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A Socioeconomic Impact Analysis of Recreation at Lake Metigoshe, North Dakota

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FOREWORD

This report presents results covering the socioeconomic phase of an interdisciplinary study directed at an evaluation of the utilization and management of water resources in the Lake Metigoshe watershed.

The authors extend special appreciation to Lake Metigoshe property owners and tourists for their generous cooperation and assistance in providing data for this study. Special thanks are due Mrs. Olive Benson, former President of the Lake Metigoshe Improvement Association, and Mr. Banks H. Sieber, Bottineau County Extension Agent, for their invaluable contributions. Special acknowledgments are due Mr. Donald M. Senechal, former Research Associate, and Mr. Merle H. Bickett, Jr., former Graduate Research Assistant, for their assistance in project methodology and data compilation.

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Highlights

Primary objective of this study was to analyze the economic impact of a recreation site on a rural community and to determine the recreationists' attitudes toward water quality factors at Lake Metigoshe.

Data for the study were obtained in a 1972 mail survey of 885 property owners and 3,500 tourists visiting Lake Metigoshe during the summer of 1972. Information obtained included expenditures per year for property owners and per trip for tourists. Ninety percent of the persons owning property at Lake Metigoshe own vacation homes or cottages, with an average length of ownership of 14 years. An estimated 12,179 tourist groups visited Lake Metigoshe with an average length of stay per trip of 2.9 days during the summer of 1972. Each tourist group had an average of 5.3 people and made an average of 3.5 visits to the lake during the 1972 summer season.

Seventy percent of the tourists and 48 percent of the property owners believed that the water quality of Lake Metigoshe was serious enough to cause concern. Forty-five percent of the property owners cited inadequate treatment and disposal of sewage as one of the three most important reasons for water quality decline. The other two important factors believed to contribute to the lake's water quality decline were overuse and improper control of the water level of the lake.

Sixty-eight percent of the owners and 45 percent of the tourists cited the area's scenic beauty as the main reason they came to Lake Metigoshe. Other factors that were listed as reasons for coming to Lake Metigoshe were swimming, fishing, camping, closeness to home, boating, and picnicking.

An estimated total direct user expenditure at Lake Metigoshe by property owners and summer tourists was $2,020,201. This is comprised of $775,081 (38.4 percent) from property owners and $1,245,120 (61.6 percent) from summer tourists. Eating and drinking establishments, grocery stores, and recreational equipment outlets were the three main economic trade sectors that benefited by direct expenditures at Lake Metigoshe.

The total economic impact (direct and indirect) of the recreational expenditures on the Bottineau County economy was $3,401,189 with an additional $862,332 going to State Planning Region II economy. These estimates were the total increase in gross business volume due to the sale of goods and services to recreationists (owner and tourist groups) frequenting Lake Metigoshe.

A SOCIOECONOMIC IMPACT ANALYSIS OF RECREATION AT LAKE METIGOSHE, NORTH DAKOTA

by
Delmer L. Helgeson and Glenn J. Holte*

Outdoor recreation, as a major leisure activity, is increasing--with approximately 90 percent of all Americans participating in some type of outdoor recreation by 1960. Participation rates[1] in outdoor recreation during the summer season are projected to increase from 4.4 billion separate outdoor recreation activity occasions in 1960 to 6.9 billion in 1976 to over 12.4 billion by the year 2000.[2] Some of the factors responsible for the upsurge in participation in recreational activities are increases in population, disposable income, leisure time, mobility, retirement at an earlier age, access to better transportation, and changes in tastes and preferences.

Water recreation is also increasing in popularity. This trend is expected to increase as long as people have water areas suitable for recreation purposes. The presence of watershed areas also facilitates increased use of on-land activities, such as camping, picnicking, and hiking. Increases in the number of vacation homes will also have an effect on future outdoor recreation. Approximately three million U.S. families own vacation homes. An estimated 100,000 to 200,000 new homes are added annually and will possibly double within the next 10 years.[3] This will result in an increased number of people using water as a major source of recreation.

Lakes in the Upper Midwest and their adjacent shorelands serve as part of the natural resource base for the recreational and tourist-oriented economy of the region. Natural lakes in this region comprise a valuable natural

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[1]Participation rates as used here are defined as an individual involved in a single recreation activity during a given day.

[2]Outdoor Recreation Resource Review Commission, Outdoor Recreation for America, Washington, D.C., 1962, p. 5.

[3]Land and Leisure: Concepts and Methods in Outdoor Recreation, David W. Fischer, J. F. Lewis, and G. B. Priddle (Editors), Monrovia Press, 1974, p. 62.

resource with signs of deterioration attributable in part to an increasing number of people using watershed areas for recreation.[4] Much of the eutrophication of lakes is caused by man and his use of natural resources during the pursuit of recreational activities. The concern for longevity of lakes, including Lake Metigoshe, has stimulated an interest in research directed at eutrophication and factors contributing to the degradation of lakes.

Factors influencing increased participation in outdoor recreation nationally have had a similar effect on activities at Lake Metigoshe, North Dakota. Increased activity has placed added emphasis on developing and/or maintaining recreational areas. Because relatively few natural lakes are available for development in North Dakota, locational and access problems are faced by many recreationists. Some recreationists must travel many miles in order to participate in water-oriented activities. This can result in overuse of certain recreational areas causing congestion at the most desirable recreational sites.

A limited number of studies have been made to evaluate the problems of lake deterioration and the socioeconomic benefits associated with intense use of lakes. As long as increased pressure on recreational areas continues, the public needs more information concerning the long-term effects of the physical demands placed on recreational sites and the socioeconomic effects that accrue to communities located in close proximity to watershed areas.

Research Objectives

Lake Metigoshe's direct economic importance and the effects that declining water quality may have on the surrounding area from decreased recreational activity served as a basis for formulating the following objectives:

1. To estimate the expenditures made in the Bottineau community for recreation at Lake Metogoshe,
2. To ascertain the public's perception of water problems at Lake Metigoshe, and
3. To estimate the economic impact from expenditures connected with Lake Metigoshe recreation upon economic sectors of Bottineau County and State Planning Region II in North Dakota.

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[4]Born, Stephen M., et al., Eutrophication Control, Technical Bulletin No. 62, Department of Natural Resources, University of Wisconsin, Madison, 1973, p. 2.

Lake Description and Characteristics

Lake Metigoshe is a natural lake located on the North Dakota-Canadian border, 13 miles north of the city of Bottineau in Bottineau County. The lake covers approximately 1,619 surface acres, divided into two major basins. Approximately 65 surface acres, or 4 percent, of the lake's surface extend into Canada making the lake an international body of water (Figure 1).

The topography is characterized by hills and wooded areas. Vegetation consists mainly of deciduous trees (oak and aspen) with easy access attained to the site going north of State Highway 5 on either State Highway 14 or 3 and then east-west on State Highway 43. This body of water is the largest and most recreationally developed of the lakes located in the Turtle Mountains. The physical characteristics of the lake and surrounding area have served to enhance development of shoreline property. Presently 85 to 90 percent of the 26-mile shoreline is privately owned and developed. There are approximately 39 cabins per mile of shoreline or approximately 1,000 buildings, the majority being private lake cottages. Only 12 of 1,923 lakes surveyed in Minnesota had a similar or greater number of cabins per mile of shoreline.[5]

Procedure

Sample Selection

Mail questionnaires were sent to all Lake Metigoshe property owners and a random sample of tourists visiting the lake during the summer (June through August) of 1972. The 885 property owners that received questionnaires were identified by use of property tax records made available by the Bottineau County Assessor's office. Motor vehicle registrations were used in identifying the 3,500 tourists sampled.[6] The tourist questionnaire was designed to collect expenditure data and to identify those tourists expressing opinions on water quality problems. Tourists indicating a water quality

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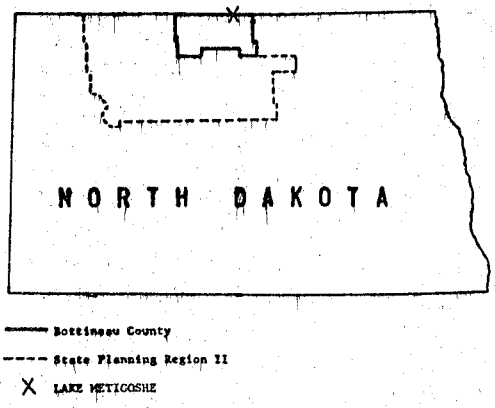
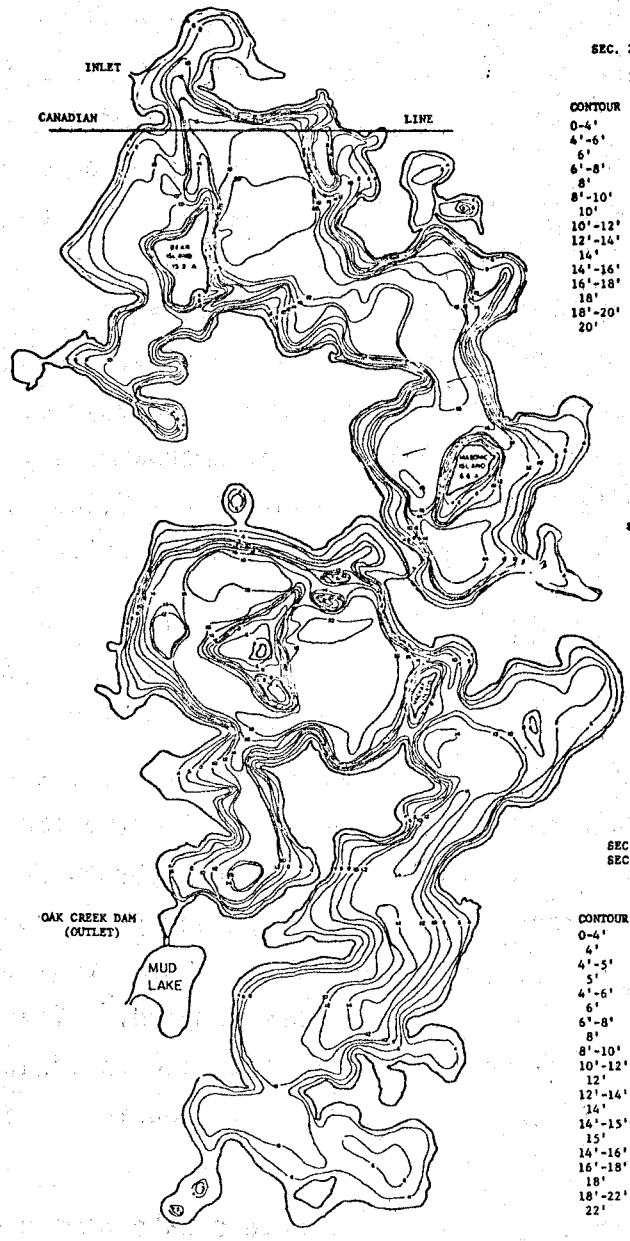
[5]Borchert, J. R., Minnesota's Lakeshore Resources Development, Policy Needs, Part I. Summary Report of Minnesota Lakeshore Development Study, State of Minnesota, St. Paul, Minnesota, 1970, p. 47.

[6]Approximately 16,000 motor vehicles were recorded visiting Lake Metigoshe. After screening out duplicate vehicle registration numbers for tourists and elimination of all property owner vehicle registration numbers, a random sample of 3,500 tourists was drawn from the remaining tourist vehicle registration listing.

ELEVATION 1844





NORTH METIGOSHE

SEC. 26,27,34,35 T. 164N R. 75W
1972
10.60 miles of shoreline

CONTOUR	ACRES	AV. DEPTH	ACRE FT.
0-4'	89.1	2'	178.2
4'-6'	74.7	5'	373.5
6'	6.1	6'	36.6
6'-8'	71.5	7'	500.5
8'	.3	8'	2.4
8'-10'	77.6	9'	698.4
10'	3.3	10'	33.0
10'-12'	82.4	11'	906.4
12'-14'	48.2	13'	626.6
14'	14.9	14'	208.6
14'-16'	47.8	15'	717.0
16'-18'	70.9	17'	1205.3
18'	1.3	18'	23.4
18'-20'	75.0	19'	1425.0
20'	31.0	20'	620.0
	694.1	10.9'	7554.9

SOUTH METIGOSHE

SEC. 1,2,3,10,11 T. 163N R. 75W
SEC. 34,35 T. 164N R. 75W
1972
13.06 miles of shoreline

CONTOUR	ACRES	AV. DEPTH	ACRE FT.
0-4'	163.2	2'	326.4
4'	.9	4'	3.6
4'-5'	1.2	4.5'	5.4
5'	.6	5'	3.0
4'-6'	126.9	5'	634.5
6'	8.9	6'	53.4
6'-8'	118.4	7'	828.8
8'	.4	8'	3.2
8'-10'	130.2	9'	1171.8
10'-12'	61.1	11'	672.1
12'	5.3	12'	63.6
12'-14'	114.9	13'	1493.7
14'	19.5	14'	273.0
14'-15'	1.5	14.5'	21.7
15'	2.7	15'	40.5
14'-16'	31.4	15'	471.0
16'-18'	55.3	17'	940.1
18'	39.0	18'	702.0
18'-22'	36.3	20'	726.0
22'	6.9	22'	151.8
	924.6	9.3'	85856

Figure 1. Lake Metigoshe, Bottineau County, North Dakota, 1972

SOURCE: North Dakota State Game and Fish Contour Map, 1972.

problem existed received a second questionnaire dealing with attitudes on water quality decline and causes of deterioration.[7]

Input-output analysis[8] was used to estimate the economic impact on the economic sectors of Bottineau County and on State Planning Region II from recreational related expenditures.

Response to Questionnaires

The return rates were 56.5 percent for the owner questionnaire, 28.6 percent for the tourist questionnaire containing a water quality control question, and a 53 percent return from tourists believing a water quality problem existed (Table 1).

TABLE 1. RESPONSE TO QUESTIONNAIRES FROM LAKE METIGOSHE PROPERTY OWNERS AND TOURISTS, NORTH DAKOTA, 1972

Survey Groups	Questionnaires		
	Mailed	Returned	
	(number)	*(number)*	*(percent)*
Property Owners	885	500	56.5
Tourists (1st Questionnaire)	3,500	1,000	28.6
Tourists (2nd Questionnaire)	283	150	53.0

Characteristics of Property Owners and Tourists

The socioeconomic characteristics of the property owners and tourists are contrasted for comparative purposes in terms of age, distance traveled one way to the lake site together with information on the length of property ownership and number of years tourists have been visiting Lake Metigoshe.

Age Distribution

Only a slight variation in the age distribution existed between property owner groups and tourist groups, with 40 percent of each group less than 20

[7] Two tourist questionnaires were mailed. The first contained personal data, expenditures, and a control question on attitude toward water quality. Tourists who responded affirmatively that a water quality problem existed received a second questionnaire.

[8] Input-output analysis is a technique for tabulating and describing the economic linkages within an economy.

years old and about 25 percent of each user group over 44 years of age (Figure 2). The largest percentage of users fell in the 20 to 44 year old age grouping.

Distance Traveled

Approximately 25 percent of the property owners and 11 percent of the tourists traveled 15 miles or less one-way from their residence to the lake (Figure 3). The cities of Carbury and Bottineau are the only two North Dakota cities within a 15-mile radius of Lake Metigoshe. Twenty-four percent of both the owners and tourists traveled 16-60 miles to Lake Metigoshe. The major cities within a 60-mile radius of the lake are Rugby, Belcourt, and Rolla.

A majority of the owners (44 percent) and a majority of the tourists (35 percent) traveled 61 to 120 miles to Lake Metigoshe. This area is bounded on the west by Powers Lake, on the east by Walhalla, and on the south by McClusky and Underwood. Also included within this periphery are Langdon, Cando, Devils Lake, New Rockford, and Minot. The remaining 7 percent of the property owners and 30 percent of the tourists traveled farther than 120 miles. The major communities located more than 120 miles from Lake Metigoshe within North Dakota are Jamestown, Grand Forks, Fargo, Williston, Bismarck, Mandan, and Dickinson.

Frequency of Tourist Visits

Many of the tourists frequenting Lake Metigoshe for recreation travel long distances with annual repeat returns commonplace. Tourists reported they had been coming to Lake Metigoshe for an average of 9.9 years. Fourteen percent of the tourists had been visiting the lake for more than 20 years (Figure 4). Seventy-nine percent of the tourists had visited the lake more than one year with 21 percent visiting the watershed area for the first time.

Lodging

Accommodations of overnight tourists were 47 percent using public or private camping facilities, 35 percent were accommodated as guests with friends or relatives, 16 percent utilized rented cabins or motel-hotel accommodations, and 2 percent had other arrangements. Forty percent of the tourists utilizing camping facilities came equipped with their own camper type vehicle.

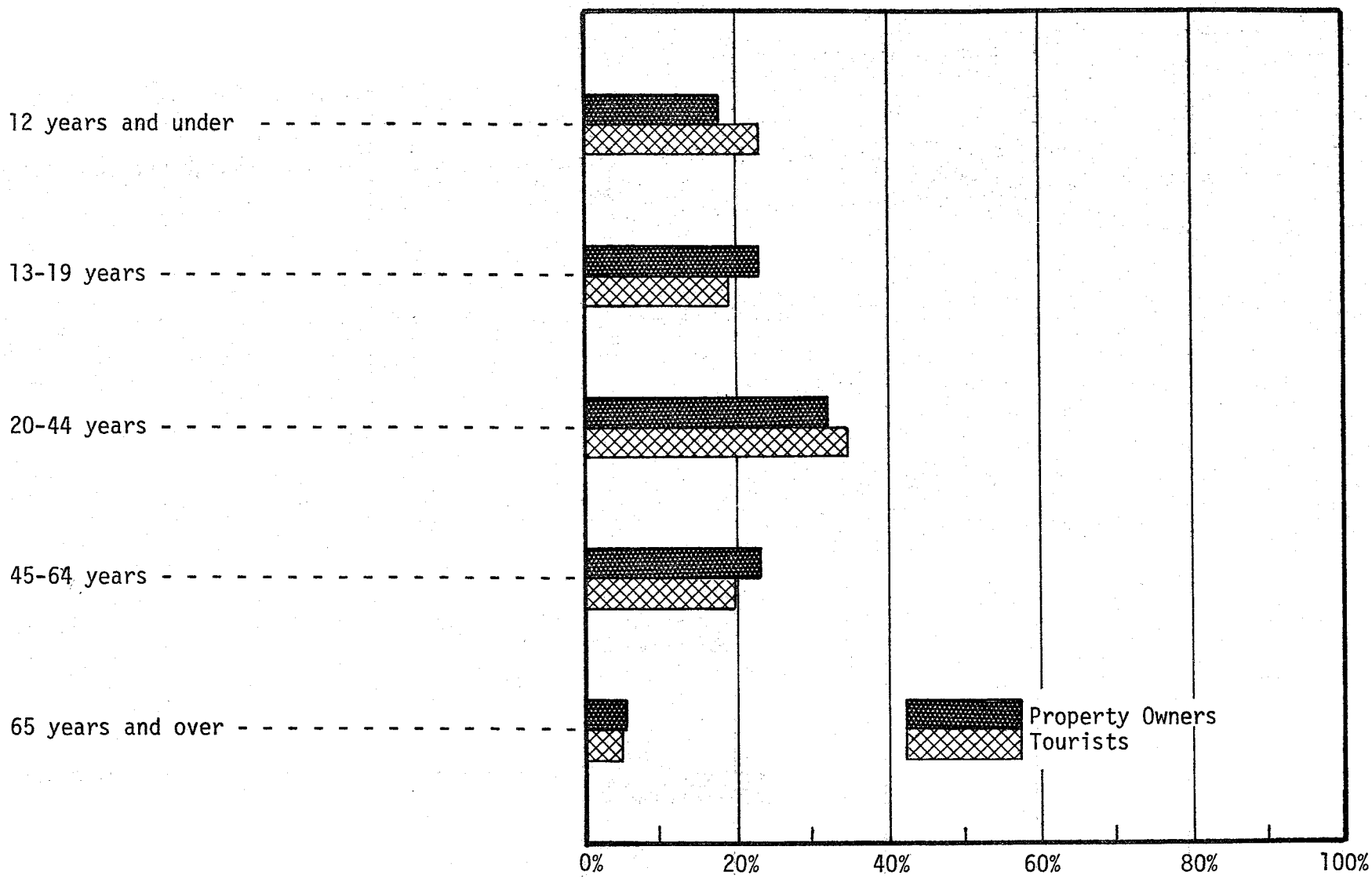


Figure 2. Percentage of Property Owners and Tourists by Age Distribution, Lake Metigoshe, 1972

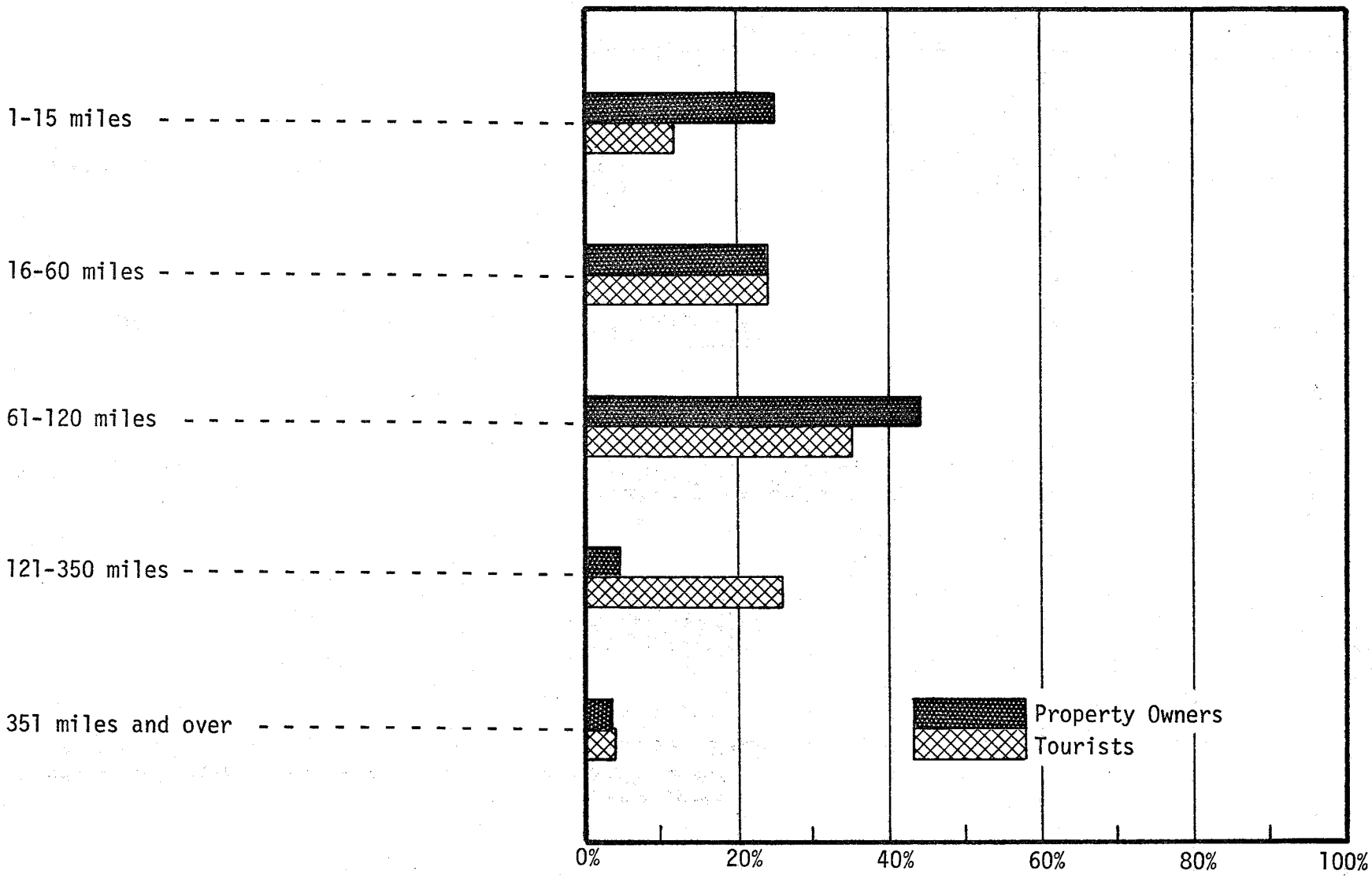


Figure 3. Distance Traveled One Way by Property Owners and Tourists to Reach Lake Metigoshe, 1972

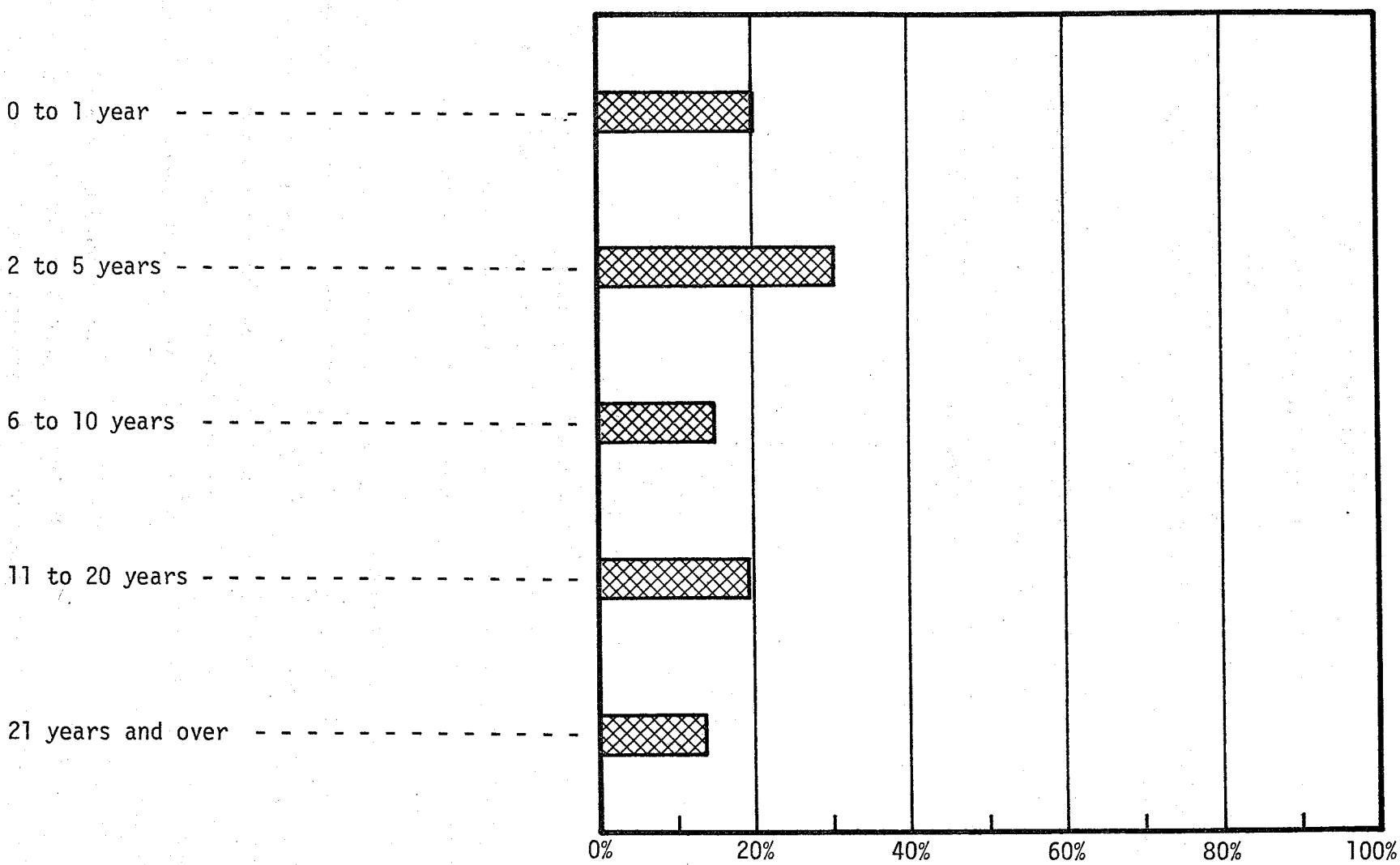


Figure 4. Years of Visitation by Tourist Groups to Lake Metigoshe, North Dakota, 1972

Duration of Tourist Visits

Forty-seven percent of the tourist visitations were one day or less in length with only 4 1/2 percent of the visits extending for more than four days (Table 2). Visitations of two days in length accounted for 23 percent of the tourists with 26 percent of the tourists extending their visitation from three to four days.

TABLE 2. DURATION OF TOURIST VISITS TO LAKE METIGOSHE, NORTH DAKOTA, 1972

Days	Tourist	
	(number)	*(percent)*
1 or Less	470	47.0
2	228	22.8
3	132	13.2
4	125	12.5
5	22	2.2
6	18	1.8
7 or More	5	0.5
Totals	1,000	100.0

Property Ownership

The primary purpose associated with lake property holdings by 93 percent of the property owner respondents was the recreational use made of their property. Only 7 percent of the owners reported a permanent residence, business, or an investment for speculative purposes as their main reason for ownership in lake property.

Ninety percent of the owners reported vacation homes or cottages as part of their lake property holdings. Five percent owned a permanent residence and 1 percent held ownership in a business located at the lake. The balance of the property owners, 4 percent (20), owned only undeveloped or unplatted real estate. A total of 16 percent (80) of the owners surveyed owned lakeshore property that was unplatted or undeveloped in addition to cottages, permanent residences, and businesses.

Forty-three percent (34 of 80) of the owners holding undeveloped property did not intend to develop their property (Figure 5). The desire for privacy was the most frequently cited reason for this decision. Thirty percent (24 of 80) of the owners holding undeveloped property plan to build a cottage and 11 percent

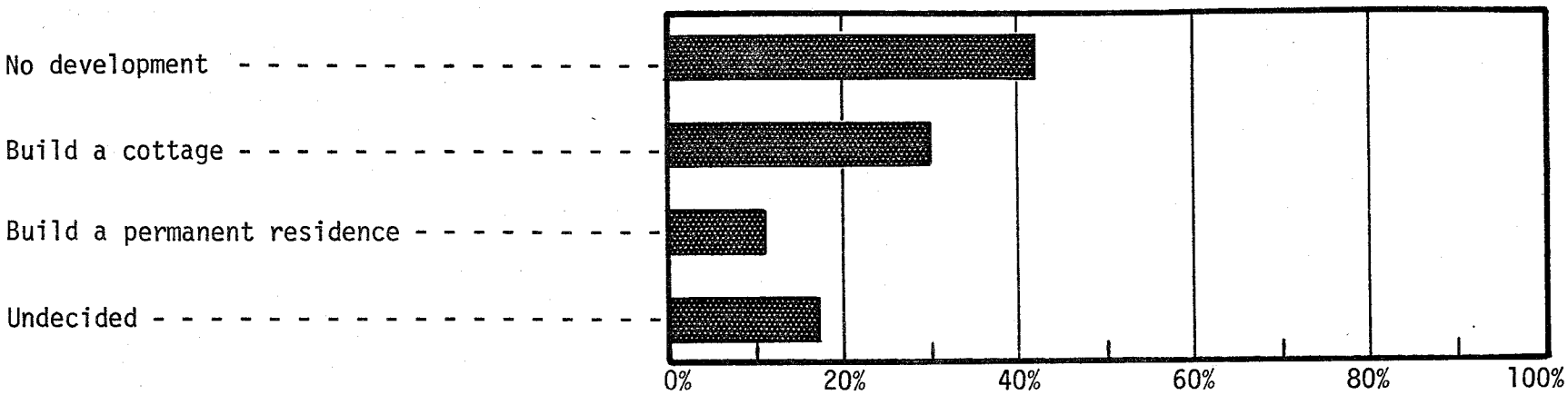


Figure 5. Future Plans of 80 Owners of Undeveloped or Unplatted Lakeshore Property, Lake Metigoshe, North Dakota, 1972

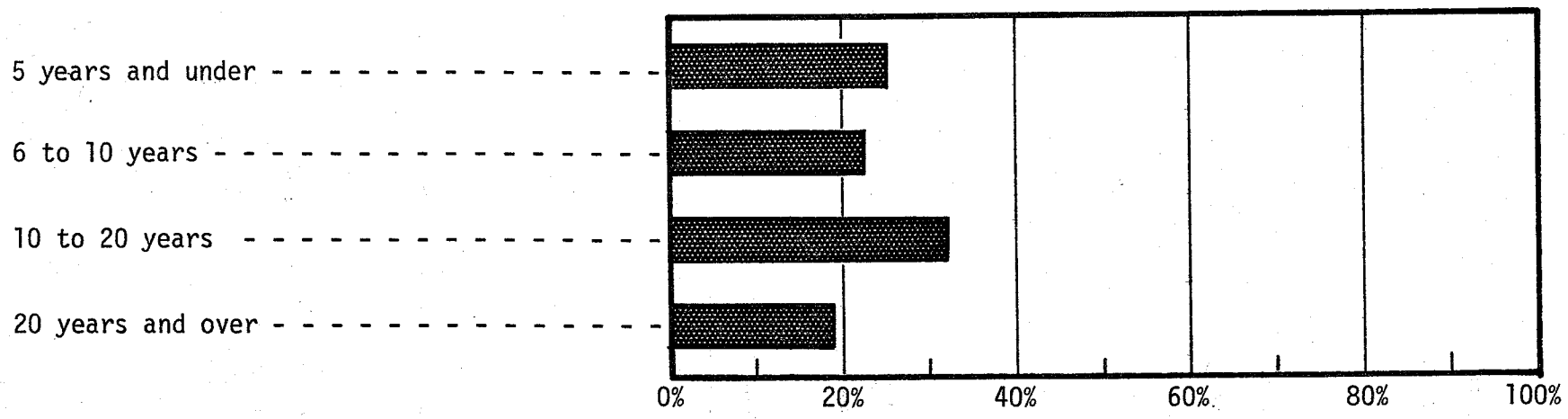


Figure 6. Length of Time Property Owners Have Held Title to Lakeshore Property at Lake Metigoshe, North Dakota, 1972

(9 of 80) plan to build a permanent residence or retirement home on their property. The remaining owners of undeveloped property (16 percent or 13 of 80) were undecided or failed to indicate their future intentions.

Length of Property Ownership

Property owners held title to their lake property for an average of 14 years. The median length of property ownership was 6-10 years. The largest percentage of property owners (32 percent) had held ownership in their property from 11-20 years, while 26 percent had owned their lake property for five years or less (Figure 6).

User Days

Property Owners

Property owners provided the basic data for estimating the number of days, by season, their property was used during the 1972 calendar year (Table 3). Sample data were used to estimate the total day use.[9]

TABLE 3. USAGE OF OWNERS' PROPERTY AT LAKE METIGOSHE BY SEASON, 1972

Season	Average Day Use Per Respondent Per Property	Percent of Total
Spring	9.68	16.9
Summer	33.01	57.8
Fall	9.00	15.8
Winter	5.45	9.5
Totals	57.14	100.0

Lake Metigoshe received an estimated 177,477 user days from the property owner respondents.[10] Over one-half of the total user days occurred during the summer season, with spring accounting for 16.9 percent of the total annual use and fall and winter accounting for 25.3 percent of the annual user days.

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[9]Day use as used in this analysis is defined as property used by one person sometime during any given day.

[10]User days were estimated as follows: (57.14, average day use per person)(3,100, number of individuals using owners' property).

The sample data were used to estimate the total annual user days for all 885 property owners. An estimated 5,487 people (6.2 per property owner) use privately owned property at Lake Metigoshe. The number of individual user days per property on an annual basis (57.14) times the estimated number of people using privately owned property (5,487) yields an estimated 313,527 user days annually for property owners at Lake Metigoshe.

Tourists

An estimate of the summer user days at Lake Metigoshe by tourists was made using primary data and secondary data made available by the State Highway Department. Traffic counts made in 1971 and observations made in 1972 provided the basis for estimating 12,179 separate tourist vehicles frequented the Lake Metigoshe area in 1972.[11] Survey data indicated the average tourist made 3.5 separate trips to Lake Metigoshe during the summer of 1972, with each vehicle carrying an average of 5.3 occupants and the duration of time spent at Lake Metigoshe averaging 2.9 days. These variables provided the basis for estimating a total of 655,169 user days spent at Lake Metigoshe by tourist groups during the summer of 1972.[12]

A combined total of 968,696 estimated user days resulted based on 313,527 user days estimated on an annual basis for the shoreline property owners and 655,169 estimated user days for tourists for only the summer

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[11]Total vehicular traffic was estimated as follows: The State Highway Department recorded 64,197 vehicles traveling the highway between Bottineau and Lake Metigoshe in 1971. Eighty percent of the traffic on this highway was observed frequenting the Lake Metigoshe area in 1972. Seventeen percent of the vehicular traffic around the lake was identified as lakeshore property owners. Duplication of observed vehicle registration numbers throughout the summer of 1972 averaged 3.5 recordings per vehicle. Given these basic traffic pattern parameters, the total estimated number of separate tourist groups frequenting the lake area was calculated as: (64,197 vehicle traffic count)(.8 observed traffic traveling to Lake Metigoshe)(.83 nonproperty owner traffic traveling to Lake Metigoshe) ÷ (3.5 observed vehicular duplications) = 12,179 separate tourist vehicles.

[12]Total user days were estimated as:

$Y = X_1X_2X_3X_4$, where:

Y = total user days
X_1 = 12,179 separate tourist vehicles
X_2 = 3.5 trips during summer months
X_3 = 5.3 occupants per vehicle
X_4 = 2.9 average number of days stayed per visit

months (June through August, 1972). While these estimates do not provide a total annual estimate of user days for an entire calendar year for both groups, they do serve to demonstrate more clearly that Lake Metigoshe is a popular watershed area used extensively for leisure activities, particularly during the summer months.

Public's Perception of Water Quality

Lakes frequently provide the base for the primary recreational activity in an area or lakes may enhance other on-land activities, such as hiking, camping, and sightseeing. A study designed to estimate future participation in outdoor activities by North Dakota residents projected large increases for water-based activities.[13] Estimated increases in participation rates over the 10-year period (1965 to 1975) were 61 percent for fishing, 36 percent for boating and waterskiing, 31 percent for swimming, and 43 percent for camping.

Water must be of adequate supply and quality to meet this increasing demand for water-related activities to take place in reasonable safety. Although water is not actually consumed by most recreational activities, it can be altered by recreational activities. The change, which may be deterioration, can be a threat to recreational areas. Deterioration in water quality attracts attention because good quality water is vital to the success of many recreation activities.

Factors that contribute to deterioration in water quality may be biological, physical, chemical, or a combination. The deterioration in water quality is interrelated with respect to the causes and effects of changes in quality. Water in natural impoundments may be impure because of chemical or bacteriological contamination. Water may be aesthetically unappealing for recreational use due to its color, odor, or the presence of weeds, algae, sediment, or refuse. Recreational activities may be limited by other physical and nonphysical conditions depending on the perception held by potential users.

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[13] Cox, Rex W., et al., Outdoor Recreation in North Dakota, Bulletin No. 475, North Dakota State University, Fargo, April, 1968, p. 7.

Lake User Attitudes

Respondents were asked to check any or all of a series of statements they felt applied to Lake Metigoshe. The statements ranged from favorable to critical in nature (Figure 7).[14]

Eighty-two percent of the property owners and 70 percent of the tourists agreed with the statement that "Lake Metigoshe is a fine lake and in a beautiful area." Seventy percent of the owners and 47 percent of the tourists indicated that "Lake Metigoshe is one of the best recreation centers in North Dakota." The percentage of owners and tourists who indicated they thought the lake area had potential for growth and development as a recreation site were 36 and 18 percent, respectively. Thirty-six percent of the owners and 28 percent of the tourists agreed with the statement that the "lake is experiencing a decline in water quality" with 54 percent of the property owners and 27 percent of the tourists agreeing that "the lake had lost some of its attractiveness because of development, pollution, and congestion."

Water Quality at Lake Metigoshe

Ten percent of the property owners indicated they thought there was "no problem" with the quality of the water in Lake Metigoshe (Figure 8). Less than 1 percent of the tourists agreed with that evaluation of lake water quality. Thirty-two percent of the owners and 11 percent of the tourists thought the quality of the lake's water was "a problem but it was not serious." Seventy percent of the tourists and 48 percent of the owners thought the quality of the water in Lake Metigoshe was a "problem serious enough to cause concern." The balance of both groups, 10 percent of the owners and 18 percent of the tourists, had no opinion concerning the quality of the water in Lake Metigoshe.

Evidence of Water Quality Decline

Various aspects of the physical condition of the lake water were referred to by owners and tourists as evidence that the quality of the

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[14]Property owner and tourist response to statements Lake Metigoshe North Dakota, 1972, appears in Appendix Table B1, p. 42. Appendix B contains corresponding tables for figures shown in this section.

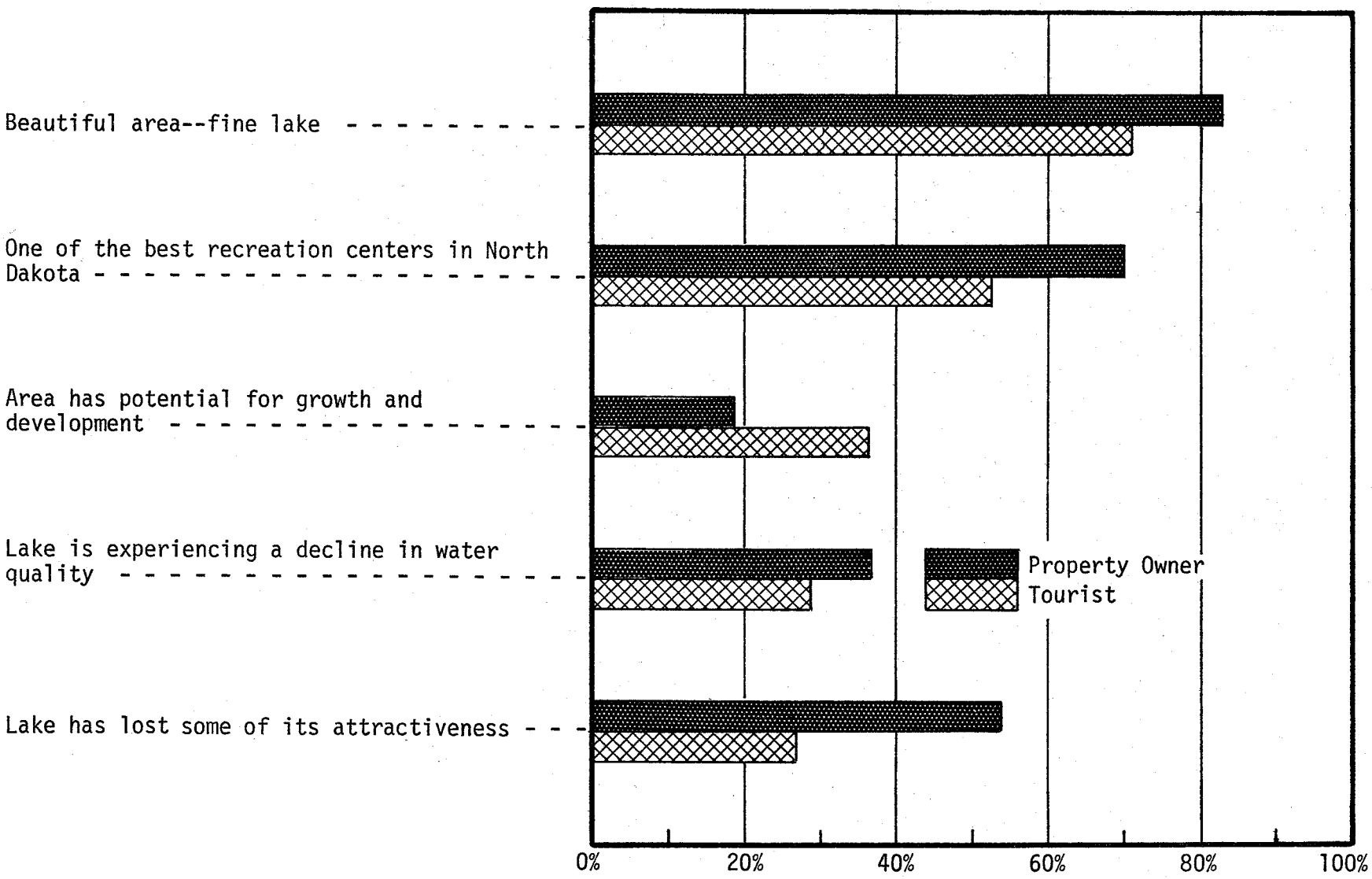

Figure 7. Property Owner and Tourist Response to Statements About Lake Metigoshe, North Dakota, 1972

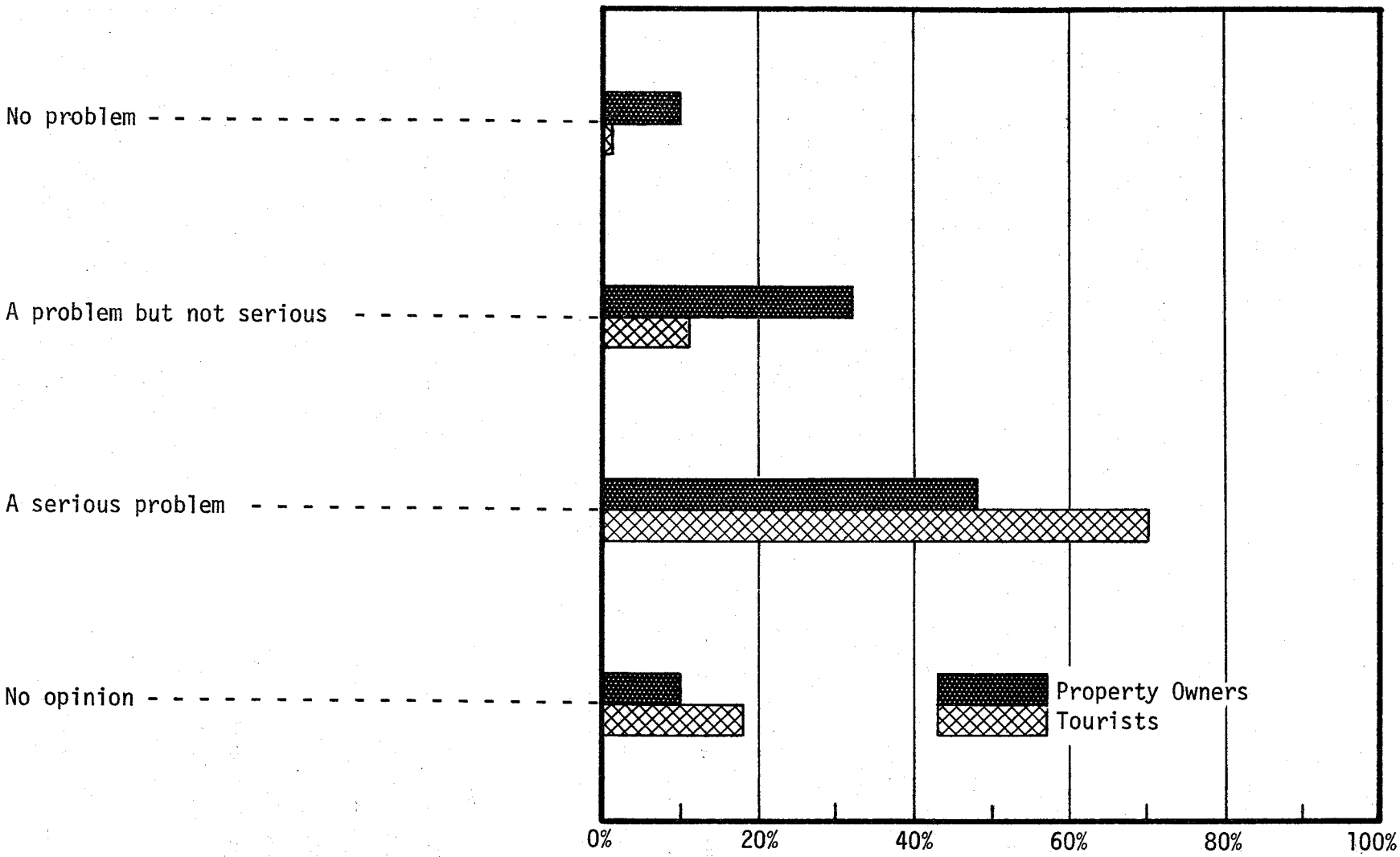

Figure 8. Opinions Reported by Owners and Tourists on Water Quality of Lake Metigoshe, North Dakota, 1972

water is less than optimum. The presence of "algae and weeds" in the water was most frequently reported as being indicative of a decline in water quality. Seventy-two percent of the owners and 90 percent of the tourists singled out this factor (Figure 9). Physical features of the water or of the shoreline, such as "color of the water," "odor" at the lake, and "trash in the water and on the beaches" were cited by a larger percentage of the tourists than the owners.[15]

Lack of or reduction in the number of game fish in Lake Metigoshe was cited by 25 percent of the tourists and 10 percent of the owners as being an indicator of declining water quality.

Important health associated factors, e.g., "skin rashes, sore throats, eye and ear infections, vomiting, etc., after swimming" at Lake Metigoshe were cited. Difficulties in these areas were mentioned by 7.2 percent of the owners and 13.3 percent of the tourists sampled.

Conditions at the lake, such as congestion, "too many people and cabins," and "controversy or news and publicity on the subject of water quality at Lake Metigoshe," were factors which made people believe there is a decline in water quality although they are not conditions of the water itself. News and publicity about the water quality of Lake Metigoshe were cited by 23 percent of the owners and 20 percent of the tourists as a cause for their belief there was a decline in water quality at the lake.

Recreational Activities Sought by Lake Users

Property owners and tourists were asked to rank five reasons in order of importance for choosing Lake Metigoshe. The most frequently cited reason by both groups of lake users for their recreational activities at Lake Metigoshe was the "scenic beauty of the area." Sixty-nine percent of the property owners and 45 percent of the tourists cited scenic beauty as one of the five most important reasons for coming to Lake Metigoshe (Table 4). Property owners ranked "boating" (second), "fishing" (third), and "swimming" (fourth) after scenic beauty as their reasons for coming to Lake Metigoshe. Tourists cited the fact that the lake was "close to home" as their second

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[15]Percentages based upon multiple responses received from 500 property owners and 150 tourist groups. See Appendix Table B3, p. 43.

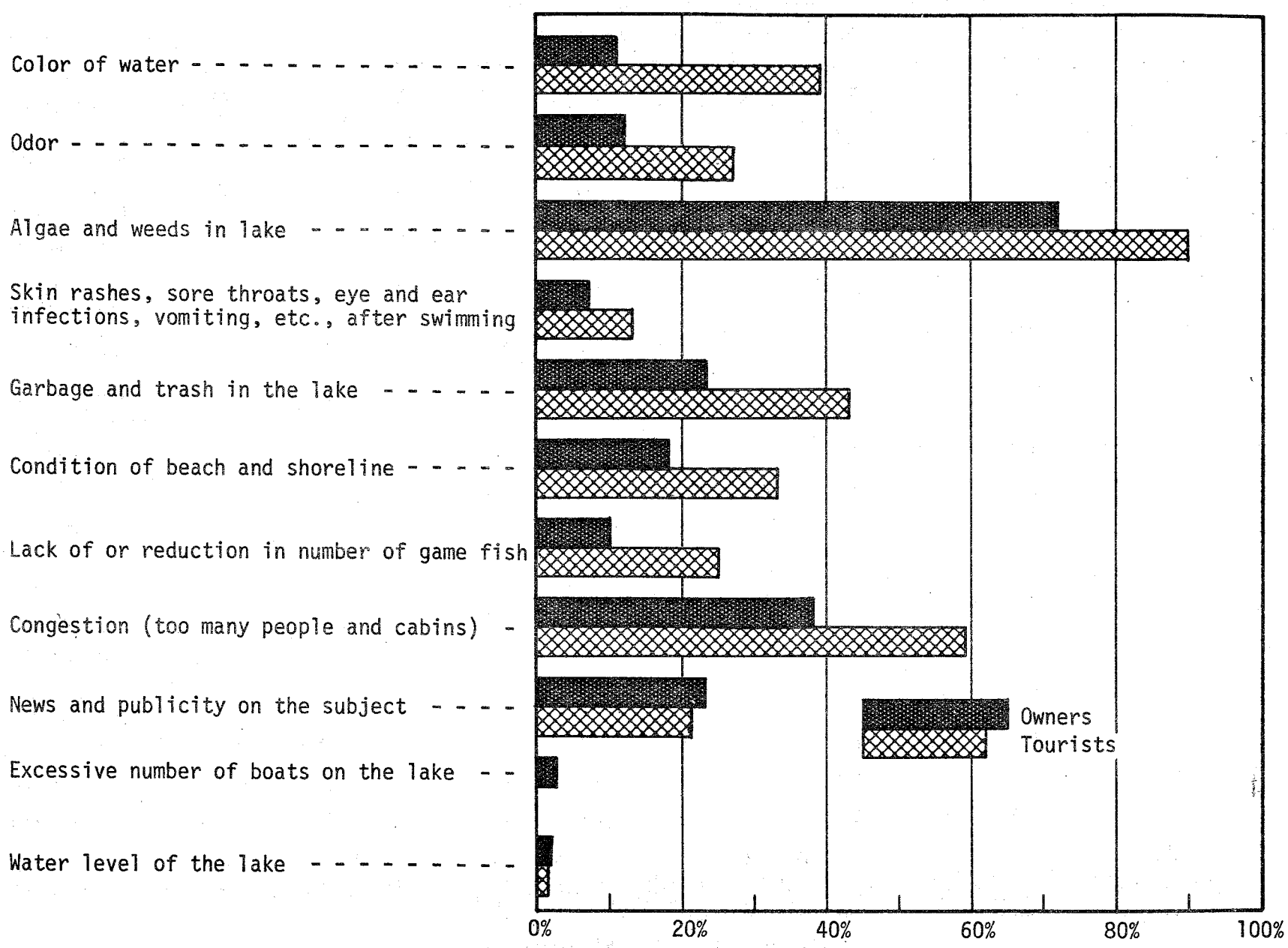

Figure 9. Factors at Lake Metigoshe Which Cause Recreationists to Believe the Lake is Declining in Water Quality

TABLE 4. RANKING OF USER'S REASONS FOR CHOOSING LAKE METIGOSHE AS A RECREATION SITE, 1972

Reason or Activity	First Choice		Second Choice		Third Choice		Fourth Choice		Fifth Choice		Percent of Total	
	Owners	Tourists	Owners	Tourists	Owners	Tourists	Owners	Tourists	Owners	Tourists	Owners	Tourists
	percent											
Scenic Beauty	35.0	14.1	14.4	9.5	9.4	8.8	5.8	8.1	4.0	4.6	68.6	45.1
Boating	11.4	3.5	16.2	6.4	17.2	7.1	12.4	7.3	4.8	4.5	62.0	28.8
Close to Home	7.2	15.0	4.2	5.9	4.8	4.4	4.4	4.7	6.6	5.0	27.2	35.0
Primitive Nature of Area	6.8	--	7.0	--	6.0	--	6.6	--	11.8	--	38.2	--
Community Itself	3.8	--	3.6	--	3.6	--	5.6	--	7.0	--	23.6	--
Fishing	3.4	2.7	10.2	4.7	11.8	7.0	13.6	5.5	10.2	5.1	49.2	25.0
Swimming	2.8	1.2	12.6	6.2	12.6	9.4	10.6	6.3	7.2	5.6	45.8	28.7
Recreation Service Available	--	2.6	1.2	3.1	2.6	3.6	5.4	4.6	5.4	4.7	14.6	18.6
Camping	--	8.3	--	7.3	--	3.7	--	4.3	--	3.6	--	27.2
Picnicking	--	1.3	--	4.6	--	3.3	--	5.9	--	4.9	--	20.0
Other Recreation Sites Nearby	--	3.2	--	5.9	--	5.4	--	4.6	--	6.0	--	25.1
Just Passing Through Area	--	3.3	--	1.0	--	1.7	--	1.2	--	1.5	--	8.7
Visiting Friends and Relatives	--	9.6	--	6.4	--	4.1	--	2.6	--	3.1	--	25.8
Snowmobiling	--	--	--	--	--	--	--	--	--	--	--	--
Church, 4-H, Boy Scout Camps	--	1.5	--	--	--	--	--	--	--	--	--	1.5
Other Business in Area	--	--	--	--	--	--	--	--	--	--	--	--
No Response	28.8	32.7	30.6	37.5	32.0	40.8	35.6	44.4	43.0	50.8		
Totals[a]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		

[a]Based on a sample of 500 property owners and 1,000 tourists. Percentage total may not equal 100 percent due to rounding.

reason for coming to Lake Metigoshe. Activities and reasons, such as "boating," "fishing," "swimming," "camping," "other recreation sites in the area," and "visiting friends and relatives" were nearly equally distributed as reasons for coming to Lake Metigoshe.

Water Quality Control

Property owners at Lake Metigoshe were asked to rank three factors they considered the most important in causing a decline in water quality (Figure 10). Forty-five percent ranked "inadequate treatment and disposal of sewage" as one of the three most important causes of decline. Thirty-seven percent indicated "overuse of the lake" (people and development) as a contributory agent.[16] "Improper control of lake water level" was ranked as the third most important factor contributing to water quality decline by 29 percent of the owners.

Degree of Control

Lake users were asked to indicate the amount of control necessary to prevent a decline in water quality (Figure 11). Nineteen percent of the owners (sample 500) felt the present level of regulation at Lake Metigoshe was adequate to maintain water quality. Two percent of the tourists (sample 150) agreed that present controls were adequate. Seventy percent of the owners (sample 500) and 88 percent of the tourists (sample 150) believe there should be additional regulations or strict regulations to prevent a decline in water quality.

Type of Control

Twenty-one percent of the owners (sample 500) and 55 percent of the tourists (sample 150) felt better sewage disposal was necessary to control

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[16]Coliform counts, as well as total aerobic counts closely paralleled traffic (population) counts. The high correlation found between bacterial and traffic counts on August 15, 1972, may have been due to a combination of two effects: (1) the number of persons using the waste facilities and the number of power boats in use that stirred up the bottom of a relatively shallow lake. The observed parallel between the two counts was not attributed to runoff since there was no precipitation from the end of July to late September of 1972. These observations were based on research conducted in 1972 by Dr. Mary C. Bromel, "Bacteriological Analyses of Lake Metigoshe Water and Sediments," Bacteriology Department, North Dakota State University, Fargo. (See Appendix Figure D1).

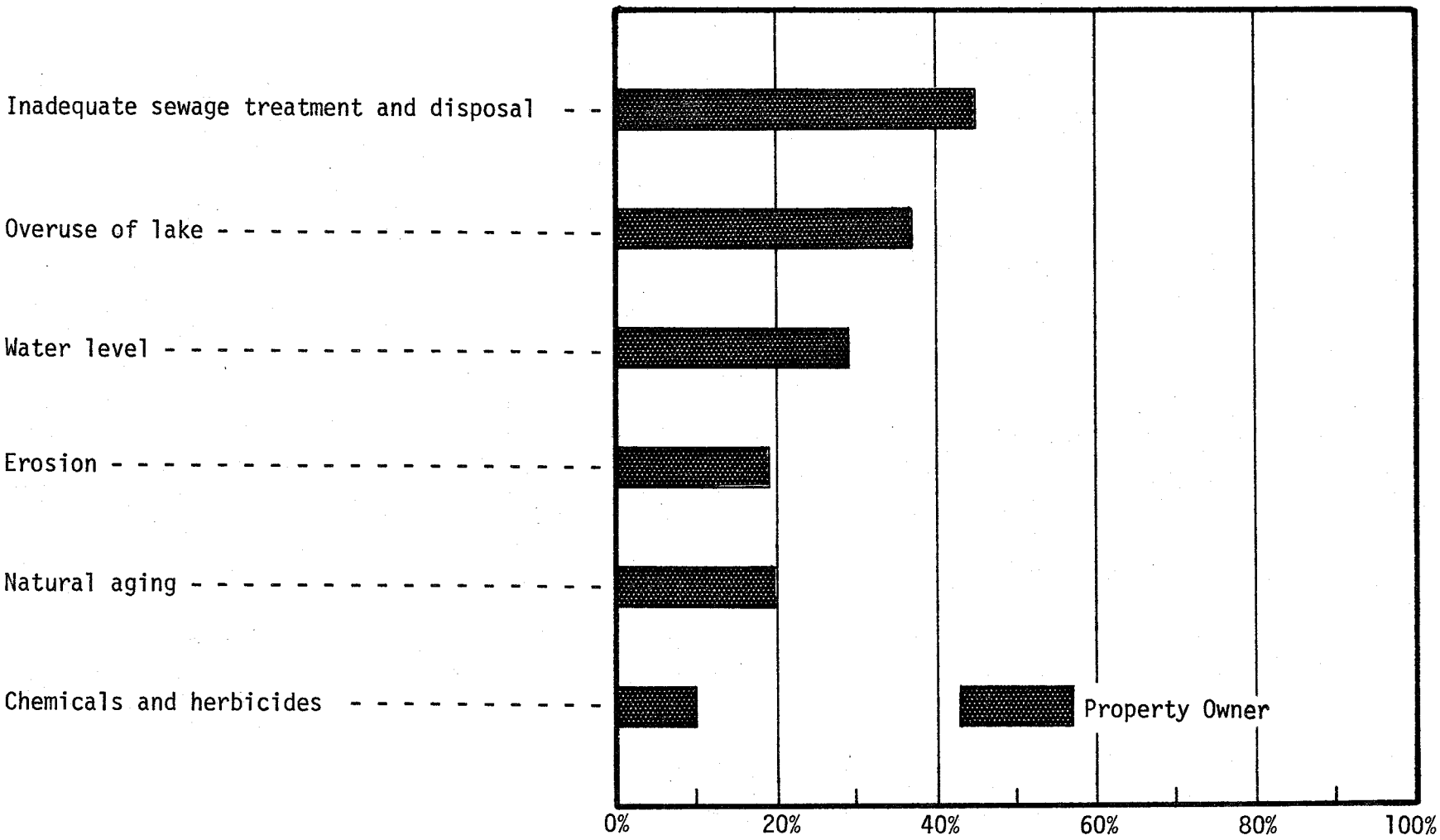

Figure 10. Factors Contributing to Water Quality Decline, Lake Metigoshe, North Dakota, 1972

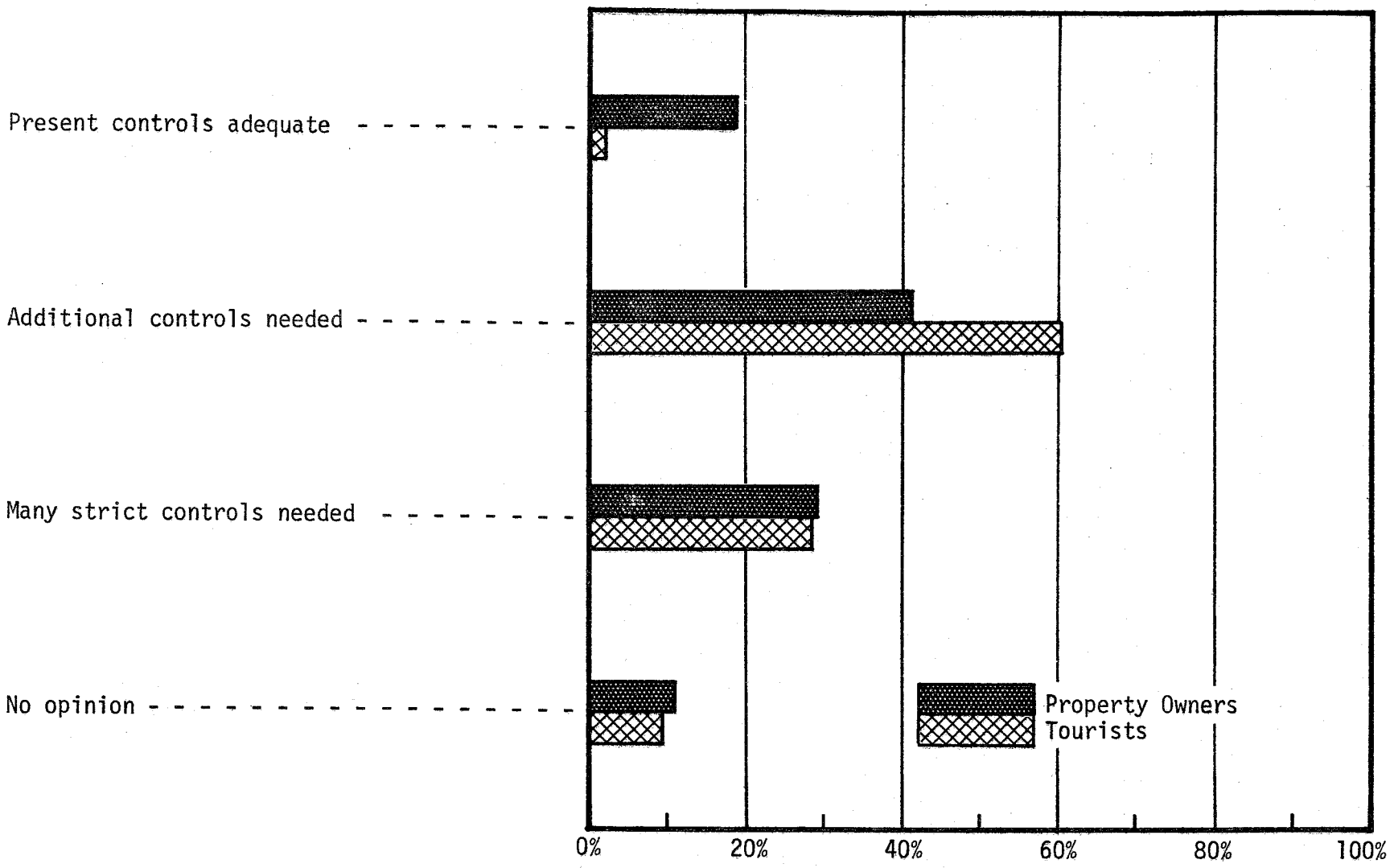

Figure 11. Controls Necessary to Prevent Water Quality Decline at Lake Metigoshe, 1972

water quality (Figure 12). Another 19 percent of the owners called for enforcement of present regulations regarding sewage disposal. Zoning, controlling the water level, and weed control were also thought to be means for preventing water quality decline.

Economic Impact

Recreationists purchase food, gasoline, fishing tackle, and other goods and services in Bottineau and the surrounding communities in conjunction with their trips to Lake Metigoshe. Businessmen supplying recreationists with these products benefit from their expenditures. These are the direct economic benefits from recreation expenditures. Secondary or indirect benefits are realized because a portion of the increase in incomes of these businessmen is spent again locally.

The relationship of the direct effects to the total change in business volume on the economy is referred to as the multiplier effect. The multiplier effect is related to the percentage of direct income which is respent in the local economy. A large proportion of the expenditures by business and individuals is made for imports (items which are not produced in the local economy). These imports represent a leakage from the local economy.

Both the direct and indirect impact of recreation expenditures were estimated. A user survey provided the primary data for estimating the magnitude of lake user expenditures. Input-output analysis was used to estimate the total economic impact of these expenditures on the local and regional economies.[17]

Direct Recreation Expenditures

Total estimated direct expenditures of $2,020,201 for recreation at Lake Metigoshe were made by property owners and summer tourists for the calendar year 1971 in the case of property owners and for the 1972 summer

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[17]A local economy, such as Bottineau County, may possess a unique industrial configuration with greater leakages (lessened multiplier effect) than the state or regional economy. The Location Quotient approach was used to compare the relative importance of an industry in a subregion to its relative importance in a larger region. This procedure provided the basis for testing and modifying the technical coefficients of the I/O model to fit the industrial structure of the area economy.

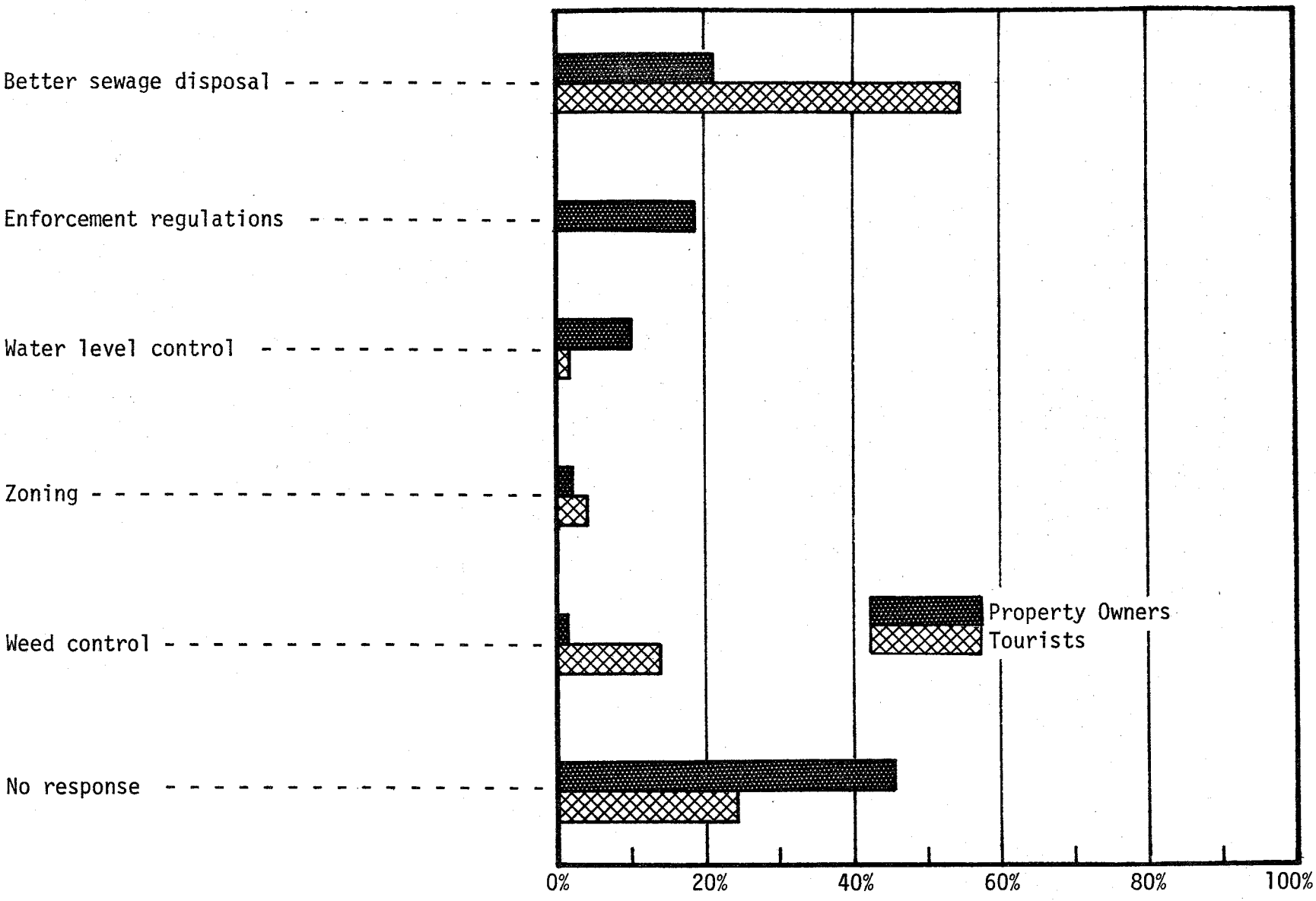

Figure 12. Type of Controls Needed to Regulate Water Quality at Lake Metigoshe, 1972

season (June through August) in the case of tourists. Property owners spent an average of $875.81 during 1971 for maintenance of their property and for recreation at Lake Metigoshe.

Total annual expenditures made by property owners were estimated by multiplying the average expenditure by the number of property owners. Eight hundred eighty-five property owners spending an average of $875.81 in 1971 yielded a total estimated direct expenditure of $775,081 spent in the Bottineau community.[18]

Tourist groups spent an average of $29.21 per trip while visiting Lake Metigoshe during the summer of 1972. An average tourist group frequenting Lake Metigoshe totaled 5.3 persons. Twelve thousand one hundred seventy-nine tourist groups were estimated to have visited the lake an average of 3.5 times during the summer of 1972 resulting in expenditures of $1,245,120 for tourists.[19]

Expenditure by Industry

Examination of Figure 13 indicates that eating and drinking establishments accounted for the largest category of total expenditures of $502,000 spent in the retail trade sector. Eating and drinking expenditures amounted to 35 percent of the total tourist expenditures and 8 percent of the total onwer expenditures. Average tourist expenditures for eating and drinking were $10.29 per trip.

Purchase of groceries and food amounted to $309,000 or 15 percent of total expenditures made in the Bottineau community by property owners and tourists. Purchases of automobile services, gasoline and repair, and recreational equipment each accounted for 11 percent of total recreational expenditures. Purchase of recreational equipment was the largest category of expenditures made by property owners, representing $135,000 or 17 percent of their total expenditures. The average annual expenditure was $152 per property owner.

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[18] Expenditures of commercial establishments at Lake Metigoshe are not included in the total property owner expenditure.

[19] $1,245,120 = ($29.21)(12,179 tourist groups)(3.5 visits per group to Lake Metigoshe).

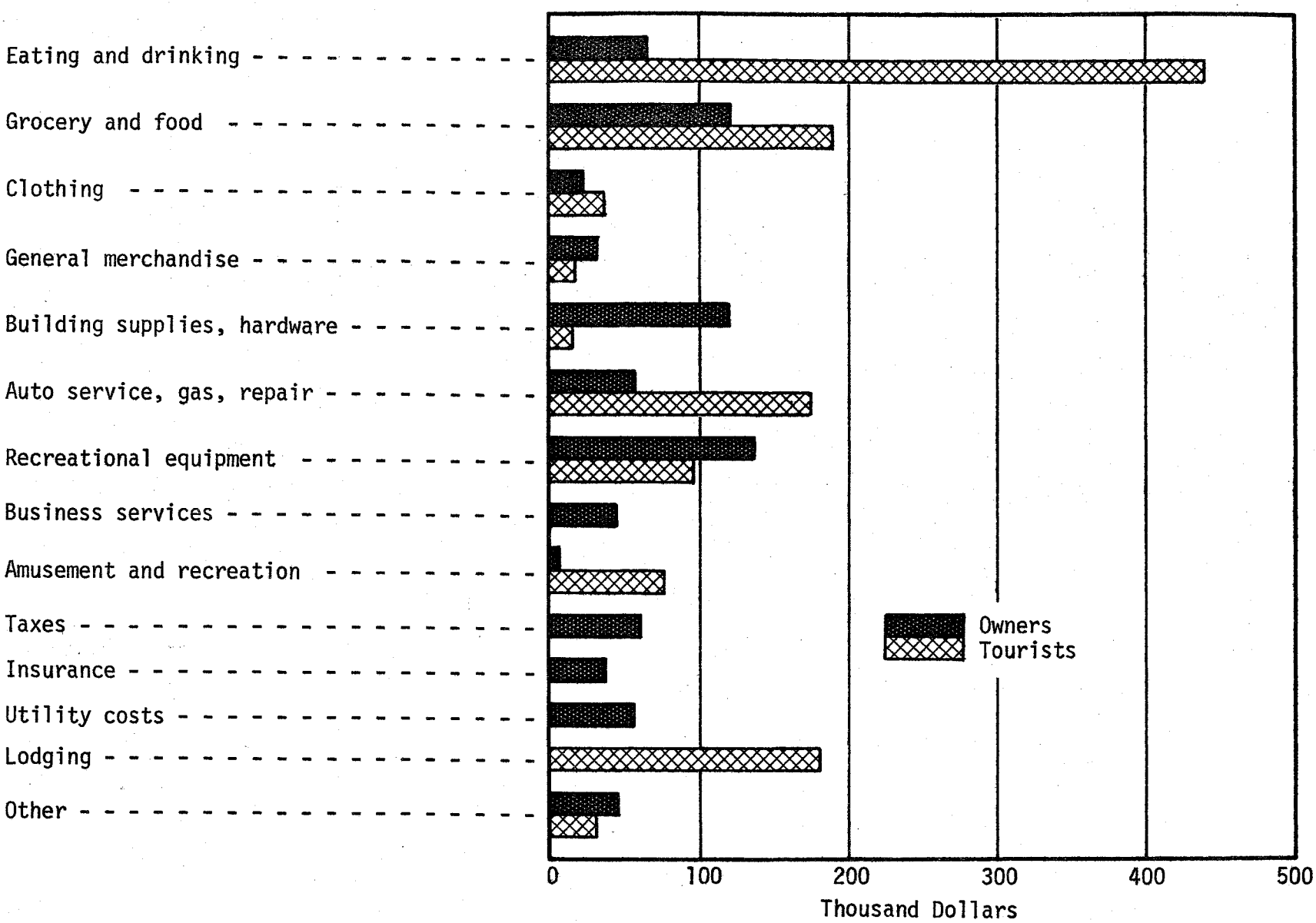

Figure 13. Estimated Direct Recreation-Based Expenditures by Property Owners and Tourists, Lake Metigoshe, North Dakota, 1972

Estimation of Expenditures

The assumption was made that lake property owners living in Bottineau would make most of their expenditures in the community. Expenditures of the lake property owner group were reduced in proportion to the number of owners who live in Bottineau by 25 percent.[20] Tourist expenditures were not reduced because the survey questions to the tourists were directed at the expenditures made during the recreation trip itself in the Bottineau community.

The direct expenditures by recreationists affect 8 of the 13 sectors employed in the analysis (Figure 14). Tourist expenditures affected only three sectors: retail, business and personal services, and professional and social services. The retail sector and the business and personal services sector are recipients of 90 percent of the total expenditures made by recreationists.

The total effect of property and tourist recreational expenditures on gross business volume of the economy was estimated at $3,401,189 (Table 5) in Bottineau County in addition to $862,332 accruing to the remaining six counties of State Planning Region II (Figure 15).[21] This represents an estimated total economic impact (direct and indirect) of $4,263,514 on the regional economy as a result of recreation expenditures attributable to Lake Metigoshe. The retail trade sector received almost one-half of the total gross business volume from recreationists' expenditures in the Bottineau community. Gross business volume of the retail trade sector for Bottineau County in 1967 was $13,588,000.[22] Estimated 1968 gross

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[20]The economic impact is limited to the expenditures that originate as a result of Lake Metigoshe. Total expenditures of the property owners were reduced from $775,081 to $581,307 or by approximately 25 percent to account for estimated expenditures that were assumed to be made in the Bottineau community without a direct relationship to the proximity of Lake Metigoshe. The combined adjusted estimate of direct expenditures ($1,245,120--tourists plus $581,307--property owners) totaled $1,826,427.

[21]North Dakota was divided into eight planning regions to facilitate economic development and public service administration through Executive Order 49 by Governor William L. Guy, September 18, 1969.

[22]U.S. Bureau of the Census, Census of Business, 1967, Vol. 11, Retail Trade-Area Statistics, Part 3, North Dakota to Wyoming, Guam, and Virgin Islands, U.S. Government Printing Office, Washington, D.C., 1970.

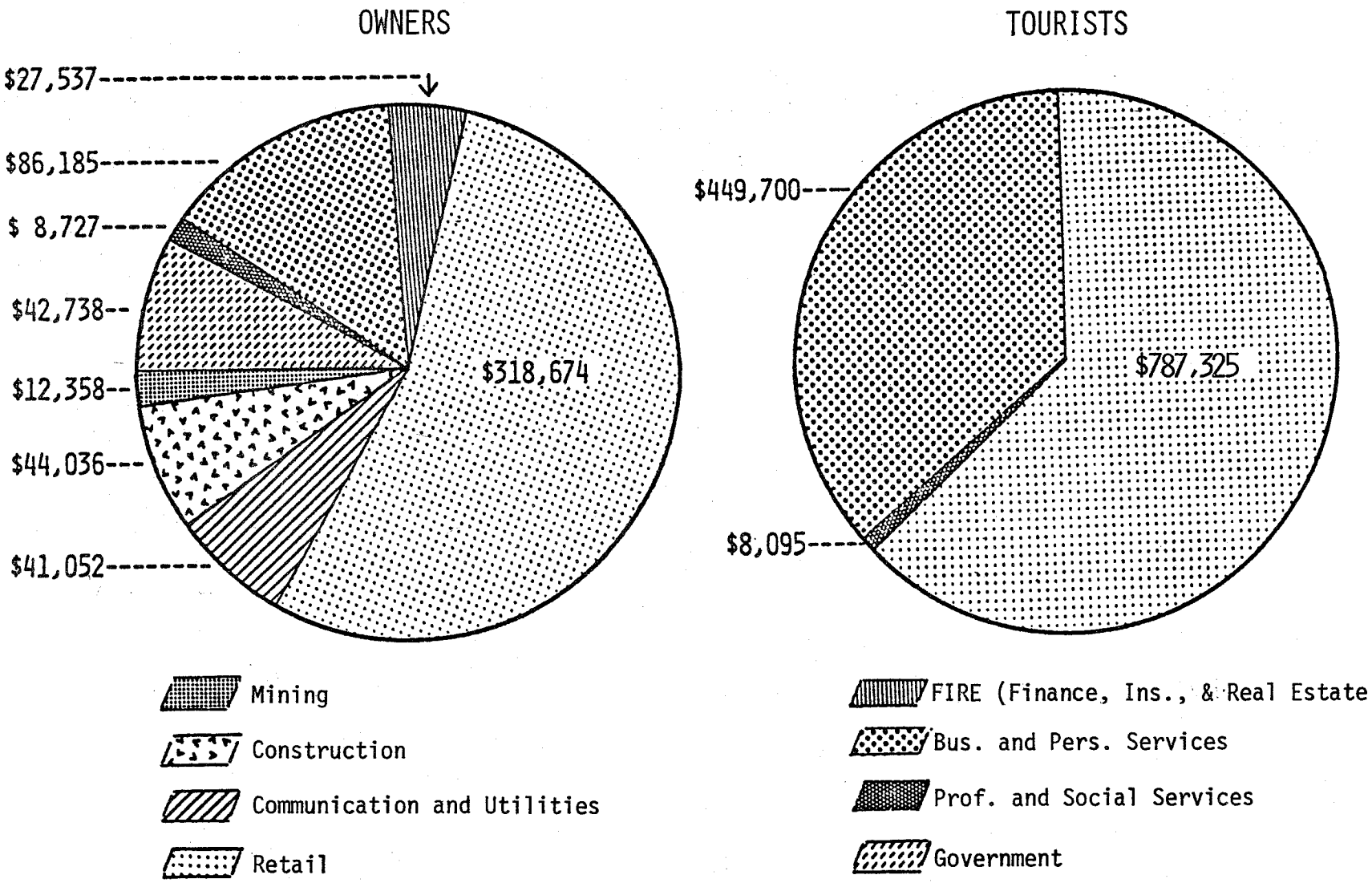


Figure 14. Recreationists' Expenditures by Economic Sector in the Bottineau Community, North Dakota, 1972

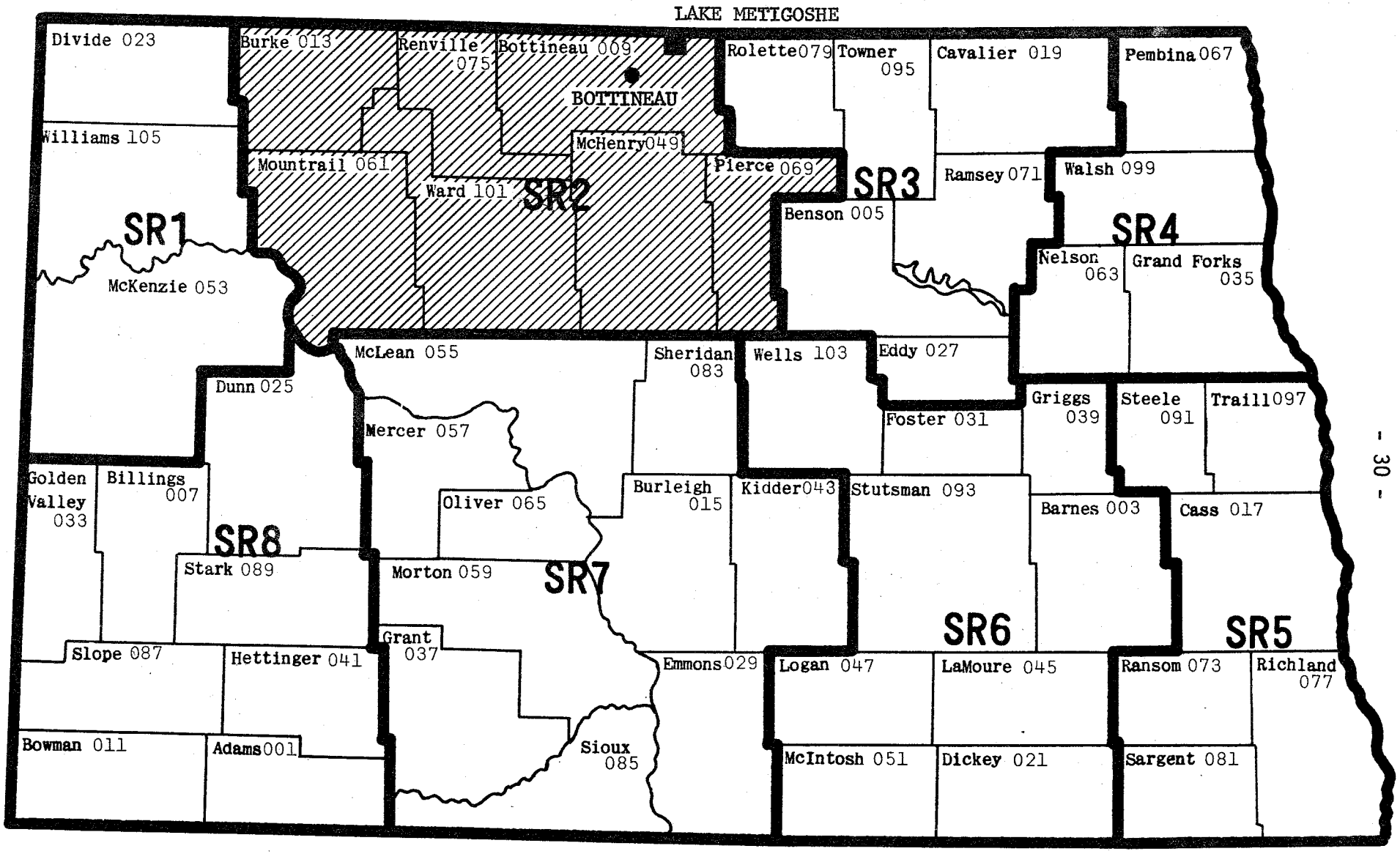


Figure 15. State Planning Region II, North Dakota, 1972

TABLE 5. EFFECT OF $1,826,427 RECREATION EXPENDITURES ON GROSS BUSINESS VOLUME OF BOTTINEAU COUNTY AND STATE PLANNING REGION II

Economic Sector	Change in Sales			
	Bottineau County		SPR II	
	($)	(%)	($)	(%)
1. Agriculture, Livestock	86,451	2.5	125,174	2.9
2. Agriculture, Crops	27,631	0.8	46,439	1.0
3. Mining	17,504	0.5	19,530	0.5
4. Construction	93,671	2.8	119,567	2.8
5. Transportation	13,833	0.4	19,691	0.5
6. Communications and Utilities	126,254	3.7	172,900	4.0
7. Agriculture Processing and Wholesaling	41,267	1.2	68,523	1.6
8. Retail	1,534,071	45.1	1,722,581	10.4
9. FIRE[a]	117,369	3.5	205,950	4.8
10. Business and Personal Services	571,037	16.8	590,822	13.9
11. Professional and Social Services	58,887	1.7	82,573	1.9
12. Households	609,585	17.9	950,215	22.3
13. Government	103,629	3.0	139,549	3.3
Totals	3,401,189	100.0	4,263,514	100.0

[a]Finance, Insurance, and Real Estate.

business volume of State Planning Region II was $896,092,000.[23] The economic impact of $3,401,189 was approximately $360 per person in Bottineau County in 1972.

Summary and Conclusions

This study was undertaken for the purpose of analyzing the economic impact of a recreation site on a rural community and to determine the recreationists' attitudes toward and perception of water quality factors at Lake Metigoshe.

Data for the study were obtained in a 1972 mail survey of 885 property owners and 3,500 tourists visiting Lake Metigoshe during the summer months (June through August) in 1972. Information obtained included expenditures per year for property owners and per trip for tourists.

[23]Senechal, Donald M., "Analysis of Validity of North Dakota Input-Output Models," Unpublished M.S. Thesis, North Dakota State University, Fargo, 1971.

User Characteristics

The 885 property owners had a total of 5,487 persons using their property for an average of 57.14 days per year. Forty percent of the users in this group were under 20 years of age and 32 percent were between 20 and 44 years of age.

Ninety percent of the persons owning property at Lake Metigoshe own vacation homes or cottages, 5 percent own permanent residences, 1 percent own businesses, and 4 percent own unplatted or undeveloped property. The average length of property ownership at Lake Metigoshe was 14 years. The median length of time property had been owned was between 6 and 10 years. Property owners traveled an average of 91.5 miles one way from their permanent home to reach Lake Metigoshe.

An estimated 12,179 tourist groups visited Lake Metigoshe during the summer of 1972. Each tourist group had an average of 5.3 people and made an average of 3.5 visits to the lake during the summer. The average length of stay per trip was 2.9 days and the median length of each visit was slightly over one day.

The composition of the tourist group of lake users was similar to the property owner group. Forty percent of the tourists were under 20 years of age and 34 percent were between the ages of 20 and 44. Tourists traveled an average of 150 miles (one way) from their permanent homes for recreation at Lake Metigoshe and had been visiting the lake an average of 9.9 years. Twenty-one percent of the tourists were visiting the lake for the first time.

Water Quality Perception

Respondents rating the water quality problem reveal 32 percent of the owners and 11 percent of the tourists sampled thought the problem was not serious. Seventy percent of the tourists and 48 percent of the owners thought the water quality problem was serious enough to cause concern.

When compared to other Midwestern lakes, 12 percent of the owners and 40 percent of the tourists said Lake Metigoshe had poorer water quality. Only 14 percent of the owners and 5 percent of the tourists thought Lake Metigoshe was better in water quality than other Midwestern lakes.

The property owners were requested to give their opinions about what factors they believed were causing a decline in water quality at Lake Metigoshe. Forty-five percent cited inadequate treatment and disposal of sewage as one of the three most important contributing factors. Thirty-seven percent indicated

that overuse of the lake for recreation and development was contributing to the decline in water quality. Twenty-nine percent of the owners thought improper control of the water level of the lake was part of the problem of declining water quality.

Sixty percent of the tourists (subsample 150) and 41 percent of the owners felt additional controls on the use of the lake were necessary in order to prevent a decline in water quality. Almost 30 percent of both groups thought strict controls and regulations were necessary. The type of changes and control advocated was proper sewage disposal, the enforcement of present regulations, control of the water level in the lake, zoning, and weed control.

Sixty-eight percent of the owners and 45 percent of the tourists cited scenic beauty of the area as one of the five main reasons they came to Lake Metigoshe. Activities, such as boating, fishing, and swimming, were reasons given by 62, 49, and 48 percent of the owner group, respectively. Tourists gave a greater variety of reasons for coming to Lake Metigoshe and the percentages of the group citing each reason as one of the top five were about equal. Reasons, such as close to home, visiting friends and relatives, camping, picnicking, and swimming, were mentioned most frequently by the tourist group.

Economic Impact

The estimated total direct user expenditure at Lake Metigoshe by owners and summer tourists was $2,020,201. The owner group spent an average of $875.81 for an estimated total annual expenditure of $775,081. Total tourist expenditures were estimated at $1,245,120--or an average of $29.21 per tourist group per trip during the summer of 1972.

When the economies of State Planning Region II and Bottineau County are divided into 13 sectors, the direct expenditures of lake property owners affected eight of the sectors and tourist expenditures were made in three of the sectors. Ninety percent of the expenditures were made to the retail and business and personal services sectors.

The total economic impact (direct and indirect) of the adjusted estimate of $1,826,427 of recreational expenditures on the Bottineau County economy was $3,401,189, with an additional $862,332 accruing to the economy of State Planning Region II. These latter figures are the total increase in gross business volume of the economy due to the goods and services sold to recreationists frequenting Lake Metigoshe.

Appendix

Appendix A: Characteristics of Property Owners and Tourists

APPENDIX TABLE A1. AGE AND SEX OF PERSONS USING PRIVATELY OWNED PROPERTY AT LAKE METIGOSHE, NORTH DAKOTA, 1972

Age	All Persons		Male		Female	
(years)	(number)	(percent)	(number)	(percent)	(number)	(percent)
12 and Under	540	17.4	275	9.0	265	8.5
13-19	696	22.4	403	13.0	293	9.4
20-44	995	32.0	520	16.7	475	15.3
45-64	713	22.9	351	11.3	362	11.6
65 and Over	162	5.2	83	2.7	79	2.5
Totals	3,106	100.0	1,632	52.7	1,474	47.3

APPENDIX TABLE A2. COMPOSITION OF TOURIST GROUPS BY AGE AND SEX, LAKE METIGOSHE, NORTH DAKOTA, 1972

Age	All Persons		Male		Female	
(years)	(number)	(percent)	(number)	(percent)	(number)	(percent)
12 and Under	1,182	22.4	614	11.6	568	10.8
13-19	979	18.5	506	9.6	473	9.0
20-44	1,811	34.3	883	16.7	928	17.6
45-64	1,041	19.7	553	10.5	488	9.2
65 and Over	266	5.0	123	2.3	143	2.7
Totals	5,279	100.0	2,679	50.7	2,600	49.3

APPENDIX TABLE A3. DISTANCE TRAVELED BY PROPERTY OWNERS FROM PERMANENT HOME TO LAKE METIGOSHE, NORTH DAKOTA, 1972

Miles Traveled	Owners	
	(number)	(percent)
Less Than 15	125	25.0
16-60	119	23.8
61-120	218	43.6
121-350	22	4.4
351 and Over	16	3.2
Totals	500	100.0

APPENDIX TABLE A4. DISTANCE TRAVELED BY TOURISTS TO LAKE METIGOSHE, NORTH DAKOTA, 1972

Distance	Tourists	
(miles)	(number)	(percent)
1-15	112	11.2
16-60	237	23.7
61-120	346	34.6
121-350	254	25.4
351-1,000	20	2.0
1,000 and Over	14	1.4
No Response	17	1.7
Totals	1,000	100.0

APPENDIX TABLE A5. LENGTH OF TIME PROPERTY OWNERS HAVE HELD TITLE TO PROPERTY AT LAKE METIGOSHE, NORTH DAKOTA, 1972

Years of Ownership	Owners	
	(number)	(percent)
5 and Under	129	25.8
6-10	113	22.6
11-20	161	32.2
Over 20	97	19.4
Totals	500	100.0

APPENDIX TABLE A6. YEARS OF VISITATION BY TOURIST GROUPS, LAKE METIGOSHE, NORTH DAKOTA, 1972

Years Visiting Lake	Tourists	
	(number)	(percent)
0-1	208	20.8
2-5	307	30.7
6-10	152	15.2
11-20	195	19.5
21 and Over	138	13.8
Totals	1,000	100.0

APPENDIX TABLE A7. DISTRIBUTION OF PROPERTY OWNERS AND TOURISTS BY THE NUMBER OF MILES TRAVELED TO REACH LAKE METIGOSHE, NORTH DAKOTA, 1972

Distance Traveled	Owners		Tourists	
(miles)	*(number)*	*(percent)*	*(number)*	*(percent)*
Less Than 15	125	25.0	112	11.2
16-60	119	23.8	237	23.7
61-120	218	43.6	346	34.6
121-350	22	4.4	254	25.4
351 and Over	16	3.2	34	3.4
No Response	0	0	17	1.7
Totals	500	100.0	1,000	100.0

Appendix B: Perceptions and Attitudes of Property Owners and Tourists

APPENDIX TABLE B1. PROPERTY OWNER AND TOURIST RESPONSE TO STATEMENTS ABOUT LAKE METIGOSHE, NORTH DAKOTA, 1972

Statement	Response[a]			
	Owners		Tourists	
	(number)	(percent)	(number)	(percent)
Beautiful Area--A Fine Lake	413	82.6	703	70.3
One of the Best Recreation Centers in North Dakota	350	70.0	473	47.3
The Area Has Potential for Growth and Development as a Recreational Area	91	18.2	361	36.1
The Lake Is Experiencing a Decline in Water Quality	182	36.4	283	28.3
The Lake Has Lost Its Attractiveness Because of Development, Pollution, and Congestion	269	53.8	267	26.7

[a]Based on multiple responses received from 500 property owners and 1,000 tourists.

APPENDIX TABLE B2. OPINIONS REPORTED BY OWNERS AND TOURISTS ON WATER QUALITY OF LAKE METIGOSHE, NORTH DAKOTA, 1972

Water Quality	Response			
	Owners		Tourists	
	(number)	(percent)	(number)	(percent)
No Problem	50	10	2	1
A Problem, But Not Serious	160	32	16	11
Problem Serious Enough to Cause Concern	240	48	105	70
No Opinion	50	10	27	18
Totals	500	100	150	100

APPENDIX TABLE B3. FACTORS AT LAKE METIGOSHE WHICH CAUSE RECREATIONISTS TO BELIEVE THE LAKE IS DECLINING IN WATER QUALITY

Factor	Response[a]			
	Owners		Tourists	
	(number)	(percent)	(number)	(percent)
Color of Water	54	10.8	59	39.3
Odor	60	12.0	41	27.3
Algae and Weeds in Lake	362	72.4	135	90.0
Skin Rashes, Sore Throats, Eye and Ear Infections, Vomiting, Etc., After Swimming	36	7.2	20	13.3
Garbage and Trash in the Lake	115	23.0	65	43.3
Condition of Beach and Shoreline	89	17.8	49	32.7
Lack of or Reduction in Number of Game Fish	52	10.4	37	24.7
Congestion (Too Many People and Cabins)	190	38.0	89	59.3
News and Publicity on the Subject	117	23.4	31	20.7
Excessive Number of Boats on the Lake	12	2.4	--	--
Water Level of the Lake	8	1.6	2	1.3

[a]Based on multiple responses received from 500 property owners and 150 tourists.

APPENDIX TABLE B4. FACTORS CONTRIBUTING TO WATER QUALITY DECLINE, LAKE METIGOSHE, 1972

Factor	Property Owner Response[a]	
	(number)	(percent)
Sewage Treatment and Disposal	230	45
Overuse of Lake	187	37
Water Level	146	29
Erosion	97	19
Natural Aging	98	20
Chemicals and Herbicides	54	10

[a]Based on multiple responses received from 500 property owners.

APPENDIX TABLE B5. CONTROLS NECESSARY TO PREVENT WATER QUALITY DECLINE AT LAKE METIGOSHE, 1972

Extent of Control	Response			
	Owners		Tourists	
	(number)	(percent)	(number)	(percent)
Present Controls Adequate	94	18.8	3	2.0
Additional Controls Are Needed	206	41.2	90	60.1
Many Strict Controls Are Needed	145	29.0	43	28.4
No Opinion	55	11.0	14	9.5
Totals	500	100.0	150	100.0

APPENDIX TABLE B6. TYPE OF CONTROLS NEEDED TO REGULATE WATER QUALITY AT LAKE METIGOSHE, 1972

Type of Control	Response			
	Owners		Tourists	
	(number)	(percent)	(number)	(percent)
Sewage Disposal	107	21.4	83	55.3
Enforcement of Present Regulations	95	19.0	--	--
Water Level	52	10.4	3	2.0
Zoning	12	2.4	7	4.7
Weed Control	7	1.4	21	14.0
No Response	227	45.4	36	24.0
Totals	500	100.0	150	100.0

Appendix C: Economic Impact

APPENDIX TABLE C1. ESTIMATED DIRECT RECREATION-BASED EXPENDITURES BY PROPERTY OWNERS AND TOURISTS, LAKE METIGOSHE, NORTH DAKOTA, 1972

Expenditure by Industry	Lake Property Owners			Tourist			Recreation Groups Combined	
	Average Expenditure[a]	Total Expenditure[b]		Average Expenditure[c]	Total Expenditure[d]		Total Expenditure[e]	
	($)	($)	(%)	($)	($)	(%)	($)	(%)
Eating and Drinking	72.03	63,746	8.2	10.29	438,626	35.2	502,372	24.9
Grocery and Food	133.77	118,386	15.3	4.47	190,540	15.3	308,926	15.3
Clothing	23.18	20,514	2.6	0.83	35,379	2.8	55,893	2.8
General Merchandise (Appliances, Etc.)	32.10	28,408	3.7	0.36	15,345	1.2	43,753	2.2
Building Supplies and Hardware	132.69	117,430	15.1	0.27	11,509	0.9	128,939	6.4
Automobile Services, Gas and Repair	60.86	53,861	6.9	4.02	171,358	13.8	225,219	11.1
Recreational Equipment (Boats, Fishing Equipment, Etc.)	152.69	135,130	17.4	2.25	95,909	7.7	231,039	11.4
Business Services (Plumber, Etc.)	47.02	41,612	5.4	--	--	--	41,612	2.1
Amusement and Recreation (Movies, Golf, Etc.)	5.82	5,150	0.7	1.80	76,727	6.2	81,877	4.1
Personal Services (Barbers, Dry Cleaners, Etc.)	4.62	4,088	0.5	0.24	10,230	0.8	14,318	0.7
Banking Services	3.47	3,070	0.4	--	--	--	3,070	0.1
Legal Services	2.07	1,831	0.2	0.03	1,278	0.1	3,109	0.1
Medical Services	11.08	9,805	1.3	0.16	6,820	0.5	16,625	0.8
Taxes	64.39	56,985	7.4	--	--	--	56,985	2.8
Insurance	38.02	33,647	4.3	--	--	--	33,647	1.7
Utility Costs (Electricity, Garbage, Etc.)	61.85	54,737	7.1	--	--	--	54,737	2.7
Sand, Gravel, Concrete	18.62	16,478	2.1	--	--	--	16,478	0.8
Charity	2.89	2,557	0.3	--	--	--	2,557	0.1
Other Expenses	8.64	7,646	1.0	--	--	--	7,646	0.4
Lodging (Hotels, Motels)	--	--	--	4.28	182,441	14.7	182,441	9.0
Camping Fees	--	--	--	0.21	8,958	0.7	8,958	0.4
Totals[f]	875.81	775,081	100.0	29.21	1,245,120	100.0	2,020,201	100.0

[a] Average total (1971) expenditure of lake property owners sampled.
[b] Total estimated annual expenditure for 1971 by lake property owners arrived at by: (average expenditure)(885 lake property owners).
[c] Average expenditure per trip by tourist groups during the summer of 1972.
[d] Total estimated expenditure for the 1972 summer season by tourists was arrived at by: (12,179, number of tourist groups)(3.5, average number of trips)($29.21, averaged expenditure per trip).
[e] Total estimated annual expenditure of property owners and summer tourists.
[f] Percentage totals may not equal 100 due to rounding.

APPENDIX TABLE C2. RECREATIONISTS' EXPENDITURES BY ECONOMIC SECTOR IN THE BOTTINEAU COMMUNITY, NORTH DAKOTA, 1972

Economic Sector	Expenditures		
	Owners	Tourists	Total
	($)	($)	($)
1. Agriculture, Livestock	--	--	--
2. Agriculture, Crops	--	--	--
3. Mining	12,358	--	12,358
4. Construction	44,036	--	44,036
5. Transportation	--	--	--
6. Communication and Utilities	41,052	--	41,052
7. Agriculture Processing and Wholesaling	--	--	--
8. Retail	318,674	787,325	1,105,999
9. FIRE[a]	27,537	--	27,537
10. Business and Personal Services	86,185	449,700	535,885
11. Professional and Social Services	8,727	8,095	16,822
12. Households	--	--	--
13. Government	42,738	--	42,738
Totals	581,307	1,245,120	1,826,427

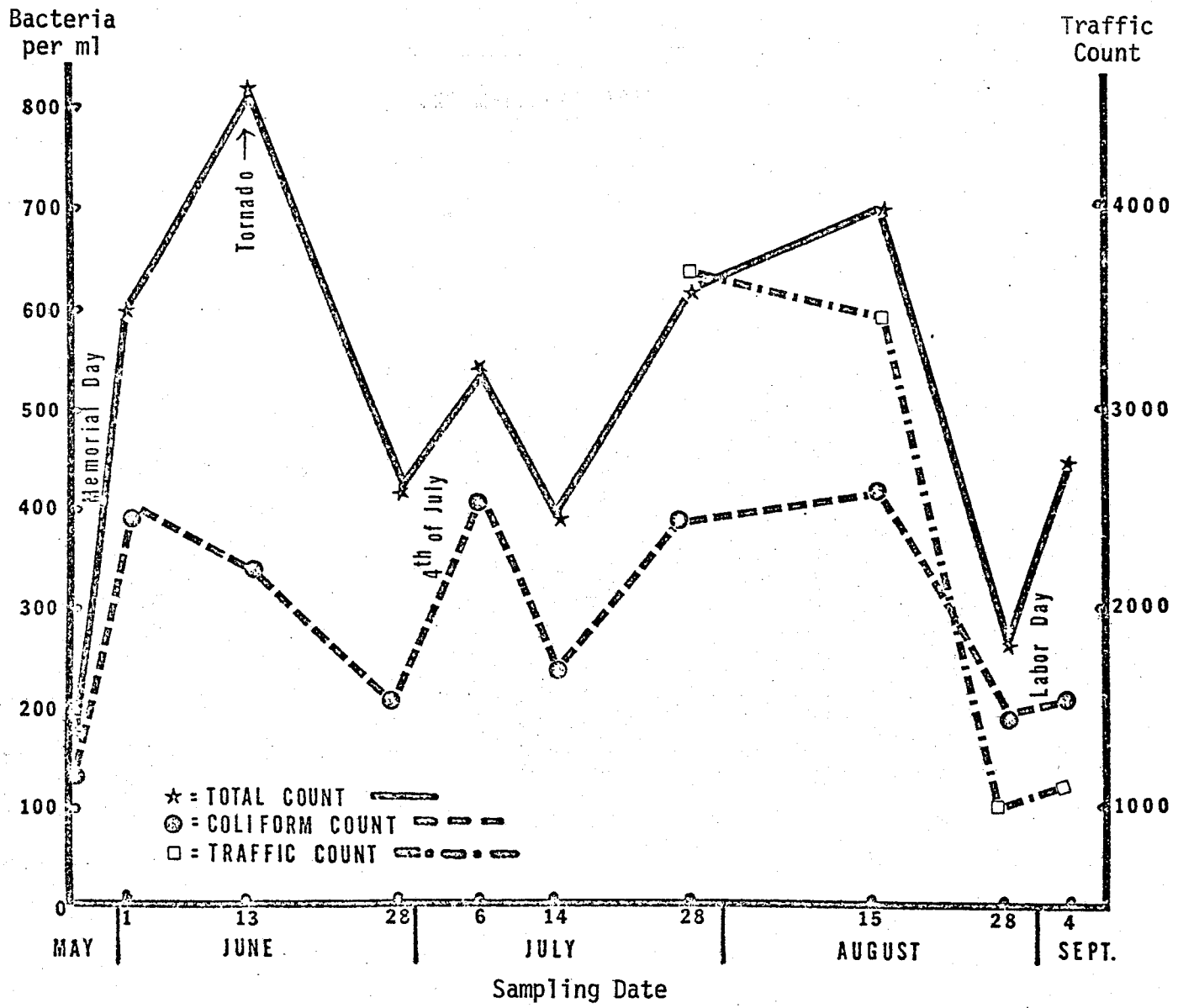
[a]Finance, Insurance, and Real Estate.

APPENDIX TABLE C3. EFFECT OF $1,826,427 RECREATION EXPENDITURES ON GROSS BUSINESS VOLUME OF BOTTINEAU COUNTY AND STATE PLANNING REGION II

Economic Sector	Change in Sales			
	Bottineau County		SPR II	
	($)	(%)	($)	(%)
1. Agriculture, Livestock	86,451	2.5	125,174	2.9
2. Agriculture, Crops	27,631	0.8	46,439	1.0
3. Mining	17,504	0.5	19,530	0.5
4. Construction	93,671	2.8	119,567	2.8
5. Transportation	13,833	0.4	19,691	0.5
6. Communication and Utilities	126,254	3.7	172,900	4.0
7. Agriculture Processing and Wholesaling	41,267	1.2	68,523	1.6
8. Retail	1,534,071	45.1	1,722,581	40.4
9. FIRE[a]	117,369	3.5	205,950	4.8
10. Business and Personal Services	571,037	16.8	590,822	13.9
11. Professional and Social Services	58,887	1.7	82,573	1.9
12. Households	609,585	17.9	950,215	22.3
13. Government	103,629	3.0	139,549	3.3
Totals	3,401,189	100.0	4,263,514	100.0

[a]Finance, Insurance, and Real Estate.

Appendix D: Bacterial Counts and Traffic Counts



Appendix Figure D1. Bacterial Counts Per Week With Traffic Counts, Lake Metigoshe, 1972

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