption. The lower figure in the range offered was used. For instance, if the respondent states his yearly usage of fuel as 100-150 gallons, only the 100 gallon response was used for computational purposes. Likewise, if more than one engine speed was stated, the lower response was used for computing hours of use into gallons of fuel use. Using this procedure understates gallons of fuel used. Engines typically use less fuel per hour operating at lower speeds than at higher speeds. Lastly, if engine horsepower ratings did not match specifically the horsepower ratings characteristic to Tables A, B, and C in the appendix, the next lower horsepower was used for computing gallons of fuel use.

These three methods indicate that the sample mean gallonages of motorboat fuel attributable to registered Montana boat owners are 83.25 gallons, 69.53 gallons, and 192.50 gallons respectively. Referring to Table 3, row I designates the data summary acquired from multiplying gallons of fuel use per week times the weeks boated per year. Row II represents the data summary for figures obtained from the total yearly gallonage as stated by the respondents. Row III designates the data obtained from hours of boat use per year and converted into gallons of fuel use per year. The designation of each method utilized for computing the data, I, II, and III, will remain consistent throughout the study.

The sample mean gallonage of 192.50 gallons in row III, Table 3, is not representative of the population. Both the range and the sample standard deviation, 0-3000 gallons and 426.31 gallons, respectively, indicate the problematic nature of converting hours of engine use into gallons of fuel use. The major source of trouble with this procedure is the difficulty for the respondents to designate engine speeds. This is evident through the low response rate for this procedure as compared to methods I and II (Table 3). A 135 horsepower engine operating at full throttle speed will use nearly 14 times as much fuel per hour as the same engine at trolling speed, and nearly twice as much fuel per hour as the same engine at cruising speed. The error is

thus very large if the operating ranges are incorrectly stated by the respondents. Procedures I and II require the respondents to estimate gallons of fuel use per week, weeks of boating per year, and gallons of fuel use per year. Procedure III requires responses not only for hours of boat use per week, weeks of boat use per year, but also additional information such as the year of engine manufacture, engine horsepower, and an engine operating range. The chances for reporting error then increase with procedure III since more information was requested.

Table 4 shows the total gallonages of motorboat fuel consumed by registered Montana boat owners during 1976. These figures only reflect fuel consumption attributable to Montana boat owners. The gallonages are 2,136,278, 1,784,209, and 4,939,742 gallons respectively for procedures I, II and III.

Table 5 depicts fuel use in motorboats attributable to rental agencies in 1976, 6,808 gallons. The sample mean gallonage for rental boat agencies is 486.32 gallons, with the range going from 105.1 gallons to 1,789 gallons.

Table 6 demonstrates total fuel use in motorboats during 1976 in Montana. Total fuel consumption estimates for all motorboats, including rentals, are 2,143,086 gallons, 1,791,017 gallons, and 4,946,551 gallons for procedures I, II and III, respectively.

Table 7 shows the total gallonage of motorboat fuel

consumption during 1976 expressed as a percentage of the gallonage of fuel existing under the Distributor's Gasoline License Tax Act. The percentages for procedures I, II and III are .44, .37, and 1.01 percent respectively. The following chapter deals with the interpretation of these percentages.

To insure that 1976 was a representative boating year in terms of the frequency of boat use, a question was included on the questionnaire to determine how much boats were used during 1976. Question 7 required respondents to determine how much they used their boats during 1976 as compared to past years. Likewise, question 2 from the questionnaire sent to rental boat agencies asked for the respondents to determine if rental boat use was normal compared to past years.

Table 8 summarizes the responses to question 7. The results indicate that 42 percent of all the individuals responding to question 7 used their boats less during 1976 than in past years. Forty-eight percent responded that they used their boats about the same in 1976 as they did in past years. The remaining 10 percent indicated that use of their boats in 1976 was more than boat use in past years. Twenty-nine percent of the rental agencies reported rental boat use in 1976 was more than in past years, 71 percent reported use was normal in 1976, and no rental agencies indicated that use was less than in past years.

Weather statistics provide comparative information on the climatic conditions prevailing during 1976 with respect to past years. Weather data was collected for the months of May through October of that year. It was assumed that most of the boating occurring in Montana was during these months. To obtain a state-wide picture of weather conditions in 1976, statistics were aggregated for five geographic areas in Montana: Helena, Kalispell, Great Falls, Billings, and Missoula. Tables 9, 10, 11, 12 and 13 summarize the weather statistics.

Tables 9 and 10 summarize cloud cover conditions during 1976. Table 9 offers cloud cover conditions in 1976 by the mean number of days cloudy, partly cloudy, and clear for the months of May through October, inclusive. The left side of Table 9 summarizes this information for May through October for a 10-year period, 1960-1970. In this way, the data for 1976 may be compared to "normal" conditions based on a 10-year period. Table 10 translates cloud cover conditions for 1960-1970 and 1976 in percentages of clear, partly cloudy, and cloudy days for each month, May to October. The percentage of clear, partly cloudy, and cloudy days was found by taking the mean number of days clear, partly cloudy, and cloudy for each month as a percentage of the number of days in that month. For instance, if September had 10 days which were on the average clear, 33 percent of the days in September were typically clear.

Table 11 aggregates cloud cover conditions for the months of June through August, 1960 to 1970 and 1976. Aggregating data for June, July, and August attempts to determine climatic conditions for the summer months only. Assuming that the greatest frequency of boat use occurs during these months, the significance of the data increases.

Tables 12 and 13 summarize precipitation and temperature departures from the normals during May through October. Table 14 compares the weekend maximum temperatures in 1976 to the weekend maximum temperatures for past years. This attempts to view how 1976 weekends compare to past years' weekends with respect to the maximum temperatures. This data becomes important if the majority of boating activity occurs during the weekends rather than during the week days. Temperatures for the weekends for all months except May were below the normal temperatures usually expected.

Chapter 5

CONCLUSIONS

The Montana legislature designates six-tenths of one percent of all monies collected under the Distributor's Gasoline License Tax Act to the state park account. This account is earmarked solely for improving, creating, and maintaining Montana's state parks where motorboating occurs. The basis for allocating six-tenths of one percent to state parks assumes that not less than .6 percent of all fuel sold in Montana is for use in motorboats.

This study derives three different means for gallonage usage of fuel attributable to motorboat use in Montana. Chapter 4 discussed the methods for obtaining the three means. To review, the mean gallonages are 83.25, 69.53, and 192.50 gallons for procedures I, II, and III, respectively. Again, caution must be exercised in interpreting the results under procedure III. Converting hours of boat use into gallons of fuel use presents a problem in that failure to designate proper throttle speeds allows for large margins of error.

Fuel use attributable to motorboat activity originating from rental agencies accounts for 6,808 gallons.

Total gallonages of fuel use in Montana during 1976 are 2,143,086.8 gallons, 1,791,017.8 gallons, and 4,946,551.0

gallons for procedures I, II, and III, respectively. These gallonages account for .44 percent, .37 percent, and 1.01 percent of the total gallonage of fuel existing under the Distributor's Gasoline License Tax Act. These estimates were obtained by using the lowest response given when ranges were offered instead of discreet numbers.

The 1976 survey year does not indicate normal boat use by Montanans. Almost half of the sample had boated less in 1976 than in past years. Only 10 percent of the sample felt they had boated more in 1976, and 48 percent felt that their frequency of boat use was the same as in past years. The gallonage of fuel use by motorboats, expressed as a percentage of the total fuel gallonage existing under the Distributor's Gasoline License Tax Act, is thus understated because of reduced boat use during 1976.

Climatic conditions for the summer months of 1976 offer some potential explanation for the reduced boat use by 42 percent of the sample. Although May, June, September, and October had below normal rainfall during 1976, July and August were characterized with above average rainfall (Table 12). If it is assumed that June, July, and August constitute the months of greatest boat use in Montana, any of these months with greater than normal rainfall could reduce boating activity by more than if other months had greater than normal rainfall. June, July, and August are months when families usually take their vacations since most

children are not in school. Therefore, a rainy July and August may have reduced boating activity. Likewise, June and August were cooler in 1976 than normally expected for these months (Table 13). Again, if it is assumed that June, July, and August are months of greatest boating activity, all three months were either rainier, cooler, or combinations of both so that boating may have been reduced. If the assumption is carried even farther to assume that more boating occurs on weekends than on weekdays, weekend climatic conditions become of greater importance. The weekend maximum temperatures for the months of June, July, August, September, and October in 1976 were all below the normal maximum temperatures normally realized (Table 14). Weekends in June and August were substantially below the maximum temperatures normally reached, -5.0° and -2.1° F. To conclude, the three summer months were characterized by lower temperatures and/or greater rainfall than normal. Weekends for the entire summer were below the normal maximum temperatures achieved.

During a three-month period, June through August, 38.3 percent of the days were cloudy as compared to a normal of 26.7 percent days being cloudy for this three-month period. Only 28 percent of the days for this period were clear, compared to 39.1 percent of the days which are normally clear. Thus, with fewer clear days and more cloudy days than normal for June, July, and August, boating activity

may have been reduced (Table 11). Seventeen of the days in June, or 57 percent, were cloudy. The normal, as established by a 10-year period, is 13.4 days cloudy, or 45 percent. Only 15 percent of the days in June, or 4.4 days, were clear compared to normals of 21 percent or 6.4 days. July typically has clear skies, 15.6 days or 50 percent of the time. July in 1976 had only 12.8 clear days, or 41 percent. Likewise, August usually has 14 clear days, accounting for 45 percent of the days. In 1976, only 28 of the days in August were clear (Tables 10 and 11).

Weather statistics cannot substantiate or refute whether or not boating activity was normal, below normal, or above normal levels. Many people use their boats regardless of the weather conditions prevailing. Nor is boating activity solely a function of weather. Climatic data can only serve as a supplement to existing information on the frequency of boat use provided by the respondents. The climatic data seems to indicate that weather conditions were not as favorable for boating during at least some of the summer months when compared to normals for those months. The important consideration though is not the weather conditions prevailing, but what the respondents feel their frequency of boat use is in relation to past years. According to this criterion alone, 1976 is not a representative boating year in terms of frequency of boat use. It is not possible to determine from this study the extent to which

the results would be altered from increased boating activity. The results of the study do seem to indicate that present allocations from state parks are justified. The degree to which .44 percent and .37 percent diverge from the present level of .6 percent does not justify changing the present level of allocation. The third percentage acquired under procedure III, 1.01 percent, does not merit considerable attention due to the problematic nature of determining gallons of fuel use from hours of fuel use.

Suggestions for future studies of similar nature may improve the results obtained with this study. The questionnaire should include responses for gallonages of fuel use for past years as well as the year in question. This would allow for yearly comparisons of motorboat fuel use to determine the present year's consumption of fuel to fuel consumption in past years. In this way, adjustments could be made to compensate for poor boating years.

First, an average could be obtained for all the year's gallonages requested on the questionnaire. As an alternative, the questionnaire recipient could be requested to respond to how he or she feels fuel use varied from normal fuel consumption levels. For instance, if an individual feels that 150 gallons less fuel was used this year than in past years, the respondent would reply his present year's fuel use followed by -150. The opposite could apply for greater than normal fuel use.

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Department of Fish and Game
December 1976

TABLE 1

STATES REPORTING ALLOCATION OF MOTOR FUEL TAXES FOR RECREATION IN 1976

STATE	AMOUNT OF MOTORBOAT FUEL TAX ALLOCATED	BASIS FOR AMOUNT OF ALLOCATION
Alabama	.35%	Study
Arizona	1.08%	Study every three years
California	.71%	Law
Florida	2.0 %	
Hawaii	.75%	Law
Idaho	1. %	Law
Illinois	$2,016,000/year	Negotiation
Indiana	0	Separate Tax at Marinas
Iowa	.9 %	Study
Maine	1.25%	Law
Maryland	.375%	Law
Massachusetts	1.56%	Law
Michigan	1.25%	Law
Montana	.6 %	Law
Nevada	1.276%	1972 Study
New Mexico	.2 %	Law
North Carolina	.125%	Law
Ohio	.5 %	Law
Oregon*	6. %	Highway General Fund
South Dakota	.4 %	Law
Utah	Annual Appropriation	Avg. Fuel Use/Boat/Year
Virginia	0	Tax on Marine Fuels
Washington	1.03%	Study every four years

*Recreational

	Mean	Standard Deviation	No.
Average Allocation of Motorboat Fuel Tax Among States Returning Questionnaire:	.4%	.52	43

TABLE 2

AN EXAMINATION OF STATE ALLOCATIONS FOR MOTORBOAT PROGRAMS*

STATE	REVENUE GENERATING SOURCE	AMOUNT OF DOLLAR ALLOCATION
Alabama**	Inland Waterways Improvement Bonds	
California**	Harbors and Watercraft Revolving Fund, Fees	
Connecticut	Fees for Numbering of Motorboats	$2,000,000/town/year
Florida**	Motorboat Revolving Trust Fund, Registration Fees	
Idaho	Waterways Fund, License Fees	
Illinois**	State Boating Act Fund, Fees	
Indiana**	Indiana Department of Conservation, Fish & Game Fund, Fuel Tax	
Iowa	Marine Fuel Tax Fund, Fuel Tax	
Kansas	State Forestry, Fish, Game Commission Fee Fund, Fees	
Maine**	Boating Facilities Fund, Fuel Tax	3.5¢ of tax paid on fuel
Maryland**	Waterways Improvement Fund	
Massachusetts**	Recreational Vehicle Fund, Fees	
Minnesota	Game and Fish Fund, Fuel Tax	
Nebraska	State Game Fund, Fees	
Nevada	Fuel Tax	Annual Appropriation
New Mexico	Gasoline Tax Act, Fuel Tax	Two-tenths of 1%/All Fuel
North Carolina**	Wildlife Resources Fund, Fees	
Ohio**	Legislative Appropriation plus Fees, Rentals, Charges	
South Dakota**	Fuel Tax	Nine-tenths of 1%
Texas	Fuel Tax	Monthly Appropriation
Utah	State Boating Act, Fuel Tax	Annual Appropriation
Virginia**	Game Protection Fund, Fuel Tax	1.5¢/gallon
Washington	Fuel Tax	Annual Appropriation Reviewed Every 4 Years

* as determined by examination of state laws

** discrepant conclusion with respect to Table I, as determined by Montana Department of Fish and Game Survey

TABLE 3

REGISTERED MONTANA BOAT OWNERS

- GALLONS -

	SAMPLE SIZE n	SAMPLE MEAN $\bar{X}$	SAMPLE STANDARD DEVIATION s	RANGE low - high
Method I	592	83.25	123.07	0 - 1,400
Method II	640	69.53	95.48	0 - 600
Method III	590	192.50	426.31	0 - 3,000

TABLE 4

TOTAL GALLONAGE OF FUEL CONSUMED BY REGISTERED MONTANA BOATS, 1976

- GALLONS -

	NUMBER OF REGISTERED BOATS	SAMPLE MEAN GALLONAGE	TOTAL GALLONAGE
Method I	25,661	83.25	2,136,278
Method II	25,661	69.53	1,784,209
Method III	25,661	192.50	4,939,742

TABLE 5

TOTAL GALLONAGE OF FUEL: RENTAL BOAT USE ONLY, 1976

- GALLONS -

NUMBER OF RENTAL AGENCIES n	SAMPLE MEAN GALLONAGE $\bar{X}$	SAMPLE STANDARD DEVIATION s	RANGE low - high	TOTAL GALLONAGE
14	486.32	551.80	105.1 - 1,789	6,808

TABLE 6

TOTAL MOTORBOAT FUEL USE IN MONTANA: 1976

- GALLONS -

	TOTAL GALLONAGE REGISTERED BOATS	TOTAL GALLONAGE RENTAL BOATS	TOTAL GALLONAGE
Method I	2,136,278	6,808	2,143,086
Method II	1,784,209	6,808	1,791,017
Method III	4,939,742	6,808	4,946,551

TABLE 7

TOTAL GALLONAGE OF MOTORBOAT FUEL EXPRESSED AS PERCENTAGE OF GALLONAGE EXISTING UNDER DISTRIBUTOR'S GASOLINE LICENSE TAX ACT

	TOTAL GALLONS CONSUMED	GALLONS UNDER LICENSE TAX ACT	PERCENT
Method I	2,143,086.8	488,315,906	.44%
Method II	1,791,017.8	488,315,906	.37%
Method III	4,946,551.0	488,315,906	1.01%

TABLE 8

REPRESENTATIVE BOATING YEAR DATA
(QUESTION 7 FROM QUESTIONNAIRE)

Total Sample Responding to Question 7
578

Total responding "use of engine(s) more than normal in 1976"	59
Percent responding "use of engine(s) more than normal in 1976"	10%
Total responding "use of engine(s) about the same as normal in 1976"	278
Percent responding "use of engine(s) about the same as normal in 1976"	48%
Total responding "use of engine(s) less than normal"	241
Percent responding "use of engine(s) less than normal"	42%
Total not responding to Question 7	67
Percent not responding to Question 7	10%

TABLE 9

CLOUD COVER CONDITIONS: MAY - OCTOBER*

Aggregated by locality (Helena-Kalispell-Great Falls-Billings-Missoula) for May-October, inclusive

	Sunrise to sunset mean number of days clear, partly cloudy, cloudy: 1960-1970	Sunrise to sunset mean number of days clear, partly cloudy, cloudy: 1976
MAY		
clear	5.6	7.8
partly cloudy	9.6	11
cloudy	15.8	12.2
JUNE		
clear	6.4	4.4
partly cloudy	10.2	8.6
cloudy	13.4	17
JULY		
clear	15.6	12.8
partly cloudy	11	10.4
cloudy	4.4	7.8
AUGUST		
clear	14	8.6
partly cloudy	10.2	12
cloudy	6.8	10.4
SEPTEMBER		
clear	10	14.2
partly cloudy	8.8	9.2
cloudy	11.2	6.6
OCTOBER		
clear	7.8	6.2
partly cloudy	8.4	10
cloudy	14.8	14.8

* Climatography of U.S., No. 64-24, Climates of U.S., U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Services, Silver Springs, Maryland, Revised March 1971, pp. 10-14.

TABLE 10

CLOUD COVER CONDITIONS: MAY - OCTOBER*

Aggregated by locality (Helena-Kalispell-Great Falls-Billings-Missoula) for May-October, inclusive

	Sunrise to sunset percent of days clear, partly cloudy, cloudy: 1960-1970	Sunrise to sunset percent of days clear, partly cloudy, cloudy: 1976
MAY		
clear	18	25
partly cloudy	31	35
cloudy	51	39
JUNE		
clear	21	15
partly cloudy	34	29
cloudy	45	57
JULY		
clear	50	41
partly cloudy	35	34
cloudy	14	25
AUGUST		
clear	45	28
partly cloudy	33	39
cloudy	22	34
SEPTEMBER		
clear	33	47
partly cloudy	29	31
cloudy	37	21
OCTOBER		
clear	25	20
partly cloudy	27	32
cloudy	48	48

* Climatography of the U.S., No. 64-24, Climates of the U.S., U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Services, Silver Springs, Maryland, Revised March 1971, pp. 10-14.

TABLE 11

CLOUD COVER CONDITIONS: JUNE - AUGUST*

Aggregated by locality (Helena-Kalispell-Great Falls-Billings-Missoula) for June-August, inclusive

- 92 days -

	Sunrise to sunset percent of days typically clear, partly cloudy, cloudy: 1960-1970	Sunrise to sunset percent of days clear, partly cloudy, cloudy: 1976
Clear	39.1	28
Partly cloudy	34.1	33.7
Cloudy	26.7	38.3

* Climatography of the U.S., No. 64-24, Climates of the U.S., U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Services, Silver Springs, Maryland, Revised March 1971, pp. 10-14.

TABLE 12

Precipitation Departures from Normal*	Inches
Aggregated by locality (Helena, Kalispell, Great Falls, Billings, Missoula) for the months of May-October, inclusive.	
May	-.70
June	-.01
July	+.04
August	+.69
September	-.23
October	-.49

* Climatological Data, Monthly Summary, U.S. Department of Commerce, National Climatic Center, National Oceanic and Atmospheric Administration, Environmental Data Service, Federal Building, Asheville, North Carolina.

TABLE 13

Temperature Departures from Normal* Degrees F

Aggregated by locality (Helena, Kalispell, Great Falls, Billings, Missoula) for the months May - October, inclusive

May	+2.5
June	-1.4
July	+ .6
August	- .3
September	+3.0
October	-1.4

* Climatological Data, Monthly Summary, U.S. Department of Commerce, National Climatic Center, National Oceanic and Atmospheric Administration, Environmental Data Service, Federal Building, Asheville, North Carolina.

TABLE 14

Weekend Maximum Temperature Departures from Normal*...°F

Aggregated by locality (Helena-Great Falls-Billings-Missoula) for May-October, inclusive

Month	Typical Temp**	Realized Temp	Departure
May	70.0	70.5	+ .5
June	76.0	71.0	-5.0
July	87.5	86.4	-1.1
August	84.6	82.5	-2.1
September	73.6	72.5	-1.1
October	61.4	58.8	-2.6

* Climatography of the U.S., No. 86-20, Decennial Census of U.S. Climate, Climatic Summary of U.S., U.S. Department of Commerce, Environmental Science, Services Administration, Washington, D.C., 1965, pp. 44-46.

** Means of Temperature Maximums determined for: 15 years in Billings
21 years in Helena
6 years in Great Falls
22 years in Missoula

APPENDIX A

MOTORBOAT FUEL CONSUMPTION TABLES

TABLE A

MOTORBOAT FUEL CONSUMPTION BY HORSEPOWER: TROLLING SPEEDS[1]

Engine Horsepower	Gallons of Fuel Used Per Hour
2	1 Gallon per 16 hours
6	6 Gallons per 56 hours
9.9 15.0 25.0	.2 Gallons/hr.
35.0 40.0 55.0	.4 Gallons/hr.
70.0 75.0 85.0 115.0 135.0	.6 Gallons/hr.

[1] Based on personal interviews with the owners at Al's Outboard Service, East Missoula.

TABLE B

MOTORBOAT FUEL CONSUMPTION BY HORSEPOWER: CRUISING SPEEDS[1]

Engine Horsepower	Gallons of Fuel Used Per Hour
4.0	.6 Gallons/hr.
4.5	.6 Gallons/hr.
7.5	.8 Gallons/hr.
9.8	1 Gallon/hr.
20.0	1.7 Gallons/hr.
40.0	3.3 Gallons/hr.
50.0	5 Gallons/hr.
65.0	6 Gallons/hr.
85.0	6 Gallons/hr.
115.0	7.2 Gallons/hr.
150.0	9.6 Gallons/hr.
175.0	10.0 Gallons/hr.

[1] Based on personal interview with the owners of Al's Outboard Service, East Missoula.

TABLE C

MOTORBOAT FUEL CONSUMPTION BY HORSEPOWER: FULL THROTTLE SPEEDS*

Engine Horsepower	Gallons of Fuel Used Per Hour
2	.2
4	.4
6	.6
9.9	.9
15	1.5
20	2.0
25	2.5
35	3.5
40	4.0
50	5.0
55	5.5
65	6.5
85	8.5
115	11.5
135	13.5
150	15.0
175	17.5

* Generally you can expect to consume fuel at wide open throttle at a rate equivalent to 10% of the related horsepower. Using this general rule of thumb you can expect about a 1 or 2 percent error. (Neal, D., Product Manager, Johnson Outboards, 200 Sea-Horse Drive, Waukegan, Illinois.)

APPENDIX B

QUESTIONNAIRES TO REGISTERED MONTANA BOAT OWNERS AND RENTAL BOAT AGENCIES

Gregg Davis
734 South 5th West
Missoula, Montana

Dear Boat Owner:

I am presently a student at the University of Montana working on my Master's degree in Economics. The following questionnaire is an attempt to quantify the gallonage of all fuel sold in the state of Montana used for propelling boats on the waterways of this state. The results of this study will be provided to the Montana Fish and Game Department for its use as a supplement to the existing data concerning motorboat use in Montana.

Please take a few minutes to answer both the front and back pages of the questionnaire. Many of the questions ask for estimates which may be difficult to make. Please make the best estimate you can.

Your cooperation in the completion and return of the questionnaire in the postage-paid envelope will assist me in meeting my thesis requirement.

If you own more than one engine for the boat or boats you use, please answer for all the engines you own in the space provided. Only include those gallons of fuel bought at fuel facilities located in Montana and used in Montana.

---

1. What are the Make, year, and horsepower of the engine(s) you presently use on your boat(s)?

	Engine # 1	Engine # 2	Engine # 3	Engine # 4
Make	_____	_____	_____	_____
Year	_____	_____	_____	_____
Horsepower	_____	_____	_____	_____

2. Based on your boating patterns this year, (1976), how many gallons of fuel does each engine use per week when it is in use? (This will fluctuate from week to week, but please try to estimate on the basis of what you consider to be an average week's usage.)

Engine # 1	Engine # 2	Engine # 3	Engine # 4
_____	_____	_____	_____

3. Consider only those weeks the engine is in use. How many hours is each engine in operation per week? (Again, try to reflect what you consider to be the average time each engine is used per week.)

Engine # 1_____ Engine # 3_____

Engine # 2_____ Engine # 4_____

4. How many weeks this year, (1976), has each boat engine been used?

Engine #1 _____ Engine #3 _____

Engine #2 _____ Engine #4 _____

5. Will the engine(s) be used again this year, (1976)?

Engine #1 Yes No Engine #3 Yes No

Engine #2 Yes No Engine #4 Yes No

(Circle the appropriate response for each engine.)

6. In your estimation, how many weeks will each engine be used yet this year, (1976)?

Engine #1 _____ Engine #3 _____

Engine #2 _____ Engine #4 _____

7. Based on the use of each engine so far this year, (1976), has each boat engine been used more than, about the same, or less than it has in past years?

Engine #1 More Same Less Engine #3 More Same Less

Engine #2 More Same Less Engine #4 More Same Less

(Circle the appropriate response for each engine.)

8. In your estimation, how many gallons of fuel have been used this year, (1976), in each boat engine?

Engine #1 _____ Engine #3 _____

Engine #2 _____ Engine #4 _____

9. Based on how each engine is operated most of the time, is each engine operated at trolling speeds, cruising speeds, or full throttle speeds?

Engine #1 Trolling Cruising Full Throttle

Engine #2 Trolling Cruising Full Throttle

Engine #3 Trolling Cruising Full Throttle

Engine #4 Trolling Cruising Full Throttle

(Circle the appropriate response for each engine.)

Gregg Davis
734 South 5th West
Missoula, Montana 59801

Dear Marina Operator:

I am presently a student at the University of Montana working on my Master's degree in Economics. The following questionnaire is an attempt to quantify the gallonage of all fuel sold by marinas in Montana for use in their rental boats in 1976.

Please take a few minutes to answer the following questions. Your cooperation in the completion of the questionnaire will assist me in meeting my thesis requirement.

Please respond for only those gallons of fuel used by your rental boats on Montana waterways during 1976.

---

1. What was the total number of gallons of gasoline sold at your marina, for use by your rental boats, in 1976? If possible, please answer from your records, if not, make the best estimate possible.

_____ Gallons

2. Consider the rental boat use patterns during 1976 at your marina. Were your boat rentals in 1976 less than, about the same as, or greater than they have been in past years?

Less Same Greater

(Circle the appropriate response)