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Completion Report

Summer Creel Survey Report
for
Leech Lake
2010

by

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And Doug Schultz

Walker Area Fisheries Office

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INTRODUCTION

In 1983, the Minnesota Department of Natural Resources increased its commitment to managing Leech Lake and other large walleye lakes by establishing the Large Lake Monitoring Program (LLP). For Leech Lake, this program includes annual collection, analysis, and reporting of fish population data for monitoring long-term population trends, the development of management recommendations, and public outreach (Wingate and Schupp 1984).

In conjunction with annual fish surveys, angler use and harvest information is collected using creel surveys. Surveys are typically conducted two consecutive years out of every six and are used to estimate catch, harvest, and pressure statistics of the recreational fishery. Yield estimates are compared to safe harvest targets prescribed in Special Publication No. 151 (MDNR 1997). If yield estimates in a large lake routinely exceed established safe target harvest levels and the population exhibits signs of biological stress (Gangl and Pereira 2003) more restrictive harvest regulations would be considered to prevent a population collapse.

While Leech Lake is well known among anglers as an exceptional multi-species fishery, most anglers target and harvest walleye *Sander vitreus*. During the 1998-99 open water seasons, anglers averaged 1.2 million angler hours and harvested 174,000 pounds of walleye per year (Sledge, 1999, 2000). However, several consecutive years without a large walleye year class caused declines in overall walleye abundance and an unbalanced population size structure; this in turn produced historically low levels of angler effort and walleye harvest during the 2004-2005 open water seasons (Rivers 2005, 2006). These changes to the walleye fishery, as well as changes in the yellow perch population, coincided with high walleye and yellow perch harvest in the late 1990's, expanding populations of double-crested cormorants during the early 2000's, expanding invasive aquatic species such as rusty crayfish, and the introduction of Eurasian watermilfoil. As a result, an aggressive management plan was developed and implemented to improve fishing quality while benefiting the long-term sustainability of Leech Lake. Regarding the walleye population, management actions included protecting the spawning stock of adult walleye, increasing overall abundance, improving the population size structure, and establishing two strong year classes during 2005-2010. Strategies adopted to achieve these goals included a reduced bag and protected slot limit for walleye (PSL: 18-26" protected, four fish in possession, one longer than 26" allowed in possession) to reduce exploitation of walleye brood stock, double-crested cormorant control, and experimental stockings of marked walleye fry to evaluate reproduction. The overall goal of this plan was to quickly improve the quality of walleye fishing on Leech Lake. In light of a substantial positive response of the walleye population to the implemented management actions (Schultz 2010a), the MN DNR scheduled creel surveys in 2008 and 2009 preceding the normally scheduled surveys during 2010 and 2011 to further assess how improvements in the walleye population transcend to the recreational fishery.

STUDY AREA

Leech Lake (DOW # 11-0203; Lake Class 26, Schupp 1992) is located in northern Cass County, Minnesota and is within the Chippewa National Forest and the Leech Lake Indian Reservation. The lake is the third-largest entirely within State boundaries and has approximately 112,000 surface acres. In its original state, Leech Lake covered about 106,000 acres. A dam constructed on the Leech River in 1884 raised the lake level approximately two feet and increased the surface area to the present state (Wilcox 1979).

Leech Lake is located in three glacial zones and has an irregular shape with many large and small bays (Figure 1). Leech Lake varies considerably from a morphological perspective. Some large bays, such as Steamboat and Boy, display highly eutrophic water characteristics whereas other large bays, such as Walker and Kabekona, have properties more congruent with oligotrophic lakes. The main portion of the lake, like most large Minnesota walleye lakes, is windswept and mesotrophic. Previous estimates of shoreline miles have varied, but using remote sensing technology, the estimate is 201 miles. Approximately 23 percent of the shoreline consists of a gravel-rubble-boulder mixture, nearly all of which is used by spawning walleye (Wilcox 1979).

The diversity of the Leech Lake shoreline and substrate, as well as its extensive littoral zone, provides excellent spawning and nursery habitats for a number of species, including Percids and Esocids which dominate the fish community. Walleye, northern pike *Esox lucius* and muskellunge *E. masquinongy* are the principal predators and are located throughout the lake. Although most fish species are found in every portion of the lake, the largest walleye and muskellunge concentrations exist in the mesotrophic areas. Northern pike are most common in eutrophic bays supporting large areas of dense vegetation. Yellow perch *Perca flavescens* are abundant throughout the lake and are the primary forage for walleye and northern pike. Cisco *Coregonus artedi* and lake whitefish *C. clupeaformis* are an important forage base for muskellunge and trophy northern pike (Engstrom-Heg et al. 1986) and are typically found in the mesotrophic and oligotrophic areas. Other species present in the lake include: white sucker *Catostomus commersoni,* burbot *Lota lota*, rock bass *Ambloplites ruspestris,* bowfin *Amia calva,* shorthead redhorse *Moxostoma macrolepidotum*, bullheads *Ameiurus spp.*, pumpkinseed *Lepomis gibbosus*, bluegill *L. macrochirus*, largemouth bass *Micropterus salmoides,* smallmouth bass *M. dolomieui*, and black crappie *Pomoxis nigromaculatus*.

METHODS

A non-uniform access-based creel survey using clusters of sampling stations was conducted on Leech Lake from 15 May through 30 September 2010; aerial boat counts were used for estimating fishing pressure (Rivers 2005).

Creel Strata

Sampling and data organization were stratified by day type (weekday and weekend/holiday), period (opening weekend and subsequent two-week intervals), and lake basin (western bays and main lake). Observed holidays included Memorial Day, Independence Day, and Labor Day. Statistics were calculated using the Creel Application Software (CAS) program developed by South Dakota Department of Game, Fish, and Parks (Soupir and Brown 2002). Statistics were calculated for each sampling period on a lake-wide basis for better comparison with historical surveys and also monthly for determination of basin-specific estimates to compare against Rivers (2005, 2006). Post-release mortality of walleye, or hooking mortality (Reeves and Bruesewitz 2007), was determined during each two-week sampling period, with basins pooled, using the angler-reported length distribution of released walleye extrapolated to the total estimated number of released walleye and observed mean water temperature recorded daily by submerged temperature loggers.

Estimation of Angling Pressure and Catch Statistics

Angling pressure was estimated using aerial boat counts. Over the course of the creel season, flights were scheduled as three weekday flights per each week and one flight per each weekend/holiday days. Two additional weekend flights were also scheduled during the fishing opener (May 15 and 16) to increase the sample size for estimating pressure during the stratum. With the exception of the opening weekend, a minimum of 8 flights were scheduled within each stratum (Soupir et al. 2006). Flights canceled due to inclement weather were made up at the same time period during the first available day within the same strata (day type and creel period). In some cases flights were pre-flown based on the pending weather forecast to avoid losing sampling days, particularly towards the end of a sampling period.

For obtaining angler interviews, Leech Lake was divided into 14 clusters with each cluster containing two to four sampling stations (Figure 1). These stations included resorts, marinas, and public accesses. Two creel clerks were employed during this survey and each clerk was assigned to a separate group of clusters. Sampling days were randomly selected for each clerk except for the opening weekend (May 15 and 16) when both clerks were scheduled. The remaining survey schedule ensured that at least one clerk worked each day of the season. Non-uniform access probabilities were developed based on the frequency of interviews obtained at each location during the 2004 open water creel survey. Therefore, sampling clusters were randomly selected for each clerk based upon the probability of an angler completing a trip within a particular cluster. Sampling times were randomly selected with equal probability. A sampling day was divided into two non-overlapping periods of equal length, entirely covering daylight hours. The sampling day was 14 hours (0800-2200) from May through August and 12 hours (0800-2000) during September.

On a scheduled sampling day each creel clerk sampled one cluster, visiting all stations within the cluster. The clerks conducted as many interviews as possible, collecting

information on angler demographics, fishing effort, and catch. Clerks were given the latitude to deviate from the schedule and sample other stations within the assigned cluster more frequently if there was no or comparatively light angling pressure at an assigned station. This was done to increase the number of angling parties interviewed by the clerk that day. During interviews, clerks identified and measured as many harvested fish as time allowed and remaining harvested fish were enumerated. Species, number, and length of released fish were obtained through angler recollection. Bullhead species (brown, black, and yellow bullhead) were pooled because anglers were likely to misidentify these species. Similarly, bluegill and pumpkinseed sunfish were also pooled for analysis. Fish weight was estimated using length-weight regression formulas determined with historical gillnet data collected from 1983-2007.

To characterize walleye tournament catch, a creel clerk was assigned to interview tournament anglers for one hour of tournament weigh-in during each day of contest at either the beginning or the end of the clerk's scheduled work day. During interviews the clerk recorded party size, trip length, basin fished, and number and sizes of fish caught, but did not measure fish brought to the weigh-ins. To estimate tournament pressure, aerial boat counts were adjusted for tournament participants using the total number of participating boats reported to the Area office (as required by the permit) and the distribution of interviewed tournament participants among basins. No attempt was made to describe non-walleye tournaments independently during the analysis as the frequency and magnitude of these events was very small relative to the walleye events.

RESULTS

Angling Pressure

A total of 1,715 Leech Lake angling parties were interviewed from 15 May through 30 September 2010 (Table 1). No interviewed parties were utilizing a launch service. The estimated total angling pressure on Leech Lake during the summer fishing season was 672,065 angler-hours (Table 2; Schupp 1972; Gustafson 1985, 1986; Haukos 1992, 1993; Sledge 1999, 2000; Rivers 2005, 2006; Schultz 2009, 2010b). This was approximately 120,000 angler-hours lower than the previous year (794,708 angler-hours; Schultz 2010b) and is slightly lower than the 1965-1999 range (697,267 – 1,290,339 angler-hours). Two walleye events spanning a total of six days of competition accounted for about 14,000 angler-hours of fishing pressure (Table 2). For comparison, walleye tournaments accounted for approximately 21,000 angler-hours on Mille Lacs Lake during 2009 (T. Jones, MN DNR, personal communication).

With the marked improvements in fishing quality over the past few years, particularly for walleye, fishing effort has returned to near the historical range (Table 2). Fuel prices were again above the 10-year average (Figure 2) during the open water season, and this, coupled with a poor national economy in general, could be influencing angler participation and travel patterns. Median distance traveled by anglers interviewed during the 2009 survey, as indexed using zip codes, was the lowest observed since zip code data

was first collected in 1998 and less variable than other fishing seasons (Figure 3). Median distance traveled in 2010 was slightly higher than 2009 but still the second lowest ever recorded. Similarly, nearly 20% of anglers interviewed during 2010 traveled less than 50 miles to fish Leech Lake (Table 3). Most anglers interviewed were Minnesota residents (Table 4) and most angling parties targeted walleye (Table 5; Figure 4).

Catch and Harvest

An estimated 900,152 fish, or 8.06 fish/acre, were caught in Leech Lake during the 2010 summer creel season (Table 6), of which 267,965 were harvested (30% of total catch; 2.40 fish/acre). Most of the total catch and harvest (in terms of numbers of fish) was comprised of yellow perch (63% and 55%, respectively) and walleye (17% and 23%, respectively). The highest stratum-specific estimate of total catch (175,290 fish) occurred during the last two weeks in September while the highest harvest (55,197 fish) occurred during May.

Total yield during the 2010 summer creel season was estimated to be 211,558 pounds of fish (1.90 lbs/acre; Table 7) and is similar to 2009 estimates (Schultz 2010b). During 2010, the overall catch and harvest rates across all anglers were 1.339 and 0.399 fish/hour, respectively (Table 8), compared to respective average catch and harvest rates of 1.023 and 0.260 fish/hour across all anglers and species during 2004-2005 (Rivers 2005, 2006) and 1.201 and 0.356 fish/hour during 2009 (Schultz 2010b). Basin-specific estimates of fishing effort, catch, and harvest are summarized in the appendix (Tables A1-A7).

Walleye

An estimated 60,928 walleye (99,721 pounds) were harvested during 2010 at a rate of 0.091 walleye/hour across all anglers (Table 2). An estimated 628 harvested walleye (2,485 pounds) were within the 18-26 inch protected slot limit (PSL), much lower than the 2009 estimate of 4,660 walleyes (10,334 pounds). Inclusion of post-release hooking mortality (1,975 walleye; 6,216 pounds) increased the total walleye kill to 62,903 fish (75,937 pounds).

The seasonal catch and harvest rates of walleye were 0.222 fish/hour and 0.091 fish/hour, respectively, across all anglers (Table 8). Seasonal walleye catch and harvest rates for anglers specifically targeting walleye were 0.645 fish/hour and 0.197 fish/hour, respectively (Table 9). The targeting walleye harvest rate has returned to the range observed during the 1990's, but is below the 2011-2015 management plan objective of 0.25 fish/hour (Schultz 2010c; Figure 5). The frequency of angling parties that harvested a limit of walleye was highest during the opening weekend. (Tables 10 and 11).

The average harvested walleye across the entire season was 15.16 inches long and weighed approximately 1.14 pounds (Table 7). Lengths of walleye caught ranged from 5-30 inches (Table 12). Creel clerks measured 1,358 harvested walleye and anglers

reported lengths on another 2,715 released walleye. Based on length, most harvested walleye appear to be from the 2006 and 2007 year classes; most of the 2005 year class grew into the PSL (Schultz 2011).

Northern pike

An estimated 16,987 northern pike (49,015 pounds) were harvested at a rate of 0.025 fish/hour across all anglers during 2010 (Table 2), both of which are below the historical averages. This could be due in large part to the success anglers were experiencing with walleye fishing, as a mere 9.5% of angling parties interviewed during the creel survey specifically targeted northern pike, whereas 62% of angling parties targeted walleye (Table 5). Northern pike catch and harvest rates (fish/hour) were highest during May (Tables 8 and 9). Only four angling parties interviewed in 2010 harvested a limit of northern pike (Tables 10 and 11).

Harvested northern pike averaged 23.13 inches long and 2.89 pounds across the entire season (Table 7). While lengths of northern pike caught by anglers ranged from eight to 40 inches, pike 20 to 30 inches were more likely to be harvested (Table 12).

Yellow perch

An estimated 146,750 yellow perch (64,516 pounds) were harvested at a rate of 0.218 fish/hour across all anglers during 2010 (Table 2). While overall harvest remains below the long-term average, the harvest rate of targeting anglers was again above its respective average. Catch and harvest of yellow perch was highest during September (Tables 6 and 7) as were catch and harvest rates (Tables 8 and 9) and the frequencies of angling parties that harvested a limit of yellow perch (Tables 10 and 11).

Anglers reported catching yellow perch that ranged in length from less than 4 inches to 16 inches (Table 12). The average size of yellow perch harvested over the entire season was 9.66 inches long and weighed 0.44 pounds (Table 7), and harvested yellow perch were usually 8.0 inches or longer (Table 12).

Muskellunge

No muskellunge harvest was observed by creel clerks during 2010 (Table 2). Angler catch rates were 0.001 fish/hour across all anglers over the entire season and 0.025 fish/hour for targeting anglers (Tables 8 and 9), or about double the 2009 estimate and similar to the 2008 estimate (Schultz 2009, Schultz 2010b,). Both statistics are within the historical range for the Leech Lake muskellunge fishery. A total of 25 muskellunge were reported released by interviewed angling parties, ranging in length from 16 to 48 inches (Table 12).

Largemouth bass

Approximately 2,611 largemouth bass (4,864 pounds) were harvested at a rate of 0.004 fish/hour across all anglers during the 2010 summer season (Tables 2 and 7). Largemouth bass catch and harvest rates of all anglers were highest during June (Tables 8). Largemouth bass caught by anglers ranged in length from less than 4 inches to 22 inches, with most harvested fish measuring 12 to 17 inches (Table 12). The average size of a harvested largemouth bass was 14.72 inches long and weighed 1.86 pounds (Table 7).

Black crappie

An estimated 5,527 black crappie (4,212 pounds) (Tables 6 and 7) were harvested at a rate of 0.008 fish/hour across all anglers; all of these statistics are lower than the 2009 estimates (Schultz 2010b). Catch and harvest of black crappie was highest during May (Tables 6-8). Length of crappies caught by anglers ranged from 6 to 14 inches, and anglers tended to harvest crappie 8.0 inches and longer (Table 12).

Bluegill/Pumpkinseed (sunfish)

An estimated 21,620 sunfish (11,213 pounds; bluegill and pumpkinseed combined) were harvested at a rate of 0.032 fish/hour across all anglers (Tables 6-8). Catch and harvest statistics across all anglers were highest during July (Table 8) while catch and harvest statistics of targeting anglers was highest during June (Table 9). Lengths of sunfish caught ranged from 4 to 11 inches, with most harvested fish measuring 7 to 9 inches long (Table 12).

DISCUSSION

Management actions implemented in 2005 and continued to date include reducing the resident double-crested cormorant population, protecting mature female walleye with an 18-26 inch protected slot limit, walleye stocking, and habitat protection. These actions, combined with conditions conducive for good walleye and yellow perch recruitment, have increased the abundance and improved the population size structures of both species (Schultz 2010). Due to the exceptionally fast growth exhibited by the 2005-2007 year classes of walleye, improvements to the walleye population have quickly transcended to the recreational fishery. Similar patterns in above-average growth of yellow perch (Schultz 2010) also contributed to improved perch population size structure and overall fishing quality.

Catch and harvest rates of most species commonly sought during summer months were slightly lower than 2009 estimates (Schultz 2010b), but remained above respective historical averages for anglers targeting a specific species in most instances. Total harvest remains below the long-term average, but this seems more a function of fishing effort, not fishing quality. Furthermore, length limits, such as protective slot limits, are intended to reduce or eliminate harvest on a particular size group of fish. The intentions of such a regulation can include improving the overall size structure of a population,

protecting mature fish for more consistent natural reproduction, and/or to improve the overall quality of the fishing experience with higher overall catch rates and generally larger sizes of fish caught. For example, about 672,000 hours of angler effort caught nearly 149,000 walleyes during the 2010 summer season at an overall catch rate of 0.222 walleye/hour; this compares to nearly 1.2 million hours of angler effort catching about 230,000 walleyes at a rate of 0.162 walleye/hour and no special regulation in place (Sledge 2000). While recent strong year classes produced during 2005-2007 have contributed to marked improvements in the walleye fishery, the role of the current protective slot limit cannot be discounted as 39% of the total walleye catch was comprised of fish that could have otherwise been harvested.

The current protected slot regulation (PSL) for walleye on Leech Lake (18-26" walleye must be immediately released; possession limit of 4, one of which may be longer than 26") was formally reviewed and compared to other regulation options in 2010 (Schultz and Staples 2010). Creel clerks solicited comment from anglers regarding proposed regulation changes during September 2010. Additional public comment was received during the month of October via the DNR website, a public meeting, and telephone, walk-in and written correspondence. The majority of public input supported maintaining the regulation through 2015, though some comments expressed consideration for a more liberal length limit that adjusts with measures of spawner biomass. Therefore, if measures of spawner biomass exceed 2.0 lbs/acre during two consecutive years, DNR will consider adjusting the regulation to a 20-26" PSL, bag of 4, one fish over 26" allowed in possession to begin the ensuing season.

Recent changes in the national economy, including high unemployment and fuel prices, may have impacted fishing effort and therefore total harvest during 2009 and 2010. With the high fuel prices and uncertainty about the economy, anglers who had to travel longer distances may have been less willing to make multiple fishing trips than during previous years. Others may have simply chose a fishing destination closer to home. Anecdotal reports from biologists on other large lakes (eg. Lake of the Woods and Winnibigoshish) suggest this trend may be occurring and that lower total fishing effort on Leech Lake may not be a lake-specific phenomenon. Future creel surveys and research efforts should consider characterizing and quantifying how these factors interact with trip travel distance to influence angler trip frequency, which in turn determines fishing effort and total harvest at the local scale.

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TABLES

Table 1. Creel survey sampling summary and angling pressure estimates by stratum for Leech Lake, Minnesota, 15 May – 30 September, 2010. Standard errors appear in parentheses.

	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1
			Sampling Summary (Number)		
Dates	May 15-16	May 17-31	Jun 1-15	Jun 16-30	Jul 1-15
Days in stratum	2	15	15	15	15
N Weekdays sampled	0	11	11	11	11
N Wknd/Hol sampled	2	4	4	4	4
N Interviews/refusals	260/0	226/0	174/0	160/0	114/0
			Boat Angler Trip Length & Party Size		
Mean anglers/boat	2.82 (0.58)	2.44 (0.45)	2.40 (0.46)	2.56 (0.45)	2.46 (0.40)
Mean trip length (h)	6.67 (2.48)	4.29 (0.88)	4.03 (0.54)	3.97 (0.84)	3.40 (0.55)
			Walleye Tournament Angler Trip Length & Party Size		
Mean anglers/boat	-	-	2.00 (0.66)	-	-
Mean trip length (h)	-	-	8.42 (2.73)	-	-
			Launch Angler Trip Length & Party Size		
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
			Fishing Pressure		
Total angler hours	81,794 (22,594)	100,542 (13,220)	87,477 (16,212)	77,975 (5,804)	70,237 (8,380)

	Stratum				
	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2
			Sampling Summary (Number)		
Dates	Jul 16-31	Aug 1-15	Aug 16-31	Sep 1-15	Sep 16-30
Days in stratum	16	15	16	15	15
N Weekdays sampled	11	10	12	11	11
N Wknd/Hol sampled	5	5	4	4	4
N Interviews/refusals	169/0	166/0	144/0	133/0	169/0
			Boat Angler Trip Length & Party Size		
Mean anglers/boat	2.38 (0.34)	2.35 (0.22)	2.28 (0.34)	2.21 (0.33)	2.25 (0.32)
Mean trip length (h)	3.71 (0.47)	3.04 (0.32)	3.34 (0.42)	4.57 (0.76)	4.31 (0.65)
			Walleye Tournament Angler Trip Length & Party Size		
Mean anglers/boat	-	-	-	-	2.00 (0.13)
Mean trip length (h)	-	-	-	-	8.34 (0.53)
			Launch Angler Trip Length & Party Size		
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
			Fishing Pressure		
Total angler hours	69,301 (7,497)	49,090 (5,427)	36,990 (4,419)	45,827 (4,790)	52,832 (5,156)

Table 2. Estimated total angling pressure and total catch statistics for the summer open water creel season on Leech Lake, Minnesota, 1965-2010.

	Year						
	1965	1966	1967	1984	1985	1991	1992
				Angling Pressure			
Angler Trips	221,220	217,185	201,093	182,530	352,646	306,585	246,198
Angler Hours	858,960	862,346	785,905	697,267	1,290,339	1,195,683	935,553
-Walleye Tourn.							
-Total hours	858,960	862,346	785,905	697,267	1,290,339	1,195,683	935,553
				Number of Harvested Fish			
Northern pike	60,943	52,336	48,108	40,109	79,144	42,376	26,610
Muskellunge	139	151	236	20	372	81	32
Largemouth bass	-	-	-	1,023	1,166	1,024	1,466
Yellow perch	150,599	145,510	13,359	143,756	229,660	176,646	216,323
Walleye (Legal)	149,917	162,091	147,822	76,170	161,193	179,898	86,877
-Illegal[1]							
-Released[2]							
-Total kill	149,917	162,091	147,822	76,170	161,193	179,898	86,877
				Pounds of Harvested Fish			
Northern pike	155,800	138,666	125,081	73,609	148,562	96,655	65,526
Yellow perch	78,050	77,813	70,805	54,236	87,033	58,412	83,777
Walleye (Legal)	199,012	224,310	201,038	95,625	163,537	186,882	119,076
-Illegal[1]							
-Released[2]							
-Total kill	199,012	224,310	201,038	95,625	163,537	186,882	119,076
				Harvest per Angler Hour (all anglers)			
Northern pike	0.071	0.061	0.061	0.058	0.061	0.035	0.028
Muskellunge	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Largemouth bass	-	-	-	0.001	0.001	0.001	0.002
Yellow perch	0.175	0.169	0.170	0.206	0.178	0.148	0.231
Walleye	0.174	0.188	0.188	0.109	0.125	0.150	0.093
				Harvest per Angler Hour (targeting anglers)			
Northern pike						0.159	0.110
Muskellunge						0.001	<0.001
Largemouth bass						0.013	0.079
Yellow perch						1.870	2.184
Walleye						0.242	0.162

[a]18-26" protected slot limit

[1]Walleye protected by length limit

[2]Estimated post-release hooking mortality (Reeves and Bruesewitz 2007)

Table 2 continued. Estimated total angling pressure and total catch statistics for the summer open water creel season on Leech Lake, Minnesota, 1965-2010.

	Year							1965-2010
	1998	1999	2004	2005[a]	2008[a]	2009[a]	2010[a]	Mean
Angling Pressure								
Angler Trips	316,930	295,976	192,407	119,114	152,044	179,118	169,590	225,188
Angler Hours	1,274,985	1,193,941	682,346	430,003	585,371	779,163	658,009	868,305
-Walleye Tourn.						15,545	14,056	14,801
-Total hours	1,274,985	1,193,941	682,346	430,003	585,371	794,708	672,065	875,677
Number of Harvested Fish								
Northern pike	50,255	47,749	23,638	13,967	16,908	10,890	16,987	37,859
Muskellunge	-	-	38	119	-	-	-	85
Largemouth bass	2,649	2,349	3,807	3,105	2,412	1,243	2,611	1,633
Yellow perch	391,367	439,768	51,355	84,783	136,096	126,476	146,750	175,175
Walleye	141,577	149,717	29,022	3,940	64,969	81,242	60,300	106,767
-Protected[1]				No est.	2,533	4,660	628	2,607
-Released[2]			708	171	3,424	9,947	1,975	3,245
-Total kill	141,577	149,717	29,730	4,111	70,926	95,849	62,903	108,484
Pounds of Harvested Fish								
Northern pike	122,684	127,013	62,659	37,654	54,820	33,588	49,015	92,238
Yellow perch	113,444	150,666	21,175	34,485	59,149	54,733	64,516	72,021
Walleye	159,393	189,028	68,355	6,348	72,959	86,428	67,236	131,373
-Protected[1]				No est.	8,451	10,334	2,485	7,090
-Released[2]			973	533	5,585	27,002	6,216	8,062
-Total kill	159,393	189,028	69,328	6,881	86,995	123,764	75,937	135,772
Harvest per Angler Hour (all anglers)								
Northern pike	0.044	0.045	0.035	0.033	0.029	0.014	0.025	0.043
Muskellunge	-	-	<0.001	<0.001	-	-	-	-
Largemouth bass	0.002	0.002	0.006	0.007	0.004	0.002	0.004	0.002
Yellow perch	0.347	0.408	0.075	0.197	0.233	0.162	0.218	0.208
Walleye	0.100	0.107	0.043	0.009	0.115	0.110	0.091	0.114
Harvest per Angler Hour (targeting anglers)								
Northern pike	0.128	0.122	0.082	0.074	0.339	0.197	0.247	0.162
Muskellunge	-	-	-	0.001	-	-	-	0.000
Largemouth bass	0.040	0.009	0.054	0.070	0.237	0.059	0.043	0.067
Yellow perch	2.156	2.283	0.479	0.442	2.730	2.020	2.100	1.807
Walleye	0.184	0.227	0.054	0.019	0.459	0.242	0.197	0.198

[a]18-26" protected slot limit

[1]Walleye protected by length limit

[2]Estimated post-release hooking mortality (Reeves and Bruesewitz 2007)

Table 3. Hometown distances of anglers fishing Leech Lake, Minnesota relative to Walker, MN, 15 May – 30 September 2010.

Distance (miles)	N	Percent
0-49	777	18.9
50-99	352	8.6
100-149	864	21.1
150-199	766	18.7
200-249	315	7.7
250-299	144	3.5
300-349	142	3.5
350-399	183	4.5
400-449	159	3.9
450-499	126	3.1
500-5,000	273	6.7
Total	4,101	100.0

Table 4. State of residence of anglers fishing Leech Lake, Minnesota, 15 May – 30 September 2010.

State of Residence	N	Percent
Minnesota	2,839	69.2
Illinois	230	5.6
Iowa	354	8.6
Wisconsin	144	3.5
Indiana	74	1.8
North Dakota	56	1.4
Nebraska	48	1.2
South Dakota	32	0.8
Other	324	7.9
Total	4,101	100.0

Table 5. Frequencies (%) of species targeted by boat parties during each stratum for Leech Lake, Minnesota, 15-May – 30 September 2010.

	Targeted Species								
Stratum	Walleye	Northern pike	Yellow perch	Largemouth bass	Black crappie	Muskellunge	No particular spp.	Other	Total (N)
Opener	96.8	0.0	1.9	0.0	1.3	0.0	0.0	0.0	718
May	78.5	3.9	9.9	0.3	5.8	0.0	0.0	1.4	634
Jun-1	85.4	4.6	1.7	3.4	0.7	1.0	0.7	2.4	410
Jun-2	60.7	13.0	7.4	6.8	0.4	5.0	1.4	5.2	484
Jul-1	58.0	15.9	5.4	3.5	0.0	4.1	4.8	8.3	314
Jul-2	40.2	19.7	9.5	4.4	1.7	12.4	5.6	6.4	482
Aug-1	44.2	21.9	5.8	7.1	0.4	8.9	5.6	6.0	448
Aug-2	36.3	9.3	18.1	6.4	2.0	11.0	10.5	6.4	408
Sep-1	31.8	12.1	38.9	1.6	1.1	7.4	4.9	2.2	365
Sep-2	53.4	2.8	34.8	1.2	0.0	2.4	2.8	2.6	423
Season	61.9	9.5	12.2	3.2	1.6	4.8	3.2	3.7	4,686

Table 6. Catch and harvest estimates by stratum for the open water creel survey on Leech Lake, Minnesota, 2010. Standard errors are in parentheses.

Number Caught

Species	Opener	May	Jun-1	Jun-2	Jul-1
Bullhead spp.	-	-	96 (67)	98 (40)	-
Northern pike	1,985 (694)	12,481 (4,895)	5,454 (1,611)	6,032 (1,320)	7,538 (1,930)
Muskellunge	6 (3)	-	-	57 (48)	94 (102)
Burbot	94 (37)	91 (56)	-	-	-
Rock bass	195 (105)	4,965 (2,679)	14,151 (8,939)	5,282 (2,047)	4,339 (867)
Sunfish spp.	46 (24)	7,377 (6,483)	2,332 (1,434)	8,624 (4,708)	13,723 (6,363)
Smallmouth bass	-	51 (11)	-	-	49 (68)
Largemouth bass	24 (19)	1,499 (843)	5,841 (1,163)	2,792 (1,351)	997 (462)
Black crappie	17 (9)	3,034 (1,424)	1,378 (1,326)	137 (140)	658 (649)
Yellow perch	15,419 (9,724)	67,887 (20,977)	30,466 (12,550)	27,315 (13,242)	42,359 (9,553)
Walleye	24,709 (6,964)	44,882 (12,874)	36,829 (7,373)	12,458 (2,258)	7,266 (1,357)
Cisco	-	-	-	30 (17)	-
Overall	42,524 (16,243)	142,406 (31,620)	96,719 (23,635)	62,824 (17,893)	77,022 (16,454)

Number Harvested

Species	Opener	May	Jun-1	Jun-2	Jul-1
Bullhead spp.	-	-	-	-	-
Northern pike	229 (105)	3,720 (1,484)	1,464 (652)	1,977 (659)	3,255 (1,118)
Muskellunge	-	-	-	-	-
Burbot	24 (19)	-	-	-	-
Rock bass	47 (59)	893 (947)	3,025 (1,999)	1,913 (1,066)	1,033 (-)
Sunfish spp.	46 (24)	3,234 (3,525)	2,022 (1,467)	4,222 (2,628)	5,233 (2,284)
Smallmouth bass	-	15 (11)	-	-	-
Largemouth bass	-	227 (264)	1,258 (871)	343 (189)	144 (114)
Black crappie	17 (9)	2,763 (1,318)	1,301 (1,248)	137 (140)	376 (371)
Yellow perch	6,851 (4,245)	23,203 (6,659)	5,396 (2,103)	5,520 (3,568)	4,697 (1,676)
Walleye	12,868 (3,434)	21,142 (6,276)	10,095 (2,225)	4,724 (1,295)	3,049 (697)
Cisco	-	-	-	30 (17)	-
Overall	20,106 (6,927)	55,197 (11,873)	24,561 (5,750)	18,867 (5,957)	17,787 (3,705)

Table 6 continued. Catch and harvest estimates by stratum for the open water creel survey on Leech Lake, Minnesota, 2010. Standard errors are in parentheses.

Number Caught

Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season
Bullhead spp.	-	-	-	25 (23)	-	219 (81)
Northern pike	6,504 (1,266)	5,559 (1,972)	3,866 (863)	3,622 (1,015)	2,917 (1,365)	55,958 (6,452)
Muskellunge	441 (250)	120 (73)	147 (102)	80 (59)	11 (8)	956 (307)
Burbot	25 (23)	-	-	-	-	210 (71)
Rock bass	5,499 (1,520)	8,584 (4,140)	4,452 (1,816)	1,494 (853)	2,646 (1,296)	51,606 (10,825)
Sunfish spp.	11,223 (5,080)	2,811 (1,392)	3,677 (1,532)	2,500 (2,366)	513 (314)	52,825 (11,938)
Smallmouth bass	-	-	-	-	-	100 (68)
Largemouth bass	1,446 (570)	2,748 (1,171)	807 (368)	866 (325)	274 (143)	17,294 (2,462)
Black crappie	124 (83)	45 (44)	113 (72)	177 (193)	496 (397)	6,179 (2,106)
Yellow perch	38,867 (8,024)	27,448 (8,533)	42,271 (9,974)	113,276 (25,033)	159,715 (30,826)	565,022 (52,652)
Walleye	5,750 (1,383)	3,250 (825)	2,774 (987)	2,707 (709)	8,646 (4,900)	149,271 (17,424)
Cisco	-	-	-	-	4 (8)	34 (18)
Overall	69,928 (11,236)	50,588 (8,636)	58,107 (12,151)	124,747 (26,519)	175,290 (32,794)	900,152 (67,383)

Number Harvested

Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season
Bullhead spp.	-	-	-	25 (23)	-	25 (23)
Northern pike	1,829 (588)	1,877 (822)	757 (301)	1,253 (324)	627 (180)	16,987 (2,361)
Muskellunge	-	-	-	-	-	-
Burbot	-	-	-	-	-	24 (19)
Rock bass	727 (513)	2,645 (1,615)	1,683 (992)	491 (503)	958 (593)	13,414 (3,239)
Sunfish spp.	2,716 (2,004)	1,084 (721)	1,502 (565)	1,444 (1,326)	117 (50)	21,620 (5,772)
Smallmouth bass	-	-	-	-	-	15 (11)
Largemouth bass	25 (23)	388 (262)	19 (21)	206 (137)	-	2,611 (983)
Black crappie	124 (83)	22 (22)	113 (72)	177 (193)	496 (397)	5,527 (1,913)
Yellow perch	6,518 (2,185)	7,553 (4,590)	10,678 (3,357)	31,666 (7,160)	44,667 (9,793)	146,750 (16,328)
Walleye	2,673 (1,034)	1,427 (506)	1,663 (747)	750 (298)	2,537 (1,043)	60,928 (7,833)
Cisco	-	-	-	-	-	30 (17)
Overall	14,611 (3,439)	14,998 (4,569)	16,414 (4,470)	36,012 (8,023)	49,403 (10,226)	267,955 (22,200)

Table 7. Yield estimates and mean weights of harvested fish by stratum for Leech Lake, Minnesota, 15 May – 30 September 2010. Standard errors are in parentheses.

Species	Opener	May	Jun-1	Jun-2	Jul-1
			Total Pounds Harvested		
Northern pike	685 (414)	10,116 (7,249)	4,507 (4,365)	5,435 (2,222)	8,290 (2,557)
Rock bass	42 (-)	714 77	1,797 (1,395)	1,217 (363)	521 (-)
Sunfish spp.	20 (-)	1,010 (1,316)	723 (611)	3,800 (3,499)	2,382 (3,054)
Largemouth bass	-	246 (-)	2,676 (2,384)	481 (92)	180 (-)
Black crappie	12 (-)	2,429 (2,176)	765 (1,726)	108 (113)	72 (-)
Yellow perch	3,227 (1,383)	9,474 (8,965)	1,523 (1,253)	1,882 (1,384)	1,954 (1,359)
Walleye	13,209 (6,992)	23,911 (17,372)	11,441 (3,823)	6,307 (2,930)	3,286 (1,327)
			Mean Weight (pounds) of Harvested Fish		
Northern pike	2.99 (2.88)	2.72 (2.30)	3.08 (3.32)	2.75 (1.47)	2.55 (1.24)
Rock bass	0.90 (-)	0.80 (0.85)	0.59 (0.61)	0.64 (0.41)	0.50 (-)
Sunfish spp.	0.44 (-)	0.31 (0.53)	0.36 (0.40)	0.90 (1.00)	0.46 (0.62)
Largemouth bass	-	1.08 (-)	2.13 (2.40)	1.40 (0.82)	1.25 (-)
Black crappie	0.69 (-)	0.88 (0.91)	0.59 (1.44)	0.79 (1.15)	0.19 (-)
Yellow perch	0.47 (0.46)	0.41 (0.41)	0.28 (0.26)	0.34 (0.33)	0.42 (0.33)
Walleye	1.03 (0.91)	1.13 (0.90)	1.13 (0.47)	1.34 (0.74)	1.08 (0.52)
			Mean Length (in) of Harvested Fish		
Northern pike	24.01 (22.92)	22.59 (18.33)	23.53 (23.44)	22.91 (12.61)	22.32 (10.53)
Rock bass	10.33 (-)	9.68 (10.29)	9.00 (9.27)	9.18 (6.09)	8.52 (-)
Sunfish spp.	7.97 (-)	7.09 (12.39)	7.30 (10.49)	9.71 (10.12)	7.81 (9.31)
Largemouth bass	-	12.45 (-)	15.48 (16.98)	13.46 (7.88)	13.01 (-)
Black crappie	10.52 (-)	11.32 (11.51)	9.87 (24.19)	10.84 (15.86)	7.01 (-)
Yellow perch	9.94 (9.69)	9.46 (9.44)	8.40 (8.63)	8.92 (9.39)	9.42 (6.62)
Walleye	14.68 (13.08)	15.17 (12.28)	15.14 (6.39)	15.83 (10.01)	14.88 (7.39)

Table 7 continued. Yield estimates and mean weights of harvested fish by stratum for Leech Lake, Minnesota, 15 May – 30 September 2010. Standard errors are in parentheses.

Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season
			Total Pounds Harvested			
Northern pike	6,820 (3,836)	5,260 (3,626)	2,877 (3,799)	3,703 (2,086)	1,323 (591)	49,015 (11,413)
Rock bass	237 (177)	1,466 (1,212)	1,058 (707)	325 (1,413)	641 (465)	8,017 (2,510)
Sunfish spp.	1,116 (1,927)	651 (383)	610 (292)	864 (954)	36 (-)	11,213 (5,342)
Largemouth bass	96 (-)	864 (789)	26 (29)	295 (33)	-	4,864 (2,513)
Black crappie	72 (55)	18 (18)	97 (60)	183 (-)	457 (385)	4,212 (2,807)
Yellow perch	1,965 (1,062)	3,748 (3,142)	4,746 (4,941)	15,392 (5,947)	20,606 (8,102)	64,516 (14,968)
Walleye	3,030 (2,226)	1,781 (1,407)	2,013 (1,907)	1,033 (127)	3,711 (1,345)	69,721 (19,699)
			Mean Weight (pounds) of Harvested Fish			
Northern pike	3.73 (2.47)	2.80 (2.31)	3.80 (5.28)	2.95 (1.89)	2.11 (1.15)	2.89 (0.80)
Rock bass	0.33 (0.35)	0.55 (0.58)	0.63 (0.57)	0.66 (3.09)	0.67 (0.64)	0.60 (0.24)
Sunfish spp.	0.41 (0.77)	0.60 (0.53)	0.41 (0.27)	0.60 (0.86)	0.31 (-)	0.52 (0.28)
Largemouth bass	3.81 (-)	2.22 (2.53)	1.35 (2.07)	1.44 (0.97)	-	1.86 (1.19)
Black crappie	0.58 (0.59)	0.79 (1.11)	0.86 (0.77)	1.03 (-)	0.92 (1.07)	0.76 (0.58)
Yellow perch	0.30 (0.20)	0.50 (0.51)	0.44 (0.49)	0.49 (0.22)	0.46 (0.21)	0.44 (0.12)
Walleye	1.13 (0.94)	1.25 (1.10)	1.21 (1.30)	1.38 (0.61)	1.46 (0.80)	1.14 (0.39)
			Mean Length (in) of Harvested Fish			
Northern pike	24.97 (16.79)	23.06 (18.23)	25.56 (33.17)	23.45 (14.03)	21.23 (11.00)	23.13 (6.12)
Rock bass	7.41 (7.74)	8.81 (8.73)	9.10 (8.19)	9.24 (45.60)	9.30 (8.52)	8.96 (3.59)
Sunfish spp.	7.73 (14.40)	8.60 (6.98)	7.56 (5.53)	8.71 (12.27)	7.09 (-)	8.09 (4.21)
Largemouth bass	18.31 (-)	15.69 (16.74)	13.41 (20.45)	13.68 (9.26)	-	14.72 (8.65)
Black crappie	10.00 (10.16)	10.84 (15.28)	11.30 (10.20)	12.01 (-)	11.51 (13.31)	10.68 (8.23)
Yellow perch	8.42 (5.44)	9.97 (10.01)	9.74 (10.59)	9.99 (4.53)	9.86 (4.54)	9.66 (2.54)
Walleye	15.01 (13.89)	15.70 (13.88)	15.52 (16.51)	15.55 (8.00)	16.24 (8.13)	15.16 (5.35)

Table 8. Estimates of catch and harvest rates of selected species for all anglers by stratum during the open water season on Leech Lake, Minnesota, 2010.

Species	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1
			Catch per Angler Hour		
Bullhead spp.	-	-	0.001 (0.001)	0.001 (0.001)	-
Northern pike	0.024 (0.009)	0.124 (0.051)	0.062 (0.023)	0.077 (0.020)	0.107 (0.035)
Muskellunge	<0.001 (<0.001)	-	-	0.001 (0.001)	0.001 (0.001)
Burbot	0.001 (0.001)	0.001 (0.001)	-	-	-
Rock bass	0.002 (0.001)	0.049 (0.022)	0.162 (0.099)	0.068 (0.051)	0.062 (0.029)
Sunfish spp.	0.001 (<0.001)	0.073 (0.064)	0.027 (0.024)	0.111 (0.061)	0.195 (0.175)
Smallmouth bass	-	0.001 (<0.001)	-	-	0.001 (0.001)
Largemouth bass	<0.001 (<0.001)	0.015 (0.009)	0.067 (0.018)	0.036 (0.017)	0.014 (0.010)
Black crappie	<0.001 (<0.001)	0.030 (0.005)	0.016 (0.012)	0.002 (0.002)	0.009 (0.009)
Yellow perch	0.189 (0.088)	0.675 (0.302)	0.348 (0.137)	0.350 (0.167)	0.603 (0.199)
Walleye	0.302 (0.125)	0.446 (0.180)	0.421 (0.152)	0.160 (0.030)	0.103 (0.027)
Cisco	-	-	-	<0.001 (<0.001)	-
Overall	0.520 (0.192)	1.416 (0.512)	1.106 (0.330)	0.806 (0.227)	1.097 (0.357)
			Harvest per Angler Hour		
Bullhead spp.	-	-	-	-	-
Northern pike	0.003 (0.001)	0.037 (0.015)	0.017 (0.007)	0.025 (0.008)	0.046 (0.018)
Muskellunge	-	-	-	-	-
Burbot	<0.001 (<0.001)	-	-	-	-
Rock bass	0.001 (0.001)	0.009 (0.009)	0.035 (0.022)	0.025 (0.018)	0.015 (0.002)
Sunfish spp.	0.001 (<0.001)	0.032 (0.034)	0.023 (0.023)	0.054 (0.034)	0.075 (0.055)
Smallmouth bass	-	<0.001 (<0.001)	-	-	-
Largemouth bass	-	0.002 (0.003)	0.014 (0.010)	0.004 (0.002)	0.002 (0.002)
Black crappie	<0.001 (<0.001)	0.027 (0.004)	0.015 (0.011)	0.002 (0.002)	0.005 (0.005)
Yellow perch	0.084 (0.039)	0.231 (0.099)	0.062 (0.023)	0.071 (0.045)	0.067 (0.029)
Walleye	0.157 (0.070)	0.210 (0.085)	0.115 (0.042)	0.061 (0.017)	0.043 (0.011)
Cisco	-	-	-	<0.001 (<0.001)	-
Overall	0.246 (0.092)	0.549 (0.195)	0.281 (0.082)	0.242 (0.079)	0.253 (0.074)

Table 8 continued. Estimates of catch and harvest rates of selected species for all anglers by stratum during the open water season on Leech Lake, Minnesota, 2010.

Species	Stratum											
	Jul-2		Aug-1		Aug-2		Sep-1		Sep-2		Season	
						Catch per Angler Hour						
Bullhead spp.	-		-		-		0.001	(0.001)	-		<0.001	(<0.001)
Northern pike	0.094	(0.026)	0.113	(0.042)	0.105	(0.038)	0.079	(0.026)	0.055	(0.026)	0.083	(0.011)
Muskellunge	0.006	(0.005)	0.002	(0.002)	0.004	(0.003)	0.002	(0.001)	<0.001	(<0.001)	0.001	(<0.001)
Burbot	<0.001	(<0.001)	-		-		-		-		<0.001	(<0.001)
Rock bass	0.079	(0.024)	0.175	(0.095)	0.120	(0.121)	0.033	(0.015)	0.050	(0.025)	0.077	(0.018)
Sunfish spp.	0.162	(0.086)	0.057	(0.028)	0.099	(0.064)	0.055	(0.054)	0.010	(0.007)	0.079	(0.021)
Smallmouth bass	-		-		-		-		-		<0.001	(<0.001)
Largemouth bass	0.021	(0.012)	0.056	(0.026)	0.022	(0.011)	0.019	(0.007)	0.005	(0.003)	0.026	(0.004)
Black crappie	0.002	(0.001)	0.001	(0.001)	0.003	(0.002)	0.004	(0.004)	0.009	(0.008)	0.009	(0.003)
Yellow perch	0.561	(0.158)	0.559	(0.205)	1.143	(0.455)	2.472	(0.687)	3.023	(0.681)	0.841	(0.096)
Walleye	0.083	(0.021)	0.066	(0.024)	0.075	(0.027)	0.059	(0.020)	0.164	(0.086)	0.222	(0.032)
Cisco	-		-		-		-		<0.001	(<0.001)	<0.001	(<0.001)
Overall	1.009	(0.247)	1.031	(0.279)	1.571	(0.572)	2.722	(0.704)	3.318	(0.711)	1.339	(0.136)
						Harvest per Angler Hour						
Bullhead spp.	-		-		-		0.001	(0.001)	-		<0.001	(<0.001)
Northern pike	0.026	(0.010)	0.038	(0.016)	0.020	(0.012)	0.027	(0.008)	0.012	(0.004)	0.025	(0.004)
Muskellunge	-		-		-		-		-		-	
Burbot	-		-		-		-		-		<0.001	(<0.001)
Rock bass	0.010	(0.008)	0.054	(0.037)	0.045	(0.060)	0.011	(0.009)	0.018	(0.011)	0.020	(0.005)
Sunfish spp.	0.039	(0.029)	0.022	(0.015)	0.041	(-)	0.032	(0.030)	0.002	(0.001)	0.032	(0.009)
Smallmouth bass	-		-		-		-		-		<0.001	(<0.001)
Largemouth bass	<0.001	(<0.001)	0.008	(0.006)	0.001	(0.001)	0.004	(0.003)	-		0.004	(0.001)
Black crappie	0.002	(0.001)	<0.001	(<0.001)	0.003	(0.002)	0.004	(0.004)	0.009	(0.008)	0.008	(0.003)
Yellow perch	0.094	(0.037)	0.154	(0.095)	0.289	(0.141)	0.691	(0.180)	0.845	(0.199)	0.218	(0.028)
Walleye	0.039	(0.016)	0.029	(0.012)	0.045	(0.021)	0.016	(0.007)	0.048	(0.015)	0.091	(0.014)
Cisco	-		-		-		-		-		<0.001	(<0.001)
Overall	0.211	(0.060)	0.306	(0.113)	0.444	(0.192)	0.786	(0.193)	0.935	(0.210)	0.399	(0.043)

Table 9. Estimates of catch and harvest rates of selected species for targeting anglers by stratum during the open water season on Leech Lake, Minnesota, 2010.

Species	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1
			Catch per Angler Hour		
Northern pike	0.240 (-)	1.831 (1.583)	0.622 (0.352)	0.599 (0.379)	0.833 (0.157)
Muskellunge	-	-	-	0.027 (0.056)	-
Rock bass	-	2.000 (-)	-	0.660 (-)	-
Sunfish spp.	-	3.979 (-)	4.356 (-)	3.890 (1.218)	3.098 (4.422)
Largemouth bass	-	4.724 (-)	0.997 (-)	0.558 (0.470)	1.044 (2.226)
Black crappie	0.080 (<0.001)	1.627 (1.502)	5.818 (-)	-	-
Yellow perch	2.828 (-)	6.286 (3.175)	17.696 (-)	3.654 (3.080)	7.458 (5.729)
Walleye	0.782 (0.868)	0.993 (0.637)	1.100 (0.258)	0.496 (0.531)	0.360 (0.216)
Targeted any	-	-	8.710 (-)	3.057 (0.147)	2.979 (2.494)
			Harvest per Angler Hour		
Northern pike	-	0.360 (0.449)	0.357 (0.233)	0.196 (0.185)	0.422 (0.174)
Muskellunge	-	-	-	-	-
Rock bass	-	0.824 (-)	-	0.234 (-)	-
Sunfish spp.	-	1.548 (-)	4.356 (-)	2.453 (1.216)	0.960 (0.973)
Largemouth bass	-	-	0.134 (-)	0.070 (0.066)	-
Black crappie	0.080 (<0.001)	1.440 (1.256)	5.455 (-)	-	-
Yellow perch	1.758 (-)	2.328 (1.053)	2.141 (-)	1.144 (1.116)	1.363 (1.065)
Walleye	0.397 (0.416)	0.458 (0.309)	0.301 (0.166)	0.190 (0.341)	0.150 (0.171)
Targeted Any	-	-	3.871 (-)	0.203 (0.317)	0.341 (0.471)

Table 9 continued. Estimates of catch and harvest rates of selected species for targeting anglers by stratum during the open water season on Leech Lake, Minnesota, 2010.

Species	Stratum											
	Jul-2		Aug-1		Aug-2		Sep-1		Sep-2		Season	
						Catch per Angler Hour						
Northern pike	0.638	(0.372)	0.858	(0.471)	0.751	(0.630)	0.476	(1.384)	0.178	(0.173)	0.755	(0.257)
Muskellunge	0.056	(0.074)	0.032	(0.036)	0.029	(0.141)	0.026	(0.041)	-		0.025	(0.027)
Rock bass	-		-		-		10.400	(-)	-		3.298	(-)
Sunfish spp.	3.756	(0.492)	1.230	(1.034)	1.937	(0.623)	2.482	(-)	0.273	(-)	2.759	(0.601)
Largemouth bass	0.571	(0.320)	0.899	(3.571)	0.495	(0.383)	0.621	(0.323)	0.331	(0.434)	0.816	(0.666)
Black crappie	0.115	(0.465)	-		0.307	(0.044)	0.299	(-)	-		1.085	(0.387)
Yellow perch	4.584	(1.420)	5.468	(3.353)	8.428	(4.012)	10.608	(5.860)	12.385	(6.577)	8.188	(1.489)
Walleye	0.377	(0.147)	0.311	(0.389)	0.313	(0.418)	0.268	(0.249)	1.034	(0.143)	0.654	(0.110)
Targeted any	8.141	(0.720)	5.244	(6.057)	8.691	(7.603)	6.545	(0.341)	4.054	(1.421)	5.968	(1.651)
						Harvest per Angler Hour						
Northern pike	0.145	(0.122)	0.272	(0.274)	0.181	(0.283)	0.229	(0.389)	-		0.247	(0.089)
Muskellunge	-		-		-		-		-		-	
Rock bass	-		-		-		6.400	(-)	-		1.842	(-)
Sunfish spp.	1.723	(0.492)	0.625	(0.450)	0.635	(0.288)	1.387	(-)	-		1.397	(0.195)
Largemouth bass	-		0.092	(0.237)	0.009	(-)	-		-		0.043	(0.043)
Black crappie	0.115	(0.465)	-		0.307	(0.044)	0.299	(-)	-		1.004	(0.326)
Yellow perch	1.325	(0.686)	1.524	(2.205)	2.182	(1.522)	3.067	(1.636)	3.240	(1.693)	2.100	(0.498)
Walleye	0.204	(0.185)	0.137	(0.271)	0.177	(0.280)	0.073	(0.147)	0.105	(0.052)	0.197	(0.068)
Targeted Any	0.053	(0.074)	2.212	(3.363)	3.208	(3.652)	1.840	(0.137)	1.218	(0.375)	1.653	(0.829)

Table 10. Percent of all angling parties who harvested a given number of fish by stratum from Leech Lake, Minnesota, 15 May – 30 September 2010.

		Number Harvested per Angler					
Species/stratum	N	0	0.1-0.9	1.0-1.9	2.0-2.9	3	
Northern pike							
Opener	260	95%	5%	0%	0%	0%	
May	226	85%	8%	5%	0%	1%	
Jun-1	174	92%	5%	3%	0%	0%	
Jun-2	160	89%	6%	4%	0%	1%	
Jul-1	114	88%	6%	3%	3%	1%	
Jul-2	169	86%	9%	3%	1%	0%	
Aug-1	166	85%	10%	4%	1%	0%	
Aug-2	144	92%	6%	1%	1%	0%	
Sep-1	133	84%	11%	5%	0%	0%	
Sep-2	169	93%	5%	1%	0%	0%	
Yellow perch	**N**	0	0.1-4.9	5.0-9.9	10.0-14.9	15.0-19.9	20
Opener	260	68%	29%	2%	0%	1%	0%
May	226	73%	20%	4%	2%	0%	0%
Jun-1	174	89%	10%	1%	1%	0%	0%
Jun-2	160	92%	6%	2%	0%	0%	0%
Jul-1	114	89%	10%	2%	0%	0%	0%
Jul-2	169	86%	11%	2%	1%	0%	0%
Aug-1	166	87%	12%	1%	1%	0%	0%
Aug-2	144	72%	20%	5%	1%	1%	0%
Sep-1	133	57%	12%	17%	8%	4%	2%
Sep-2	169	62%	11%	10%	10%	5%	2%
Walleye	**N**	0	0.1-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4
Opener	260	32%	26%	18%	14%	5%	4%
May	226	48%	16%	20%	8%	3%	4%
Jun-1	174	63%	11%	17%	6%	1%	3%
Jun-2	160	72%	15%	11%	1%	1%	1%
Jul-1	114	79%	10%	9%	1%	2%	0%
Jul-2	169	88%	7%	4%	1%	1%	0%
Aug-1	166	87%	8%	2%	1%	1%	1%
Aug-2	144	88%	5%	3%	3%	1%	0%
Sep-1	133	89%	8%	2%	0%	0%	0%
Sep-2	169	84%	10%	4%	1%	1%	1%

Northern pike: 3 fish in possession, 1 fish over 30 inches allowed in possession (statewide regulation).

Yellow perch: 20 fish daily, 40 in possession, no length limit (statewide regulation).

Walleye: 4 fish in possession, 18-26 inch PSL, 1 fish over 26 inches allowed in possession (special regulation).

Table 11. Percent of targeting angling parties who harvested a given number of fish by stratum from Leech Lake, Minnesota, 15 May – 30 September 2010.

		Number Harvested per Angler					
Species/stratum	N	0	0.1-0.9	1.0-1.9	2.0-2.9	3	
Northern pike							
Opener	1	100%	0%	0%	0%	0%	
May	13	54%	8%	15%	8%	15%	
Jun-1	8	50%	25%	25%	0%	0%	
Jun-2	25	60%	16%	20%	0%	4%	
Jul-1	20	60%	25%	5%	10%	0%	
Jul-2	36	72%	11%	14%	3%	0%	
Aug-1	41	63%	22%	15%	0%	0%	
Aug-2	17	65%	18%	6%	12%	0%	
Sep-1	20	45%	35%	20%	0%	0%	
Sep-2	4	100%	0%	0%	0%	0%	
	0						
Yellow perch	N	0	0.1-4.9	5.0-9.9	10.0-14.9	15.0-19.9	20
Opener	6	33%	33%	17%	0%	17%	0%
May	25	16%	40%	20%	16%	4%	4%
Jun-1	3	67%	0%	33%	0%	0%	0%
Jun-2	12	42%	42%	17%	0%	0%	0%
Jul-1	6	17%	50%	33%	0%	0%	0%
Jul-2	17	24%	59%	12%	6%	0%	0%
Aug-1	11	73%	18%	0%	9%	0%	0%
Aug-2	25	32%	44%	12%	8%	4%	0%
Sep-1	62	26%	13%	34%	16%	6%	5%
Sep-2	63	13%	25%	24%	24%	8%	6%
	0						
Walleye	N	0	0.1-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4
Opener	257	32%	26%	19%	14%	5%	4%
May	199	42%	19%	23%	9%	3%	5%
Jun-1	157	59%	11%	18%	6%	1%	4%
Jun-2	120	66%	18%	13%	2%	1%	1%
Jul-1	79	71%	13%	13%	1%	3%	0%
Jul-2	86	80%	10%	7%	1%	1%	0%
Aug-1	88	78%	14%	3%	1%	1%	2%
Aug-2	70	79%	7%	7%	6%	1%	0%
Sep-1	52	81%	13%	6%	0%	0%	0%
Sep-2	106	81%	10%	6%	1%	1%	1%

Northern pike: 3 fish in possession, 1 fish over 30 inches allowed in possession (statewide regulation).

Yellow perch: 20 fish daily, 40 in possession, no length limit (statewide regulation).

Walleye: 4 fish in possession, 18-26 inch PSL, 1 fish over 26 inches allowed in possession (special regulation).

Table 12. Length-frequency distribution (%) of harvested and released fish for Leech Lake, Minnesota, 15 May – 30 September 2010.

	Number Harvested (H) and Released (R)													
	Bullhead spp.		Northern pike		Muskellunge		Burbot		Rock bass		Smallmouth Bass		Largemouth bass	
TL (inches)	H	R	H	R	H	R	H	R	H	R	H	R	H	R
<4.00														1
4.00-4.99										2				3
5.00-5.99									1	90				
6.00-6.99										185				2
7.00-7.99									8	104				2
8.00-8.99				3				1	65	162		1		2
9.00-9.99		1		1					72	33	1	2		1
10.00-10.99		2		3					40	68				8
11.00-11.99									10	23				9
12.00-12.99	1			44					3	45			11	33
13.00-13.99				8						2			9	30
14.00-14.99			5	39						2			7	59
15.00-15.99		1	3	49					1				5	39
16.00-16.99				80		1							6	63
17.00-17.99			19	28									8	101
18.00-18.99			7	128									1	51
19.00-19.99			14	29										3
20.00-20.99			40	136										3
21.00-21.99			25	40										1
22.00-22.99			70	62									1	
23.00-23.99			15	29										
24.00-24.99			37	124				2						
25.00-25.99			45	21										
26.00-26.99			8	23				1						
27.00-27.99			7	5										
28.00-28.99			13	20										
29.00-29.99			6	8										
30.00-30.99			14	27		2								
31.00-31.99			2	2										
32.00-32.99			1	3		2								
33.00-33.99				3		1								
34.00-34.99			2	2										
35.00-35.99			2	13										
36.00-36.99				3		2								
37.00-37.99			2	2		1								
38.00-38.99				2		3								
39.00-39.99				2		1								
40.00-40.99				2		2								
41.00-41.99						1								
42.00-42.99						1								
43.00-43.99														
44.00-44.99						1								
45.00-45.99						2								
46.00-46.99														
47.00-47.99														
48.00-48.99						5								
49.00-49.99														
≥50.00														
Total (N)	1	4	337	941	-	25		4	200	716	1	3	48	411

Table 12 continued. Length-frequency distribution (%) of harvested and released fish for Leech Lake, Minnesota, 15 May – 30 September 2010.

	Number Harvested (H) and Released (R)													
	Black crappie		Bluegill		Sunfish spp.		Pumpkinseed		Yellow perch		Walleye[1]		Cisco/ Whitefish	
TL (inches)	H	R	H	R	H	R	H	R	H	R	H	R	H	R
<4.00				1						265				
4.00-4.99				24		41				499				
5.00-5.99				59	9	67			2	1,171		1		
6.00-6.99		10	6	57	20	115	1		23	2,733		13		
7.00-7.99	4		39	27	61	37	5		86	2,077		5		
8.00-8.99	8		39	46	50	24	2		439	2,104		29		
9.00-9.99	20	5	11		48	7		1	1,111	841	1	7		
10.00-10.99	33	6	6	2	22	6			1,164	236	4	38		
11.00-11.99	33				8				400	40	10	37		
12.00-12.99	42								167	52	90	152		1
13.00-13.99	3								27	2	217	126		
14.00-14.99	1	1							1		279	111		
15.00-15.99									1		282	92		
16.00-16.99									1		305	101		
17.00-17.99											148	98		
18.00-18.99											**2**	**164**		
19.00-19.99											**4**	**192**		
20.00-20.99												**305**		
21.00-21.99												**302**		
22.00-22.99											**1**	**345**		
23.00-23.99												**264**		
24.00-24.99											**2**	**174**		
25.00-25.99											**5**	**113**		
26.00-26.99											5	32		
27.00-27.99											3	5		
28.00-28.99												4		
29.00-29.99												4		
30.00-30.99												1		
31.00-31.99														
32.00-32.99														
33.00-33.99														
34.00-34.99														
35.00-35.99														
≥ 36.00														
Total (N)	144	22	101	216	218	297	8	1	3,422	10,021	1,358	2,715	-	1

[1]Bold font denotes walleye protected by length limit.

FIGURES

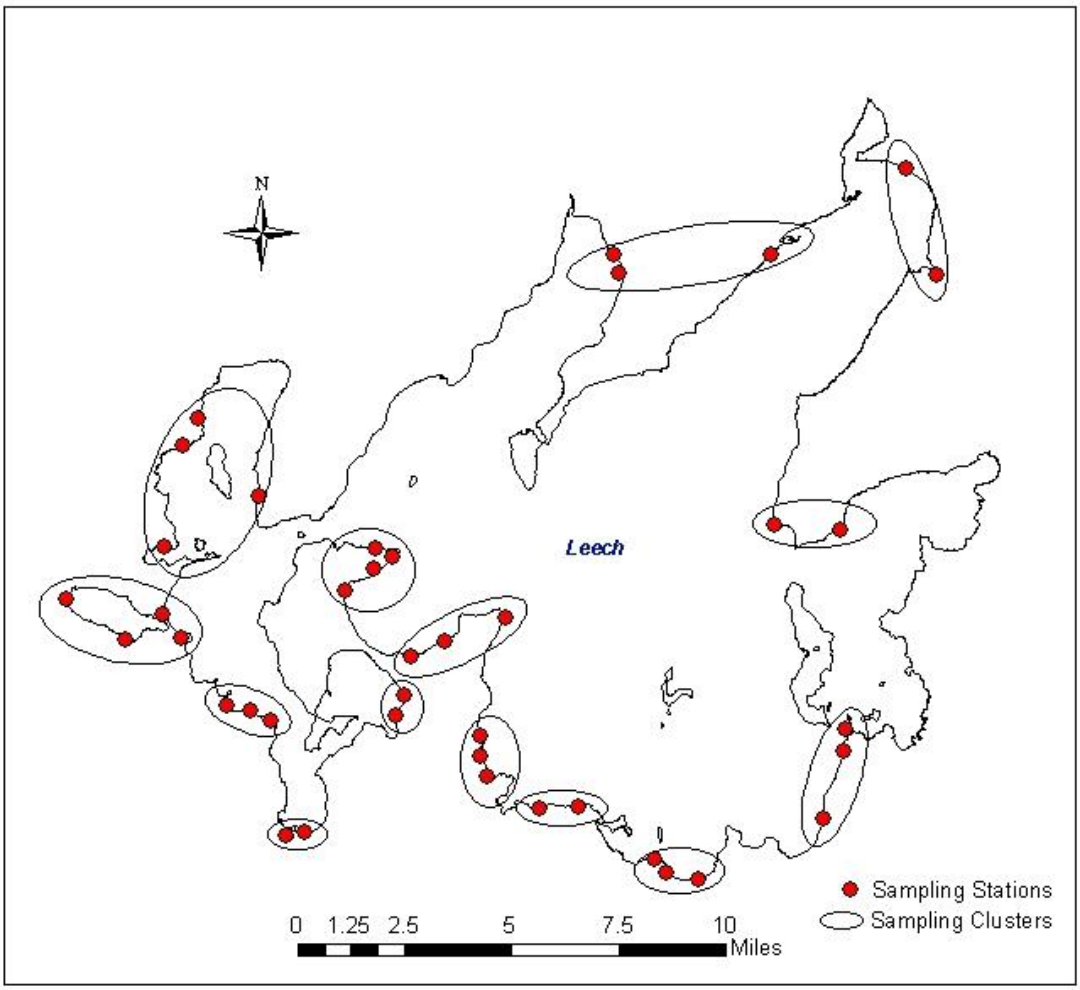

Figure 1. Creel survey sampling clusters (circles) and stations (dots) on Leech Lake, Minnesota.

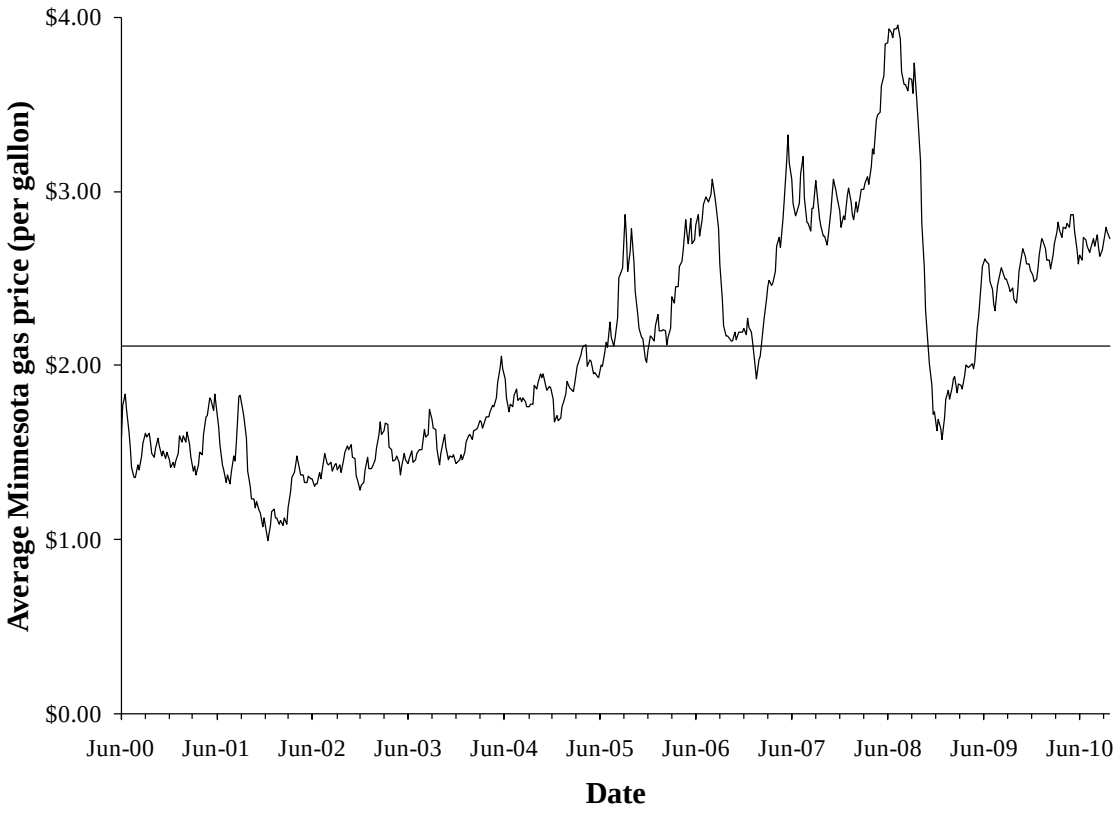

Figure 2. Weekly price ($) per gallon of regular gasoline in Minnesota, June 2000 – September 2010 (EIA 2011). The horizontal line depicts the 10-year average.

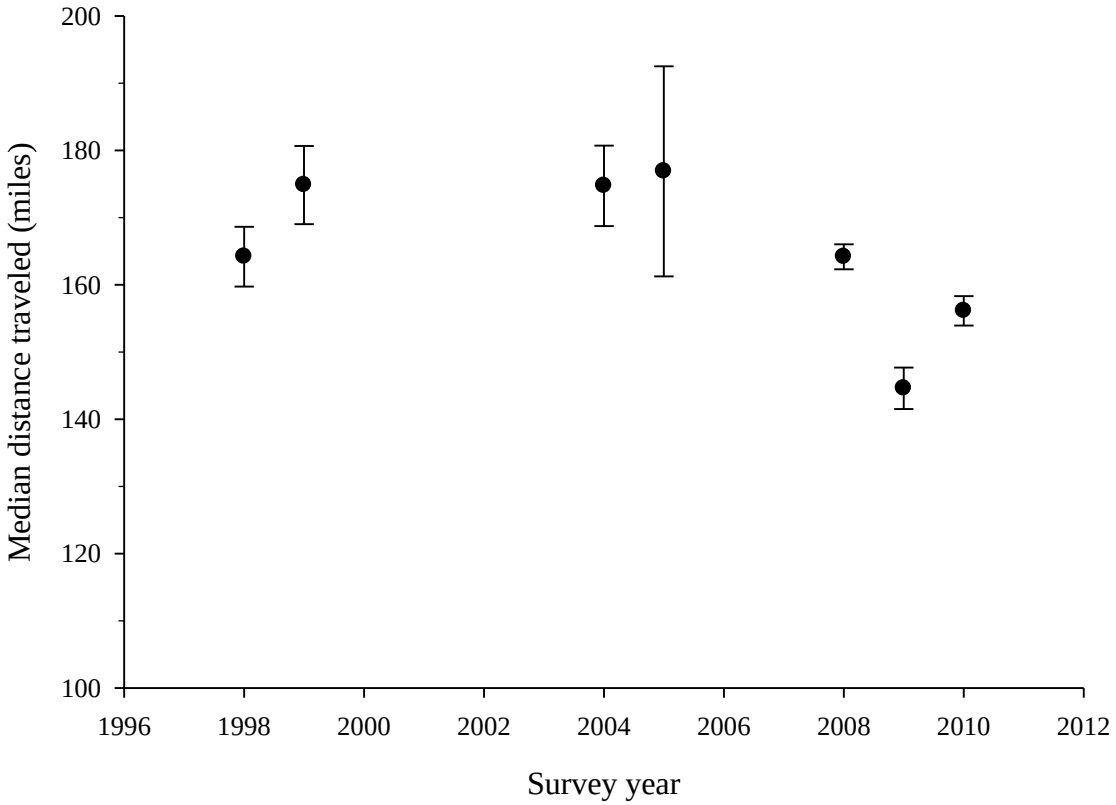

Figure 3. Median distance (miles ± 95% CI) traveled by Leech Lake anglers interviewed during summer creel surveys, 1998-2010.

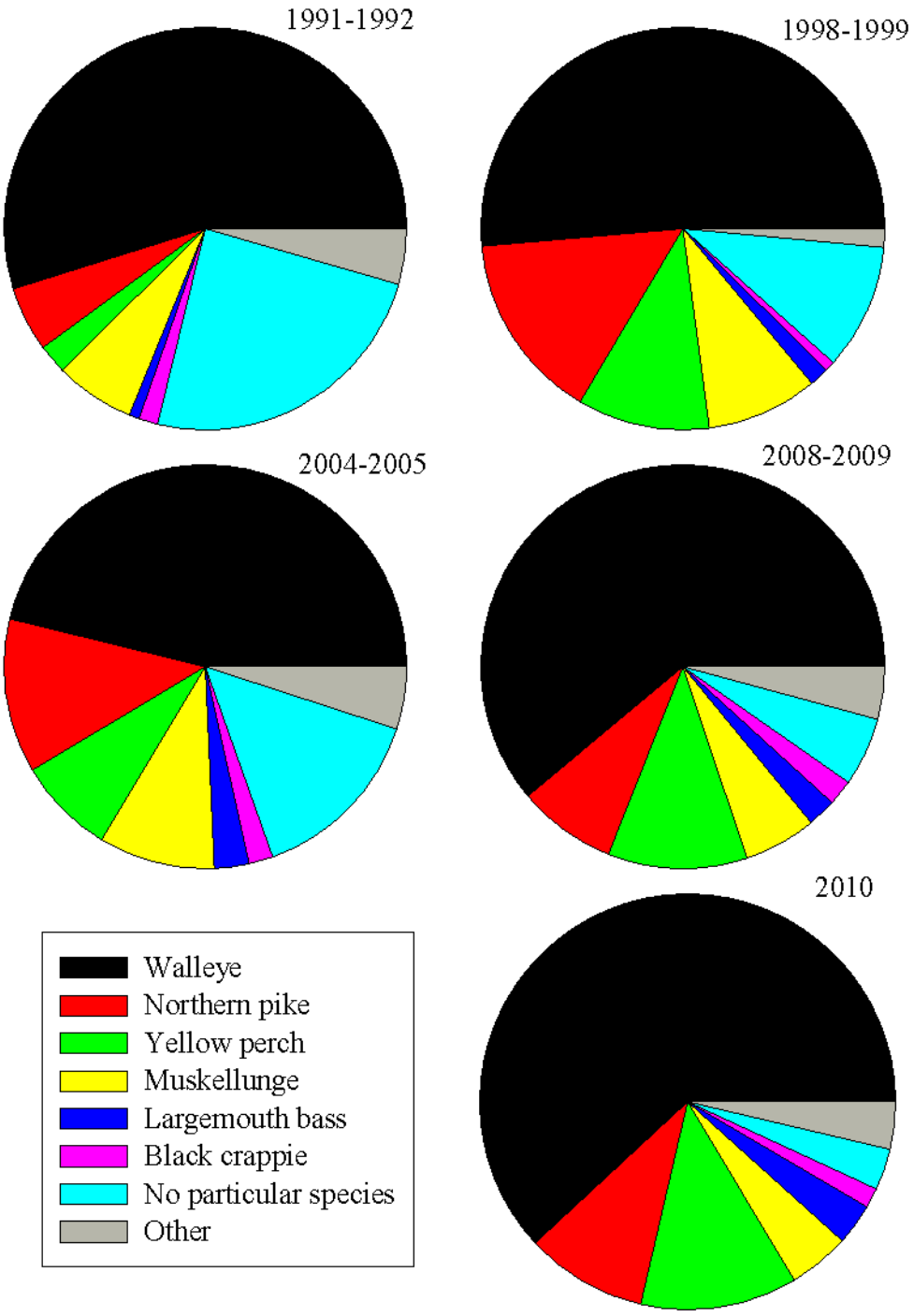

Figure 4. Mean distribution of species targeted by anglers interviewed during summer creel surveys on Leech Lake, 1991-2010.

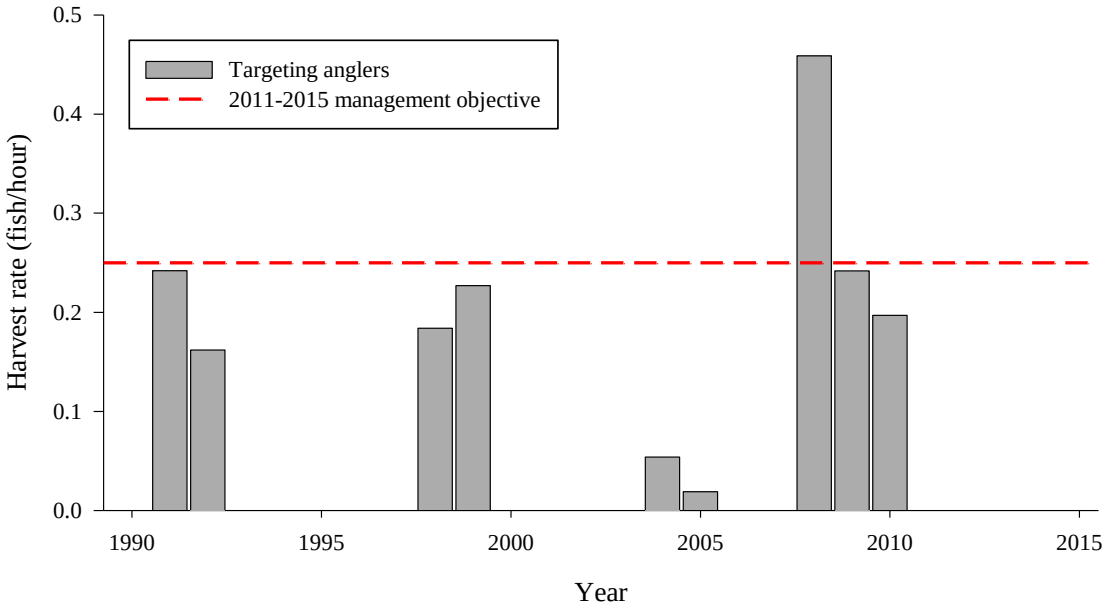

Figure 5. Walleye harvest rates by Leech Lake walleye anglers, 1991-2010. The dashed line represents the 2011-2015 management plan objective of a targeting harvest rate of 0.25 walleye/hour or higher.

APPENDIX

Table A1. Creel survey sampling summary and angling pressure estimates by month and basin for Leech Lake, Minnesota, 15 May – 30 September, 2010. Standard errors appear in parentheses.

	Stratum					
Western Bays	May	June	July	August	September	Season
N Interviews/refusals	145/0	78/0	77/0	119/0	109/0	528/0
Mean anglers/boat	2.49 (0.35)	2.61 (0.16)	2.48 (0.43)	2.32 (0.30)	2.27 (0.07)	2.43 (0.04)
Mean trip length	4.68 (0.86)	4.12 (0.51)	3.42 (0.56)	3.06 (0.40)	5.31 (0.17)	4.05 (0.12)
Total angler hours	22,743 (2,303)	41,086 (4,034)	49,769 (5,449)	31,511 (2,840)	37,743 (3,391)	182,854 (8,416)
Total hours per acre	1.27 (0.13)	2.29 (0.23)	2.78 (0.30)	1.76 (0.16)	2.11 (0.19)	10.20 (0.47)
Main Lake						
N Interviews/refusals	341/0	256/0	206/0	191/0	193/0	1,187/0
Mean anglers/boat	2.48 (0.72)	2.31 (0.12)	2.35 (0.30)	2.31 (0.27)	2.09 (0.19)	2.29 (0.05)
Mean trip length	4.47 (1.42)	4.29 (0.31)	3.70 (0.45)	3.33 (0.35)	4.74 (0.43)	4.06 (0.11)
Total angler hours	159,593 (26,076)	124,366 (16,741)	89,769 (9,835)	54,569 (6,397)	60,915 (6,168)	489,212 (33,703)
Total hours per acre	1.70 (0.28)	1.32 (0.18)	0.96 (0.10)	0.58 (0.07)	0.65 (0.07)	5.21 (0.36)

Table A2. Catch and harvest estimates by month in the western bays basin (17,927 acres) of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Number Caught per Acre			
Bullhead spp.	-	0.007 (0.003)	-	-	0.001 (0.001)	0.009 (0.003)
Northern pike	0.070 (0.023)	0.178 (0.046)	0.207 (0.065)	0.175 (0.036)	0.109 (0.027)	0.739 (0.094)
Muskellunge	<0.001 (<0.001)	-	-	0.001 (0.001)	<0.001 (<0.001)	0.002 (0.002)
Burbot	0.001 (-)	-	-	-	-	0.001 (-)
Rock bass	0.025 (0.014)	0.554 (0.466)	0.395 (0.097)	0.500 (0.229)	0.192 (0.086)	1.666 (0.535)
Sunfish spp.	0.013 (0.007)	0.532 (0.271)	1.211 (0.445)	0.160 (0.047)	0.153 (0.133)	2.068 (0.540)
Smallmouth bass	0.003 (0.001)	-	-	-	-	0.003 (0.001)
Largemouth bass	0.042 (0.031)	0.077 (0.017)	0.079 (0.033)	0.080 (0.036)	0.010 (0.005)	0.288 (0.061)
Black crappie	0.085 (0.050)	0.008 (0.008)	-	0.004 (0.002)	0.026 (0.022)	0.123 (0.056)
Yellow perch	0.303 (0.070)	1.142 (0.489)	2.877 (0.593)	2.481 (0.619)	7.445 (1.611)	14.248 (1.890)
Walleye	0.329 (0.074)	0.661 (0.161)	0.280 (0.081)	0.109 (0.036)	0.243 (0.123)	1.622 (0.233)
Cisco	-	-	-	-	<0.001 (<0.001)	<0.001 (<0.001)
Overall	0.872 (0.140)	3.162 (1.002)	5.049 (0.977)	3.511 (0.609)	8.184 (1.727)	20.779 (2.309)
			Number Harvested per Acre			
Bullhead spp.	-	-	-	-	0.001 (0.001)	0.001 (0.001)
Northern pike	0.012 (0.003)	0.042 (0.015)	0.030 (0.017)	0.030 (0.009)	0.027 (0.010)	0.141 (0.027)
Muskellunge	-	-	-	-	-	-
Burbot	-	-	-	-	-	-
Rock bass	0.005 (0.002)	0.107 (0.095)	0.041 (0.029)	0.163 (0.090)	0.075 (0.043)	0.390 (0.141)
Sunfish spp.	0.009 (0.005)	0.312 (0.165)	0.325 (0.158)	0.064 (0.028)	0.078 (0.074)	0.788 (0.242)
Smallmouth bass	0.001 (0.001)	-	-	-	-	0.001 (0.001)
Largemouth bass	-	0.019 (0.006)	0.008 (0.006)	0.011 (0.012)	0.002 (0.001)	0.040 (0.015)
Black crappie	0.070 (0.040)	0.008 (0.008)	-	0.003 (0.001)	0.026 (0.022)	0.107 (0.047)
Yellow perch	0.122 (0.035)	0.172 (0.063)	0.339 (0.115)	0.583 (0.275)	1.810 (0.403)	3.026 (0.507)
Walleye	0.157 (0.039)	0.229 (0.083)	0.148 (0.058)	0.039 (0.019)	0.069 (0.052)	0.641 (0.122)
Cisco	-	-	-	-	-	-
Overall	0.375 (0.074)	0.888 (0.210)	0.890 (0.223)	0.893 (0.275)	2.088 (0.462)	5.135 (0.623)

Table A3. Catch and harvest estimates by month in the main lake basin (93,914 acres) of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Number Caught per Acre			
Bullhead spp.	-	0.001 (0.001)	-	-	-	0.001 (0.001)
Northern pike	0.141 (0.052)	0.088 (0.020)	0.110 (0.021)	0.067 (0.022)	0.049 (0.017)	0.455 (0.066)
Muskellunge	-	0.001 (0.001)	0.006 (0.003)	0.003 (0.001)	0.001 (0.001)	0.010 (0.003)
Burbot	0.002 (0.001)	-	<0.001 (<0.001)	-	-	0.002 (0.001)
Rock bass	0.050 (0.028)	0.101 (0.040)	0.029 (0.002)	0.043 (0.020)	0.007 (0.002)	0.231 (0.053)
Sunfish spp.	0.077 (0.069)	0.015 (0.008)	0.035 (0.018)	0.039 (0.020)	0.003 (0.002)	0.168 (0.075)
Smallmouth bass	-	-	0.001 (0.001)	-	-	0.001 (0.001)
Largemouth bass	0.008 (0.007)	0.077 (0.019)	0.011 (0.005)	0.023 (0.011)	0.010 (0.004)	0.129 (0.023)
Black crappie	0.016 (0.012)	0.015 (0.014)	0.008 (0.007)	0.001 (0.001)	0.002 (0.002)	0.042 (0.020)
Yellow perch	0.829 (0.246)	0.397 (0.170)	0.316 (0.070)	0.269 (0.075)	1.486 (0.290)	3.297 (0.429)
Walleye	0.678 (0.155)	0.399 (0.076)	0.085 (0.014)	0.043 (0.012)	0.074 (0.047)	1.280 (0.180)
Cisco	-	<0.001 (<0.001)	-	-		<0.001 (<0.001)
Overall	1.803 (0.378)	1.095 (0.251)	0.601 (0.101)	0.487 (0.108)	1.633 (0.305)	5.618 (0.566)
			Number Harvested per Acre			
Bullhead spp.	-	-	-	-	-	-
Northern pike	0.040 (0.016)	0.029 (0.009)	0.048 (0.013)	0.022 (0.009)	0.015 (0.003)	0.154 (0.025)
Muskellunge	-	-	-	-	-	-
Burbot	<0.001 (<0.001)	-	-	-	-	<0.001 (<0.001)
Rock bass	0.009 (0.010)	0.032 (0.016)	0.011 (<0.001)	0.015 (0.011)	0.001 <0.001	0.068 (0.022)
Sunfish spp.	0.033 (0.038)	0.007 (0.006)	0.023 (0.012)	0.015 (0.008)	0.002 (0.001)	0.080 (0.041)
Smallmouth bass	-	-	-	-	-	-
Largemouth bass	0.002 (0.003)	0.013 (0.009)	<0.001 (<0.001)	0.002 (0.002)	0.002 (0.001)	0.020 (0.010)
Black crappie	0.016 (0.012)	0.014 (0.013)	0.005 (0.004)	0.001 (0.001)	0.002 (0.002)	0.038 (0.018)
Yellow perch	0.297 (0.084)	0.083 (0.042)	0.055 (0.019)	0.083 (0.030)	0.467 (0.104)	0.985 (0.144)
Walleye	0.332 (0.076)	0.114 (0.022)	0.033 (0.007)	0.025 (0.009)	0.022 (0.006)	0.526 (0.080)
Cisco	-	<0.001 (<0.001)	-	-	-	<0.001 (<0.001)
Overall	0.730 (0.146)	0.293 (0.079)	0.175 (0.033)	0.164 (0.043)	0.511 (0.107)	1.873 (0.204)

Table A4. Monthly estimates of catch and harvest rates of all anglers in the western bays basin of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Catch per Angler Hour			
Bullhead spp.	-	0.003 (0.001)	-	-	0.001 (0.001)	0.001 (<0.001)
Northern pike	0.055 (0.027)	0.078 (0.021)	0.075 (0.021)	0.100 (0.029)	0.052 (0.018)	0.072 (0.010)
Muskellunge	<0.001 (<0.001)	-	-	0.001 (0.001)	<0.001 (<0.001)	<0.001 (<0.001)
Burbot	0.001 (-)	-	-	-	-	<0.001 (-)
Rock bass	0.020 (0.011)	0.242 (0.206)	0.142 (0.067)	0.284 (0.146)	0.091 (0.031)	0.163 (0.056)
Sunfish spp.	0.010 (0.006)	0.232 (0.160)	0.436 (0.366)	0.091 (0.029)	0.072 (0.066)	0.203 (0.084)
Smallmouth bass	0.002 (0.001)	-	-	-	-	<0.001 (<0.001)
Largemouth bass	0.033 (0.025)	0.033 (0.009)	0.029 (0.020)	0.045 (0.019)	0.005 (0.003)	0.028 (0.007)
Black crappie	0.067 (0.035)	0.003 (0.003)	-	0.002 (0.001)	0.012 (0.011)	0.012 (0.005)
Yellow perch	0.239 (0.061)	0.498 (0.222)	1.036 (0.344)	1.412 (0.456)	3.536 (0.929)	1.397 (0.223)
Walleye	0.259 (0.059)	0.288 (0.091)	0.101 (0.034)	0.062 (0.019)	0.116 (0.042)	0.159 (0.023)
Cisco	-	-	-	-	<0.001 (<0.001)	<0.001 (<0.001)
Overall	0.687 (0.129)	1.380 (0.473)	1.819 (0.622)	1.998 (0.567)	3.887 (0.984)	2.037 (0.298)
			Harvest per Angler Hour			
Bullhead spp.	-	-	-	-	0.001 (0.001)	<0.001 (<0.001)
Northern pike	0.009 (0.004)	0.018 (0.007)	0.011 (0.006)	0.017 (0.007)	0.013 (0.005)	0.014 (0.003)
Muskellunge	-	-	-	-	-	-
Burbot	-	-	-	-	-	-
Rock bass	0.004 (0.002)	0.046 (0.043)	0.015 (0.011)	0.092 (0.061)	0.036 (0.015)	0.038 (0.014)
Sunfish spp.	0.007 (0.004)	0.136 (0.109)	0.117 (0.095)	0.037 (0.017)	0.037 (0.036)	0.077 (0.032)
Smallmouth bass	0.001 <0.001	-	-	-	-	<0.001 (<0.001)
Largemouth bass	-	0.008 (0.003)	0.003 (0.003)	0.006 (0.008)	0.001 (<0.001)	0.004 (0.002)
Black crappie	0.055 (0.028)	0.003 (0.003)	-	0.002 (0.001)	0.012 (0.011)	0.010 (0.005)
Yellow perch	0.096 (0.027)	0.075 (0.029)	0.122 (0.051)	0.332 (0.162)	0.860 (0.224)	0.297 (0.054)
Walleye	0.124 (0.034)	0.100 (0.038)	0.053 (0.021)	0.022 (0.010)	0.033 (0.018)	0.063 (0.011)
Cisco	-	-	-	-	-	-
Overall	0.296 (0.062)	0.388 (0.119)	0.321 (0.111)	0.508 (0.198)	0.992 (0.243)	0.503 (0.074)

Table A5. Monthly estimates of catch and harvest rates of all anglers in the main lake basin of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Catch per Angler Hour			
Bullhead spp.	-	0.001 (0.001)	-	-	-	<0.001 (<0.001)
Northern pike	0.083 (0.033)	0.067 (0.020)	0.115 (0.033)	0.115 (0.043)	0.075 (0.028)	0.087 (0.015)
Muskellunge	-	<0.001 (<0.001)	0.006 (0.004)	0.004 (0.002)	0.001 (0.001)	0.002 (0.001)
Burbot	0.001 (0.001)	-	<0.001 (<0.001)	-	-	<0.001 (<0.001)
Rock bass	0.030 (0.015)	0.076 (0.039)	0.031 (0.005)	0.075 (0.070)	0.011 (0.005)	0.044 (0.012)
Sunfish spp.	0.045 (0.041)	0.011 (0.007)	0.036 (0.019)	0.066 (0.044)	0.005 (0.003)	0.032 (0.015)
Smallmouth bass	-	-	0.001 (0.001)	-	-	<0.001 (<0.001)
Largemouth bass	0.005 (0.004)	0.058 (0.015)	0.011 (0.007)	0.039 (0.021)	0.016 (0.006)	0.025 (0.005)
Black crappie	0.010 (0.005)	0.011 (0.009)	0.009 (0.007)	0.002 (0.001)	0.003 (0.003)	0.008 (0.003)
Yellow perch	0.488 (0.181)	0.300 (0.122)	0.330 (0.094)	0.463 (0.197)	2.291 (0.535)	0.633 (0.098)
Walleye	0.399 (0.132)	0.301 (0.090)	0.089 (0.018)	0.075 (0.027)	0.115 (0.074)	0.246 (0.045)
Cisco	-	<0.001 (<0.001)	-	-	-	<0.001 (<0.001)
Overall	1.061 (0.324)	0.827 (0.208)	0.629 (0.142)	0.838 (0.297)	2.517 (0.541)	1.079 (0.144)
			Harvest per Angler Hour			
Bullhead spp.		-	-	-	-	-
Northern pike	0.023 (0.010)	0.022 (0.007)	0.051 (0.017)	0.038 (0.017)	0.023 (0.007)	0.030 (0.005)
Muskellunge	-	-	-	-	-	-
Burbot	<0.001 (<0.001)	-	-	-	-	<0.001 (<0.001)
Rock bass	0.005 (0.006)	0.024 (0.013)	0.012 (0.001)	0.026 (0.033)	0.002 (0.001)	0.013 (0.005)
Sunfish spp.	0.020 (0.022)	0.005 (0.005)	0.024 (0.013)	0.026 (0.011)	0.003 (0.001)	0.015 (0.008)
Smallmouth bass	-	-	-	-	-	-
Largemouth bass	0.001 (0.002)	0.010 (0.007)	<0.001 (<0.001)	0.004 (0.003)	0.003 (0.002)	0.004 (0.002)
Black crappie	0.010 (0.005)	0.010 (0.009)	0.006 (0.004)	0.002 (0.001)	0.003 (0.003)	0.007 (0.003)
Yellow perch	0.175 (0.060)	0.063 (0.031)	0.057 (0.023)	0.143 (0.072)	0.720 (0.170)	0.189 (0.032)
Walleye	0.195 (0.066)	0.086 (0.026)	0.034 (0.009)	0.044 (0.018)	0.034 (0.011)	0.101 (0.019)
Cisco	-	<0.001 (<0.001)	-	-	-	<0.001 (<0.001)
Overall	0.430 (0.129)	0.221 (0.064)	0.183 (0.043)	0.282 (0.110)	0.788 (0.177)	0.360 (0.051)

Table A6. Monthly estimates of catch and harvest rates of targeting anglers in the western bays basin of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Catch per Angler Hour			
Northern pike	1.778 (-)	0.642 (-)	0.892 (0.281)	0.948 (0.555)	0.599 (2.176)	0.877 (0.397)
Muskellunge	-	-	-	0.007 (0.021)	-	0.002 (0.007)
Rock bass	-	1.064 (-)	-	-	10.400 (-)	5.510 (-)
Sunfish spp.	3.077 (-)	5.320 (0.888)	5.130 (3.618)	1.335 (0.687)	1.791 (-)	3.370 (0.935)
Largemouth bass	4.724 (-)	0.832 (0.409)	1.130 (2.061)	0.668 (0.495)	-	1.055 (0.520)
Black crappie	1.773 (2.196)	-	-	0.476 (-)	-	0.717 (0.747)
Yellow perch	5.315 (4.542)	22.703 (-)	7.192 (4.577)	9.967 (3.902)	14.094 (7.619)	11.013 (2.584)
Walleye	0.811 (0.722)	1.008 (0.483)	0.459 (0.216)	0.299 (0.361)	0.919 (0.178)	0.717 (0.169)
Targeted any	-	4.761 (0.147)	6.830 (1.301)	6.555 (6.397)	6.482 (0.393)	6.256 (1.842)
			Harvest per Angler Hour			
Northern pike	-	0.311 (-)	0.300 (-)	0.128 (0.135)	0.214 (0.600)	0.220 (0.106)
Muskellunge	-	-	-	-	-	-
Rock bass	-	0.213 (-)	-	-	6.400 (-)	3.159 (-)
Sunfish spp.	-	4.306 (0.888)	1.752 (0.679)	0.729 (0.298)	0.925 (-)	1.723 (0.260)
Largemouth bass	-	0.170 (-)	-	0.049 (0.108)	-	0.057 (0.047)
Black crappie	1.443 (1.644)	-	-	0.476 (-)	-	0.605 (0.559)
Yellow perch	2.545 (1.267)	2.919 (-)	1.573 (0.870)	2.521 (2.221)	3.359 (1.753)	2.559 (0.805)
Walleye	0.391 (0.439)	0.302 (0.329)	0.247 (0.239)	0.109 (0.199)	0.074 (0.065)	0.204 (0.112)
Targeted Any	-	2.139 (0.317)	0.165 (0.228)	2.066 (3.456)	2.357 (0.159)	1.614 (0.979)

Table A7. Monthly estimates of catch and harvest rates of targeting anglers in the main lake basin of Leech Lake, 15 May – 30 September 2010.

Species	May	June	July	August	September	Season
			Catch per Angler Hour			
Northern pike	1.675 (2.328)	0.585 (0.482)	0.574 (0.302)	0.683 (0.546)	0.209 (0.168)	0.656 (0.336)
Muskellunge	-	0.038 (0.076)	0.058 (0.076)	0.054 (0.148)	0.026 (0.041)	0.045 (0.050)
Rock bass	2.000 (-)	0.255 (-)	-	-	-	1.086 (-)
Sunfish spp.	4.581 (-)	0.115 (0.175)	1.043 (1.302)	1.777 (0.979)	-	1.823 (0.516)
Largemouth bass	-	0.699 (0.352)	0.478 (0.425)	0.713 (3.443)	0.630 (0.314)	0.646 (1.078)
Black crappie	1.117 (1.485)	4.267 (-)	0.369 (1.487)	0.111 (0.048)	0.896 (-)	1.356 (0.387)
Yellow perch	6.736 (3.916)	3.711 (2.432)	4.318 (1.917)	4.024 (3.529)	8.899 (4.421)	5.591 (1.589)
Walleye	1.125 (0.885)	0.715 (0.199)	0.279 (0.142)	0.325 (0.444)	0.683 (0.176)	0.595 (0.142)
Targeted any	-	5.302 (-)	0.785 (0.242)	7.492 (7.418)	4.441 (1.232)	5.555 (3.025)
			Harvest per Angler Hour			
Northern pike	0.529 (0.660)	0.258 (0.283)	0.258 (0.210)	0.315 (0.349)	0.093 (0.081)	0.268 (0.137)
Muskellunge	-	-	-	-	-	-
Rock bass	0.824 (-)	0.255 (-)	-	-	-	0.526 (-)
Sunfish spp.	2.581 (-)	-	0.781 (0.878)	0.544 (0.435)	-	0.898 (0.291)
Largemouth bass	-	0.061 (0.057)	-	0.049 (0.202)	-	0.034 (0.065)
Black crappie	1.117 (1.485)	4.000 (-)	0.369 (1.487)	0.111 (0.048)	0.896 (-)	1.297 (0.387)
Yellow perch	2.070 (1.484)	0.903 (0.881)	1.107 (0.810)	1.206 (1.447)	2.948 (1.571)	1.678 (0.605)
Walleye	0.510 (0.338)	0.213 (0.068)	0.108 (0.081)	0.206 (0.336)	0.111 (0.092)	0.191 (0.079)
Targeted Any	-	-	0.224 (0.311)	3.386 (3.586)	0.852 (0.325)	1.710 (1.449)

Minnesota Department of Natural Resources
Section of Fisheries

Creel Survey Summary for Leech Lake, Minnesota

Fish Management Area: Walker

Year Surveyed: 15 May - 30 September 2010

Angling Pressure	
Angler-hours	672,065
Angler-hours/acre	6.03
Anglers/boat	2.36
Mean Trip Length (h)	4.05

	Catch (number)		Harvest (number)		Harvest (pounds)	
Species	Total N	N/acre	Total N	N/acre	Total lbs.	lbs./acre
Bullhead spp.	219	0.002	25	0.000	-	-
Northern pike	55,958	0.501	16,987	0.152	49,015	0.439
Muskellunge	956	0.009	-	0.000	-	-
Burbot	210	0.002	24	0.000	-	-
Rock bass	51,606	0.462	13,414	0.120	8,017	0.072
Sunfish spp.	52,825	0.473	21,620	0.194	11,213	0.100
Smallmouth bass	100	0.001	15	0.000	-	-
Largemouth bass	17,294	0.155	2,611	0.023	4,864	0.044
Black crappie	6,179	0.055	5,527	0.050	4,212	0.038
Yellow perch	565,022	5.064	146,750	1.315	64,516	0.578
Walleye	149,271	1.338	60,928	0.546	69,721	0.625
Cisco	34	0.000	30	0.000	-	-
All species	899,674	8.063	267,931	2.401	211,558	1.896

	Catch Rate (fish/hour)		Harvest Rate (fish/hour)	
	Angler Type		Angler Type	
Species	All	Targeting	All	Targeting
Bullhead spp.	<0.001	-	<0.001	-
Northern pike	0.083	0.755	0.025	0.247
Muskellunge	0.001	0.025	-	-
Burbot	<0.001	-	<0.001	-
Rock bass	0.077	3.298	0.020	1.842
Sunfish spp.	0.079	2.759	0.032	1.397
Smallmouth bass	<0.001	-	<0.001	-
Largemouth bass	0.026	0.816	0.004	0.043
Black crappie	0.009	1.085	0.008	1.004
Yellow perch	0.841	8.188	0.218	2.100
Walleye	0.222	0.654	0.091	0.197
Cisco	<0.001	-	<0.001	-
All/Targeted Any	1.339	5.968	0.399	1.653

Creel Survey Summary for Leech Lake, Minnesota

Length Frequency Summary for Harvested (measured) Fish (inch groups)

Species	0.0-4.9	5.0-8.9	9.0-12.9	13.0-16.9	17.0-20.9	21.0-24.9	25.0-29.9	≥30.0
Bullhead spp.			1					
Northern pike				8	74	153	79	23
Muskellunge								
Burbot								
Rock bass		74	125	1				
Sunfish spp.		231	96					
Smallmouth bass			1					
Largemouth bass			10	28	9	1		
Black crappie		10	130	4				
Yellow perch		540	2852	30				
Walleye			103	1077	162	3	13	
Cisco								

Comments:

Citation: Vondra, B.A. and D.W. Schultz. 2011. Summer creel survey for Leech Lake, 2010. Minnesota Department of Natural Resources, Section of Fisheries, Study 4, Job 854.