MINNESOTA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
SECTION OF FISHERIES

Fish Management Report No. 13

A CREEL CENSUS AND WATER SURFACE USE STUDY OF FOUR WASHINGTON COUNTY LAKES

March 1979

INTRODUCTION

This creel census report is a part of the continuing effort to census all lakes in the Metro Region. The main purpose of any creel census is to determine fishing pressure and success. In addition, this study provides estimates of pressure for the non-fishing activities of speedboating, water-skiing, sailboating, canoeing and house or pontoon boating. While a complete census may be desirable and very reliable, it is also expensive. Because of this, sampling type censuses which have good reliability have been developed. The statewide creel census is a modification of one developed by Daley and Skrypek, 1964. The estimates of fishing pressure and harvest found in this study can be compared to previous censuses in the metro area, as well as to creel census data on lakes outside the metro area, to determine how good fishing is and how much pressure occurs on metro lakes. The estimates of non-fishing pressure can be compared to previous Metro Region creel censuses.

CREEL CENSUS METHODS

Four lakes in Washington County were selected for this study. The names, counties, identification numbers, township, range, sections, and acreages are given below:

Lake	I.D. No.	Township	Range	Section	Acreage
Forest	82-159	32	21	Various	2,251.0
Bone	82-54	32	20	4,5,8,9	207.0
Goose	82-59	32	20	11,14	66.4
Big Marine	82-52	31,32	20	5,20,29-34	1,582.0

Work Schedule

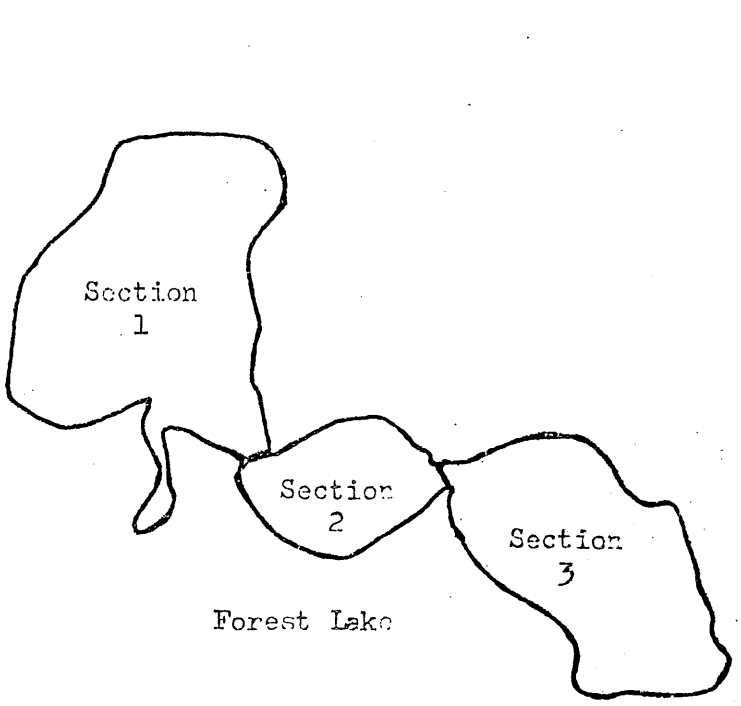
One creel census clerk was employed for this census. The clerk worked an eight hour day, forty hours per week, with two consecutive work days off. Each

weekend and holiday was censused and the days off were scheduled so that all days of the week were censused during each month. The clerk came into the office on a different weekday every two weeks to fill out the necessary creel census forms. The time the clerk started working on any particular day was selected randomly and varied from 6:00 a.m. to 2:00 p.m. The lake which the clerk started working on was also selected randomly.

Sampling Method

Forest and Big Marine Lakes were divided into three and two sections respectively along with Bone and Goose lakes there were a total of seven sections. (Fig. 1) The clerk spent one hour and 30 minutes per section on Big Marine Lake and one hour each on the remaining sections, including boating and/or driving time to the next section. The following map shows the lakes divided into the appropriate sections.

At each visit to a section, the clerk would make instantaneous counts of all shore anglers, pier anglers, fishing boats and boat anglers, runabouts, waterskiers, sailboats, canoes, houseboats and pontoon boats which were present. This data was then recorded on the rough data sheet. Any person or craft that entered the area after the instantaneous count had been made was not counted, and any person or craft that had been counted but left before the count was completed was not subtracted. After the instantateous count, the clerk would then interview as many anglers as possible and still have enough time to reach the next section at the appropriate time. The interviews were made as objective as possible so that clerks would not influence or bias the angler response. For each angler interviewed, the following information was obtained and recorded



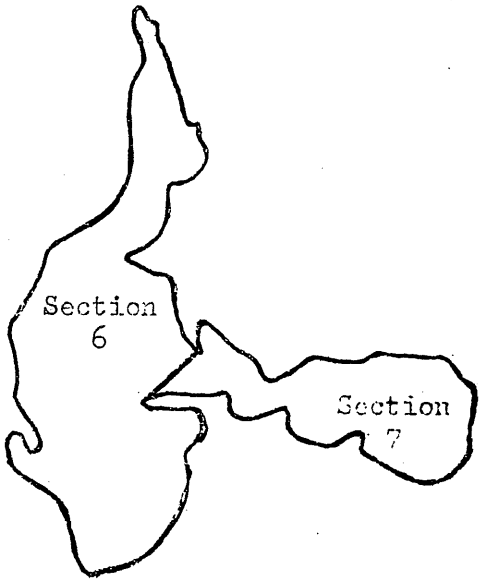


Figure 1. Outline of Forest and Big Marine Lakes showing census sections.

on the rough data sheet: whether the trip was complete or not, time of the interview, time the angler started fishing, type of fishing, method of fishing, fishing lure or bait, species sought, number and species of fish caught, weight of species caught, age, sex, and hometown. The information from the instantaneous counts was then transferred to Form A, and the information obtained from the interviews was transferred to Form B on the day the clerk was in the office. In addition to counting and interviewing anglers, the clerk also weighed as many creeled fish as possible to obtain average weights for each species which are used in calculating harvest.

Calculations

The estimated number of man-hours spent fishing (fishing pressure), speedboating, waterskiing, sailboating, houseboating or pontoon boating, canoeing and the number of fish caught per man-hour (fishing success) are the parameters measured.

Fishing Pressure Estimates: The formula used is--

$$\frac{\text{Total number of anglers counted}}{\text{Number of counts}} \times \text{fishing hours in period} = \text{man-hours in the period}$$

The method of calculation assumes that conditions observed on a section at the time of an instantaneous count are representative of conditions on the section for one hour. Each fisherman counted then represents one man-hour and can be expressed as such. If counts are made at random times each day throughout the period, the average of those counts can be considered representative of conditions during any hour. Multiplying the average count by the number of available fishing hours in a period, gives an estimate of the number of man-hours during that period on that section. It is assumed that the number of fishing hours and recreational activity hours is equal to the number of daylight hours. Use of the flexible starting times (between 6:00 a.m. and 2:00 p.m.) enabled the

clerks to sample all fishing hours without working more than eight hours per day (Hawkinson and Krosch, 1972).

In order to estimate the number of man-hours in any time period for a particular activity, one must count the actual number of people present during the instantaneous counts. This is extremely difficult to do for distant, fast moving, nonfishing watercraft. To overcome this difficulty, the number of watercraft were counted during the instantaneous counts and then a special effort was made during the entire census to count the number of people in the various watercraft. This information was then used to arrive at the mean number of people for each type of watercraft. The means are as follows:

TABLE 1 Lake		Runabouts	Sailboats	Canoes	Pontoon or Houseboat	Fishing Boats
Forest Lake	No. of Craft	374.00	85.00	31.00	95.00	1,553.00
	No. of People	924.00	255.00	74.00	387.00	3,902.00
	Ave. People Per Craft	2.47	3.00	2.39	4.07	2.51
Bone Lake	No. of Craft	54.00	1.00	10.00	9.00	59.00
	No. of People	140.00	2.00	18.00	32.00	134.00
	Ave. People Per Craft	2.59	2.00	1.80	3.56	2.27
Goose Lake	No. of Craft	9.00	--	11.00	1.00	26.00
	No. of People	17.00	--	20.00	2.00	60.00
	Ave. People Per Craft	1.89	--	1.82	2.00	2.31
Big Marine Lake	No. of Craft	139.00	29.00	22.00	20.00	2,065.00
	No. of People	350.00	64.00	53.00	76.00	4,817.00
	Ave. People Per Craft	2.52	2.21	2.41	3.80	2.33

With the exception of fishing boats, the formulas used to estimate pressure for the types of watercraft listed above are:

1. $\frac{\text{Total Number of Watercraft}}{\text{Number of Counts}} \times \text{Recreational Activity Hours in the Period} = \text{Watercraft Hours In the Period}$

2. (Watercraft hrs. in period) X Average number of people in watercraft = Man-hours in the period

Fishing Success

Fishing success is measured by the catch per unit of effort expended and can be described as the ratio of the number or pounds of fish caught over the number of hours spent fishing. There are two types of catch ratios which can be computed. The overall ratio is the number of all species caught divided by the total hours spent fishing. This catch rate was used in making estimates of harvest. A catch ratio of less than .005 fish per man-hour and equal to or greater than .001 fish per man-hour was recorded as a trace (tr.). Any catch ratio or harvest less than .001 was considered zero. The catch ratio for selected species was also calculated. It was computed by dividing the number of particular species caught by anglers seeking that species by the number of man-hours spent fishing for that particular species as it eliminates the people who were fishing for other species and may have been using gear, methods, and lures or bait not suited for catching the species being considered (Hawkinson and Krosch, 1972).

Harvest

Harvest is defined as number or pounds of fish removed per time period from a particular fishery. It is calculated as follows:

1. (Estimated man-hours fishing)(overall catch rate) = estimated number of fish for period

2. (Estimated number of fish)(average weight) = estimated lbs. for the period

3. (Estimated lbs.) ÷ (lake acreage) = lbs. per acre per period

Harvest can be calculated for each species and all species combined for the whole census period and for smaller periods of time.

Fishing pressure, non-fishing pressure, fishing success and harvest were stratified by weekend days, holidays and weekdays. Separate calculations were then made and the two estimates added together to provide the final estimate.

RESULTS

The creel census started on May 12, 1978, and continued through September 24, 1978.

Non-Fishing Recreational Pressure

The most popular non-fishing recreational activity on the four Washington County lakes was speed or pleasure boating (6.78 moving man-hours/acre). Pontoon or houseboating and sailboating (2.33 and 2.12 moving man-hours/acre respectively) were the next most popular activities, with canoe or rowboating being lower in popularity (.98 moving man-hours/acre).

Parked or idle craft were also noted for the lakes, although parked craft were not separated from idle craft by the census clerk. Idle non-fishing recreational craft were considered to be those craft which were not under power, either by motor, sail, or man-powered, at the time of the instantaneous count. These craft are still utilizing the lake's surface as they drift for swimming or sunbathing, and should be taken into account when planning surface use zoning.

Parked craft were assumed to have used the public access but were beached, usually at a park or other public property. On lakes largely undeveloped or having shorelines mostly in public ownership, this information would be more useful than on the lakes included in this census report.

Table 2 gives a summary of the non-fishing recreational pressure on the four Washington County lakes in moving and total man-hours. Total recreational pressure (fishing and non-fishing) was 219,471 man-hours, or 53.45 man-hours/acre (moving man-hours only for non-fishing). Table 3 provides a month by month breakdown of the fishing and non-fishing recreational activities on the lakes. Tables 19a-22a give monthly breakdown for individual lakes.

Tables 5a through 9a provide a section by section breakdown of each of the non-fishing activities censuses. The greatest number of runabout man-hours was on Section 1 of Forest Lake with 9,696 man-hours, or 8.79 man-hours per acre. The pressure in man-hours per acre was actually lower than that found on sections 2 and 3 of Forest Lake (12.29 and 10.20 man-hours/acre respectively) and that of Bone Lake with 12.27 man-hours per acre. Idle and parked man-hours were an important percentage of the total man-hours on all sections but Bone Lake, section 4. The percentages of idle and parked runabouts can be seen below:

Forest Lake, Section 1	-	19.96%
Forest Lake, Section 2	-	20.91%
Forest Lake, Section 3	-	18.92%
Bone Lake, Section 4	-	5.75%
Goose Lake, Section 5	-	22.47%
Big Marine Lake, Section 6	-	19.20%
Big Marine Lake, Section 7	-	13.84%

The largest total man-hours of waterskiing (925 man-hours) also occurred on Forest Lake, Section 1.

The greatest number of pontoon or houseboating man-hours were again found on Section 1 of Forest Lake (3,911 man-hours, or 3.55 man-hours/acre) followed closely by Forest Lake sections 2 and 3 (1,835, and 3,728 man-hours), although the latter sections received a greater pressure with 4.79 and 4.87 man-hours per acre respectively.

Forest Lake Section 1, again, experienced the greatest total man-hours of sailboating of all sections censused with 4,600 man-hours, 4.17 man-hours per acre. Section 3 followed closely with 4,125 man-hours, but had higher pressure with 5.39 man-hours per acre.

TABLE 2 Summary of the Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978

Runabouts		Sailboats		Waterskiing		Canoeing		House or Pontoon Boating	
Est. MH	Est. MH per Acre	Est. MH	Est. MH Per Acre	Est. MH	Est. MH Per Acre	Est. MH	Est. MH Per Acre	Est. MH	Est. MH Per Acre
27,841*	6.78	3,161*	.77	8,709*	2.12	4,044*	.98	9,548*	2.33
34,033**	8.29			11,294**	2.75	4,803**	1.17	12,611**	3.07

*Moving
**Moving plus idle or parked

The following shows the percentages of idle and parked (sailboats) by section:

Section 1 - 18.37%
Section 2 - 7.58%
Section 3 - 32.15%
Section 4 - 0.0%
Section 6 - 20.44%
Section 7 - 24.80%

No sailboat activity was observed on Goose Lake, Section 5.

The greatest total number of man-hours of canoeing occurred on Section 6 of Big Marine Lake (1,325 man-hours, 1.20 man-hours/acre) although the greatest pressure was found on Goose Lake with 8.15 man-hours per acre.

Figure 2 shows non-fishing and fishing pressure distributed by month for all sections combined over the census period. The greatest fishing pressure occurred in the month of June with 45,941 man-hours or 11.19 man-hours per acre. June accounted for 27.65% of the period total fishing pressure. May had the highest fishing pressure per day with 2,036.1 man-hours per day compared to 1,531.4 man-hours per day in June. Fishing pressure dropped rapidly after the month of July but always remained higher than all other non-fishing recreation activities combined. The following lists fishing as a percentage of all recreational activities by month.

May	-	89.05%
June	-	78.08%
July	-	73.68%
August	-	67.12%
September	-	59.62%

Of non-fishing recreational activities, waterskiing and pontoon or houseboating had the greatest pressure during June, runabouts and canoes in July, and sailboating had the greatest pressure during the month of August.

Table 3 provides a breakdown of the fishing and non-fishing recreational activities by month for the survey period.

Characteristics of the People Fishing

A total of 4,475 anglers were interviewed on all lakes. The age and sex of each angler interviewed was recorded. The results are shown in Table 4.

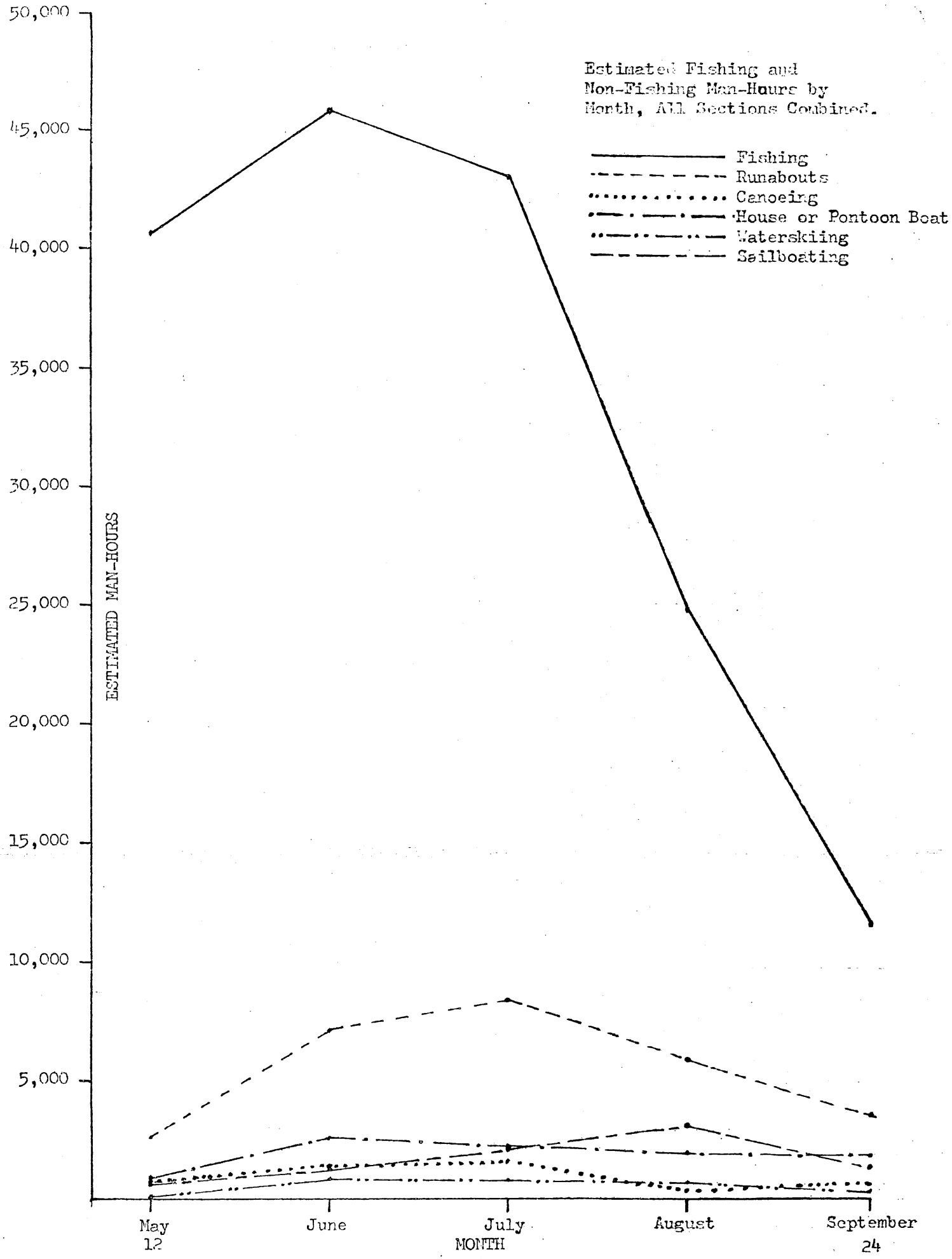

Estimated Fishing and
Non-Fishing Man-Hours by
Month, All Sections Combined.
Fishing
Runabouts
Canoeing
House or Pontoon Boat
Waterskiing
Sailboating
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
ESTIMATED MAN-HOURS
May
12
June
July
August
September
24
MONTH

TABLE 3 A Month by Month Summary of Fishing and Non-fishing Pressure on Four Washington County Lakes, May 12 - September 24, 1978. All Sections Combined. Results for Non-fishing activities Expressed in Moving Man-hours Only.

	May 12-31	June	July	August	Sept. 1-24	Total
Fishing	40,722	45,941	43,065	24,858	11,582	166,168
Runabouts	2,705	7,195	8,431	5,875	3,635	27,841
Waterskiing	74	945	913	796	433	3,161
Sailboats	615	1,322	2,221	3,185	1,366	8,709
Canoes	711	873	1,547	361	552	4,044
House and/or Pontoon Boats	900	2,560	2,270	1,960	1,858	9,548
Total	45,727	58,836	58,447	37,035	19,426	219,471

TABLE 4 - Number and Percent of Male and Female Anglers for Each Age Group for All Sections Combined, May 12 - September 24, 1978

Age Group	No. Males	Percent Males	No. Females	Percent Females	Total Number in Age Group	Total Percent
0-12	607	13.58	94	2.10	701	15.6
13-15	268	5.99	42	0.94	310	6.92
16-17	124	2.77	17	0.38	141	3.15
18-24	509	11.37	125	2.79	634	14.16
25-34	927	20.73	171	3.82	1,098	24.55
35-44	507	11.32	101	2.26	608	13.58
45-64	628	14.03	132	2.95	760	16.98
65+	192	4.29	31	0.69	223	4.98
Total	3,762	84.07	713	15.93	4,475	100.00

The age group with the highest number of male and female anglers was the 25-34 year old group. The average age of all male anglers was 31.75 years, and 31.11 years for all female anglers interviewed, on all lakes combined. The average age of males ranged from a high of 33.99 years on Goose Lake to a low of 29.68 years on Bone Lake, and the average age of females on the four lakes ranged from 32.09 years on Forest Lake to a low of 26.92 years on Bone Lake. The female angler participation was higher than for Eighteen Metropolitan Lakes (Shodeen and Tureson, 1975) and only slightly lower than for Five Metro Area Lakes (Tureson, 1978) and Lake Minnetonka (Tureson, 1978).

Of anglers interviewed, 77.55 percent indicated that they had traveled a distance of less than 25 miles. Another 19.04 percent indicated they had traveled 26 to 50 miles to fish. The percentage of anglers from the 26-50 mile is much higher than for the same mileage zone found in Eighteen Metropolitan Lakes (Shodeen and Tureson, 1975), the Mississippi River (Tureson, 1978), and Lake Minnetonka (Tureson, 1978). Table 5 is a list of hometowns of anglers interviewed.

TABLE 5. List of Hometowns of Anglers Interviewed for All Sections Combined.

Seven County Metro Area	Male	Female	Total	Seven County Metro Area	Male	Female	Total
Afton	1	0	1	Cottage Grove	42	8	50
Andover	5	2	7	Crystal	2	1	3
Anoka	21	6	27	E. Bethel	9	0	9
Apple Valley	7	0	7	Eagan	12	1	13
Bethel	1	0	1	Eden Prairie	1	0	1
Blaine	69	21	90	Edina	2	0	2
Bloomington	9	1	10	Falcon Heights	3	0	3
Brooklyn Center	18	5	23	Farmington	0	1	1
Brooklyn Park	8	0	8	Forest Lake	366	71	437
Burnsville	5	0	5	Fridley	29	7	36
Cedar	3	0	3	Golden Valley	3	1	4
Champlin	1	0	1	Ham Lake	5	1	6
Circle Pines	24	1	25	Hampton	2	0	2
Columbia Heights	5	3	8	Hastings	17	10	27
Coon Rapids	32	9	41	Hugo	82	6	88

Table 5 Cont.

Seven County Metro Area	Male	Female	Total
Inver Grove Hts.	46	14	60
Lake Elmo	16	4	20
Lakeland	2	0	2
Lakeville	0	1	1
Lexington	1	0	1
Lino Lakes	12	3	15
Little Canada	5	4	9
Mahtomedi	10	2	12
Maplewood	40	1	41
Marine	83	19	102
Mendota	1	4	5
Mendota Hts.	6	0	6
Minneapolis	299	55	254
Minnetonka	4	0	4
Moundsview	13	2	15
New Brighton	58	15	73
Newport	6	2	8
New Scandia Twp.	145	30	175
North Oaks	1	0	1
North St. Paul	60	5	65
Oakdale	7	0	7
Osseo	2	0	2
Ramsey	1	0	1
Richfield	4	0	4
Robbinsdale	1	0	1
Rosemount	1	0	1
Roseville	44	5	49
St. Anthony	4	1	5
St. Croix Beach	1	0	1
St. Louis Park	6	3	9
St. Paul	1,473	288	1,761
St. Paul Park	16	6	22
Shakopee	3	0	3
Shoreview	10	5	15
So. St. Paul	69	9	78
Spring Lake Park	5	0	5
Spring Park	1	0	1
Stillwater	104	26	130
Vadnais Hts.	4	1	5
Waconia	3	2	5
Wayzata	3	0	3
W. St. Paul	41	1	42
White Bear Lake	109	14	123
Withrow	7	2	9
Woodbury	4	0	4
TOTAL	3,515	679	4,194

Other Minnesota Cities - All Sections

Aitkin	2	1	3
Albany	1	0	1
Albert Lea	2	0	2
Big Fork	1	0	1
Chatfield	1	0	1
Chisago City	12	2	14
Duluth	1	1	2
Elk River	3	0	3
Fairmont	18	0	18
Glenco	1	0	1
Hector	1	0	1
LeCenter	1	1	2
Lindstrom	2	0	2
Mora	1	0	1
New Ulm	3	0	3
North Branch	5	1	6
Owatonna	8	0	8
Princeton	0	1	1
Red Wing	4	0	4
Renville	2	0	2
Rochester	3	1	4
St. Charles	1	0	1
St. Francis	2	4	6
Springhill	2	0	2
Stacy	10	1	11
Vermillion	1	1	2
Waseca	5	0	5
Winona	2	0	2
Wyoming	19	1	20
TOTAL	97	15	112
UNSPECIFIED	6	4	10

Table 5 Cont.

Other States	Male	Female	Total
Alaska	1	0	1
Arizona	8	2	10
California	18	6	24
Colorado	2	0	2
Florida	6	0	6
Georgia	1	1	2
Illinois	14	3	17
Indiana	10	0	10
Iowa	14	1	15
Kansas	3	1	4
Kentucky	1	0	1
Michigan	3	2	5
Missouri	7	1	8
Nebraska	1	0	1
New Jersey	1	0	1
New York	1	0	1
North Dakota	5	0	5
Ohio	2	0	2
Pennsylvania	2	0	2
South Dakota	1	1	2
Texas	8	1	9
Utah	1	0	1
Virginia	1	0	1
Washington	1	0	1
Wisconsin	25	0	25
TOTAL	137	19	156

Other Countries			
Iran	1	0	1
Taiwan	2	0	2
TOTAL	3	0	3
GRAND TOTAL	3,758	717	4,475

By far, the majority of anglers (93.72%) interviewed were from the seven county metropolitan area, many of them being in the 25-50 mile zone. It is obvious that many users come from the Twin Cities area population centers.

Anglers from the seven county metropolitan area were further broken down by county. For the 4,194 anglers from the seven county area, the percentages are as follows:

Ramsey County	-	51.50%
Washington County	-	25.46%
Hennepin County	-	10.37%
Anoka County	-	6.56%
Dakota County	-	5.91%
Carver and Scott Counties	-	.20%

Anglers from the local communities of Forest Lake and New Scandia Township (both

in Washington County) make up 14.59% of anglers from the seven county area.

It is also interesting to note that 39.35% of all anglers interviewed were from St. Paul and 7.91% from Minneapolis.

Trip Data

A total of 65 complete fishing trips were tallied for the four lakes combined. The average length of a completed trip was 4.52 hours.

Fishing Pressure and Non-Fishing Pressure

Fishing Pressure: The estimated man-hours spent fishing on all four lakes shown in Table 6.

TABLE 6 Total Acres	Estimated Man-hours Weekends	Estimated Man-hours Weekdays	Total Estimated Man-hours	Man-hours Per Acre	Estimated Man-trips	Estimated Man-trip/ Acre
4,106.40	114,741	51,454	166,168	40.47	36,764.84	8.95

Table 10a provides a breakdown of fishing pressure by census sections. The range of pressure on the four lakes was from a high of 56.38 man-hours/acre on Big Marine Lake to a low of 15.72 man-hours/acre on Bone Lake.

FISHING STYLE

Boat fishing was the most popular type of fishing with 77.81% of the total estimated man-hours. Fishing from a boat with a locator accounted for 21.02% while bank and pier fishing accounted for only .87% and .30% respectively. There were no actual fishing piers on any of the lakes, but private docks, bridges, etc., were considered as piers. Table 7 provides a summary of the

fishing types.

TABLE 7 - Summary of the Estimated Man-hours of Fishing Pressure for the Different Types of Fishing and Percent of the Total for all Sections Combined, for Four Washington County Lakes, May 12 - September 24, 1978

Type	Estimated Man-hours	Percent of Total
Boat	129,295	77.81
Boat with Locator	34,929	21.02
Bank	1,446	0.87
Pier	498	0.30
	166,168	100.00

Table 11a provides a breakdown of fishing style of anglers interviewed by fishing type, fishing method, and fishing bait or lure. Still fishing using natural bait was the most popular fishing method on all three sections of Forest Lake and on both sections of Big Marine Lake. A mixed method of fishing was the most popular on Bone and Goose lakes with an equal percent use of natural and mixed baits on Bone Lake and the prevalent use of artificial baits on Goose Lake.

Principal Species Sought

The largest percentage of fishermen interviewed indicated they were fishing for more than one species, except on Goose Lake where fishermen were largely seeking northern pike. This would probably explain the high use of artificial baits previously mentioned for Goose Lake.

Combining all sections, seeking a mixed bag accounted for 46.73% of all fishermen interviewed, northern pike 19.26%, and panfish 12.36%. Table 8 shows angler preference by section.

TABLE 8. Breakdown of the Number of Anglers Seeking a Specific Species by Section and for All Sections Combined. May 12 - September 24, 1978.

	Forest Lake Section 1		Forest Lake Section 2		Forest Lake Section 3		Bone Lake Section 4		Goose Lake Section 5		Big Marine Lake Section 6		Big Marine Lake Section 7		TOTAL	
Species	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Northern	103	16.94	74	11.65	54	7.66	18	12.00	32	41.03	361	28.09	220	21.70	862	19.26
Walleye	1	.16	4	.63	3	.43	--	--	--	--	32	2.49	4	.39	44	.98
Crappies	24	3.95	68	10.71	75	10.64	34	22.67	10	12.82	56	4.36	30	2.96	297	6.64
Sunfish	51	8.39	42	6.61	42	5.96	2	1.33	2	2.56	85	6.61	58	5.72	282	6.30
L.M.Bass	37	6.08	43	6.77	65	9.22	16	10.67	1	1.28	84	6.54	97	9.57	343	7.66
Mixed	294	48.36	258	40.63	350	49.65	63	42.00	30	38.46	572	44.51	524	51.68	2091	46.73
Panfish	98	16.12	146	22.99	116	16.45	17	11.33	3	3.85	93	7.24	80	7.89	553	12.36
Bullheads	--	--	--	--	--	--	--	--	--	--	2	.16	1	.10	3	.07
TOTAL	608	100.00	635	100.00	705	100.00	150	100.00	78	100.00	1285	100.00	1014	100.00	4475	100.00

Table 9 shows the species contribution to the sport catch by numbers and percent, for each section and all sections combined. Bluegills made up 48.42% of the total sport catch on all sections combined followed by black crappie (22.49%) and northern pike (9.46%). Bluegill were the most frequently caught fish on Forest Lake and Big Marine Lake, followed by black crappie. The black crappie was the most frequent catch on Bone and Goose lakes. Northern pike was the second most frequently caught species on Goose Lake and third on Big Marine Lake being nearly equal to the percentage catch for black crappie.

FISHING SUCCESS

Catch Per Unit Effort

This parameter is expressed in numbers of fish per man-hour of fishing for each species caught on each section and for the combined number of each species caught on each section. The combined catch rate (all types of fishing methods and lures) varied from .839 fish per man-hour on Bone Lake to .331 fish per man-hour on Goose Lake. The bluegill had the highest catch rate on Forest and Big Marine lakes. The black crappie had the highest overall catch rate of .650 (Bone Lake) and the highest individual species catch rate on Goose Lake. The combined catch rate for all species and all sections was .540 fish per man-hour. Table 12a gives the overall catch rate for each species for each section.

Catch Per Man-hour by Fishing Type, Method and Lure

Tables 13a - 16a give the catch rate of each species by section for each of the types of fishing censused. Boat fishing was the most popular type of fishing on all lakes combined, and had a catch rate of .579 fish per man-hour. Pier fishing had the highest catch rate (1,577 fish per man-hour) of any type of fishing on the combined lakes.

TABLE 9. Species Composition of the Sport Catch by Section and for All Sections Combined, May 12 - September 24, 1978.

	Forest Lake Section 1		Forest Lake Section 2		Forest Lake Section 3		Bone Lake Section 4		Goose Lake Section 5		Big Marine Lake Section 6		Big Marine Lake Section 7		TOTAL	
Species	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Northern	64	7.16	32	3.25	27	2.72	3	1.36	17	29.31	226	16.99	173	14.09	542	9.46
Walleye	2	.22	1	.10	2	.20	--	--	--	--	6	.45	--	--	11	.19
Bl. Crappie	134	14.94	195	19.70	297	29.94	172	77.47	37	63.79	270	20.25	184	15.00	1289	22.49
Wht. Crappie	56	6.24	95	9.65	83	8.37	--	--	--	--	4	.30	--	--	238	4.17
Bluegill	491	54.98	503	50.80	439	43.68	12	5.45	--	--	643	48.35	686	55.86	2774	48.42
Pumpkinseed	32	3.57	40	4.07	50	5.04	4	1.82	--	--	41	3.08	49	3.99	216	3.77
Gr. Sunfish	--	--	1	.10	--	--	1	.45	--	--	--	--	--	--	2	.04
Hy. Sunfish	7	.78	14	1.42	9	.91	--	--	--	--	7	.52	14	1.14	51	.91
L.M.Bass	45	5.02	21	2.13	53	5.34	8	3.60	--	--	60	4.50	79	6.43	266	4.59
Perch	6	.67	28	2.85	8	.81	2	.91	--	--	14	1.05	1	.08	59	1.03
Bl. Bullhd.	8	.89	23	2.34	11	1.11	20	9.09	4	6.90	22	1.65	10	.81	98	1.72
Br. Bullhd.	--	--	1	.10	3	.30	--	--	--	--	2	.15	1	.08	7	.12
Yel. Bullhd.	--	--	2	.20	6	.60	--	--	--	--	38	2.86	31	2.53	77	1.35
Rock Bass	48	5.35	34	3.46	17	1.71	--	--	--	--	--	--	--	--	99	1.73
TOTAL	893	100.00	990	100.00	1005	100.00	222	100.00	58	100.00	1333	100.00	1228	100.00	5729	100.00

Still fishing and a mixed method of fishing were very nearly equal in popularity on all sections combined (4,154 and 4,107 man-hours respectively), but the catch rate for the still fishing method (.817 fish per man-hour) was more than twice that for the mixed method (.403 fish/man-hour).

The most frequently used bait on combined sections was natural bait. The catch rate with use of natural baits was .780 fish per man-hour (Table 17a).

Catch Rate for Selected Species

During the interview, the angler was asked what species he or she was fishing for. Table 10 provides the catch rate for the most important species and classes of fish by different types of fishing for all lakes combined. The catch rates were calculated by dividing the number of a particular species or class of fish by the number of hours spent fishing for that species or class of fish. Pier fishing had the highest catch rate followed by bank fishing, boat fishing and finally boat fishing with a locator.

TABLE 10 - The Catch Rate of Anglers Fishing for a Specific Species or Class of Fish by Fishing Type on Four Washington County Lakes, May 12 - Sept. 24, 1978. Results are in Fish Per Man-hour

Type of Fishing	Northern	Walleye	Crappies	Sunfish	L.M. Bass	Bullheads	Mixed Panfish	Total
Boat	.130	--	1.125	1.570	.170	--	.450 1.1601	.576
Boat w/ Locator	.180	--	.470	.740	.119	--	.470 1.880	.370
Bank	.380	--	3.000	3.880	--	--	.100 1.580	.839
Pier	.400	--	12.000	.770	.670	--	.650 4.440	1.577

Number and Percent Successful Anglers

A successful angler was one who caught and kept at least one fish of any species. Of the 4,475 anglers interviewed, 1,978 or 43.5% were successful. Table 11 provides a section by section breakdown of successful fishermen.

TABLE 11. The Number and Percentage of Successful Fishermen on Four Washington County Lakes, May 12 - September 24, 1978.

Section	Number of Fishermen	Successful	Percent Successful
1	608	270	44.40
2	635	283	44.60
3	705	307	43.50
4	150	68	45.30
5	78	35	44.90
6	1,285	526	40.90
7	1,014	456	45.00
Total	6,187	2,592	41.89

HARVEST

This parameter is expressed in estimated numbers and pounds of each species caught during the period for each section. The harvest for all lakes combined was 88,833 fish weighing 42,342 pounds or 10.31 pounds per acre. Big Marine lake section 6 had the highest total estimated number of fish of any section censused, (25,798). Goose Lake being the lowest with 581 fish. Big Marine Lake, section 7, had the highest estimated pounds per acre with 14.62 pounds per acre. Bone Lake was the lowest with 3.65 pounds per acre.

Table 18a gives a breakdown of the harvest by species and section. Bluegills were the most frequently caught fish with black crappie second, but northern pike was the single species with the largest pound harvest for all lakes combined.

Five fish species, bluegill, black crappie, white crappie, northern pike, and largemouth bass, accounted for 93.04% of all estimated fish caught by number and 90.31% of all fish estimated caught by weight for the combined sections.

DISCUSSION

Publications such as Moyle and Franklin (1955), Johnson (1957), Scidmore (1961), Hawkinson and Krosch (1971), and Hawkinson et. al. (1976), provide estimates of fishing pressure and harvest for many Minnesota lakes. The estimates for the lakes in this study were in the range found in the above report.

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CONTENTS OF APPENDIX

List of Hometowns of Anglers Interviewed for Forest Lake

Table 1a - Forest (Secs. 1-3) Seven County Metro Area

	Male	Female	Total
Anoka	11	2	13
Andover	4	2	6
Apple Valley	4	0	4
Blaine	39	11	50
Bloomington	8	1	9
Brooklyn Ctr.	14	3	17
Brooklyn Pk.	4	0	4
Cedar	1	0	1
Champlin	1	0	1
Circle Pines	11	1	12
Columbia Hts.	2	0	2
Coon Rapids	15	8	23
Cottage Grove	15	2	17
Crystal	1	1	2
E. Bethel	1	0	1
Eagan	9	0	9
Eden Prairie	1	0	1
Edina	2	0	2
Farmington	0	1	1
Forest Lake	330	66	396
Fridley	20	4	24
Golden Valley	1	1	2
Ham Lake	5	1	6
Hastings	3	3	6
Hugo	10	1	11
Inver Grove Hts.	16	4	20
Lake Elmo	5	3	8
Lino Lakes	7	3	10
Little Canada	4	4	8
Mahtomedi	5	1	6
Maplewood	10	0	10
Marine	1	1	2
Mendota Hts.	3	0	3
Minneapolis	152	32	182
Minnetonka	2	0	2
Moundsview	4	1	5
New Brighton	31	10	41
Newport	3	0	3
New Scandia Twp.	6	3	9
No. St. Paul	17	3	20
Oakdale	5	0	5
Osseo	1	0	1
Richfield	4	0	4
Rosemount	1	0	1
Roseville	16	0	16
St. Anthony	1	0	1
St. Croix Beach	1	0	1
St. Louis Park	2	0	2
St. Paul	564	144	708
St. Paul Park	1	1	2
Shoreview	6	4	10
So. St. Paul	30	4	34
Spring Lake Pk.	1	0	1
Stillwater	9	0	9
Vadnais Hts.	4	1	5
W. St. Paul	17	0	17
White Bear Lake	41	4	45
Woodbury	2	0	2
Total	1484	331	1815

Other Minnesota Cities

	Male	Female	Total
Aitkin	2	1	3
Chisago City	9	2	11
Elk River	1	0	1
Red Wing	3	0	3
Rochester	3	1	4
St. Francis	2	4	6
Stacy	5	1	6
Waseca	2	0	2
Big Fork	1	0	1
Duluth	0	1	1
Owatonna	8	0	8
Renville	2	0	2
St. Charles	1	0	1
Springhill	2	0	2
Vermillion	1	1	2
Wyoming	5	1	6
Total	47	12	59

Other States

	Male	Female	Total
Arizona	6	2	8
California	8	1	9
Colorado	1	0	1
Illinois	9	2	11
Indiana	4	0	4
Iowa	6	0	6
Kansas	1	1	2
Michigan	3	2	5
Missouri	3	0	3
New York	1	0	1
No. Dakota	1	0	1
Pennsylvania	2	0	2
So. Dakota	1	1	2
Texas	4	0	4
Wisconsin	7	0	7
Total	57	9	66

Other Countries

	Male	Female	Total
Taiwan	2	0	2
Total	2	0	2
Unspecified	1	0	1
GRAND TOTAL	1591	352	1943

Table 2a - List of Hometowns of Anglers Interviewed for Bone Lake, Sec. 4

Seven County Metro Area

	Male	Female	Total		Male	Female	Total
Blaine	3	2	5	New Scandia Twp.	42	9	51
Brooklyn Pk.	1	0	1	North Oaks	1	0	1
Coon Rapids	0	1	1	Ramsey	1	0	1
Cottage Grove	5	3	8	St. Paul	30	2	32
Forest Lake	4	0	4	Spring Park	1	0	1
Hugo	4	0	4	Stillwater	4	0	4
Minneapolis	8	1	9	W. St. Paul	1	0	1
New Brighton	2	0	2	Total	113	23	136

Other Minnesota Cities

	Male	Female	Total		Male	Female	Total
Chisago City	1	0	2	Princeton	0	1	1
Lindstrom	2	0	2	Wyoming	2	0	2
Mora	1	0	1	Total	6	1	7

Other States

	Male	Female	Total
Kansas	1	0	1
No. Dakota	1	0	1
Total	2	0	2
Unspecified	1	0	1
GRAND TOTAL	122	24	146

Table 3a - List of Hometowns of Anglers Interviewed for Goose Lake, Sec. 5

Seven County Metro Area

	Male	Female	Total		Male	Female	Total
Anoka	2	1	3	Minneapolis	3	1	4
Blaine	2	2	4	New Scandia Twp.	30	5	35
Forest Lake	5	0	5	Osseo	1	0	1
Golden Valley	1	0	1	St. Paul	7	1	8
Hugo	1	0	1	Stillwater	4	0	4
Inver Grove Hts.	18	0	1	White Bear Lake	6	3	9
Maplewood	2	0	2	Withrow	2	0	2
Marine	2	1	3	Total	69	14	83

Table 3a - Goose Lake (cont.)

Other Minnesota Cities

	Male	Female	Total
Albert Lea	2	0	2
Total	2	0	2

Other States

	Male	Female	Total
California	2	2	4
Illinois	1	1	2
Total	3	3	6
GRAND TOTAL	74	17	91

Table 4a - List of Hometowns of Anglers Interviewed for Big Marine Lake, Secs. 6 & 7

Seven County Metro Area

	Male	Female	Total
Afton	1	0	1
Andover	1	0	1
Anoka	8	3	11
Apple Valley	3	0	3
Bethel	1	0	1
Blaine	25	6	31
Bloomington	1	0	1
Brooklyn Ctr.	4	2	6
Brooklyn Pk.	3	0	3
Burnsville	5	0	5
Cedar	2	0	2
Circle Pines	13	0	13
Columbia Hts.	3	3	6
Coon Rapids	17	0	17
Cottage Grove	22	3	25
Crystal	1	0	1
E. Bethel	8	0	8
Eagan	3	1	4
Falcon Hts.	3	0	3
Forest Lake	27	5	32
Fridley	9	3	12
Golden Valley	1	0	1
Hampton	2	0	2
Hastings	14	7	21
Hugo	67	5	72
Inver Grove Hts.	29	10	39
Lake Elmo	11	1	12
Lakeland	2	0	2
Lakeville	0	1	1
Lexington	1	0	1
Lino Lakes	5	0	5
Little Canada	1	0	1
Mahtomedi	5	1	6
Maplewood	28	1	29
Marine	80	17	97
Mendota	1	4	5
Mendota Hts.	3	0	3
Minneapolis	136	21	157
Minnetonka	2	0	2
Moundsview	9	1	10
New Brighton	25	5	30
Newport	3	2	5
New Scandia Twp.	67	13	80
No. St. Paul	43	2	45
Oakdale	2	0	2
Robbinsdale	1	0	1
Roseville	28	5	33
St. Anthony	3	1	4
St. Louis Park	4	3	7
St. Paul	872	141	1013
St. Paul Park	15	5	20
Shakopee	3	0	3
Shoreview	4	1	5
So. St. Paul	39	5	20
Spring Lake Pk.	4	0	4
Stillwater	81	21	102
Waconia	3	2	5
Wayzata	3	0	3
W. St. Paul	23	1	24
White Bear Lake	62	7	69
Withrow	5	2	7
Woodbury	2	0	2
Total	1849	311	2160

Table 4a. Big Marine (Secs. 6 & 7)

Other Minnesota Cities

	Male	Female	Total		Male	Female	Total
Albany	1	0	1	LeCenter	1	1	2
Chatfield	1	0	1	New Ulm	3	0	3
Chisago City	2	0	2	North Branch	5	1	6
Duluth	1	0	1	Red Wing	1	0	1
Elk River	2	0	2	Stacy	5	0	5
Fairmont	1	0	1	Waseca	3	0	3
Glenco	1	0	1	Winona	2	0	2
Hector	1	0	1	Wyoming	12	0	12
				Total	42	2	44

Other States

	Male	Female	Total		Male	Female	Total
Alaska	1	0	1	Missouri	4	1	5
Arizona	2	0	2	Nebraska	1	0	1
California	8	3	11	New Jersey	1	0	1
Colorado	1	0	1	N. Dakota	3	0	3
Florida	6	0	6	Ohio	2	0	2
Georgia	1	1	2	Texas	4	1	5
Illinois	4	0	4	Utah	1	0	1
Indiana	6	0	6	Virginia	1	0	1
Iowa	8	1	9	Washington	1	0	1
Kansas	1	0	1	Wisconsin	18	0	18
Kentucky	1	0	1	Total	75	7	82

Other Countries

	Male	Female	Total
Iran	1	0	1
Total	1	0	1
GRAND TOTAL	1972	323	2295

Table 5a. Estimated Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978
Runabouts Results are in Moving Man-hours and Total Man-hours

Lake and Sec. No. (acreage)	Days in Period	Est M-H on Weekends + (% Total)	Est M-H on Weekdays + (% Total)	Total Est. Man-Hours	Est. Total Man-Hours per day	Est. Total M-H/acre per day	Est. Total Man-Hours per acre
Forest Lake Sec. 1 (1103.00)	136	3954 (50.94)	3807 (49.06)	7761	57.07	0.05	7.04
		5109 (52.69)	4587 (47.31)	9696	71.29	0.06	8.79
Forest Lake Sec. 2 (382.70)	136	2310 (62.09)	1410 (37.91)	3720	27.35	0.07	9.72
		2887 (61.38)	1816 (38.62)	4703	34.58	0.09	12.29
Forest Lake Sec. 3 (765.30)	136	3833 (60.58)	2494 (39.42)	6327	46.52	0.06	8.27
		4835 (61.96)	2968 (38.04)	7803	57.38	0.08	10.20
Bone Lake Sec. 4 (207.00)	136	1741 (72.76)	652 (27.24)	2393	17.60	0.09	11.56
		1887 (74.32)	652 (25.68)	2539	18.67	0.09	12.27
Goose Lake Sec. 5 (66.40)	136	131 (38.04)	214 (61.96)	345	2.54	0.04	5.20
		160 (35.96)	285 (64.04)	445	3.27	0.05	6.70
Big Marine L. Sec. 6 (1107.4)	136	3785 (76.68)	1151 (23.32)	4936	36.29	0.03	4.46
		4811 (78.75)	1298 (21.25)	6109	44.92	0.04	5.52
Big Marine L. Sec. 7 (474.60)	136	1576 (66.80)	783 (33.20)	2359	17.35	0.04	4.97
		1786 (65.23)	952 (34.77)	2738	20.13	0.04	5.77
TOTAL 4106.40 acres	136	17330 (62.25)	10511 (37.75)	27841	204.71	0.05	6.78
		21475 (63.10)	12558 (36.90)	34033	250.24	0.06	8.29

Table 6a. Estimated Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978
Water Skiing Results are in Moving Man-hours and Total Man-Hours

Lake and Sec. No. (acreage	Days in Period	Est M-H on Weekends + (% Total)	Est M H on Weekdays + (% Total)	Total Est. Man-Hours	Est. Total Man-Hours per day	Est. Total M-H/acre per day	Est. Total Man-Hours per acre
Forest Lake Sec. 1 (1103.00)	136	494 (53.39)	431 (46.61	925	6.80	0.01	0.84
Forest Lake Sec. 2	136	220 (70.36)	92 (29.64)	312	2.29	0.01	0.82
Forest Lake Sec. 3 (765.30)	136	301 (69.57)	132 (30.43)	433	3.18	<0.01	0.57
Bone Lake Sec. 4 (207.00)	136	425 (77.78)	122 (22.22)	547	4.02	0.02	2.64
Goose Lake Sec. 5 (66.40)	136	56 (68.29)	26 (31.71)	82	0.60	0.01	1.23
Big Marine L. Sec. 6 (1107.4)	136	485 (89.32)	58 (10.68)	543	3.99	<0.01	0.49
Big Marine L. Sec. 7 (474.60)	136	230 (72.10)	89 (27.90)	319	2.35	< 0.01	0.67
TOTAL 4106.40 acres	136	2211 (69.95)	950 (30.05)	3161	23.24	0.01	0.77

Table 7a. Estimated Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978
House or Pontoon Boat Results are in Moving Man-hours and Total Man-hours.

Lake and Sec. No. (acreage)	Days in Period	Est M-H on Weedends + (% Total)	Est M-H on Weekdays + (% Total)	Total Est. Man-Hours	Est. Total Man-hours per day	Est. Total M-H/acre per day	Est. Total Man-Hours per acre
Forest Lake Sec. 1 (1103.00)	136	1941 (59.25)	1335 (40.75)	3276	24.09	0.02	2.97
		2458 (62.85)	1453 (37.15)	3911	28.76	0.03	3.55
Forest Lake Sec. 2 (382.70)		973 (72.50)	369 (27.50)	1342	9.87	0.03	3.31
		1466 (79.89)	369 (20.11)	1835	13.49	0.04	4.79
Forest Lake Sec. 3 (765.30)	136	20.74 (76.36)	642 (23.64)	2716	19.97	0.03	3.55
		2417 (64.83)	1311 (35.17)	3728	27.41	0.04	4.87
Bone Lake Sec. 4 (207.00)	136	360 (62.83)	213 (37.17)	573	4.21	0.02	2.77
		517 (70.82)	213 (29.18)	730	5.37	0.03	3.53
Goose Lake Sec. 5 (66.40)	136	-0-	49 (100.00)	49	0.36	0.01	0.74
		-0-	49 (100.00)	49	0.36	0.01	0.74
Big Marine Lake Sec. 6 (1107.4)	136	934 (73.08)	344 (26.92)	1278	9.40	0.01	1.15
		1431 (75.87)	455 (24.13)	1886	13.87	0.01	1.70
Big Marine L. Sec. 7	136	314 (100.00)	-0-	314	2.31	<0.01	0.66
		362 (76.69)	110 (23.31)	472	3.47	0.01	0.99
TOTAL 4106.40 acres	136	6596 (52.77)	2952 (47.23)	9548	70.21	0.02	2.33
		8651 (68.60)	3960 (31.40)	12611	92.73	0.02	3.07

Table 8a. Estimated Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978
Canoes Results are in Moving Man-hours and Total Man-hours

Lake and Sec. No. (acreage)	Days In Period	Est M-H on Weekends + (% Total)	Est M-H on Weekdays + (% Total)	Total Est. Man-hours	Est. Total Man-Hours per day	Est. Total M-H/acre per day	Est. Total Man-hours per acre
Forest Lake Sec. 1 (1103.00)	136	148 (25.62)	408 (73.38)	556	4.09	< 0.01	0.50
		182 (30.85)	408 (69.15)	590	4.34	< 0.01	0.53
Forest Lake Sec. 2 (382.70)	136	185 (54.25)	156 (45.75)	341	2.51	0.01	0.89
		221 (65.58)	156 (34.42)	377	2.77	0.01	0.99
Forest Lake Sec. 3 (765.30)	136	150 (17.52)	706 (82.48)	856	6.29	0.01	1.12
		339 (32.44)	706 (67.56)	1045	7.68	0.01	1.37
Bone Lake Sec. 4 (207.00)	136	224 (83.58)	44 (16.42)	268	1.97	0.01	1.29
		279 (86.38)	44 (13.62)	323	2.38	0.01	1.56
Goose Lake Sec. 5 (66.40)	136	82 (15.98)	431 (84.02)	513	3.77	0.06	7.73
		110 (20.33)	431 (79.67)	541	3.98	0.06	8.15
Big Marine L. Sec. 6 (1107.40)	136	372 (40.97)	536 (59.03)	908	6.68	0.01	0.82
		536 (40.45)	789 (59.55)	1325	9.74	0.01	1.20
Big Marine L. Sec. 7 (474.60)	136	70 (11.63)	532 (88.37)	602	4.43	0.01	1.27
		70 (11.63)	532 (88.37)	602	4.43	0.01	1.27
TOTAL 4106.40 acres	136	1231 (30.44)	2813 (69.56)	4044	29.74	0.01	0.98
		1737 (36.16)	3066 (63.84)	4803	35.32	0.01	1.17

Table 9a. Estimated Non-fishing Recreational Pressure on Four Washington County Lakes, May 12 - September 24, 1978
Sailboat Results are in Moving Man-hours and Total Man-hours

Lake and Sec. No. (acreage)	Days In Period	Est M-H on Weekends + (% Total)	Est M-H on Weekdays + (% Total)	Total Est. Man-hours	Est. Total Man-Hours per day	Est. Total M-H/acre per day	Est. Total Man-hours per acre
Forest Lake Sec. 1 (1103.00)	136	2754 (13.34)	1001 (26.66)	3755	27.61	0.03	3.40
		3424 (74.43)	1176 (25.57)	4600	33.82	0.03	4.17
Forest Lake Sec. 2 (382.70)	136	332 (36.32)	582 (63.68)	914	6.72	0.02	2.39
		407 (41.15)	582 (58.85)	989	7.27	0.02	2.58
Forest Lake Sec. 3 (382.70)	136	1396 (49.88)	1403 (50.12)	2799	20.58	0.03	3.66
		2407 (58.35)	1718 (41.65)	4125	30.33	0.04	5.39
Bone Lake Sec. 4 (207.00)	136	30 (100.00)	-0-	30	0.22	< 0.01	0.14
		30 (100.00)	-0-	30	0.22	< 0.01	0.14
Goose Lake Sec. 5 (66.40)	136	-0-	-0-	-0-	-0-	-0-	-0-
		-0-	-0-	-0-	-0-	-0-	-0-
Big Marine L. Sec. 6 (1107.04)	136	697 (84.08)	132 (15.92)	829	6.10	0.01	0.75
		697 (66.89)	345 (33.11)	1042	7.66	0.01	0.94
Big Marine L. Sec. 7 (474.60)	136	214 (56.02)	168 (43.98)	382	2.81	0.01	0.80
		276	232	508	3.74	0.01	1.07
TOTAL 4106.40 acres	136	5423 (62.27)	3286 (37.73)	8709	64.04	0.02	2.12
		7241 (64.11)	4053 (35.89)	11294	83.04	0.02	2.75

Table 10a. Estimated Fishing Pressure on Four Washington County Lakes, May 12 - September 24, 1978

Lake and Sec. No. (Acreage)	Days in Period	Est M-H on Weekends + (% Total)	Est M-H on Weekdays + (% Total)	Total Est. Man-hours	Est. Total Man-hours per day	Est. Total M-H/day per acre	Est. Total Man-Hours per acre
Forest Lake Sec. 1 (1103.0)	136	15405 (70.79)	6357 (29.21)	21762	160.01	0.15	19.73
Forest Lake Sec. 2 (382.7)	136	9923 (61.64)	6182 (38.36)	16105	118.42	0.31	42.08
Forest Lake Sec. 3 (765.3	136	25397 (74.47)	8705 (25.53)	34102	250.75	0.33	44.56
Forest Lake Total (2251)	136	50724 (70.48)	21245 (29.52)	71969	529.18	0.24	31.97
Bone Lake Sec. 4 (207.0)	136	1862 (57.20)	1393 (42.80)	3255	23.93	0.12	15.72
Goose Lake Sec. 5 (66.4)	136	787 (44.77)	970 (55.23)	1757	12.92	0.19	26.46
Big Marine Lake Sec. 6 (1107.4)	136	41607 (69.03)	18666 (30.97)	60273	443.19	0.40	54.43
Big Marine Lake Sec. 7 (474.6)	136	19734 (68.25)	9180 (31.75)	28914	212.60	0.45	60.92
Big Marine Lake Total (1582.0)	136	61341 (68.78)	27846 (31.22)	89187	655.79	0.41	56.38
Total	136	114714	51454	166168	1221.82	0.30	40.47

Total acres = 4106.40

Table 11a. Fishing Style Expressed in Percent for each Section, May 12 - September 24, 1978
Estimated Man-Hours in Parenthesis

FISHING STYLE

Sec.	Fishing Type: Boat	Boat W/ Lokator	Bank	Pier	Fishing Method: Still	Troll	Cast	Jig	Mixed	Fishing Bait or Lure: Artificial	Natural	Mixed	Prepared
1	75.90 (16,517)	23.81 (5182)	.04 (9)	.25 (54)	44.57	13.98	12.99	.33	28.13	21.38	46.55	32.07	-0-
2	75.87 (12,219)	23.25 (3744)	.35 (56)	.53 (86)	54.17	7.09	10.39	.47	27.87	16.54	56.06	27.40	-0-
3	80.10 (27,316)	19.87 (6776)	-0-	.03 (10)	53.33	6.10	14.04	1.42	25.11	21.42	53.76	24.82	-0-
4	83.45 (2716)	8.24 (268)	6.42 (209)	1.89 (62)	35.33	10.00	16.00	2.67	36.00	28.00	36.00	36.00	-0-
5	85.28 (1498)	6.27 (110)	6.85 (121)	1.60 (28)	25.64	20.51	19.23	-0-	34.62	46.15	25.64	28.21	-0-
6	78.47 (47,296)	20.87 (12,579)	.41 (247)	.25 (151)	41.95	14.79	9.81	.23	33.23	18.21	43.74	38.05	-0-
7	76.51 (22,122)	21.61 (6248)	1.71 (494)	.17 (50)	43.69	12.33	11.34	.30	32.35	23.47	46.15	30.08	.30
TOTAL	77.81 (129,295)	21.02 (34,929)	.87 (1,446)	.30 (498)	45.72	11.60	11.71	.56	30.41	20.92	47.41	31.60	.07

Table 12a. Number of Fish Caught Per Man-Hour for All Types and Methods of Fishing, By Section. May 12 - September 24, 1978

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total No. of Fish	Catch Per Man-Hour
Northern	.051	.021	.016	.011	.097	.073	.067	542	.051
Walleye	tr.	tr.	tr.	---	---	tr.	---	11	tr.
Bl. Crappie	.108	.127	.175	.650	.211	.087	.071	1289	.121
Wht. Crappie	.045	.062	.049	---	---	tr.	---	238	.022
Blugill	.394	.327	.258	.045	---	.207	.266	2774	.262
Pumpkinseed	.026	.026	.029	.015	---	.013	.019	216	.020
Green Sunfish	---	tr.	---	tr.	---	---	---	2	tr.
Hybrid Sunfish	.006	.009	.005	---	---	tr.	.005	51	.005
L.M. Bass	.036	.014	.031	.030	---	.019	.031	266	.025
Perch	.005	.018	.005	.007	---	.005	0	59	.006
Bl. Bullhead	.006	.015	.006	.076	.023	.007	tr.	98	.009
Yl. Bullhead	---	tr.	tr.	---	---	.012	.012	77	.007
Br. Bullhead	---	tr.	tr.	---	---	tr.	0	7	.001
Rock Bass	.039	.022	.010	---	---	---	---	99	.009
Total Number	893	990	1005	222	58	1333	1228	5729	
Hours Fished	1245.1	1539.6	1701.0	264.6	175.3	3107.1	2576.0	10608.7	
Catch Per Man-Hour	.717	.643	.591	.839	.331	.429	.477	---	.540

tr. = catch/man-hour, .005 > tr. ≤ .001

Table 13a. Number of Fish Caught Per Man-Hour, by Section, Boat Fishing. May 12 - September 24, 1978.

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total No. of Fish	Catch Per Man-Hour
Northern	.043	.017	.013	.009	.080	.069	.072	405	.049
Walleye	.001	.001	.001	---	---	---	---	4	tr.
Bl. Crappie	.140	.134	.207	.657	.227	.094	.053	1099	.133
Wht. Crappie	.057	.053	.058	---	---	.002	---	199	.024
Bluegill	.497	.366	.300	.050	---	.240	.274	2441	.295
Pumpkinseed	.034	.021	.033	.005	---	.014	.017	170	.020
Green Sunfish	---	.001	---	---	---	---	---	1	tr.
Hybrid Sunfish	.006	.010	.006	---	---	.003	.005	44	.005
L.M. Bass	.022	.012	.021	.023	---	.011	.020	140	.017
Perch	.006	.007	.006	.005	---	.005	---	35	.004
Bl. Bullhead	.008	.011	.008	.063	.020	.009	.004	79	.010
Br. Bullhead	---	.002	.002	---	---	.001	---	6	.001
Yl. Bullhead	---	.002	.004	---	---	.014	.012	66	.008
Rock Bass	.050	.025	.012	---	---	---	---	92	.011
Total Number	819	785	916	180	49	1131	901	4781	
Hours Finished	945.1	1168.1	1362.5	220.8	149.5	2438.0	1970.9	8254.9	
Catch Per Man-Hour	.866	.666	.664	.811	.328	.462	.457	---	.579

Table 14a. Number of Fish Caught Per Man-Hour, by Section, Boat with Locator, May 12 - September 24, 1978.

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total No. of Fish	Catch Per Man-Hour
Northern	.074	.031	.027	.046	.091	.088	.056	132	.059
Walleye	.003	---	---	---	---	.006	---	7	.003
Bl. Crappie	.007	.073	.044	.092	---	.056	.144	161	.072
Wht. Crappie	.007	.092	.012	---	---	---	---	39	.017
Bluegill	.054	.204	.083	---	---	.076	.185	270	.121
Pumpkinseed	---	.045	.015	---	---	.002	.018	32	.014
Green Sunfish	---	---	---	---	---	---	---	5	.002
Hybrid Sunfish	---	.006	.003	---	---	---	.004	125	.056
L.M. Bass	.081	.014	.071	.137	---	.048	.068	23	.010
Perch	---	.056	---	---	---	.003	.002	10	.004
Bl. Bullhead	---	.028	---	---	---	---	---	---	---
Br. Bullhead	---	---	---	---	---	---	---	---	---
Yl. Bullhead	---	---	---	---	---	.005	.013	10	.004
Rock Bass	.003	.014	---	---	---	---	---	7	.003
Total Number	69	201	87	6	1	185	272	821	
Hours Fished	296.4	357.9	338.0	21.8	11.0	648.6	556.6	2230.3	
Catch Per Man-Hour	.250	.562	.247	.229	.091	.285	.489	---	.368

Table 15a. Number of Fish Caught Per Man-Hour, by Section, Pier Fishing, May 12 - September 24, 1978

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total No. of Fish	Catch Per Man-Hour
Northern	---	.123	---	---	.357	---	---	2	.063
Walleye	---	---	---	---	---	---	---	---	---
Bl. Crappie	---	---	---	4.800	---	.130	---	25	.789
Wht. Crappie	---	---	---	---	---	---	---	---	---
Bluegill	1.290	.123	---	.200	---	---	---	6	.189
Pumpkinseed	---	---	---	.200	---	.779	---	7	.221
Green Sunfish	---	---	---	.200	---	---	---	1	.032
Hybrid Sunfish	---	---	---	---	---	---	---	---	---
L.M. Bass	---	.247	---	---	---	---	---	2	.063
Perch	---	---	---	.200	---	---	---	1	.032
Bl. Bullhead	---	---	---	1.200	---	---	---	6	.189
Br. Bullhead	---	---	---	---	---	---	---	---	---
Yl. Bullhead	---	---	---	---	---	---	---	---	---
Rock Bass	---	---	---	---	---	---	---	---	---
Total Number	4	4	---	34	1	7	---	50	
Hours Fished	3.1	8.1	.5	5.0	2.8	7.7	4.5	31.7	
Catch Per Man-Hour	1.290	.494	---	6.800	.357	.090	---	---	1.577

Table 16a. Number of Fish Caught Per Man-Hour, by Section, Bank Fishing. May 12 - September 24, 1978

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total No. of Fish	Catch Per Man-Hour
Northern	---	---	---	---	.250	---	---	3	.033
Walleye	---	---	---	---	---	---	---	---	---
Bl. Crappie	---	---	---	---	.250	---	---	3	.033
Wht. Crappie	---	---	---	---	---	---	---	---	---
Blugill	---	.182	---	---	---	.781	1.023	56	.610
Pumpkinseed	---	---	---	.118	---	.078	.091	7	.076
Green Sunfish	---	---	---	---	---	---	---	---	---
Hybrid Sunfish	2.000	---	---	---	---	---	.045	3	.033
L.M. Bass	---	---	---	---	---	---	---	---	---
Perch	---	---	---	---	---	---	---	---	---
Bl. Bullhead	---	---	---	---	.083	---	.045	3	.033
Br. Bullhead	---	---	---	---	---	---	.023	1	.011
Yl. Bullhead	---	---	---	---	---	---	.023	1	.011
Rock Bass	---	---	---	---	---	---	---	---	---
Total Number	1	1	---	2	7	11	55	77	
Hours Fished	.5	5.5	---	17.0	12.0	12.8	44.0	91.8	
Catch Per Man-Hour	2.000	.182	---	.118	.583	.859	1.250	---	.834

Table 17a. Number of Fish Per Man-Hour for Specified Method or Lure for Four Washington County Lakes May 12 - September 24, 1978

	Method					Bait or Lure			
Species	Still	Troll	Cast	Jig	Mixed	Artificial	Natural	Prepared	Mixed
Northern Pike	.034	.177	.031	----	.044	.081	.040	----	.047
Walleye	----	.007	----	----	.001	tr.	.002	----	.001
Black Crappie	.160	.053	.040	1.834	.107	.096	.133	----	.118
White Crappie	.031	.004	.002	.135	.023	.007	.035	----	.017
Bluegill	.485	.012	.043	.097	.169	.057	.460	----	.152
Pumpkinseed	.035	----	.015	.019	.012	.006	.036	----	.011
Green Sunfish	tr.	----	----	----	----	----	tr.	----	----
Hybrid Sunfish	.008	.001	.001	.039	.004	.001	.008	----	.003
L.M. Bass	.011	.015	.101	.019	.017	.064	.012	----	.018
Perch	.007	.001	----	----	.007	----	.010	----	.003
Black Bullhead	.017	----	----	----	.007	----	.016	----	.007
Brown Bullhead	.001	----	----	----	----	----	.001	----	----
Yellow Bullhead	.012	----	.001	----	.007	tr.	.011	----	.007
Rock Bass	.017	.001	.002	.058	.006	.006	.016	----	.004
Number Caught	3396	271	307	114	1663	686	3494	----	1571
Hours Fished	4153.9	1002.0	1293.9	51.8	4107.1	2149.4	4432.2	1.5	4025.6
Catch Per Man-Hour	.817	.270	.236	2.201	.403	.319	.78	----	.389

Estimates of Harvest on Four Washington County Lakes Expressed in Numbers of Fish Caught and Weight in Pounds in Parenthesis.

Table 18a. May 12 - September 24, 1978

Species	Forest L. Sec. 1	Forest L. Sec. 2	Forest L. Sec. 3	Bone L. Sec. 4	Goose L. Sec. 5	Big Marine L. Sec. 6	Big Marine L. Sec. 7	Total
Northern	1110 (2575)	338 (961)	456 (1653)	36 (187)	170 (503)	4400 (7480)	1937 (2848)	8447 (16207)
Walleye	43 (68)	16 (13)	34 (33)	----	----	121 (582)	----	214 (699)
Bl. Crappie	2350 (611)	2045 (491)	5968 (1552)	2116 (444)	371 (96)	5244 (1521)	2053 (657)	20147 (5372)
Wht. Crappie	979 (353)	998 (309)	1671 (485)	----	----	----	----	3648 (1147)
Bluegill	8574 (1715)	5266 (1053)	8798 (1672)	146 (29)	----	12477 (2495)	7691 (1538)	42952 (8502)
Pumpkinseed	566 (113)	419 (88)	989 (188)	49 (7)	----	784 (165)	549 (115)	3356 (676)
Green Sunfish	----	16 (1)	----	13 (2)	----	----	----	29 (3)
Hybrid Sunfish	131 (31)	145 (32)	171 (29)	----	----	121 (28)	145 (39)	713 (159)
L.M. Bass	783 (1449)	225 (482)	1057 (1945)	----	----	1145 (1729)	896 (1407)	4106 (7012)
Perch	109 (23)	290 (32)	171 (19)	26 (5)	----	301 (30)	12 (3)	909 (112)
Bl. Bullhead	131 (64)	242 (113)	205 (109)	247 (82)	40 (15)	422 (219)	116 (68)	1403 (680)
Br. Bullhead	----	16 (9)	68 (63)	----	----	60 (51)	----	144 (123)
Yl. Bullhead	----	16 (20)	136 (171)	----	----	723 (492)	347 (264)	1222 (947)
Rock Bass	848 (373)	354 (156)	341 (174)	----	----	----	----	1543 (703)
Total Est. No.	15624	10386	20065	2633	581	25798	13746	88833
Total Est. lbs.	7375	3763	8103	756	614	14792	6939	42342
Pounds/Acre	6.69	9.83	10.59	3.65	9.25	13.36	14.62	10.32

Lake Total = 8.55 lbs./acre

Lake Total = 13.74 lbs./acre

TABLE 19a. A Month by Month Summary of Fishing and Non-Fishing Pressure on Forest Lake

May 12 - September 24, 1978

Results for Non-Fishing Activities Expressed in Moving Man-Hours Only

MONTH	RUNABOUTS	WATERSKIING	SAILBOATS	CANOES & ROWBOATS	PONTOON & HOUSEBOATS	FISHING
May 12 - 31	1912	45	615	480	794	17,951
June	5079	639	1017	358	1607	20,064
July	4508	395	1652	247	1883	18,940
August	4020	425	2872	206	1379	10,912
Sept. 1-24	2288	165	1311	461	1670	4,102
TOTAL	17,807	1669	7467	1752	7333	71,969

TABLE 20a. A Month by Month Summary of Fishing and Non-Fishing Pressure on Bone Lake

May 12 - September 24, 1978

Results for Non-Fishing Activities Expressed in Moving Man-Hours Only

MONTH	RUNABOUTS	WATERSKIING	SAILBOATS	CANOES & ROWBOATS	PONTOON & HOUSEBOATS	FISHING
May 12 - 31	63	0	0	44	0	475
June	562	186	0	56	110	1447
July	948	168	30	27	215	496
August	589	155	0	50	203	697
Sept. 1-24	231	38	0	91	45	140
TOTAL	2393	547	30	268	573	3255

TABLE 21a. A Month by Month Summary of Fishing and Non-Fishing Pressure on Goose Lake

May 12 - September 24, 1978

Results for Non-Fishing Activities Expressed in Moving Man-Hours Only

MONTH	RUNABOUTS	WATERSKIING	SAILBOATS	CANOES & ROWBOATS	PONTOON & HOUSEBOATS	FISHING
May 12 - 31	0	0	0	116	49	256
June	58	0	0	343	0	902
July	57	15	0	55	0	335
August	81	28	0	0	0	213
Sept. 1 - 24	148	39	0	0	0	50
TOTAL	344	82	0	514	49	1756

TABLE 22a. A Month by Month Summary of Fishing and Non-Fishing Pressure on Big Marine Lake

May 12 - September 24, 1978

Results for Non-Fishing Activities Expressed in Moving Man-Hours Only

MONTH	RUNABOUTS	WATERSKIING	SAILBOATS	CANOES & ROWBOATS	PONTOON & HOUSEBOATS	FISHING
May 12 - 31	730	30	0	71	56	22,041
June	1479	119	304	116	844	23,527
July	2917	335	538	1218	172	23,293
August	1184	186	312	104	377	13,035
Sept. 1 - 24	966	191	56	0	143	7,291
TOTAL	7276	861	1210	1509	1592	89,187