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A Study of Boat Ownership in the Omaha-Council Bluffs Metropolitan Area

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A STUDY OF BOAT OWNERSHIP
IN THE
OMAHA-COUNCIL BLUFFS METROPOLITAN AREA

By

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Omaha District Office of the Army Corps of Engineers



Center for Applied Urban Research
University of Nebraska at Omaha

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The cover photograph is courtesy of the Nebraska Game and Parks Commission.

Any opinions expressed in the report are those of the authors and do not necessarily represent those of the University of Nebraska at Omaha.

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A STUDY OF BOAT OWNERSHIP
IN THE OMAHA-COUNCIL BLUFFS METROPOLITAN AREA

Introduction

Continuing increases in leisure time, income, greater mobility, levels of education, and general health have whetted and nourished the American appetite for outdoor recreation activities. Statistics indicate that almost every American engages in one or more recreation activities when he or she is at all able. Measured by the number of recreation occasions, American outdoor recreation activity increased by 53 percent between 1960 and 1965. From 1965 to 1980, it will increase by another 59 percent.¹

With more and more Americans continuing to turn to outdoor recreation activity, pressures on public and private recreation resources and facilities far exceed previous expectations.

During the past two decades, recreational boating has increased its popularity in Omaha as well as throughout the United States. For instance, the number of registered boats in Douglas County increased from 3,515 in 1966 to 7,297 in 1976, an increase of 108 percent within a ten year period. In responding to increasing needs for boating facilities, the Omaha District Corps of Engineers is considering a project for the construction of small boat harbors in the Omaha-Council Bluffs Metropolitan Area. The harbors would be constructed along the Missouri River at three possible locations:

1. Marina City in downtown Omaha.
2. Near Haworth Park in Bellevue, Nebraska.
3. At the Chain o'Lakes area in Council Bluffs, Iowa.

In determining the feasibility of constructing these harbors, efforts have been directed toward estimating the existing demand for moorage space and to project this demand into the future. Factors affecting the demand for moorage space are numerous, but the number of power boats in the Omaha-Council Bluffs metropolitan area is the obvious major one.

¹U.S. Senate, Committee on Interior and Insular Affairs, The Recreation Imperative, U.S. Government Printing Office, Washington: 1974, p. 201.

In response to a request from the Omaha District Corps of Engineers, the Center for Applied Urban Research has entered into a contract with the Corps to conduct an analysis of boat ownership as a part of the demand study. The major objectives of this project are to identify quantitatively factors significantly affecting power boat ownership and to estimate and project the total number of power boats up to 1980 and 1985.²

Data Source and Methodology

The method of multiple regression analysis was used to identify and establish factors significantly contributing to boat ownership. In conducting regression analysis both cross-sectional and time-series models were employed. The major purpose of using a cross-sectional model in regression analysis is its wide adaptability, while the major purpose of using a time-series model in regression analysis is its ability of projection. The use of two regression models serves to complement each other given the problems of multicollinearity and autocorrelation.³

Only secondary and published data were used in the analysis. For the data not readily available, estimates were made by using established statistical procedures. Major sources of data included but were not limited to the Nebraska Game and Parks Commission, the Iowa Conservation Commission, the Omaha Metropolitan Area Planning Agency (MAPA), the Omaha Planning Department, the Omaha Recreation Division, and the Omaha District Offices of the Army Corps of Engineers.

Boating Pattern in the Study Area

The Study Area

The study area consisted of five counties located mainly in the Omaha-Council Bluffs metropolitan area (Map 1).⁴ These counties were: Douglas

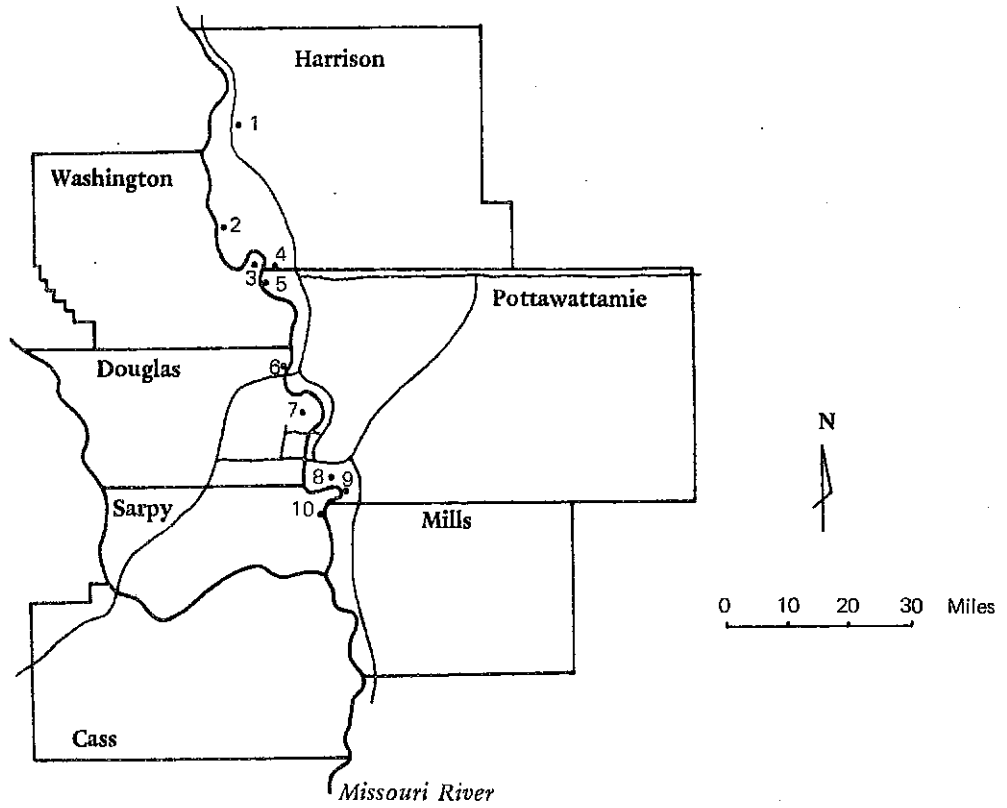
²Boats were categorized into five classes by the Nebraska Game and Parks Commission. Boats of class I were small (less than 16 feet in length and powered by engines of 5 horsepower or less), and owners of such boats would not be potential users of small boat harbors. Therefore, boats of class I were excluded in the regression analysis and projections. Power boats in this study refer to boats of class II to class V.

³For a detailed discussion of multicollinearity and autocorrelation and their problems in regression analysis see Brennan (1960).

⁴Usually the term "Omaha-Council Bluffs metropolitan area" means Omaha-Council Bluffs Standard Metropolitan Statistical Area (SMSA) which comprises Douglas and Sarpy Counties in Nebraska and Pottawattamie County in Iowa.

MAP 1

LOCATION OF BOATING AREAS IN OMAHA-COUNCIL BLUFFS METROPOLITAN AREA



- | | |
|--------------------|--------------------|
| 1. Round Lake | 6. N.P. Dodge Park |
| 2. California Bend | 7. Carter Lake |
| 3. DeSoto Bend | 8. Lake Manawa |
| 4. Nobles Lake | 9. Long's Landing |
| 5. Wilson Island | 10. Haworth Park |

Sarpy, Washington, and Cass in Nebraska, and Pottawattamie in Iowa. The area had a total population of 615,900 in 1976, mostly living in cities. Outdoor recreation, including water-related activities, has been ranked as good to excellent by most of the residents (Todd, 1975, p. 5). Power boating has become increasingly popular in this area. Table 1 and Map 1 show the names and locations of the major power boating facilities and their estimated annual visitation (persons).

Boating Pattern

Outdoor recreation has become an integral part of the lifestyle of many Americans. The Omaha metropolitan area, characterized by a high concentration of urban residents, is no exception. With increasing population, climbing incomes, and shorter work weeks, outdoor recreation continues to increase. For example, power boating has become an increasingly popular outdoor sport in the Omaha metropolitan area for the past two decades. The number of power boats in the five-county study area has increased from 5,703 in 1966 to 11,825 in 1976, representing 107 percent increase within a ten-year period (Table 2). The popularity of power boating could be further revealed by looking at the number of power boats owned per thousand population. Approximately 11 out of every thousand persons owned a boat in 1966 as compared to about 19 out of every thousand in 1976 (Table 3). The increase is almost 100 percent.

Growth trends of power boats and of total boat registrations are shown in Chart 1. As the number of power boats increases, the demand for water surface acreage, number of harbors, and boating related facilities such as the number of slips, concessions, and gasoline service stations will increase. The 1973 State Comprehensive Outdoor Recreation Plan (SCORP) indicated that the most critical need in Region 1 (the Omaha area) was for additional boating and fishing acreage and facilities. The deficiency of water suitable for power boating, skiing, and fishing in the Omaha area was estimated to be 18,000 acres.

Regression Analysis and Major Findings

Both cross-sectional data and time-series data were used in conducting the regression analyses. A discussion of both approaches follows.

TABLE 1

EXISTING RECREATION AREAS WITH WATER SURFACE SUITABLE FOR POWER
BOATING IN THE OMAHA-COUNCIL BLUFFS METROPOLITAN AREA, 1975

| Name | Water Surface (Acres) | Estimated Annual Visitation (Persons) |
|---|--------------------------|---|
| Round Lake | 131 | Not Available |
| California Bend | 360 | Not Available |
| DeSoto Bend National Wildlife Refuge | 800 | 319,800 |
| Nobles Lake | 164 | Not Available |
| Wilson Island River Access | 500 | 80,000 |
| N.P. Dodge Park | Missouri River | Heavily Used No Count Available |
| Levi Carter Park | 281 | 48,200 |
| Lake Manawa State Park | 660 | 705,300 |
| Long's Landing River Access | 500 | 73,100 |
| Haworth Park | Missouri River | Heavily Used No Count Available |

Source: Omaha District Office, U. S. Army Corps of Engineers.

TABLE 2

NUMBER OF REGISTERED BOATS FOR THE
FIVE COUNTIES IN THE STUDY AREA, 1966-76

| Year | Number of Registered Boats (Classes II-V) | | | | | Total | Total Boat Registrations |
|------|---|---------|-------|------------|---------------|--------|--------------------------|
| | Cass | Douglas | Sarpy | Washington | Pottawattamie | | |
| 1966 | 190 | 3,515 | 272 | 208 | 1,518 | 5,703 | 6,874 |
| 1967 | 201 | 3,876 | 320 | 228 | 1,765 | 6,390 | 7,716 |
| 1968 | 223 | 4,129 | 324 | 253 | 1,839 | 6,768 | 8,181 |
| 1969 | 243 | 4,344 | 352 | 257 | 1,845 | 7,041 | 8,528 |
| 1970 | 264 | 4,458 | 385 | 265 | 1,931 | 7,303 | 8,858 |
| 1971 | 280 | 4,994 | 446 | 306 | 2,198 | 8,224 | 9,988 |
| 1972 | 319 | 5,529 | 519 | 355 | 2,238 | 8,960 | 10,896 |
| 1973 | 385 | 5,972 | 603 | 370 | 2,518 | 9,848 | 11,996 |
| 1974 | 401 | 6,387 | 725 | 399 | 2,646 | 10,558 | 12,876 |
| 1975 | 448 | 6,814 | 784 | 414 | 2,496 | 10,956 | 13,382 |
| 1976 | 487 | 7,297 | 848 | 450 | 2,743 | 11,825 | 14,480 |

Source: Nebraska Game and Parks Commission, Lincoln, Nebraska.

TABLE 3

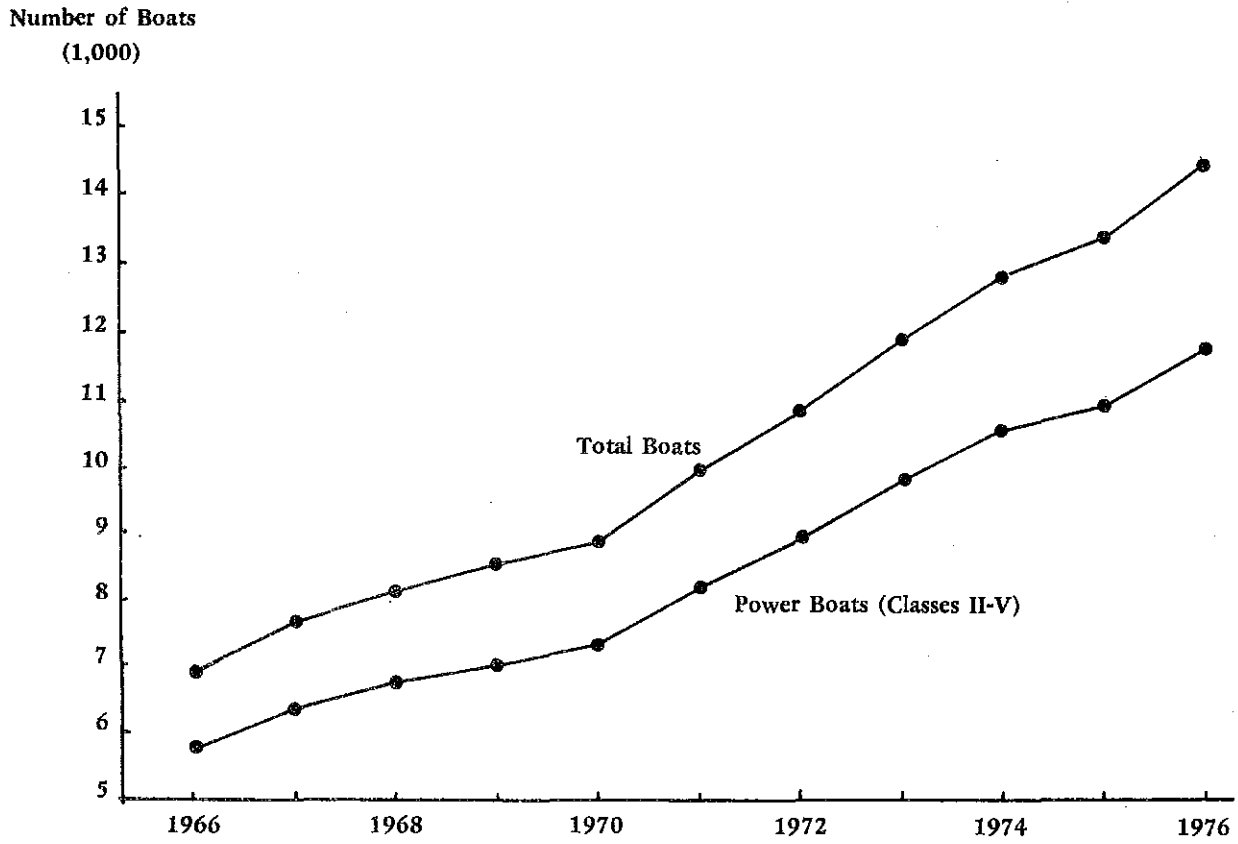
POPULATION, MEDIAN FAMILY INCOME, AND BOATS PER THOUSAND POPULATION
FOR OMAHA-COUNCIL BLUFFS METROPOLITAN AREA, 1966-76^{a/}

| Year | Population | Boats (Class II to V) Per 1,000 Population | Median Family Income (\$) |
|------|------------|--|------------------------------|
| 1966 | 541,000 | 10.54 | 8,709 |
| 1967 | 549,500 | 11.63 | 9,144 |
| 1968 | 557,600 | 12.14 | 9,643 |
| 1969 | 564,600 | 12.47 | 10,113 |
| 1970 | 574,032 | 12.72 | 10,728 |
| 1971 | 590,200 | 13.93 | 11,259 |
| 1972 | 602,400 | 14.87 | 12,159 |
| 1973 | 606,000 | 16.25 | 13,203 |
| 1974 | 609,400 | 17.33 | 13,720 |
| 1975 | 607,800 | 18.03 | 14,970 |
| 1976 | 615,900 | 19.20 | 16,161 |

^{a/} Including Cass, Douglas, Sarpy, Washington, and Pottawattamie Counties.

Sources: (1) Population Estimates, Bureau of the Census, U. S. Department of Commerce (2) 1969 Median Family Income was obtained from 1972 County and City Data Book, Bureau of Census. For other years, median family income was estimated assuming the rates of changes in median family income were the same as in the average wages per employee. Wage and employee data were from County Business Patterns. Median family income for an area comprised of more than a county was calculated by taking the average of the counties' median family incomes, weighted by the counties' populations.

CHART 1: NUMBERS OF REGISTERED BOATS IN THE STUDY AREA



Source: Same as in Table 2.

Cross-sectional Regression Analysis

Determination and selection of boating areas. At least 15 observations are needed in order to gain a high level of reliability in establishing the significance of each independent variable. Hence 15 power boating areas were determined for analytical purposes. A boating area comprised one or more counties commonly sharing one or more water surfaces suitable for power boating. Three additional criteria were used for determination of the boating areas: 1) boating sites are roughly within a 40-mile radius of major population centers, with fair to good highway accessibility between the sites and the population centers, 2) the facilities such as boat ramps, gas stations, and other concessions exist in the boating sites, and 3) the boating sites are all located either in the Omaha metropolitan area or elsewhere in the State of Nebraska which can be assumed to have similar factors affecting most boaters such as the length of the boating season, weather conditions, and the proximity to the study area. The 15 boating areas selected are outlined on Map 2, and the sites for power boating in each area are listed in Table 4.

The selection of independent variables. Independent variables in this study were defined as those factors affecting boat ownership (the dependent variable). The selection of independent variables was based upon the following principles: a) Consumer demand and behavior theories and/or hypotheses generated from literature research and b) those variables whose values are either readily available or might be estimated with adequate reliability.

For example, total population and median family income were selected as two major independent variables since they represent the total number of consumers in the markets and their willingness and ability to purchase the commodity (McConnel, 1977). Since the availability of water surface suitable for power boating and the existence of boat ramps are necessary conditions for power boating, both the amount of water surface acreage and the number of boat ramps were selected as independent variables. Table 5 shows the magnitudes of all the independent variables selected for cross-sectional regression analysis.

MAP 2. BOATING AREAS AND BOATING SITES



Boating Area with number corresponding to Table 5

• Boating Site

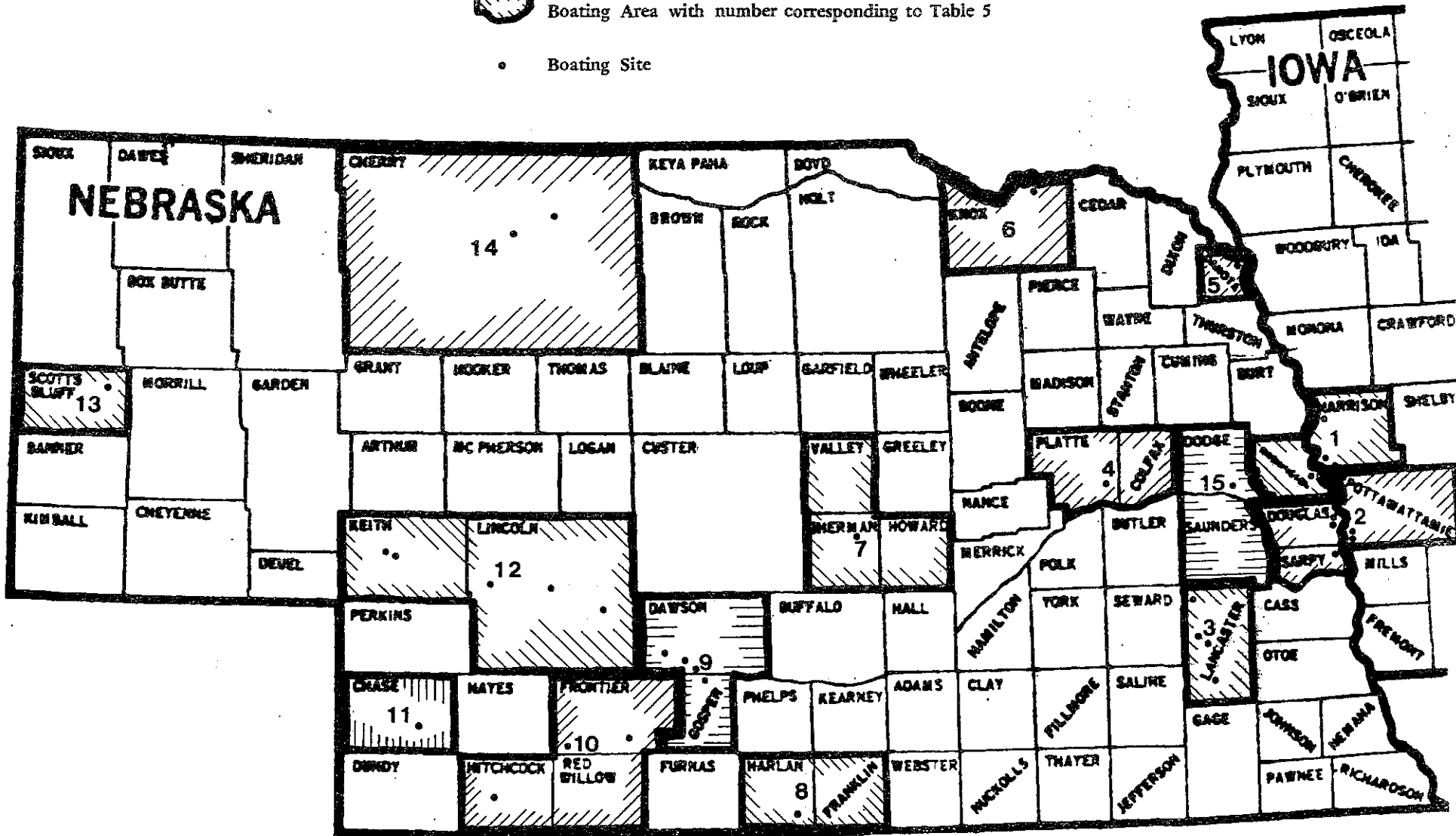


TABLE 4

SITES FOR POWER BOATING IN THE SELECTED BOATING AREAS

| Boating Area | County | Names of Lakes, Parks, Harbors, and Reservoirs Suitable for Power Boating * |
|--------------|--|---|
| 1. | { Washington Harrison (Iowa) | DeSoto Bend Lake California Bend (Iowa) |
| 2. | { Douglas Sarpy Pottawattamie (Iowa) | Carter Lake (Iowa), N. P. Dodge Park, Haworth Park, Lake Manawa (Iowa), Long's Landing (Iowa), Wilson Island (Iowa) |
| 3. | Lancaster | Bluestem, Conestoga, Pawnee, Branched Oak |
| 4. | { Platte Colfax | Lake North |
| 5. | Dakota | (Three small boat harbors in Sioux City) |
| 6. | Knox | Lewis and Clark Lake |
| 7. | { Sherman Howard Valley | Sherman Reservoir |
| 8. | { Harlan Franklin | Harlan County Reservoir |
| 9. | { Dawson Gosper | Gallagher Canyon Reservoir, Midway Canyon Reservoir, Plum Creek Reservoir, Johnson Lake |
| 10. | { Frontier Red Willow Hitchcock | Harry D. Strunk Lake (Medicine Creek), Hugh Butler Lake (Red Willow), Swanson Reservoir |
| 11. | Chase | Enders Reservoir |
| 12. | { Lincoln Keith | Lake Maloney, Jeffrey Canyon Reservoir, Sutherland Reservoir, Lake Ogallala, Lake McConaughy |
| 13. | Scotts Bluff | Minatare Lake |
| 14. | Cherry | Merritt Reservoir, Big Alkali Lake |
| 15. | { Dodge Saunders | Fremont Lakes |

* Sources: (1) Nebraska Game and Parks Commission, (2) Omaha District Office, U. S. Army Corps of Engineers.

TABLE 5

VARIABLES USED FOR CROSS-SECTIONAL
REGRESSION ANALYSIS

| Boating Area | County | Number of Power Boats (1975) | Power Boats Per 1,000 Population (1975) | Population (1975) | Median Family Income (1975) | Water Surface Suitable For Boating (Acres) | Water Acres Per 1,000 Population | Number of Boat Ramps |
|--------------|---------------------------------------|------------------------------|---|-------------------|-----------------------------|--|----------------------------------|----------------------|
| 1 | { Washington Harrison | 793 | 25.7 | 30,900 | 12,677 | 1,455 | 47.1 | 5 |
| 2 | { Douglas Sarpy Pottawattamie | 10,067 | 17.5 | 573,700 | 15,144 | 3,941 | 6.9 | 9 |
| 3 | Lancaster | 4,158 | 22.8 | 182,600 | 14,987 | 3,095 | 16.9 | 10 |
| 4 | { Platte Colfax | 613 | 16.2 | 37,900 | 14,447 | 900 | 23.7 | 1 |
| 5 | Dakota | 385 | 24.4 | 15,800 | 13,175 | 1,500 | 94.9 | 3 |
| 6 | Knox | 281 | 25.1 | 11,200 | 8,391 | 7,349 | 656.2 | 4 |
| 7 | { Sherman Howard Valley | 400 | 24.0 | 16,700 | 9,215 | 2,845 | 170.4 | 3 |
| 8 | { Harlan Franklin | 277 | 31.1 | 8,900 | 10,359 | 13,600 | 1,528.1 | 2 |
| 9 | { Dawson Gosper | 749 | 32.3 | 23,200 | 11,553 | 4,081 | 175.9 | 6 |
| 10 | { Frontier Red Willow Hitchcock | 844 | 40.6 | 20,800 | 11,962 | 8,370 | 402.4 | 9 |
| 11 | Chase | 199 | 44.2 | 4,500 | 12,505 | 1,707 | 379.3 | 4 |
| 12 | { Lincoln Keith | 1,777 | 41.0 | 43,300 | 12,605 | 40,137 | 927.0 | 12 |
| 13 | Scotts Bluff | 981 | 27.1 | 36,200 | 12,297 | 2,158 | 59.6 | 2 |
| 14 | Cherry | 296 | 42.3 | 7,000 | 11,906 | 3,748 | 535.4 | 3 |
| 15 | { Dodge Saunders | 1,205 | 22.3 | 54,100 | 13,285 | 270 | 5.0 | 6 |

Sources: 1. Boats - same as in Table 2.
2. Population and median family income - same as in Table 3.
3. Water acres and ramps - same as in Table 4,

Model. For conducting a cross-sectional regression analysis, the following regression (equation 1) is defined:

$$Y_i = a + b_1X_{1i} + b_2X_{2i} + b_3X_{3i} + b_4X_{4i} \dots(1)$$

where Y_i = number of power boats registered in 1975 for boating area i.

X_{1i} = median family income of 1975 for boating area i.

X_{2i} = total population of 1975 for boating area i.

X_{3i} = water surface acreage suitable for boating in boating area i.

X_{4i} = number of boat ramps for boating area i.

a = constant

b's = regression coefficients to be estimated.

Table 6 shows the matrix of correlation coefficients among independent and dependent variables. The total population is highly correlated with the number of boats. Median family income and number of boat ramps are also significantly correlated with the dependent variable (at a 5 percent significance level) even though their correlation coefficients are relatively low. Water surface acreage does not correlate with the number of boats at all. One possible explanation for this phenomenon is that the existence of boating facilities such as the number of boat ramps is a crucial factor for boating regardless of the relative size of the water surface acreage.

A step-wise multiple regression analysis was used to determine the factors associated with power boat ownership. In the use of this process, the regression coefficient between median income and boat ownership became statistically insignificant primarily because of the strong correlation between median income and the dominant factor of population. Thus, median family income has been dropped from the equation. The final regression equation (equation 2) established is as follows:

$$Y_i = 121.7 + 0.0165X_{2i} + 91.51X_{4i} \dots(2)$$

t: (47.31)** (5.987)**

Estimated Standard Error = 170.5

$R^2 = 0.99$

** significant at 1% significance level.

TABLE 6

CORRELATION MATRIX

| | Number of Boats | Population (1975) | Median Family Income (1975) | Water Surface Acres | Water Surface Acres Per 1,000 Population | Number of Boat Ramps |
|--|-----------------------|----------------------|-----------------------------------|------------------------|---|----------------------------|
| Number of Boats | 1.00 | 0.99** | 0.58* | <0.01 | -0.28 | 0.54** |
| Population (1975) | | 1.00 | 0.55* | -0.07 | -0.30 | 0.44 |
| Median Family Income (1975) | | | 1.00 | -0.13 | -0.52* | 0.36 |
| Water Surface Acres | | | | 1.00 | 0.64* | 0.54* |
| Water Surface Acres Per 1,000 Population | | | | | 1.00 | -0.02 |
| Number of Boat Ramps | | | | | | 1.00 |

* Significant at 5% significance level.

** Significant at 1% significance level.

Results. As equation 2 indicates both total population and the number of boat ramps in a boating area were significantly contributing factors to the number of boats owned by area residents. Their combined effects could explain 99 percent of the variation in boat ownership as indicated by the magnitude of the adjusted multiple regression correlation R^2 .

Median family income was not found as a significant factor affecting boat ownership. While it may appear surprising, the finding is similar to other studies, e.g. U. S. Army Corps of Engineers (1974).

Time-series Regression Analysis and Boat Ownership Projection

The selection of independent variables. The selection of independent variables for a time-series regression analysis was based upon the same principle as it was for cross-sectional regression analysis. In addition to total population and median family income, a time variable was selected to represent changes in consumers' tastes and preferences.

The regression analysis was conducted using data relevant to the five county study areas, and data cover a ten-year time period from 1966 to 1976. Table 3 shows magnitudes of all independent variables selected for conducting the time-series regression analysis.

Model. The following regression equation (equation 3) is defined for conducting a time-series regression analysis:

$$Y_t = a + b_1 X_{1t} + b_2 X_{2t} + b_3 X_{3t} \quad \dots(3)$$

- Where: Y_t = number of power boats registered for year t.
 X_{1t} = median family income for year t.
 X_{2t} = total population for year t.
 X_{3t} = a time variable (year) representing changes in consumers' tastes.
 t = year from 1966 to 1976
 a = constant
 b 's = regression coefficients.

Table 7 shows the correlation matrix among all variables. The correlation coefficients are significantly high not only between the dependent variable and independent variables but also among various independent

TABLE 7

CORRELATION MATRIX
FOR TIME-SERIES REGRESSION ANALYSIS

| | Number of Boats | Total Population | Median Family Income | Time Variable |
|-------------------------|--------------------|---------------------|-------------------------|---------------|
| Number of Boats | 1.00 | 0.96** | 0.99** | 0.99** |
| Total Population | | 1.00 | 0.94** | 0.97** |
| Median Family Income | | | 1.00 | 0.98** |
| Time Variable | | | | 1.00 |

** Significant at 1% significance level.

variables.⁵

In the process of conducting regression analysis, the regression coefficient of the time variable was found insignificant and thus, was dropped from the equation. The final equation established is as follows:

$$Y_t = -9262.231 + 0.6530 X_{1t} + 0.0172 X_{2t} \dots(4)$$

$$t: \qquad \qquad (8.8086)^{**} \quad (2.5578)^*$$

Estimated Standard Error = 200.7913

$$R^2 = 0.99$$

* significant at 5% significance level

** significant at 1% significance level

Major findings. Equation 4 indicates that both population and median family income were significant factors contributing to boat ownership. Both factors had positive effects on the number of power boats owned by area residents. Their combined effects could explain 99 percent of the variation in boat ownership as indicated by the magnitudes of the adjusted multiple regression correlation coefficient, R^2 .

Boat ownership projection. Once estimates of parameters were found, the time-series regression equation could be used to make a projection. Since both population and median family income are exogenous variables,⁶ their values are either taken as given or are determined outside the regression model. Table 8 shows population and income projections up to 1980 and 1985.

Substituting independent variables in equation 4 for their respective values obtained from Table 8, the projected number of power boats can be obtained. For example, the projected number of power boats is 12,768 for 1980 and 14,501 for 1985.

In reading the projections, readers are cautioned that the regression

⁵The existence of a high correlation among independent variables indicates the presence of a linear relation among them or multicollinearity. The problem associated with multicollinearity is the difficulty in measuring the separate influences of these independent variables upon the dependent variables.

⁶Exogenous variables are those variables whose values are assumed to be known and taken as given for the purpose of the model. For a detailed explanation of this concept, see Brennan (1960), pp. 11, 204, and 205.

TABLE 8

INCOME AND POPULATION PROJECTIONS, 1980-85

| County | Population | | Median Family Income | |
|---------------|---------------|---------------|----------------------|---------------|
| | (1980) | (1985) | (1980) | (1985) |
| Cass | 19,210 | 19,812 | 12,927 | 14,598 |
| Douglas | 428,936 | 445,319 | 17,735 | 19,661 |
| Sarpy | 81,929 | 89,363 | 15,416 | 17,324 |
| Washington | 15,681 | 17,011 | 15,223 | 17,065 |
| Pottawattamie | <u>88,757</u> | <u>91,407</u> | <u>15,935</u> | <u>17,854</u> |
| Total | 634,513 | 662,912 | 16,976 | 18,879 |

Sources: (1) Population of Nebraska County: Vicki Stepp, Nebraska Population Projections II, Bureau of Business Research, The University of Nebraska-Lincoln, Lincoln, Nebraska, July, 1976. Population of Pottawattamie: John P. Zipay, Pottawattamie County Population Projections, 1975-2020, CAUR, CPACS, University of Nebraska at Omaha, May, 1974. Medium Series were used. (2) Median Family Income was assumed to grow at the same rate as per capita income. Per capita income projections: Nebraska Economic Projections, 1975-2000, Bureau of Business Research, The University of Nebraska-Lincoln, Lincoln, Nebraska, July, 1974. Growth rate of per capita income for Pottawattamie was assumed to be the average rate of the four Nebraska counties.

yields a standard error of about 201 boats. In other words, the projected number of power boats carries a margin of error of about 394 boats at a 95 percent confidence level. Table 9 shows the estimated and/or projected total number of power boats along with the actual number of boats registered.

Summary and Conclusions

During the past two decades, recreational power boating has increased in popularity in the vicinity of Omaha as well as throughout the United States. For instance, the total number of registered boats suitable for power boating in the five-county metropolitan area has more than doubled for a ten-year period from 1966 to 1976. Boating popularity could be further revealed by looking at the number of power boats owned per thousand population. Approximately 11 out of every thousand persons owned a boat in 1966. This number was almost doubled in 1976.

As the total number of power boats increases, the needs for water surface acreage and the amount of boating facilities will increase. In determining the feasibility of constructing more harbors, efforts have been directed toward estimating the existing demand for moorage space and factors affecting boat ownership. This study mainly reports findings from regression analyses of boat ownership.

Two regression models have been used: the cross-sectional model and the time-series model. The former was designed to identify factors significantly affecting boat ownership and the latter to forecast the number of boats in 1980 and 1985. The population and the number of boat ramps are major factors affecting boat ownership in the vicinity of Omaha as well as in boating areas in the State of Nebraska. The combined effects of these two factors could explain 99 percent of the variation of the number of power boats.

From the analysis of time-series data, total population and median family income have been found to affect significantly the number of power boats for a period between 1966 and 1976. Their combined effects also explain about 99 percent of the variation of the number of power boats. The number of power boats is projected to grow from 11,823 in 1976 to 12,768 in 1980 and to 14,501 in 1985. The projection carries a margin of error of about 394 boats at a 95 percent confidence level.

TABLE 9

NUMBER OF BOATS (CLASS II TO V) ESTIMATED AND
PROJECTED FROM REGRESSION EQUATIONS

| Year | Number of Boats Registered | Number of Boats Estimated/Projected |
|------|-------------------------------|--|
| 1966 | 5,703 | 5,757 |
| 1967 | 6,390 | 6,188 |
| 1968 | 6,768 | 6,653 |
| 1969 | 7,041 | 7,081 |
| 1970 | 7,303 | 7,645 |
| 1971 | 8,224 | 8,271 |
| 1972 | 8,960 | 9,069 |
| 1973 | 9,848 | 9,813 |
| 1974 | 10,558 | 10,209 |
| 1975 | 10,956 | 10,998 |
| 1976 | 11,825 | 11,915 |
| 1980 | | 12,768 |
| 1985 | | 14,501 |

BIBLIOGRAPHY

- Brennan, Michael G., Jr. Preface to Econometrics. Cincinnati: Southwestern Publishing Co., 1960.
- Fornaciari, Gilbert M. An Analytical Study of Family Participation in Outdoor Recreation Activity Within Ohio. Ph.D. dissertation, The Ohio State University, 1978.
- McConnell, Campbell R. Economics. (7th ed.) New York: McGraw-Hill Book Co., 1977.
- Nebraska Game and Parks Commission. State Comprehensive Outdoor Recreation Plan (SCORP). Lincoln: Nebraska Game and Parks Commission, 1973.
- Nebraska, University of. Nebraska Annual Social Indicators Survey. Lincoln: University of Nebraska-Lincoln, Bureau of Sociological Research. October 1977.
- Nebraska, University of. Nebraska Economic Projections, 1975-2000. Lincoln: Bureau of Business Research, The University of Nebraska-Lincoln, July, 1974.
- Phillips, Clynn, G. Fred Doll, and Ronald Babcock. Outdoor Recreation Participation in Nebraska, 1972 and 1990. Laramie: University of Wyoming, Division of Business and Economic Research, 1973.
- Stepp, Vicki. Nebraska Population Projections II. Lincoln: Bureau of Business Research, The University of Nebraska-Lincoln, July, 1976.
- Todd, Ralph, Murray Frost, David Hinton, Paul Lee, and Armin Ludwig. Recreational Activities and Facilities Needs. Omaha: Center for Applied Urban Research, University of Nebraska at Omaha, June, 1975.
- U.S. Army Corps of Engineers (Chicago District). Lake Michigan Regional Boating Survey and Analysis. January, 1974.
- U.S. Department of Commerce. City and County Data Book, 1972. Washington, D.C.: U.S. Bureau of the Census, 1973.
- U.S. Department of Commerce. County Business Patterns, 1975 (Nebraska). Washington, D.C.: U.S. Bureau of the Census, 1975.
- U.S. Senate, Committee on Interior and Insular Affairs. The Recreation Imperative. Washington, D.C.: U.S. Government Printing Office, 1974.
- Zipay, John P. Pottawattamie County Population Projections, 1975-2020. Omaha: Center for Applied Urban Research, University of Nebraska at Omaha, May, 1974.