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A Recalculation of the Annual Statewide Recreational Fishing Effort and Harvest in Minnesota Lakes[1]

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Abstract.-- Creel surveys have been the primary tool used to measure the recreational fisheries in Minnesota since the 1930s. By using over 2,100 previously conducted creel surveys, we were able to estimate the magnitude of the statewide fish harvest from lakes based on actual angler harvest. The annual fishing effort on Minnesota lakes (excluding Lake Superior) is approximately 57 million angler-hours with an estimated harvest of 47 million fish weighing 30 million pounds. Anglers annually harvest 3.8 million walleye, 2.0 million northern pike, 15.6 million sunfish, and 7.0 million crappie.

Introduction

Recreational fishing is among the most popular outdoor activities in Minnesota. Fishing opportunities abound in Minnesota with 5,483 fishable lakes, 15,000 miles of rivers, 2,600 miles of trout streams, and Lake Superior. This translates into over 5.2 million acres of water available for angling. Currently, over 1.5 million anglers annually fish Minnesota waters as indicated by license sales (Cook et al. 1997). When adjusted for anglers not required to purchase a fishing license, it is estimated that 2.3 million people fish Minnesota waters. These Minnesota anglers annually spend about 27 million days on the water fishing (U.S. Department of the Interior and U.S. Department of Commerce 1997).

To efficiently manage Minnesota's fish populations and compete for budgetary dollars, fish managers and administrators must have current information on the statewide fishing effort and harvest. The last published calculation of the statewide harvest of fish by anglers was estimated at 22,200,000 pounds nearly 50 years ago (Moyle 1951). While this number has been updated to 35,000,000 pounds, it is unknown how this estimate was generated. Several other harvest estimates of an unknown origin have been widely used in recent years, such as Minnesota anglers collectively harvest 3.5 million walleye, 3.2 million northern pike, and 64 million panfish annually. With the creation of a creel survey database (Cook and Younk 1998), it was possible to recalculate the statewide harvest based on actual angler harvest data collected during creel surveys.

The Minnesota Department of Natural Resources (MNDNR) has conducted creel surveys as the primary means to estimate the

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recreational harvest since the 1930s. Creel surveys have been conducted on over 976 lakes, resulting in more than 750 publications that discuss various aspects of the recreational catch. Consequently, a very large database was available for analysis. The earliest attempts at quantifying angling information involved selecting lakes representative of "typical" fishing waters (Hiner 1943; Moyle and Franklin 1952, 1955; Scidmore 1961). The first study to describe recreational fishing use on lakes with similar fish assemblages occurred in the 1970s (Hawkinson and Krosch 1972; Peterson 1978). Recently, MNDNR implemented a lake classification system that uses limnological variables to identify distinct lake types (Schupp 1992). Most of the 43 lake classes are also characterized by different fish communities and have diverse geographic centers (Figure 1). Fishery managers already use this lake classification system to evaluate lake survey results and management techniques by comparing lakes of the same classification.

This study had three objectives. The first was to continue collecting and compiling all available creel survey estimates from Minnesota's recreational fisheries. The second was to recalculate long-term creel survey statistics (means and quartiles) by Lake Class. The third was to recalculate the annual statewide harvest of fish by anglers and apportion it among the 43 Lake Classes.

Methods

Creel Survey History, Assumptions, and Data Base Design

The MNDNR has conducted creel surveys to primarily answer specific management questions on a particular water body. Rarely was a larger comprehensive design used for choosing which lakes to sample, and consequently, large-scale geographic or statewide long-term trends have not been previously described. Because a comprehensive sampling design was lacking, we made several assumptions in the analysis of the creel survey database. To obtain a larger sample size, we grouped creel surveyed lakes by Lake Class (Schupp 1992) and described the recreational fishing within a class. However, in many cases within a lake class, creel surveys were not equally distributed either between lakes or years, thus limiting our analyses. We treated multiple creel surveys from a lake as random and independent observations based on the contention that fishing success and species composition of the harvest can change dramatically from year to year in the north-central Great Lakes region (Kempinger et al. 1975; Bruesewitz 1996; Albert 1996). Many reasons for the variation in harvest have been given, including: varying weather conditions (O'Bara 1991); year-class strength (Bruesewitz 1996); partial winter kills (Bandow et al. 1993); and forage composition and availability (Lux and Smith 1960; Kempinger et al. 1975). Because of the variety of factors affecting fishing success on any particular lake, we felt that using each season of creel survey as an independent observation would give the best measure of variability from within a lake class (as opposed to averaging all creels from a given lake).

Creel surveys in Minnesota have been conducted by a variety of sampling designs (Cook et al. 1997). For example, the opening day of walleye and northern pike fishing season is not constant from year to year. Most summer creel surveys were started on opening day, thus survey start dates varied. The ending date of summer creel surveys has been less consistent, ranging from just after Labor Day to late November. The text of many creel reports, however, declared that the survey ended after most anglers had quit fishing for the season, or when fishing effort dropped to an insignificant level. Rather than trying to adjust all the survey estimates to a standard time frame, we assumed that the reported creel estimates accounted for most of the recreational fishing during that season, and any angler activity not sampled was insignificant. A complete description of the creel survey database system can be found in Cook and Younk (1998).

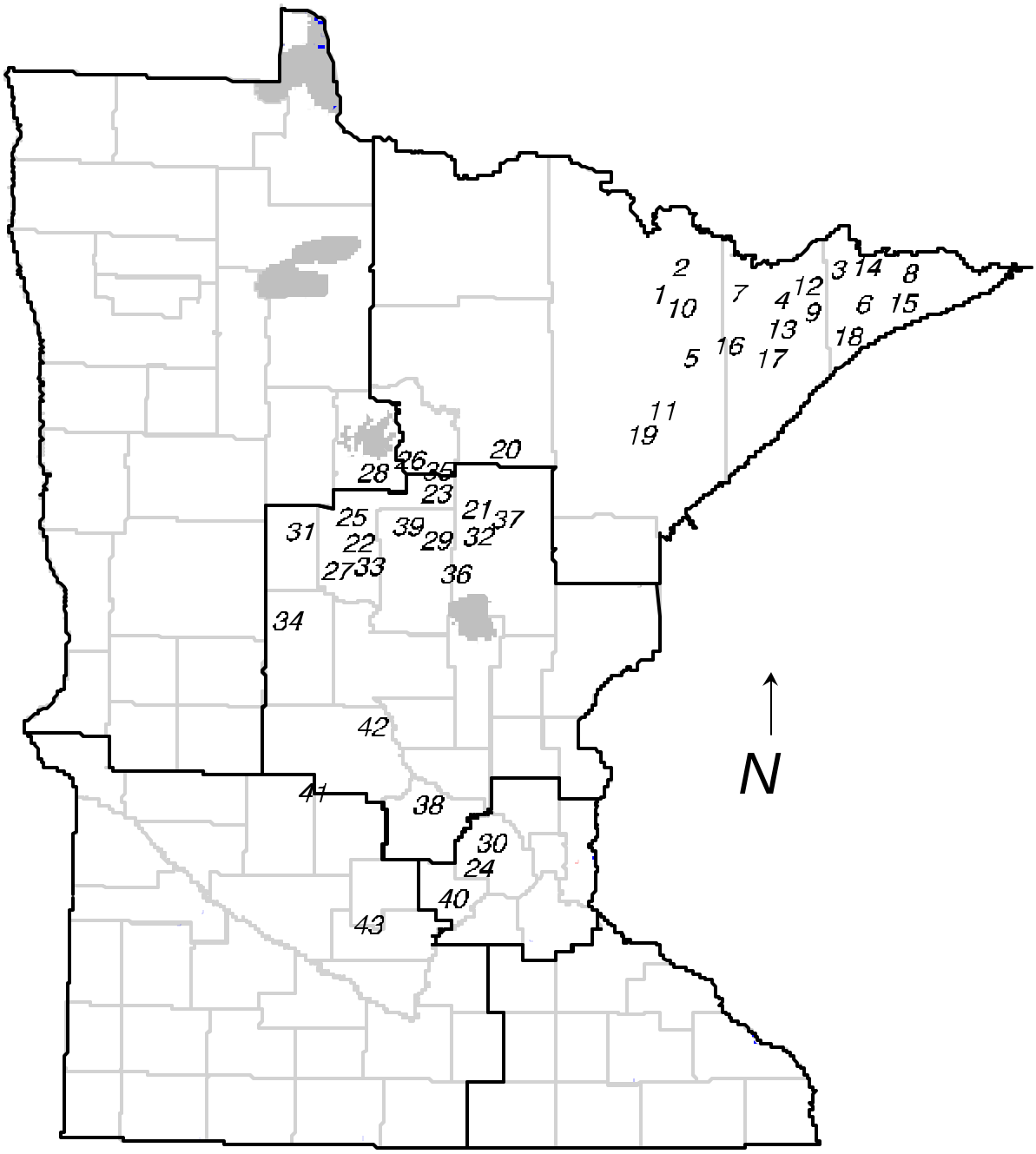

Figure 1. Geographic centers of 43 Minnesota lake classes (adapted from Schupp 1992). Lake Classes 1-19 lie mainly in the three northeastern counties and most are soft-water lakes. The remaining lakes (Lake Classes 20-43), which lie southwest of the arrowhead region of Minnesota, form two clusters of hard-water lakes.

Statistical Analysis

Creel survey estimates from 976 lakes, 2,121 fishing seasons, and 9,828 estimates of harvest were available for analysis. Long-term descriptive values (means, medians and quartiles) were calculated for fishing effort and harvest (by species) for each of the 43 lake classes. Because of small sample sizes in some instances, extreme values could greatly influence means; therefore, on several occasions professional judgement was used to remove outliers. Species harvest estimates of zero were often not included in creel reports. This presented an analysis problem, since it was unknown how many reports excluded these values. Therefore, we excluded all zero values from the harvest analyses. The harvest estimates in this report represent catches greater than zero, or when fish were indeed reported caught. True means and quartiles for harvest estimates would be lower than values presented here. Conversely, values of zero were included in fishing effort analysis, since zero fishing effort has normally been reported in Minnesota creel reports. Number Cruncher Statistical Systems© was used in performing all statistical calculations (Hintze 1995).

Six of the 43 lakes classes had effort estimates but no harvest estimates. By using the dendrogram from Schupp's (1992) classification, harvest estimates were assigned to Lake Classes 11 and 37 from their nearest neighbor in the dendrogram. Four classes (15, 17, 18, and 19) were not used in the harvest analysis presented in this report. Of the 5,483 lakes managed for fishing, 3,531 have been classified into one of the 43 lakes classes by the MNDNR. The remaining unclassified lakes are remote, small, and often susceptible to major environmental disturbances such as winterkill and likely receive little fishing effort. Lake Superior was excluded from all calculations and estimates presented in this report. Therefore, the statewide effort and harvest estimates presented in this report should be considered minimum values for Minnesota lakes.

Un-weighted means of fishing effort and harvest per acre were computed from creel surveys within each lake class. All available surveys from within a lake class were used to compute mean values. Mean values per acre were expanded to include all acreage within a lake class by fishing season (winter and summer), and these seasonal estimates were summed by lake class. Statewide estimates were formed by summing effort and harvest values from the 43 lake classes.

The genus level is used throughout much of this report for discussing conclusions about several species (bullhead, crappie, and sunfish), because creel estimates for these species were occasionally combined in creel survey reports. Historically, MNDNR has given little attention to rivers and streams, and creel surveys on rivers were no exception. Unfortunately, there was not enough information from rivers and streams to make an estimate of the harvest from this resource.

Results & Discussion

Annual fishing effort was computed for each of the 43 lake classes (Table 1), which ranged from as little as 1,100 angler-hours in Lake Class 18 to more than 8 million angler-hours in Lake Class 26. Minnesota's premier walleye lakes are contained in Lake Classes 2 and 26, and together these two classes accounted for 23 percent of the statewide fishing effort. Much of the remaining annual fishing effort was also found in lakes where walleye fisheries were prominent such as Lake Classes 7, 22, 27, and 41 (Table 1).

When summed across lakes classes, the Minnesota annual angler-effort on lakes was 57 million hours (Table 1). The U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census (1997) estimated that 25,850,000 million angler-days were spent fishing in Minnesota, and when expanded by the un-weighted mean of trip length (3.4 hours), an estimated 87,890,000 angler-hours are expended

Table 1. Estimated annual fishing effort by geographic region, lake class, and statewide in Minnesota based on a compilation of creel surveys.

Lake Classes 1-19 (Soft-water lakes)				Lake Classes 20-43 (Hard-water lakes)			
Lake class	Angler-hours	Percentage effort by water hardness	Percentage statewide effort	Lake class	Angler-hours	Percentage effort by water hardness	Percentage statewide effort
1	517,695	6.5	0.9	20	747,243	1.5	1.3
2	3,196,015	40.1	5.6	21	699,472	1.4	1.2
3	282,645	3.5	0.5	22	5,415,261	10.9	9.4
4	162,915	2.0	0.3	23	1,310,363	2.6	2.3
5	437,277	5.5	0.8	24	4,108,950	8.3	7.2
6	146,800	1.8	0.3	25	3,577,012	7.2	6.2
7	1,530,194	19.2	2.7	26	8,668,192	17.5	15.1
8	110,208	1.4	0.2	27	4,020,422	8.1	7.0
9	60,395	0.8	0.1	28	1,158,959	2.3	2.0
10	67,659	0.8	0.1	29	981,028	2.0	1.7
11	70,676	0.9	0.1	30	921,476	1.9	1.6
12	492,224	6.2	0.9	31	1,274,876	2.6	2.2
13	212,947	2.7	0.4	32	527,760	1.1	0.9
14	83,957	1.1	0.1	33	1,654,439	3.3	2.9
15	47,532	0.6	0.1	34	1,806,290	3.7	3.1
16	465,155	5.8	0.8	35	1,078,577	2.2	1.9
17	10,803	0.1	0.0	36	424,693	0.9	0.7
18	1,099	0.0	0.0	37	290,550	0.6	0.5
19	66,916	0.8	0.1	38	1,323,677	2.7	2.3
Total	8,524,438	100.0	14.6	39	1,526,546	3.1	2.7
				40	698,774	1.4	1.2
				41	4,313,877	8.7	7.5
Statewide annual fishing effort				42	1,203,795	2.4	2.1
57,427,522 angler-hours				43	1,730,339	3.5	3.0
				Total	49,462,570	100	86.1

annually in Minnesota. It is not surprising that the estimate based on the federal survey is higher than the creel surveys estimate since it included all waters in Minnesota, not just lakes. The estimate formed from creel surveys does not include unclassified waters, streams, nor Lake Superior.

When Schupp (1992) classified Minnesota's lakes, he separated lakes from the three most northeasterly counties from the rest of the state based on geological history and water quality. Lake Classes (1-19) account for only 15% of the annual fishing effort, although they comprise almost 28% of the water acreage. The limited access, large distance from major metropolitan areas, and the lower productivity likely contributes to the lower angling effort in this region. The highest effort on a per acre basis is still found in lakes near Minneapolis/St. Paul (Lake Classes 30 and 40; Table 2), and those managed for stream trout fisheries (Lake Classes 21, 28, and 33) as originally reported by Cook and Younk (1998).

The annual statewide harvest of all fish was estimated at 47 million fish weighing 30 million pounds (Table 3). This includes an annual harvest of 3.8 million walleye, 2.0 million northern pike, 7.0 million crappie, and 15.6 million sunfish. In recent history, the MNDNR has been using harvest values of 3.5 million walleye and 3.2 million northern pike. The annual harvest values we computed are higher for walleye and lower for northern pike (Table 3).

When Moyle (1951) calculated the first statewide harvest estimates, he did not have the benefit of the large number of creel survey estimates that now exists. Moyle (1951) had estimated an annual harvest of 22 million pounds of fish, while this study estimated an annual

Table 2. Estimated mean fishing effort (angler-hours/acre) by season and lake class in Minnesota based on a compilation of creel surveys.

	Summer fishing effort (Angler-hours/Acre)					Winter fishing effort (Angler-hours/Acre)				
Lake class	Number of surveys	Mean	SE	Minimum	Maximum	Number of surveys	Mean	SE	Minimum	Maximum
1	68	8.3	1.2	0.5	55.5	132	4.0	0.5	0.0	36.2
2	72	7.3	0.7	0.6	23.4	11	1.0	0.2	0.0	1.7
3	24	10.8	1.6	0.3	25.8	69	4.1	0.5	0.0	24.5
4	17	61.2	27.9	0.0	392.0	29	4.7	1.2	0.0	28.4
5	22	13.5	1.5	1.8	26.4	16	5.6	3.0	0.0	39.9
6	11	9.3	1.4	0.4	15.6	8	1.9	1.1	0.0	8.7
7	25	13.4	1.7	6.0	50.6	1	8.4	---	8.4	8.4
8	13	21.1	6.1	1.7	75.5	26	10.6	2.9	0.0	47.1
9	13	59.1	19.2	0.0	192.8	17	6.6	2.2	0.0	35.7
10	14	5.9	1.7	0.0	20.1	9	3.2	1.6	0.0	13.9
11	1	3.4	--	3.4	3.4	---	---	---	---	---
12	11	27.3	8.7	0.0	78.7	3	2.7	1.5	0.4	5.6
13	16	22.1	7.5	0.0	92.0	17	8.8	2.4	0.0	39.5
14	9	27.9	11.7	0.0	90.3	8	5.9	1.7	1.2	16.7
15	3	13.9	1.8	10.4	16.3	---	---	---	---	---
16	9	8.6	0.9	4.3	12.3	5	1.0	0.5	0.0	2.3
17	6	1.1	0.8	0.0	5.1	---	---	---	---	---
18	--	--	--	--	--	4	0.8	0.3	0.0	1.1
19	1	3.0	--	3.0	3.0	---	---	---	---	---
20	20	112.7	14.9	5.9	271.2	15	7.0	2.2	0.0	25.8
21	17	223.4	43.9	0.0	516.0	11	4.3	1.1	0.0	13.1
22	85	17.5	1.0	3.2	57.2	54	3.7	0.7	0.0	23.7
23	43	32.1	5.5	0.7	127.8	13	7.3	2.8	0.1	29.2
24	178	52.1	2.3	0.1	213.1	45	21.0	1.7	0.0	49.3
25	44	34.1	3.4	9.7	146.8	25	11.2	2.1	0.6	37.4
26	73	6.9	0.6	0.5	17.5	72	4.4	0.7	0.0	22.2
27	101	27.0	1.3	3.9	58.6	70	6.7	1.1	0.0	49.4
28	10	110.4	37.4	0.0	344.9	---	---	---	---	---
29	28	34.6	3.5	9.0	82.2	19	6.7	1.1	0.2	21.9
30	75	89.5	16.7	0.0	822.2	6	38.5	9.6	19.8	74.5
31	26	30.9	3.4	11.0	75.9	9	4.2	1.0	0.9	8.5
32	18	33.0	4.2	4.2	62.1	7	5.1	2.2	2.1	18.3
33	12	303.4	92.9	39.4	1009.3	2	85.8	31.8	54.0	117.6
34	22	54.9	7.0	1.5	138.6	13	15.1	4.2	0.0	42.0
35	17	38.4	7.2	0.5	104.3	8	16.4	4.2	0.1	34.1
36	13	58.0	14.9	1.7	199.4	5	12.9	8.1	0.0	43.5
37	1	37.1	--	37.1	37.1	---	---	---	---	---
38	35	60.0	9.3	0.0	268.0	9	17.7	4.0	0.0	34.8
39	17	33.7	4.9	8.9	80.3	6	6.6	3.1	1.2	21.6
40	28	179.7	62.7	0.0	1786.8	---	---	---	---	---
41	31	22.1	2.7	2.2	53.8	25	7.9	1.1	0.1	18.6
42	18	45.0	13.6	0.9	217.3	3	26.6	9.9	12.5	45.7
43	27	30.8	7.5	0.0	154.0	3	5.3	4.8	0.2	14.8

Table 3. Estimated annual fish harvest in Minnesota based on a compilation of creel surveys.

	Annual harvest estimate		
Species	Number	Pounds	Mean weight
Walleye	3,817,799	4,633,345	1.21
Sauger	472,421	386,053	0.82
Yellow perch	5,201,339	1,969,275	0.38
Northern pike	2,033,612	4,645,495	2.28
Muskellunge	2,678	51,464	19.22
Tiger muskie	9,179	302,913	33.00
Black crappie	6,093,854	2,715,080	0.45
White crappie	1,250,542	305,093	0.24
Crappie	7,025,680	3,006,548	0.43
Bluegill	14,120,442	4,226,677	0.30
Hybrid sunfish	873,894	92,230	0.11
Pumpkinseed	859,401	208,988	0.24
Green sunfish	170,868	42,409	0.25
Long-eared sunfish	1,205	---	---
Sunfish spp	15,636,062	4,681,331	0.30
Largemouth bass	868,804	1,147,678	1.32
Smallmouth bass	354,914	364,444	1.03
Whitebass	118,679	102,085	0.86
Rock bass	472,000	257,202	0.54
Tullibee	156,628	172,245	1.10
Lake whitefish	13,644	45,475	3.33
Channel catfish	273,341	497,667	1.82
Flathead catfish	4,200	18,816	4.48
Catfish spp.	17,938	----	---
Black bullhead	1,948,137	954,867	0.49
Brown bullhead	599,724	55,331	0.09
Yellow bullhead	152,471	109,830	0.72
Bullhead	2,741,305	1,609,247	0.59
Freshwater drum	165,380	361,936	2.19
Burbot	146,641	249,110	1.70
Carp	89,848	434,773	4.84
Suckers	70,200	71,523	1.02
Bowfin	14,833	45,925	3.10
Buffalo	1,439	----	---
Other species	726,317	353,722	0.49
Annual harvest of all fish[a]	**46,591,139**	**29,560,140**	0.63

[a] All fish estimates are not directly additive from individual species.

harvest of 30 million pounds. We would expect the current estimate to be higher than Moyle's (1951) estimate given the increase in fishing effort in the last 50 years.

Fish harvest from Minnesota lakes varies dramatically depending on the species and lake class (Table 4), however, some broad conclusions can be made. First, the majority of the fish harvest comes from Lake Classes 20-43 (the hard-water more fertile lakes) with the exception of three species; lake trout, splake, and smallmouth bass. Much of the management for these three species occurs in Lake Classes 1-19. Walleye, yellow perch, and northern pike were harvested from nearly all lake classes.

Three lake classes (22, 24, and 26) provided 31% of the total statewide harvest (Table 4), due to the large size of the lakes (Lake Classes 22 and 26) and number of lakes (Lake Class 24). Two lake classes (22 and 27) characterized by deep, relatively clear waters, sandy bottoms and abundant bullrushes, account for 31% of the largemouth bass and 24% of the northern pike harvest. These two lake classes were also very closely related in Schupp's (1992) classification. Walleye and yellow perch harvest were predominated in Lake Classes 22 and 26 (Table 4), two classes known for percid fisheries. A working estimate of 40% of the walleye harvest is from Minnesota's large-lakes has been used for years (D. Schupp, personal communi-cation). Our estimate is that 43% of the statewide walleye harvest comes from Lakes Classes 22 and 26. However, the estimate based on these two lake classes incorporated a few more lakes than were included in the original 40% figure. Lake Classes 24, 25, and 38 stood out as premier crappie waters (Table 4). Lakes Classes 24 and 25 also were outstanding fisheries for sunfish along with Lake Classes 22 and 41. Lake Classes 2, 3, and 12 were noticeable in terms of smallmouth bass harvest.

In a project such as this, many assumptions have to be made, and of course, estimates are indicative of trends they may at times be far from exact. But several of the results help provide faith in the estimates presented in this report. First, estimated numbers of fish harvested are in expected proportions between species. For example, more panfish species (sunfish and crappie) were harvested than predator species (walleye and northern pike). Species that are rare in the harvest such as muskellunge and burbot also had low statewide harvest estimates (Table 3). However, we suspect the margin of error on these smaller harvest numbers to be greater. As a cross check on the estimated harvest numbers and pounds, mean weight for each species was calculated (Table 4). The resultant mean weights were about what one would expect for each of the reported species, which again provides credence to the statewide estimates. As more creel surveys are completed, the reliance and faith in the estimates will continue to grow.

Management Implications

Recreational fishing is among the most popular outdoor activities in Minnesota. More than two million anglers annually fish Minnesota waters (Minnesota Department of Administration 1988), and spend over $1.9 billion (U.S. Department of the Interior and U.S. Department of Commerce 1997). Similarly the MNDNR has spent a large proportion if its budget measuring the recreational harvest of fish on lakes throughout the state. This report is the first to take creel surveys from individual lakes and combine them by lake class for a larger statewide picture of the recreational harvest.

The estimates by lake class provided in this report should be valuable in making management decisions on a statewide level, useful in work-load analysis, and planning activities. Insight on realistic expectations of harvest and fishing effort between lake classes may also resolve some difficulties in interpreting harvest from a particular lake, geographic location, or between user groups. Similarly, it is probable that particular harvest goals could be developed for each classification type based on existing creel surveys. Knowledge of fish

Table 4. Estimated annual angling harvest by lake class in Minnesota, based on a compilation of creel surveys. No creel surveys that estimated harvest have been conducted in Lake Classes 15, 17, 18, and 19.

Lake class	All Fish		Largemouth bass		Smallmouth bass		Northern pike		Walleye		Yellow perch	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1	132,121	0.4	0	0.0	14,964	4.2	1,808	0.1	29,182	0.8	10,761	0.3
2	733,644	2.1	9,109	1.0	42,924	12.1	81,991	4.0	473,770	12.4	56,300	1.5
3	70,752	0.2	0	0.0	50,045	14.1	4,545	0.2	15,311	0.4	6,459	0.2
4	16,496	0.0	0	0.0	3,688	1.0	0	0.0	0	0.0	0	0.0
5	163,890	0.5	0	0.0	13,263	3.7	5,485	0.3	53,271	1.4	6,185	0.2
6	42,207	0.1	0	0.0	13,310	3.8	3,409	0.2	26,462	0.7	1,836	0.0
7	422,744	1.2	23,961	2.8	36,035	10.2	89,642	4.4	137,751	3.6	50,470	1.3
8	52,575	0.2	0	0.0	0	0.0	0	0.0	1,389	0.0	278	0.0
9	23,106	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
10	29,100	0.1	1,275	0.1	0	0.0	675	0.0	0	0.0	0	0.0
11	24,356	0.1	0	0.0	7,681	2.2	1,967	0.1	15,270	0.4	1,059	0.0
12	242,948	0.7	0	0.0	56,183	15.8	19,656	1.0	8,518	0.2	47,011	1.2
13	146,253	0.4	0	0.0	16,465	4.6	4,685	0.2	20,529	0.5	3,445	0.1
14	56,561	0.2	0	0.0	0	0.0	0	0.0	0	0.0	981	0.0
16	121,741	0.3	0	0.0	41,980	11.8	14,854	0.7	62,312	1.6	15,460	0.4
20	342,850	1.0	4,285	0.5	0	0.0	0	0.0	0	0.0	0	0.0
21	292,711	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
22	3,325,311	9.5	126,583	14.6	17,925	5.1	260,992	12.8	508,357	13.3	603,483	15.8
23	437,158	1.2	39,882	4.6	4,510	1.3	26,049	1.3	13,866	0.4	5,021	0.1
24	4,135,694	11.8	61,074	7.0	6,603	1.9	138,759	6.8	59,627	1.6	224,284	5.9
25	2,720,380	7.8	70,843	8.2	3,396	1.0	169,057	8.3	88,638	2.3	168,488	4.4
26	3,490,302	10.0	3,601	0.4	1,497	0.4	135,399	6.7	1,127,710	29.5	1,997,621	52.3
27	2,236,550	6.4	139,903	16.1	1,789	0.5	233,528	11.5	294,101	7.7	379,633	9.9
28	535,143	1.5	0	0.0	0	0.0	152,880	7.5	0	0.0	0	0.0
29	1,169,222	3.3	47,521	5.5	0	0.0	57,900	2.8	6,352	0.2	33,923	0.9
30	623,652	1.8	12,479	1.4	936	0.3	34,846	1.7	3,504	0.1	29,487	0.8
31	968,008	2.8	29,082	3.3	0	0.0	61,638	3.0	47,924	1.3	61,193	1.6
32	365,198	1.0	20,570	2.4	0	0.0	22,899	1.1	11,095	0.3	1,315	0.0
33	687,106	2.0	11,977	1.4	14,028	4.0	1,658	0.1	0	0.0	8,162	0.2
34	1,257,839	3.6	24,533	2.8	1,418	0.4	131,749	6.5	52,491	1.4	25,155	0.7
35	682,482	1.9	12,573	1.4	492	0.1	28,554	1.4	22,626	0.6	35,414	0.9
36	361,063	1.0	14,905	1.7	0	0.0	16,388	0.8	300	0.0	7,280	0.2
37	472,419	1.3	19,502	2.2	0	0.0	21,442	1.1	392	0.0	9,526	0.3
38	2,089,880	6.0	35,122	4.0	0	0.0	59,288	2.9	4,558	0.1	155,350	4.1
39	1,225,823	3.5	49,095	5.7	504	0.1	94,758	4.7	277,136	7.3	367,017	9.6
40	344,752	1.0	22,748	2.6	0	0.0	4,186	0.2	635	0.0	8,631	0.2
41	2,465,959	7.0	48,534	5.6	5,276	1.5	123,889	6.1	253,978	6.7	404,490	10.6
42	957,248	2.7	26,124	3.0	0	0.0	18,693	0.9	12,292	0.3	72,251	1.9
43	1,614,724	4.6	13,522	1.6	0	0.0	10,344	0.5	188,451	4.9	403,372	10.6

Table 4. Continued.

Lake class	Black and white crappie		Sunfish		Splake and lake trout		Stream trout		Whitefish and tullibee		Rough fish	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1	0	0.0	0	0.0	80,201	13.9	350,943	6.3	1,927	1.1	1,051	0.6
2	30,552	0.4	190,498	1.2	33,081	5.7	0	0.0	7,671	4.5	0	0.0
3	0	0.0	9,026	0.1	60,284	10.5	17,374	0.3	0	0.0	0	0.0
4	0	0.0	0	0.0	4,320	0.8	85,999	1.5	0	0.0	0	0.0
5	71,315	1.0	183,534	1.2	4,826	0.8	569,138	10.2	0	0.0	0	0.0
6	262	0.0	0	0.0	71,990	12.5	71,597	1.3	0	0.0	0	0.0
7	43,995	0.6	376,326	2.4	0	0.0	0	0.0	0	0.0	2,467	1.4
8	0	0.0	0	0.0	31,746	5.5	49,749	0.9	0	0.0	0	0.0
9	0	0.0	0	0.0	9,373	1.6	35,277	0.6	0	0.0	0	0.0
10	0	0.0	0	0.0	24,975	4.3	2,475	0.0	0	0.0	0	0.0
11	151	0.0	0	0.0	41,543	7.2	41,316	0.7	0	0.0	0	0.0
12	0	0.0	0	0.0	1,065	0.2	290,376	5.2	0	0.0	0	0.0
13	0	0.0	0	0.0	46,087	8.0	246,351	4.4	0	0.0	0	0.0
14	0	0.0	0	0.0	16,432	2.9	93,910	1.7	0	0.0	0	0.0
16	7,266	0.1	1,453	0.0	0	0.0	0	0.0	0	0.0	1,453	0.9
20	0	0.0	0	0.0	0	0.0	855,754	15.3	0	0.0	9,381	5.5
21	0	0.0	0	0.0	0	0.0	300,129	5.4	0	0.0	0	0.0
22	328,174	4.7	1,768,975	11.3	147,614	25.6	7,657	0.1	67,256	39.5	119,216	70.0
23	42,707	0.6	249,288	1.6	2,243	0.4	329,874	5.9	0	0.0	37,279	21.9
24	1,451,355	20.7	1,968,845	12.6	0	0.0	0	0.0	0	0.0	728,137	427.6
25	784,266	11.2	1,548,781	9.9	0	0.0	701,342	12.5	1,580	0.9	157,960	92.8
26	16,761	0.2	39,023	0.3	0	0.0	0	0.0	76,863	45.1	323,118	189.8
27	620,811	8.8	1,466,184	9.4	0	0.0	0	0.0	14,976	8.8	228,846	134.4
28	0	0.0	0	0.0	0	0.0	529,366	9.5	0	0.0	0	0.0
29	248,143	3.5	811,363	5.2	0	0.0	0	0.0	0	0.0	63,224	37.1
30	180,577	2.6	233,590	1.5	0	0.0	0	0.0	0	0.0	194,771	114.4
31	262,147	3.7	525,278	3.4	0	0.0	0	0.0	0	0.0	76,625	45.0
32	61,311	0.9	228,696	1.5	0	0.0	0	0.0	0	0.0	1,384	0.8
33	255,315	3.6	207,502	1.3	0	0.0	1,006,035	18.0	0	0.0	18,726	11.0
34	424,318	6.0	676,880	4.3	0	0.0	12,120	0.2	0	0.0	54,153	31.8
35	273,448	3.9	389,434	2.5	0	0.0	0	0.0	0	0.0	5,792	3.4
36	86,614	1.2	242,361	1.6	0	0.0	0	0.0	0	0.0	3,670	2.2
37	113,327	1.6	317,108	2.0	0	0.0	0	0.0	0	0.0	4,802	2.8
38	691,646	9.8	961,463	6.1	0	0.0	0	0.0	0	0.0	295,729	173.7
39	207,174	2.9	549,553	3.5	0	0.0	0	0.0	0	0.0	9,080	5.3
40	12,375	0.2	283,496	1.8	0	0.0	0	0.0	0	0.0	32,554	19.1
41	365,459	5.2	1,633,400	10.4	0	0.0	0	0.0	0	0.0	746,552	438.4
42	173,460	2.5	462,437	3.0	0	0.0	0	0.0	0	0.0	24,920	14.6
43	272,751	3.9	311,568	2.0	0	0.0	0	0.0	0	0.0	837345	491.8

harvest on a statewide basis will be useful in settling user conflicts or allocating limited resources. Statewide estimates could also be used to promote conservation of Minnesota's renewable, but limited fishery resource.

The popularity of fishing in Minnesota is due to the variety and abundance of fishing opportunities available. Anglers may choose from kid's fishing ponds, warm and cold water stream fisheries, salmonid fishing in Lake Superior, world class walleye fisheries, and trophy muskellunge fisheries, just to name a few. The current statewide estimates should also be useful to the resort and tourism industry when describing the popularity or variety of recreational fishing opportunities available in Minnesota.

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