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**Minnesota Department of Natural Resources  
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**Completion Report**

**Summer Creel Survey Report  
for  
Leech Lake  
2011**

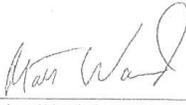
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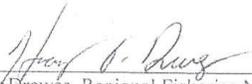
**Walker Area Fisheries Office**

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**Completion Report**  
**Summer Creel Survey**  
**Leech Lake**  
**2011**

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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. Management actions implemented since 2005 have lead to increases in walleye and yellow perch abundance and increased angler success. 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 nearly 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 artedii* 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 rupestris*, bowfin *Amia calva*, shorthead redhorse *Moxostoma macrolepidotum*, bullheads *Ameiurus spp.*, pumpkinseed *Lepomis gibbosus*, bluegill *L. macrochirus*, largemouth bass *Micropterus salmoides*, smallmouth bass *M. dolomieu*, 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 2011; 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.

Due to the state of Minnesota experiencing a statewide shutdown from July 1 - 20, 2011, the creel survey was suspended during that time. Values within this report for the Jul-1 stratum were averages of the Jun-2 and Jul-2 strata. Although July 16 - 20 was not sampled, sufficient sampling was completed from July 21-31 to account for missing observations. Most sensitive to the shutdown were aerial boat counts; the schedule was adjusted immediately following the shutdown to ensure missing flights were made-up during the remainder of the stratum. Pressure, yield, and the number of fish caught and harvested were estimated for the Jul-1 strata within this report.

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.

Fishing effort and total catch associated with walleye tournaments were not estimated in 2011. The number of walleye tournament events was similar to 2009 and 2010.

## **RESULTS**

### **Angling Pressure**

A total of 1,517 Leech Lake angling parties were interviewed from 15 May through 30 September 2011 (Table 1, Figure 6). The estimated total angling pressure on Leech Lake during the summer fishing season was 696,536 angler-hours (Table 2). This was approximately 24,000 angler-hours higher than the previous year (672,065 angler-hours; Vondra and Schultz 2011) and is slightly lower than the 1965-1999 range (697,267 – 1,290,339 angler-hours; Schupp 1972; Gustafson 1985, 1986; Haukos 1992, 1993; Sledge 1999). No interviewed parties utilized a launch service in 2011; only two launch services remain on Leech Lake, and associated effort and harvest has been a very small portion of total effort and harvest (Schultz 2009; Schultz 2010b; Vondra and Schultz 2011). In 2009 and 2010, walleye tournament events spanned a total of six days of competition each year and accounted for about 14,000 to 15,000 angler-hours of fishing pressure (Table 2), or 2.0-2.1% of total fishing effort.

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 (145 miles), as indexed using zip codes, was the lowest observed since zip code data was first collected in 1998 (range 145-177 miles) and less variable than other fishing seasons (Figure 3). Median distance traveled in 2011 was slightly higher than 2009 but still the second lowest ever recorded (147 miles). Similar to the past three years, nearly 22% of anglers interviewed in 2011 traveled less than 50 miles to fish Leech Lake (Table 3; 2008-2010 range 19%-28%). In 2011, most anglers interviewed were again Minnesota residents (Table 4) and most angling parties continue to target walleye (Table 5; Figure 4).

### **Catch and Harvest**

An estimated 842,880 fish, or 7.53 fish/acre, were caught in Leech Lake during the 2011 summer creel season (Table 6), of which 253,731 were harvested (30% of total catch; 2.27 fish/acre). Most of the total catch and harvest (in terms of numbers of fish) was comprised of yellow perch (60% and 58%, respectively) and walleye (19% and 22%, respectively). The highest stratum-specific estimate of total catch (238,797 fish) and harvest (73,400) occurred during the last two weeks in September and was comprised primarily of yellow perch.

Total yield during the 2011 summer creel season was estimated to be 208,645 pounds of fish (1.86 lbs/acre; Table 7) and is similar to 2010 estimates (1.90; Vondra and Schultz 2011). During 2011, the overall catch and harvest rates across all anglers were 1.255 and 0.383 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 1.323 and 0.411 fish/hour during 2008-2010 (Schultz 2009, 2010b; Vondra and Schultz 2011). Basin-specific estimates of fishing effort, catch, and harvest are summarized in the appendix (Tables A1-A7).

### *Walleye*

An estimated 55,723 walleye (72,628 pounds) were harvested during 2011 at a rate of 0.079 walleye/hour across all anglers (Table 2). An estimated 756 harvested walleye (2,888 pounds) were within the 18-26 inch protected slot limit (PSL), much lower than the 2009 estimate of 4,660 walleyes (10,334 pounds). Post-release hooking mortality (3,004 walleye; 7,925 pounds) increased the total walleye kill to 58,727 fish (80,553 pounds, Figure 7). The estimated total number and pounds of walleye killed in 2011 was slightly above the 2005-2010 average (58,503 and 74,826, respectively), the time period since the new regulations have been in place.

The seasonal catch and harvest rates of walleye were 0.232 fish/hour and 0.079 fish/hour, respectively, across all anglers (Table 8). Seasonal walleye catch and harvest rates for anglers specifically targeting walleye were 0.584 fish/hour and 0.177 fish/hour, respectively (Table 9). The targeting walleye harvest rate has returned to the range observed during the 1990's (range 0.162-0.242), 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 15.6 inches long and weighed approximately 1.3 pounds (Table 7). Lengths of walleye caught ranged from 4-32 inches (Table 12). Creel clerks measured 1,629 harvested walleye and anglers reported lengths on another 2,929 released walleye. After creel analysis, the number of walleye harvested was estimated at 58,727, and the estimated number released was 105,379 (Tables 2 and 12). Based on length, most harvested walleye appear to be from the 2006 and 2008 year classes; most of the 2005 year class had grown into the PSL (D. Schultz, unpublished data).

### *Northern pike*

An estimated 15,133 northern pike (44,490 pounds) were harvested at a rate of 0.022 fish/hour across all anglers during 2011 (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 7.4% of angling parties interviewed during the creel survey specifically targeted northern pike, whereas 66.2% of angling parties targeted walleye (Table 5). Northern pike catch rates (fish/hour) were highest during early August, while harvest rates were highest during late September (Tables 8 and 9). No angling parties interviewed in 2011 harvested a limit of northern pike (Tables 10 and 11). The estimated total number and pounds of northern pike

harvested in 2011 was within the range of the past four creel surveys (number range 10,890-16,908; pounds range 37,654-54,820).

Harvested northern pike averaged 23.3 inches long and 2.9 pounds across the entire season (Table 7). While lengths of northern pike caught by anglers ranged from five to 35 inches, pike 20 to 30 inches were more likely to be harvested (Table 12).

### *Yellow perch*

An estimated 146,774 yellow perch (64,275 pounds) were harvested at a rate of 0.228 fish/hour across all anglers during 2011 (Table 2). Overall harvest and the harvest rate of targeting anglers both remained below long-term averages. Catch and harvest of yellow perch was highest during late 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). The estimated total number and pounds of yellow perch harvested in 2011 was second highest during the past four creel surveys (number range 84,783-146,750; pounds range 34,485-64,516).

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 9.7 inches long and weighed 0.4 pounds (Table 7), and harvested yellow perch were usually 7.0 inches or longer (Table 12).

### *Muskellunge*

One harvested muskellunge was observed by creel clerks during 2011 (Table 2). This fish was a 42 inch muskellunge illegally harvested by an angler stating they were targeting muskellunge. Angler catch rates were 0.003 fish/hour across all anglers over the entire season and 0.032 fish/hour for targeting anglers (Tables 8 and 9). Catch rates for anglers targeting muskellunge was the highest it's been in the since 2008 (range: 0.013-0.025). A total of 35 muskellunge were reported released by interviewed angling parties, ranging in length from 7 to 47 inches. After creel analysis, the estimated number of muskellunge harvested was 116 and the estimated number released was 1,570 (Table 12).

### *Largemouth bass*

Approximately 851 largemouth bass (2,086 pounds) were harvested at a rate of 0.001 fish/hour across all anglers during the 2011 summer season (Tables 2 and 7). Largemouth bass catch and harvest rates of all anglers were highest during August (Table 8). Largemouth bass caught by anglers ranged in length from less than 7 inches to 22 inches, with harvested fish measuring 14 to 18 inches (Table 12). The average size of a harvested largemouth bass was 16.9 inches long and weighed 2.7 pounds (Table 7).

### *Black crappie*

An estimated 10,085 black crappie (12,065 pounds) (Tables 6 and 7) were harvested at a rate of 0.016 fish/hour across all anglers (Table 8). The number harvested and the total pounds harvested in 2011 were each within the 2008-2010 ranges (5,527-20,444; 4,212-13,127, respectively). Catch and harvest of black crappie was highest during May (Tables 6-8). Length of crappies caught by anglers ranged from 7 to 14 inches, and anglers tended to harvest crappie 9.0 inches and longer (Table 12).

### *Bluegill/Pumpkinseed (sunfish)*

An estimated 19,664 sunfish (10,366 pounds; bluegill and pumpkinseed combined) were harvested at a rate of 0.027 fish/hour across all anglers (Tables 6-8). Catch rates across all anglers were highest during late July while harvest rates across all anglers were highest during early August (Table 8). Catch rates across targeting anglers were highest during late September while harvest rates across targeting anglers were highest during May (Table 9). Lengths of sunfish caught ranged from 3 to 12 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 2011). Similar patterns in above-average growth of yellow perch (Schultz 2011) 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 remained slightly lower than 2009 estimates for the second year in a row (Schultz 2010b), but remained above respective long-term 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 (PSL), 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, 696,536 hours of angler effort caught nearly 160,345 walleyes during the 2011 summer season at an overall catch rate of 0.232 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 40% of the total walleye catch in 2011 was comprised of fish that could have otherwise been harvested. The

2005-2007 year classes are nearly fully recruited to the existing 18-26" PSL, and continue to provide quality catch and release opportunities.

The PSL for walleye on Leech Lake 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 through 2011. 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 Minnesota large lakes 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, 2011. Standard errors appear in parentheses.

	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1
<i>Sampling Summary (Number)</i>					
Dates	May 14-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-15
Days in stratum	2	16	15	15	15
N Weekdays sampled	0	11	11	11	0
N Wknd/Hol sampled	2	4	4	4	0
N Interviews/refusals	204/0	280/0	226/0	166/0	0/0
<i>Boat Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	2.51 (0.36)	2.24 (0.31)	2.23 (0.23)	2.36 (0.37)	0 (0)
Mean trip length (h)	6.48 (2.42)	4.17 (0.57)	4.71 (0.66)	3.44 (0.50)	0 (0)
<i>Walleye Tournament Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
<i>Launch Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
<i>Fishing Pressure</i>					
Total angler hours	48,361 (9,295)	129,217 (9,405)	83,743 (6,124)	76,202 (12,082)	67,349 <sup>1</sup>
	Stratum				
	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2
<i>Sampling Summary (Number)</i>					
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	98/0	141/0	127/0	137/0	138/0
<i>Boat Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	2.15 (0.25)	2.44 (0.26)	2.09 (0.33)	2.21 (0.28)	2.23 (0.30)
Mean trip length (h)	3.57 (0.50)	3.80 (0.60)	3.77 (0.69)	3.97 (0.49)	4.41 (0.86)
<i>Walleye Tournament Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
<i>Launch Angler Trip Length &amp; Party Size</i>					
Mean anglers/boat	-	-	-	-	-
Mean trip length (h)	-	-	-	-	-
<i>Fishing Pressure</i>					
Total angler hours	58,495 (4,967)	57,560 (6,299)	47,103 (3,622)	52,149 (4,219)	76,357 (3,646)

<sup>1</sup> July-1 pressure data is estimated because the creel survey did not occur from July 1-20, 2011 due to the state shutdown. Estimate is an average of the Jun-2 and Jul-2 data.

Table 2. Estimated total angling pressure and total catch statistics for the summer open water creel season on Leech Lake, Minnesota, 1965-2011.

	Year							
	1965	1966	1967	1984	1985	1991	1992	1998
<i>Angling Pressure</i>								
Angler Trips	221,220	217,185	201,093	182,530	352,646	306,585	246,198	316,930
Angler Hours	858,960	862,346	785,905	697,267	1,290,339	1,195,683	935,553	1,274,985
-Walleye Tourm.								
-Total hours	858,960	862,346	785,905	697,267	1,290,339	1,195,683	935,553	1,274,985
<i>Number of Harvested Fish</i>								
Northern pike	60,943	52,336	48,108	40,109	79,144	42,376	26,610	50,255
Muskellunge	139	151	236	20	372	81	32	-
Largemouth bass	-	-	-	1,023	1,166	1,024	1,466	2,649
Yellow perch	150,599	145,510	13,359	143,756	229,660	176,646	216,323	391,367
Walleye (Legal)	149,917	162,091	147,822	76,170	161,193	179,898	86,877	141,577
-Illegal <sup>1</sup>								
-Released <sup>2</sup>								
-Total kill	149,917	162,091	147,822	76,170	161,193	179,898	86,877	141,577
<i>Pounds of Harvested Fish</i>								
Northern pike	155,800	138,666	125,081	73,609	148,562	96,655	65,526	122,684
Yellow perch	78,050	77,813	70,805	54,236	87,033	58,412	83,777	113,444
Walleye (Legal)	199,012	224,310	201,038	95,625	163,537	186,882	119,076	159,393
-Illegal <sup>1</sup>								
-Released <sup>2</sup>								
-Total kill	199,012	224,310	201,038	95,625	163,537	186,882	119,076	159,393
<i>Harvest per Angler Hour (all anglers)</i>								
Northern pike	0.071	0.061	0.061	0.058	0.061	0.035	0.028	0.044
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	0.002
Yellow perch	0.175	0.169	0.170	0.206	0.178	0.148	0.231	0.347
Walleye	0.174	0.188	0.188	0.109	0.125	0.150	0.093	0.100
<i>Harvest per Angler Hour (targeting anglers)</i>								
Northern pike						0.159	0.110	0.128
Muskellunge						0.001	<0.001	-
Largemouth bass						0.013	0.079	0.040
Yellow perch						1.870	2.184	2.156
Walleye						0.242	0.162	0.184

<sup>a</sup>18-26" protected slot limit

<sup>1</sup>Walleye protected by length limit

<sup>2</sup>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, 1965-2011.

	1999	2004	2005 <sup>a</sup>	2008 <sup>a</sup>	2009 <sup>a</sup>	2010 <sup>a</sup>	2011 <sup>a,3</sup>	1965-2011 Mean
<i>Angling Pressure</i>								
Angler Trips	295,976	192,407	119,114	152,044	179,118	169,590	156,514	220,610
Angler Hours	1,193,941	682,346	430,003	585,371	779,163	658,009	696,536	857,570
-Walleye Tourn.					15,545	14,056		14,801
-Total hours	1,193,941	682,346	430,003	585,371	794,708	672,065	696,536	863,734
<i>Number of Harvested Fish</i>								
Northern pike	47,749	23,638	13,967	16,908	10,890	16,987	15,133	36,344
Muskellunge	-	38	119	-	-	-	116	87
Largemouth bass	2,349	3,807	3,105	2,412	1,243	2,611	851	1,580
Yellow perch	439,768	51,355	84,783	136,096	126,476	146,750	146,774	173,281
Walleye	149,717	29,022	3,940	64,969	81,242	60,300	54,967	103,313
-Protected <sup>1</sup>			No est.	2,533	4,660	628	756	2,144
-Released <sup>2</sup>		708	171	3,424	9,947	1,975	3,004	3,205
-Total kill	149,717	29,730	4,111	70,926	95,849	62,903	58,727	105,167
<i>Pounds of Harvested Fish</i>								
Northern pike	127,013	62,659	37,654	54,820	33,588	49,015	44,490	89,055
Yellow perch	150,666	21,175	34,485	59,149	54,733	64,516	64,275	71,505
Walleye	189,028	68,355	6,348	72,959	86,428	67,236	69,740	127,264
-Protected <sup>1</sup>			No est.	8,451	10,334	2,485	2,888	6,040
-Released <sup>2</sup>		973	533	5,585	27,002	6,216	7,925	8,039
-Total kill	189,028	69,328	6,881	86,995	123,764	75,937	80,553	132,091
<i>Harvest per Angler Hour (all anglers)</i>								
Northern pike	0.045	0.035	0.033	0.029	0.014	0.025	0.022	0.041
Muskellunge	-	<0.001	<0.001	-	-	-	<0.001	-
Largemouth bass	0.002	0.006	0.007	0.004	0.002	0.004	0.001	0.002
Yellow perch	0.408	0.075	0.197	0.233	0.162	0.218	0.228	0.210
Walleye	0.107	0.043	0.009	0.115	0.110	0.091	0.079	0.112
<i>Harvest per Angler Hour (targeting anglers)</i>								
Northern pike	0.122	0.082	0.074	0.339	0.197	0.247	0.228	0.169
Muskellunge	-	-	0.001	-	-	-	0.002	0.000
Largemouth bass	0.009	0.054	0.070	0.237	0.059	0.043	0.025	0.063
Yellow perch	2.283	0.479	0.442	2.730	2.020	2.100	1.696	1.796
Walleye	0.227	0.054	0.019	0.459	0.242	0.197	0.177	0.196

<sup>a</sup>18-26" protected slot limit

<sup>1</sup>Walleye protected by length limit

<sup>2</sup>Estimated post-release hooking mortality (Reeves and Bruesewitz 2007)

<sup>3</sup> Overall angling pressure, number of harvested fish, and pounds of harvested fish data includes the estimated quantity from the July-1 period because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

Table 3. Hometown distances of anglers fishing Leech Lake, Minnesota relative to Walker, MN, 15 May – 30 September 2011.

Distance (miles)	N	Percent
0-49	775	21.8
50-99	336	9.4
100-149	803	22.6
150-199	675	19.0
200-249	245	6.9
250-299	92	2.6
300-349	143	4.0
350-399	162	4.6
400-449	83	2.3
450-499	73	2.1
500-5,000	171	4.8
Total	3,558	100.0

Table 4. State of residence of anglers fishing Leech Lake, Minnesota, 15 May – 30 September 2011.

State of Residence	N	Percent
Minnesota	2,640	74.2
Illinois	135	3.8
Iowa	318	8.9
Wisconsin	97	2.7
Indiana	34	1.0
North Dakota	62	1.7
Nebraska	21	0.6
South Dakota	27	0.8
Other	224	6.3
Total	3,558	100.0

Table 5. Frequencies (%) of species targeted by boat parties during each stratum for Leech Lake, Minnesota, 15-May – 30 September 2011.

Stratum	Targeted Species								Total (N)
	Walleye	Northern pike	Yellow perch	Largemouth bass	Black crappie	Muskellunge	Sunfish spp.	Other	
Opener	98.1	0.0	1.3	0.0	0.6	0.0	0.0	0.0	520
May	84.0	2.2	4.2	0.1	6.4	0.0	3.0	0.0	669
Jun-1	82.2	5.1	2.8	2.0	3.0	1.4	3.4	0.2	507
Jun-2	80.5	9.0	1.5	0.7	0.5	4.7	3.0	0.0	401
Jul-1 <sup>1</sup>	65.9	12.2	2.4	3.9	0.7	11.7	3.4	0.0	0
Jul-2	51.2	15.3	3.3	7.0	0.9	18.6	3.7	0.0	215
Aug-1	50.3	11.3	8.7	1.7	0.0	18.6	9.3	0.0	344
Aug-2	54.0	7.5	13.2	3.8	0.4	15.1	6.0	0.0	265
Sep-1	49.2	7.8	19.4	2.9	2.6	17.5	0.6	0.0	309
Sep-2	46.4	8.4	37.8	2.8	0.3	2.5	1.9	0.0	323
Season	66.2	7.4	10.2	2.3	1.6	8.7	3.4	0.0	3,553

<sup>1</sup> Jul-1 data is estimated based on the average between the Jun-2 and Jul-2 data because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

Table 6. Catch and harvest estimates by stratum for the open water creel survey on Leech Lake, Minnesota, 2011. Standard errors are in parentheses.

<i>Number Caught</i>					
Species	Opener	May	Jun-1	Jun-2	Jul-1 <sup>1</sup>
Bowfin	45 (11)	--	--	--	-
Bullhead spp.	-	94 (88)	73 (-)	--	-
Northern pike	2,215 (922)	8,094 (1,234)	9,260 (1,855)	6,077 (1,344)	5,634
Muskellunge	--	47 (-)	113 (44)	--	157
Burbot	--	--	--	86 (-)	43
Rock bass	836 (461)	4,074 (3,001)	8,552 (2,426)	5,163 (1,517)	4,002
Sunfish spp.	809 (443)	13,344 (8,097)	2,125 (519)	3,076 (3,074)	6,632
Smallmouth bass	14 (16)	37 (41)	--	--	-
Largemouth bass	16 (9)	463 (241)	1,787 (1,125)	134 (82)	661
Black crappie	453 (248)	11,990 (7,458)	1,475 (807)	--	167
Yellow perch	16,082 (3,094)	62,908 (13,713)	34,473 (7,303)	31,241 (8,997)	21,545
Walleye	26,061 (10,187)	34,627 (3,342)	31,537 (4,707)	24,909 (6,518)	14,419
Cisco/Whitefish	--	--	--	28 (37)	74
Overall	46,530 (13,601)	135,679 (23,398)	89,395 (10,519)	70,714 (15,613)	53,333

<i>Number Harvested</i>					
Species	Opener	May	Jun-1	Jun-2	Jul-1 <sup>1</sup>
Bowfin	--	--	--	--	-
Bullhead spp.	--	--	--	--	-
Northern pike	158 (56)	1,389 (367)	1,451 (603)	1,546 (543)	1,607
Muskellunge	--	--	--	--	-
Burbot	--	--	--	--	-
Rock bass	--	1,157 (1,166)	1,209 (529)	739 (384)	370
Sunfish spp.	--	7,544 (4,197)	838 (179)	1,492 (1,493)	2,366
Smallmouth bass	--	--	--	--	-
Largemouth bass	--	--	136 (119)	67 (79)	152
Black crappie	291 (160)	7,702 (4,510)	897 (688)	--	-
Yellow perch	5,010 (1,002)	21,129 (5,561)	9,552 (2,425)	5,405 (1,776)	3,289
Walleye	9,673 (2,533)	14,946 (2,410)	7,138 (1,276)	8,184 (1,984)	5,040
Cisco/Whitefish	--	--	--	28 (37)	14
Overall	15,132 (3,321)	53,868 (10,681)	21,221 (3,982)	17,462 (3,624)	12,837

<sup>1</sup> July-1 catch and harvest estimate data is based on an average between the Jun-2 and Jul-2 data because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

Table 6 continued. Catch and harvest estimates by stratum for the open water creel survey on Leech Lake, Minnesota, 2011. Standard errors are in parentheses.

<i>Number Caught</i>						
Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season <sup>1</sup>
Bowfin	--	--	--	--	--	45
Bullhead spp.	--	--	--	--	--	167
Northern pike	5,191 (1,731)	9,137 (2,010)	3,357 (546)	5,588 (1,363)	11,010 (1,947)	65,563
Muskellunge	313 (154)	533 (137)	212 (140)	363 (65)	105 (20)	1,843
Burbot	--	--	--	--	--	129
Rock bass	2,842 (1,537)	1,739 (500)	2,160 (685)	2,257 (1,554)	1,925 (1,093)	33,549
Sunfish spp.	10,188 (6,525)	8,409 (2,240)	747 (310)	135 (66)	4,001 (4,402)	49,465
Smallmouth bass	--	--	--	--	--	51
Largemouth bass	1,188 (643)	1,294 (111)	1,266 (606)	1,400 (657)	1,559 (757)	9,769
Black crappie	334 (173)	80 (-)	467 (397)	265 (136)	383 (256)	15,614
Yellow perch	11,849 (3,903)	29,864 (5,955)	28,362 (5,912)	56,614 (11,308)	213,180 (40,289)	506,118
Walleye	3,929 (1,210)	7,212 (1,855)	6,599 (1,254)	4,418 (918)	6,633 (1,841)	160,345
Cisco/Whitefish	119 (117)	--	--	--	--	221
Overall	35,953 (10,713)	58,268 (9,138)	43,171 (7,346)	71,040 (13,061)	238,797 (40,013)	842,880

<i>Number Harvested</i>						
Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season <sup>1</sup>
Bowfin	--	--	--	--	--	0
Bullhead spp.	--	--	--	--	--	0
Northern pike	1,667 (575)	1,967 (734)	1,041 (189)	1,558 (426)	2,750 (893)	15,133
Muskellunge	--	--	116 (124)	--	--	116
Burbot	--	--	--	--	--	0
Rock bass	--	164 (170)	354 (182)	1,257 (906)	848 (584)	6,098
Sunfish spp.	3,240 (2,767)	3,487 (814)	156 (78)	41 (38)	500 (550)	19,664
Smallmouth bass	--	--	--	--	--	0
Largemouth bass	236 (246)	--	--	--	260 (190)	851
Black crappie	--	80 (-)	467 (397)	265 (136)	383 (256)	10,085
Yellow perch	1,173 (595)	8,202 (2,303)	10,084 (3,954)	16,125 (3,962)	66,803 (12,889)	146,774
Walleye	1,896 (799)	2,391 (732)	2,130 (548)	1,713 (459)	1,855 (632)	54,967
Cisco/Whitefish	--	--	--	--	--	42
Overall	8,212 (3,625)	16,291 (3,448)	14,349 (4,108)	20,959 (4,692)	73,400 (13,619)	253,731

<sup>1</sup> Season catch and harvest estimate data includes the estimated Jul-1 data and therefore does not have standard error associated with it.

Table 7. Yield estimates and mean weights of harvested fish by stratum for Leech Lake, Minnesota, 15 May – 30 September 2011. Standard errors are in parentheses.

Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season <sup>1</sup>
<i>Total Pounds Harvested</i>						
Northern pike	4,631 (2,429)	5,570 (2,129)	3,076 (540)	4,646 (1,278)	8,441 (7,497)	44,490
Muskellunge	- -	- -	18.8 (-)	- -	- -	18.8 (-)
Rock bass	- -	66 (-)	242 (128)	1,022 (931)	904 (764)	5,603
Sunfish spp.	1,225 (1,244)	1,693 (821)	71 (16)	18 (-)	133 (-)	10,366
Largemouth bass	580 (-)	- -	- -	- -	580 (-)	2,086
Black crappie	- -	452 (-)	495 (-)	386 (208)	429 (297)	12,065
Yellow perch	348 (210)	2,942 (1,258)	3,886 (1,781)	7,019 (2,318)	29,431 (15,192)	64,275
Walleye	2,058 (1,574)	2,904 (1,057)	2,629 (950)	2,373 (955)	2,543 (1,230)	69,740
Cisco/Whitefish	- -	- -	- -	- -	- -	- -
<i>Mean Weight (pounds) of Harvested Fish</i>						
Northern pike	2.8 (2)	2.8 (2)	3.0 (1)	3.0 (2)	3.1 (3)	2.9 (1)
Muskellunge	- -	- -	18.8 (-)	- -	- -	18.8 (-)
Rock bass	- -	0.4 (-)	0.7 (1)	0.8 (1)	1.1 (1)	0.9 (0)
Sunfish spp.	0.4 (1)	0.5 (0)	0.5 (0)	0.4 (-)	0.3 (-)	0.6 (0)
Largemouth bass	2.5 (-)	- -	- -	- -	2.9 (-)	2.7 (1)
Black crappie	- -	1.1 (-)	1.1 (-)	1.5 (1)	1.1 (1)	1.2 (1)
Yellow perch	0.3 (0)	0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)
Walleye	1.1 (1)	1.2 (1)	1.2 (1)	1.4 (1)	1.4 (1)	1.3 (0)
Cisco/Whitefish	- -	- -	- -	- -	- -	2.0 (-)
<i>Mean Length (in) of Harvested Fish</i>						
Northern pike	23.3 (16)	23.1 (13)	22.9 (7)	23.6 (13)	23.8 (21)	23.3 (6)
Muskellunge	- -	- -	42.0 (-)	- -	- -	42.0 (-)
Rock bass	- -	8.0 (-)	9.4 (7)	9.9 (11)	10.7 (12)	10.0 (5)
Sunfish spp.	7.6 (10)	8.2 (4)	8.1 (4)	8.0 (-)	6.9 (-)	8.4 (4)
Largemouth bass	16.3 (-)	- -	- -	- -	17.3 (-)	16.9 (9)
Black crappie	- -	12.1 (-)	12.0 (-)	13.3 (10)	12.1 (12)	12.2 (14)
Yellow perch	8.5 (7)	9.1 (5)	9.2 (6)	9.6 (4)	9.7 (5)	9.7 (3)
Walleye	15.0 (13)	15.2 (7)	15.5 (7)	15.9 (8)	15.9 (11)	15.6 (4)
Cisco/Whitefish	- -	- -	- -	- -	- -	18.0 (-)

<sup>1</sup> Season total pounds harvested data includes the estimated Jul-1 data and therefore does not have standard error associated with it.

Table 7 continued. Yield estimates and mean weights of harvested fish by stratum for Leech Lake, Minnesota, 15 May – 30 September 2011. Standard errors are in parentheses.

Species	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2	Season <sup>1</sup>
<i>Total Pounds Harvested</i>						
Northern pike	4,631 (2,429)	5,570 (2,129)	3,076 (540)	4,646 (1,278)	8,441 (7,497)	44,490
Muskellunge	- -	- -	18.8 (-)	- -	- -	18.8 (-)
Rock bass	- -	66 (-)	242 (128)	1,022 (931)	904 (764)	5,603
Sunfish spp.	1,225 (1,244)	1,693 (821)	71 (16)	18 (-)	133 (-)	10,366
Largemouth bass	580 (-)	- -	- -	- -	580 (-)	2,086
Black crappie	- -	452 (-)	495 (-)	386 (208)	429 (297)	73,266
Yellow perch	348 (210)	2,942 (1,258)	3,886 (1,781)	7,019 (2,318)	29,431 (15,192)	64,275
Walleye	2,058 (1,574)	2,904 (1,057)	2,629 (950)	2,373 (955)	2,543 (1,230)	69,740
Cisco/Whitefish						
<i>Mean Weight (pounds) of Harvested Fish</i>						
Northern pike	2.8 (2)	2.8 (2)	3.0 (1)	3.0 (2)	3.1 (3)	2.9 (1)
Muskellunge	- -	- -	18.8 (-)	- -	- -	18.8 (-)
Rock bass	- -	0.4 (-)	0.7 (1)	0.8 (1)	1.1 (1)	0.9 (0)
Sunfish spp.	0.4 (1)	0.5 (0)	0.5 (0)	0.4 (-)	0.3 (-)	0.6 (0)
Largemouth bass	2.5 (-)	- -	- -	- -	2.9 (-)	2.7 (1)
Black crappie	- -	1.1 (-)	1.1 (-)	1.5 (1)	1.1 (1)	1.2 (1)
Yellow perch	0.3 (0)	0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)
Walleye	1.1 (1)	1.2 (1)	1.2 (1)	1.4 (1)	1.4 (1)	1.3 (0)
Cisco/Whitefish	- -	- -	- -	- -	- -	2.0 (-)
<i>Mean Length (in) of Harvested Fish</i>						
Northern pike	23.3 (16)	23.1 (13)	22.9 (7)	23.6 (13)	23.8 (21)	23.3 (6)
Muskellunge	- -	- -	42.0 (-)	- -	- -	42.0 (-)
Rock bass	- -	8.0 (-)	9.4 (7)	9.9 (11)	10.7 (12)	10.0 (5)
Sunfish spp.	7.6 (10)	8.2 (4)	8.1 (4)	8.0 (-)	6.9 (-)	8.4 (4)
Largemouth bass	16.3 (-)	- -	- -	- -	17.3 (-)	16.9 (9)
Black crappie	- -	12.1 (-)	12.0 (-)	13.3 (10)	12.1 (12)	12.2 (14)
Yellow perch	8.5 (7)	9.1 (5)	9.2 (6)	9.6 (4)	9.7 (5)	9.7 (3)
Walleye	15.0 (13)	15.2 (7)	15.5 (7)	15.9 (8)	15.9 (11)	15.6 (4)
Cisco/Whitefish	- -	- -	- -	- -	- -	18.0 (-)

<sup>1</sup> Season total pounds harvested data includes the estimated Jul-1 data and therefore does not have standard error associated with it.

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, 2011.

Species	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1 <sup>1</sup>
<i>Catch per Angler Hour</i>					
Burbot	0.001 (<0.001)	- -	- -	- -	- -
Bullhead spp.	- -	0.001 (0.001)	0.001 (0.001)	- -	- -
Northern pike	0.046 (0.026)	0.063 (0.013)	0.111 (0.025)	0.080 (0.033)	- -
Muskellunge	- -	<0.001 (<0.001)	0.001 (0.001)	- -	- -
Burbot	- -	- -	- -	0.001 (<0.001)	- -
Rock bass	0.017 (0.012)	0.032 (0.023)	0.102 (0.040)	0.068 (0.024)	- -
Sunfish spp.	0.017 (0.010)	0.103 (0.062)	0.025 (0.006)	0.040 (0.041)	- -
Smallmouth bass	<0.001 (<0.001)	<0.001 (<0.001)	- -	- -	- -
Largemouth bass	<0.001 (<0.001)	0.004 (0.002)	0.021 (0.012)	0.002 (0.001)	- -
Black crappie	0.009 (0.005)	0.093 (0.060)	0.018 (0.010)	- -	- -
Yellow perch	0.333 (0.103)	0.487 (0.122)	0.412 (0.093)	0.410 (0.280)	- -
Walleye	0.539 (0.289)	0.268 (0.034)	0.377 (0.080)	0.327 (0.188)	- -
Cisco/Whitefish	- -	- -	- -	<0.001 (<0.001)	- -
Overall	0.962 (0.424)	1.050 (0.215)	1.067 (0.182)	0.928 (0.456)	
<i>Harvest per Angler Hour</i>					
Burbot	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -
Northern pike	0.003 (0.002)	0.011 (0.003)	0.017 (0.007)	0.020 (0.009)	- -
Muskellunge	- -	- -	- -	- -	- -
Burbot	- -	- -	- -	- -	- -
Rock bass	- -	0.009 (0.009)	0.014 (0.007)	0.010 (0.006)	- -
Sunfish spp.	- -	0.058 (0.032)	0.010 (0.002)	0.020 (0.020)	- -
Smallmouth bass	- -	- -	- -	- -	- -
Largemouth bass	- -	- -	0.002 (<0.001)	0.001 (0.001)	- -
Black crappie	0.006 (0.003)	0.060 (0.037)	0.011 (0.008)	- -	- -
Yellow perch	0.104 (0.030)	0.164 (0.046)	0.114 (0.030)	0.071 (0.025)	- -
Walleye	0.200 (0.081)	0.116 (0.021)	0.085 (0.017)	0.107 (0.059)	- -
Cisco/Whitefish	- -	- -	- -	<0.001 (<0.001)	- -
Overall	0.313 (0.111)	0.417 (0.092)	0.253 (0.052)	0.229 (0.093)	

<sup>1</sup> July-1 catch and harvest rate estimates were not determined because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

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, 2011.

Species	Stratum						Season
	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2		
<i>Catch per Angler Hour</i>							
Burbot	- -	- -	- -	- -	- -	- -	<0.001 (<0.001)
Bullhead spp.	- -	- -	- -	- -	- -	- -	<0.001 (<0.001)
Northern pike	0.089 (0.033)	0.159 (0.034)	0.071 (0.016)	0.107 (0.014)	0.144 (0.028)	0.095 (0.009)	0.095 (0.009)
Muskellunge	0.005 (0.003)	0.009 (0.004)	0.004 (0.003)	0.007 (0.001)	0.001 (<0.001)	0.003 (<0.001)	0.003 (<0.001)
Burbot	- -	- -	- -	- -	- -	- -	<0.001 (<0.001)
Rock bass	0.049 (0.023)	0.030 (0.009)	0.046 (0.029)	0.043 (0.030)	0.025 (0.014)	0.047 (0.009)	0.047 (0.009)
Sunfish spp.	0.174 (0.113)	0.146 (0.043)	0.016 (0.007)	0.003 (0.001)	0.052 (0.058)	0.068 (0.019)	0.068 (0.019)
Smallmouth bass	- -	- -	- -	- -	- -	- -	<0.001 (<0.001)
Largemouth bass	0.020 (0.012)	0.022 (0.003)	0.027 (0.013)	0.027 (0.013)	0.020 (0.010)	0.014 (0.003)	0.014 (0.003)
Black crappie	0.006 (0.003)	0.001 (<0.001)	0.010 (0.008)	0.005 (0.003)	0.005 (0.003)	0.025 (0.012)	0.025 (0.012)
Yellow perch	0.203 (0.084)	0.519 (0.116)	0.602 (0.190)	1.086 (0.245)	2.792 (0.457)	0.770 (0.089)	0.770 (0.089)
Walleye	0.067 (0.024)	0.125 (0.031)	0.140 (0.033)	0.085 (0.013)	0.087 (0.041)	0.232 (0.031)	0.232 (0.031)
Cisco/Whitefish	0.002 (0.002)	- -	- -	- -	- -	- -	<0.001 (<0.001)
Overall	0.615 (0.221)	1.012 (0.120)	0.917 (0.207)	1.362 (0.259)	3.127 (0.487)	1.255 (0.116)	1.255 (0.116)
<i>Harvest per Angler Hour</i>							
Burbot	- -	- -	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -	- -	- -
Northern pike	0.028 (0.011)	0.034 (0.012)	0.022 (0.088)	0.030 (0.009)	0.036 (0.012)	0.021 (0.003)	0.021 (0.003)
Muskellunge	- -	- -	0.002 (0.003)	- -	- -	- -	<0.001 (<0.001)
Burbot	- -	- -	- -	- -	- -	- -	- -
Rock bass	- -	0.003 (0.003)	0.008 (0.008)	0.024 (0.018)	0.011 (0.008)	0.009 (0.003)	0.009 (0.003)
Sunfish spp.	0.055 (0.047)	0.061 (0.016)	0.003 (0.003)	0.001 (0.001)	0.007 (0.007)	0.027 (0.009)	0.027 (0.009)
Smallmouth bass	- -	- -	- -	- -	- -	- -	- -
Largemouth bass	0.004 (0.004)	- -	- -	- -	0.003 (0.002)	0.001 (0.001)	0.001 (0.001)
Black crappie	- -	0.001 (<0.001)	0.010 (0.008)	0.005 (0.003)	0.005 (0.003)	0.016 (0.007)	0.016 (0.007)
Yellow perch	0.020 (0.013)	0.142 (0.043)	0.214 (0.089)	0.309 (0.082)	0.875 (0.155)	0.228 (0.026)	0.228 (0.026)
Walleye	0.032 (0.015)	0.042 (0.010)	0.045 (0.012)	0.033 (0.008)	0.024 (0.010)	0.079 (0.010)	0.079 (0.010)
Cisco/Whitefish	- -	- -	- -	- -	- -	- -	<0.001 (<0.001)
Overall	0.140 (0.068)	0.283 (0.014)	0.305 (0.096)	0.402 (0.091)	0.961 (0.168)	0.383 (0.036)	0.383 (0.036)

<sup>1</sup> July-1 catch and harvest rate estimates were not determined because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

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, 2011.

Species	Stratum				
	Opener	May	Jun-1	Jun-2	Jul-1 <sup>1</sup>
<i>Catch per Angler Hour</i>					
Northern pike	- -	0.416 (0.256)	0.665 (0.674)	0.504 (0.370)	- -
Muskellunge	- -	- -	0.014 (<0.001)	- -	- -
Rock bass	- -	2.000 (<0.001)	4.000 (<0.001)	- -	- -
Sunfish spp.	- -	5.097 (1.859)	1.959 (0.063)	5.133 (<0.001)	- -
Largemouth bass	- -	0.578 (<0.001)	1.033 (2.727)	0.218 (0.861)	- -
Black crappie	2.800 (<0.001)	1.574 (1.555)	1.102 (0.150)	- -	- -
Yellow perch	1.631 (<0.001)	4.612 (6.822)	4.121 (4.896)	4.677 (4.517)	- -
Walleye	1.153 (0.578)	0.683 (0.562)	0.992 (0.687)	0.947 (0.746)	- -
<i>Harvest per Angler Hour</i>					
Northern pike	- -	0.066 (0.109)	0.213 (0.293)	0.141 (0.115)	- -
Muskellunge	- -	- -	- -	- -	- -
Rock bass	- -	0.578 (<0.001)	4.000 (<0.001)	- -	- -
Sunfish spp.	- -	3.267 (1.562)	0.693 (<0.001)	2.493 (<0.001)	- -
Largemouth bass	- -	- -	- -	0.218 (0.861)	- -
Black crappie	1.800 (<0.001)	1.052 (0.788)	1.102 (0.150)	- -	- -
Yellow perch	0.802 (<0.001)	1.492 (1.166)	1.873 (2.143)	1.228 (1.141)	- -
Walleye	0.384 (0.176)	0.273 (0.158)	0.148 (0.118)	0.326 (0.270)	- -

<sup>1</sup> July-1 catch and harvest rate estimates were not determined because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

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, 2011.

Species	Stratum						Season
	Jul-2	Aug-1	Aug-2	Sep-1	Sep-2		
<i>Catch per Angler Hour</i>							
Northern pike	0.581 (0.298)	1.382 (1.640)	0.247 (0.221)	0.555 (0.784)	0.829 (0.557)	0.640 (0.265)	
Muskellunge	0.049 (0.036)	0.068 (0.060)	0.023 (0.030)	0.051 (0.013)	- -	0.032 (0.012)	
Rock bass	- -	- -	- -	- -	- -	2.289 (<0.001)	
Sunfish spp.	3.326 (<0.001)	6.350 (2.350)	1.005 (0.921)	- -	7.164 (<0.001)	3.779 (0.568)	
Largemouth bass	0.285 (0.409)	0.986 (2.148)	1.047 (0.111)	0.728 (0.609)	0.626 (0.001)	0.792 (0.563)	
Black crappie	0.150 (<0.001)	- -	1.402 (<0.001)	0.485 (<0.001)	0.425 (<0.001)	1.072 (0.424)	
Yellow perch	0.539 (<0.001)	5.038 (3.180)	4.633 (2.626)	6.926 (4.129)	9.195 (4.813)	4.988 (1.487)	
Walleye	0.223 (0.184)	0.577 (0.406)	0.569 (0.390)	0.364 (0.490)	0.257 (0.667)	0.584 (0.188)	
<i>Harvest per Angler Hour</i>							
Northern pike	0.237 (0.281)	0.448 (0.497)	0.105 (0.106)	0.204 (0.355)	0.429 (0.251)	0.228 (0.101)	
Muskellunge	- -	- -	0.012 (0.026)	- -	- -	0.002 (0.004)	
Rock bass	- -	- -	- -	- -	- -	2.289 (<0.001)	
Sunfish spp.	0.988 (<0.001)	2.371 (0.825)	0.203 (0.423)	- -	0.896 (<0.001)	1.619 (0.336)	
Largemouth bass	0.057 (0.184)	- -	- -	- -	0.046 (0.168)	0.025 (0.052)	
Black crappie	- -	- -	1.402 (<0.001)	0.485 (<0.001)	0.425 (<0.001)	0.877 (0.217)	
Yellow perch	- -	1.761 (1.389)	2.056 (2.942)	2.052 (1.344)	2.845 (1.804)	1.682 (0.613)	
Walleye	0.089 (0.195)	0.174 (0.147)	0.184 (0.179)	0.134 (0.181)	0.058 (0.102)	0.177 (0.061)	

<sup>1</sup> July-1 catch and harvest rate estimates were not determined because the creel survey did not occur from July 1-20, 2011 due to the state shutdown.

Table 10. Percent of all angling parties who harvested a given number of fish by stratum from Leech Lake, Minnesota, 15 May – 30 September 2011.

Species/stratum	N	Number Harvested per Angler					
		0	0.1-0.9	1.0-1.9	2.0-2.9	3	
<b>Northern pike</b>							
Opener	204	95%	5%	0%	0%	0%	
May	280	92%	6%	2%	0%	0%	
Jun-1	226	92%	6%	1%	1%	0%	
Jun-2	166	89%	11%	1%	0%	0%	
Jul-1	NA	NA	NA	NA	NA	NA	
Jul-2	98	90%	5%	4%	1%	0%	
Aug-1	141	89%	6%	4%	2%	0%	
Aug-2	127	90%	6%	3%	1%	0%	
Sep-1	137	83%	12%	4%	1%	0%	
Sep-2	138	80%	10%	9%	1%	0%	
Overall	1,517	89%	7%	3%	1%	0%	
<b>Yellow perch</b>							
	N	0	0.1-4.9	5.0-9.9	10.0-14.9	15.0-19.9	20
Opener	204	62%	35%	2%	0%	0%	0%
May	280	65%	29%	3%	1%	0%	1%
Jun-1	226	82%	15%	2%	1%	0%	0%
Jun-2	166	87%	11%	1%	1%	1%	0%
Jul-1	NA	NA	NA	NA	NA	NA	NA
Jul-2	98	94%	6%	0%	0%	0%	0%
Aug-1	141	88%	9%	3%	0%	0%	0%
Aug-2	127	87%	11%	0%	2%	0%	0%
Sep-1	137	70%	21%	5%	2%	1%	0%
Sep-2	138	38%	28%	19%	7%	3%	4%
Overall	1,517	74%	20%	4%	2%	0%	1%
<b>Walleye</b>							
	N	0	0.1-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4
Opener	204	34%	12%	24%	13%	7%	10%
May	280	62%	15%	12%	7%	3%	1%
Jun-1	226	66%	12%	10%	5%	4%	2%
Jun-2	166	69%	14%	12%	3%	1%	1%
Jul-1	NA	NA	NA	NA	NA	NA	NA
Jul-2	98	87%	8%	4%	0%	0%	1%
Aug-1	141	86%	7%	4%	3%	0%	0%
Aug-2	127	85%	6%	4%	3%	2%	0%
Sep-1	137	80%	14%	4%	1%	0%	0%
Sep-2	138	80%	14%	4%	1%	1%	1%
Overall	1,517	69%	12%	10%	5%	2%	2%

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 2011.

Species/stratum	N	Number Harvested per Angler					
		0	0.1-0.9	1.0-1.9	2.0-2.9	3	
<b>Northern pike</b>							
Opener	2	100%	0%	0%	0%	0%	
May	22	86%	9%	5%	0%	0%	
Jun-1	17	65%	18%	6%	12%	0%	
Jun-2	16	63%	38%	0%	0%	0%	
Jul-1	NA	NA	NA	NA	NA	NA	
Jul-2	19	74%	11%	11%	5%	0%	
Aug-1	33	67%	15%	9%	9%	0%	
Aug-2	16	69%	25%	6%	0%	0%	
Sep-1	18	44%	39%	11%	6%	0%	
Sep-2	14	50%	14%	29%	7%	0%	
Overall	157	66%	20%	9%	5%	0%	
<b>Yellow perch</b>							
	N	0	0.1-4.9	5.0-9.9	10.0-14.9	15.0-19.9	20
Opener	9	11%	67%	22%	0%	0%	0%
May	44	20%	50%	16%	9%	0%	5%
Jun-1	17	53%	29%	6%	12%	0%	0%
Jun-2	10	40%	40%	10%	0%	10%	0%
Jul-1	NA	NA	NA	NA	NA	NA	NA
Jul-2	4	100%	0%	0%	0%	0%	0%
Aug-1	16	44%	31%	25%	0%	0%	0%
Aug-2	19	53%	32%	0%	16%	0%	0%
Sep-1	39	31%	38%	18%	8%	5%	0%
Sep-2	74	14%	36%	27%	11%	4%	8%
Overall	232	28%	39%	18%	9%	3%	3%
	0						
<b>Walleye</b>							
	N	0	0.1-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4
Opener	202	34%	12%	24%	13%	7%	10%
May	240	56%	18%	14%	8%	3%	1%
Jun-1	197	61%	14%	11%	6%	5%	3%
Jun-2	138	64%	17%	14%	4%	1%	1%
Jul-1	NA	NA	NA	NA	NA	NA	NA
Jul-2	52	81%	12%	8%	0%	0%	0%
Aug-1	76	78%	9%	8%	5%	0%	0%
Aug-2	74	77%	8%	7%	5%	3%	0%
Sep-1	72	71%	21%	7%	1%	0%	0%
Sep-2	79	73%	16%	6%	1%	1%	1%
Overall	1,130	60%	15%	13%	7%	3%	3%

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 the estimated number of harvested and released fish for Leech Lake, Minnesota, 15 May – 30 September 2011.

TL (inches)	Estimated Number Harvested (H) and Released (R)													
	Bullhead spp.		Northern pike		Muskellunge		Burbot		Rock bass		Smallmouth Bass		Largemouth bass	
	H	R	H	R	H	R	H	R	H	R	H	R	H	R
<4.00														
4.00-4.99										271				
5.00-5.99				302					153	678				
6.00-6.99														
7.00-7.99		84		173		45			511	7,503				86
8.00-8.99									205					
9.00-9.99				432		45			3,478	11,118				
10.00-10.99				86					869	1,808				
11.00-11.99									153					
12.00-12.99		84		1,339					358	1,401				431
13.00-13.99										45				
14.00-14.99			93	3,111						90	51	108	3,191	
15.00-15.99				1,599						45			54	1,639
16.00-16.99										859			108	43
17.00-17.99			930	7,345									323	2,760
18.00-18.99			279										108	
19.00-19.99			2,045	9,678		90								172
20.00-20.99			883	1,383										43
21.00-21.99			325											
22.00-22.99			2,696	7,258										43
23.00-23.99			651	86										
24.00-24.99			2,743	6,654		135								
25.00-25.99			558	951		45								
26.00-26.99			325	130										
27.00-27.99			976	2,549		90	86							
28.00-28.99			139	43										
29.00-29.99			418	1,901		135								
30.00-30.99			186	130		90								
31.00-31.99			93	43										
32.00-32.99			139	691		179								
33.00-33.99														
34.00-34.99				389										
35.00-35.99			46	130										
36.00-36.99														
37.00-37.99						90								
38.00-38.99														
39.00-39.99						90								
40.00-40.99						90								
41.00-41.99														
42.00-42.99					116	179								
43.00-43.99														
44.00-44.99						135								
45.00-45.99						90								
46.00-46.99														
47.00-47.99						45								
48.00-48.99														
49.00-49.99														
≥50.00														
Total (N)	-	168	13,527	46,402	116	1,570	-	86	5,728	23,818	-	51	701	8,408

Table 12 continued. Length-frequency distribution of the estimated number of harvested and released fish for Leech Lake, Minnesota, 15 May – 30 September 2011.

Estimated Number Harvested (H) and Released (R)												
TL (inches)	Black crappie		Bluegill		Bowfin		Yellow perch		Walleye <sup>1,2</sup>		Cisco/ Whitefish	
	H	R	H	R	H	R	H	R	H	R	H	R
<4.00				973				408				
4.00-4.99				3,709			639	45,811		144		
5.00-5.99			303	5,898			511	108,495		1,475		
6.00-6.99			303	608				2,767				
7.00-7.99		1,514	10,075	12,707			12,518	130,176	108	7,411		
8.00-8.99			3,035				3,193	8,981	36	216		
9.00-9.99	1,484	1,766	3,035	1,520			87,198	34,925	1,262	6,116		
10.00-10.99	2,620	1,577	121				32,699	4,853	324	2,518		
11.00-11.99	568		121	61			2,682	91	252	216		
12.00-12.99	4,017	442	303	61			3,321	3,583	2,776	11,657		119
13.00-13.99	480								1,947	144		
14.00-14.99	873	63					128	998	14,168	3,058		
15.00-15.99	44						255		16,223	1,475		
16.00-16.99							341		8,111	432		
17.00-17.99						15			12,438	3,094	28	
18.00-18.99									<b>108</b>	<b>1,403</b>		
19.00-19.99									<b>108</b>	<b>17,809</b>		
20.00-20.99									<b>72</b>	<b>8,059</b>		
21.00-21.99										<b>1,511</b>		
22.00-22.99									<b>180</b>	<b>22,522</b>		
23.00-23.99									<b>108</b>	<b>1,547</b>		
24.00-24.99						15			<b>180</b>	<b>10,541</b>		
25.00-25.99										<b>2,195</b>		
26.00-26.99									216	648		
27.00-27.99						15			72	1,043		
28.00-28.99									36	72		
29.00-29.99										36		
30.00-30.99												
31.00-31.99												
32.00-32.99										36		
33.00-33.99												
34.00-34.99												
35.00-35.99												
≥ 36.00												
Total (N)	10,085	5,362	17,298	25,536	-	45	143,485	341,089	58,727	105,379	28	119

<sup>1</sup>Bold font denotes walleye protected by length limit.

<sup>2</sup>harvested and released walleye lengths include those that were estimated from the Jul-1 time period when the creel survey was suspended due to the state shutdown.

## **FIGURES**

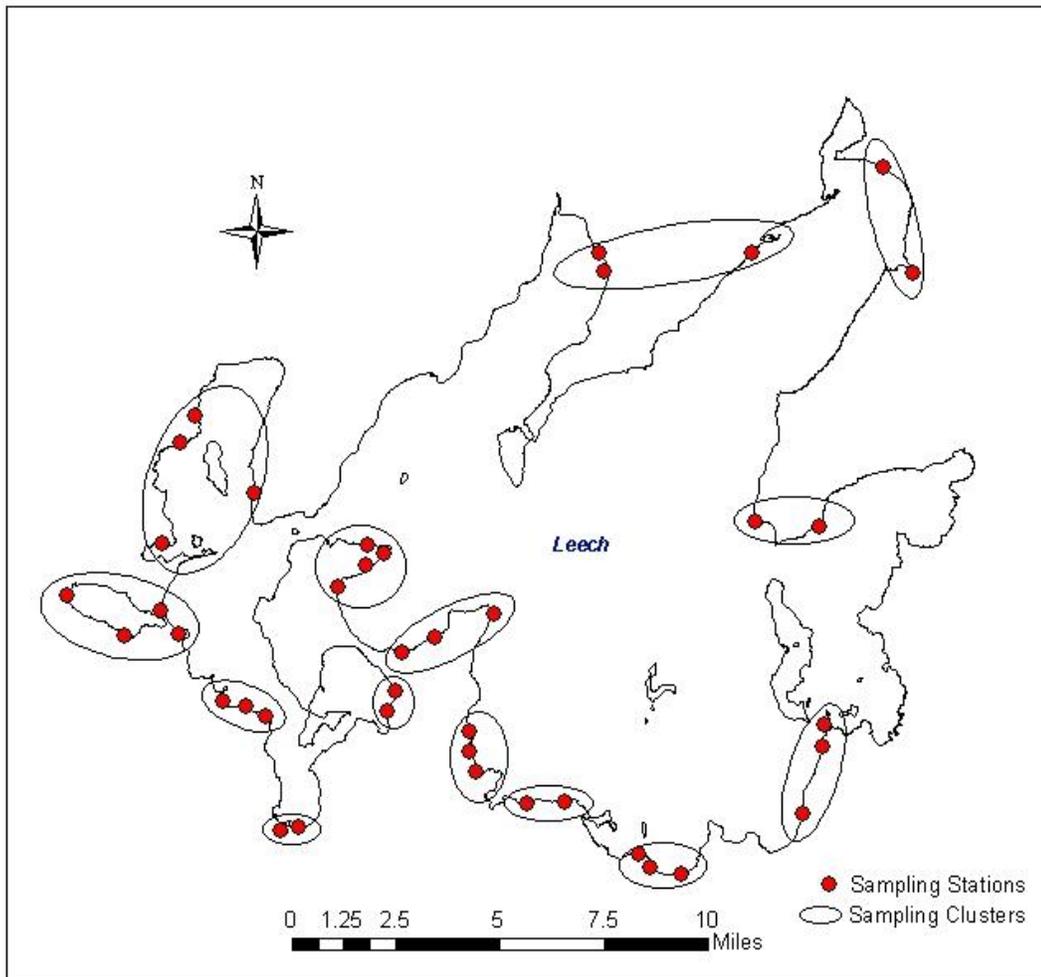


Figure 1. Creel survey sampling clusters (circles) and stations (dots) on Leech Lake, Minnesota.

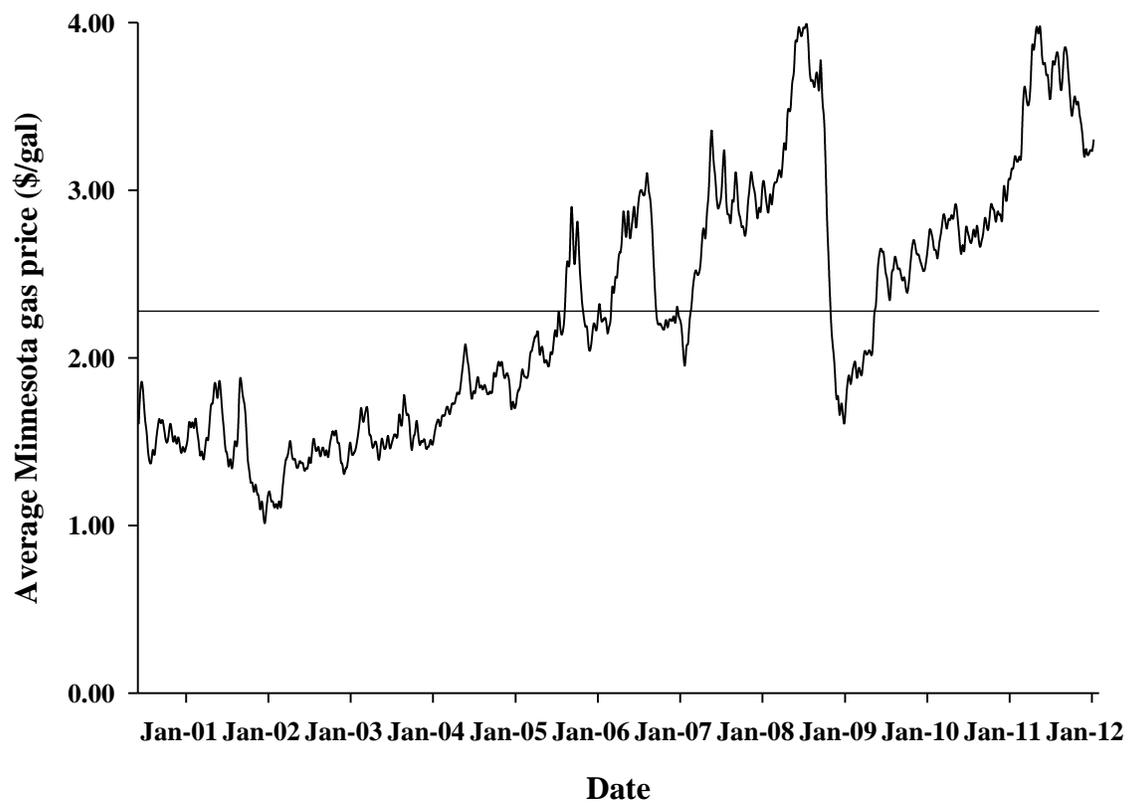


Figure 2. Weekly price (\$) per gallon of regular gasoline in Minnesota, June 2000 – January 2012 (EIA 2011). The horizontal line depicts the 10-year average.

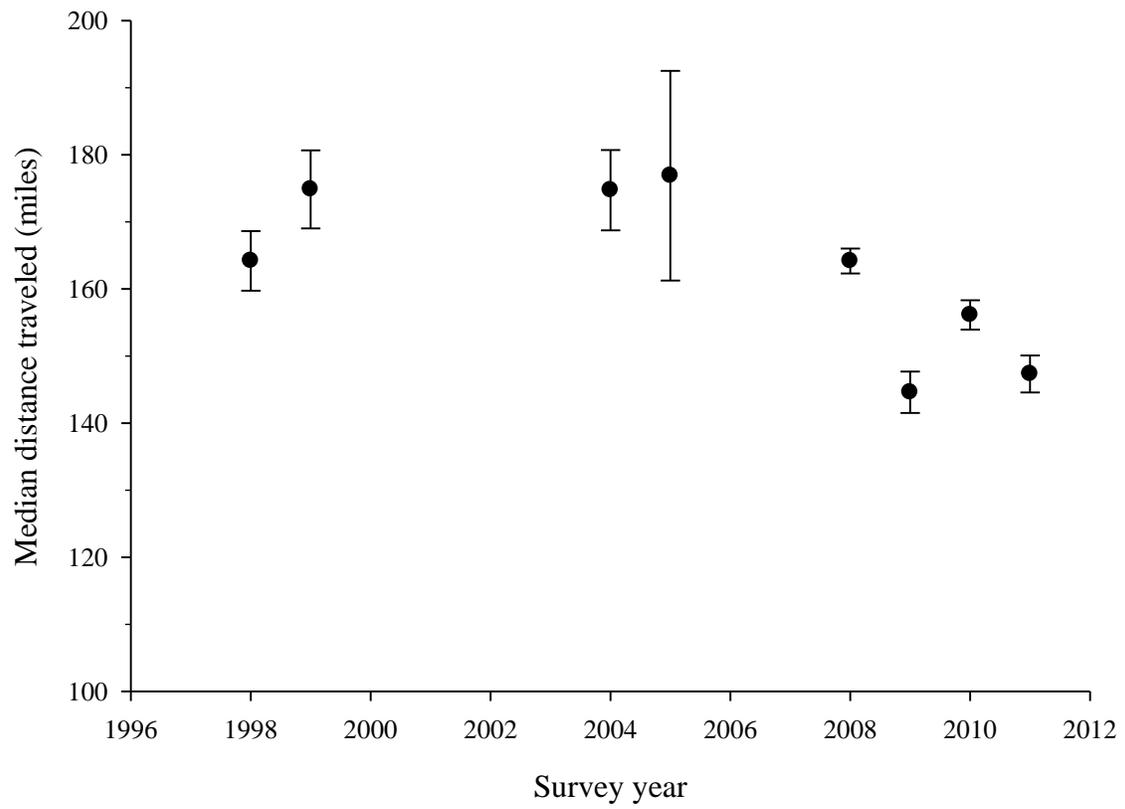


Figure 3. Median distance (miles  $\pm$  95% CI) traveled by Leech Lake anglers interviewed during summer creel surveys, 1998-2011.

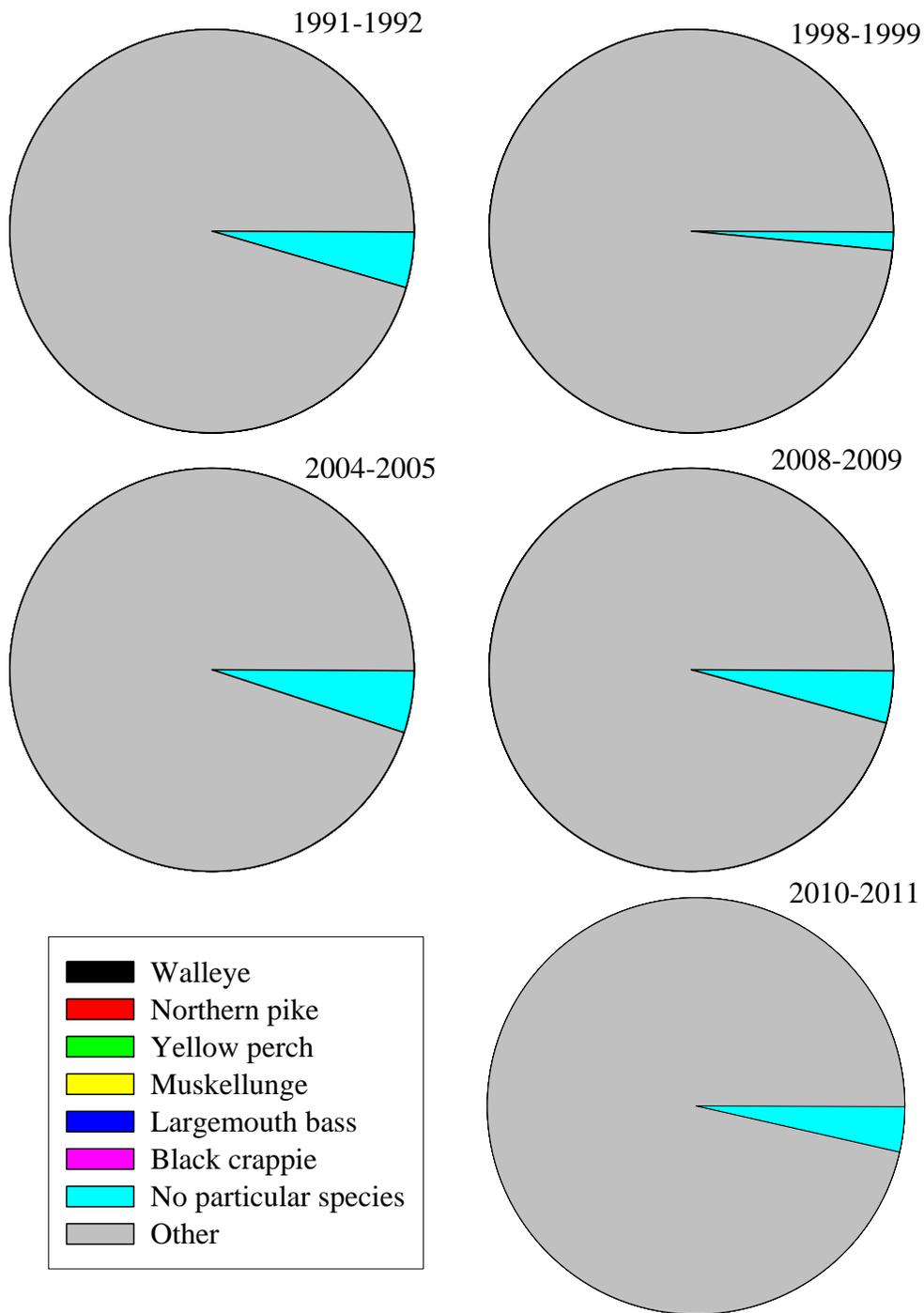


Figure 4. Mean distribution of species targeted by anglers interviewed during summer creel surveys on Leech Lake, 1991-2011.

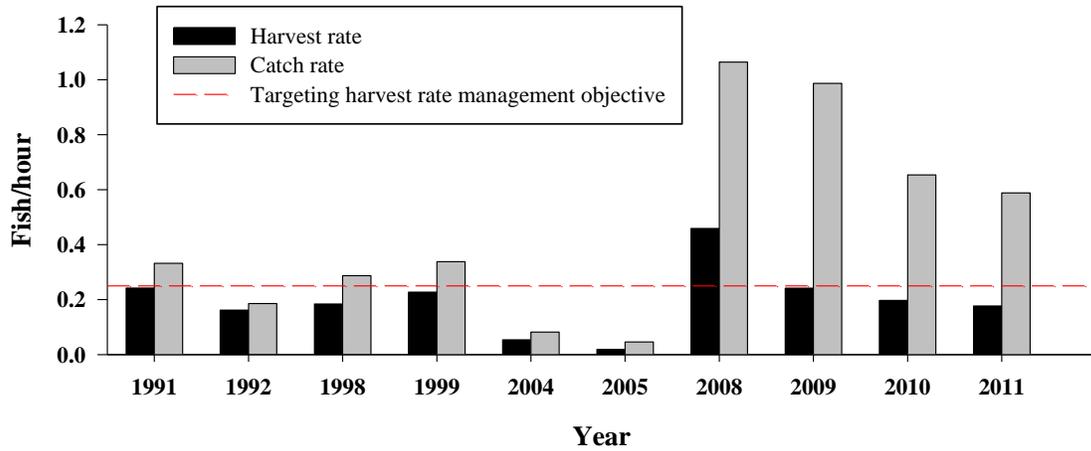


Figure 5. Walleye catch harvest rates by Leech Lake anglers targeting walleye, 1991-2011. The dashed line represents the 2011-2015 management plan objective of a targeting harvest rate of 0.25 walleye/hour or higher.

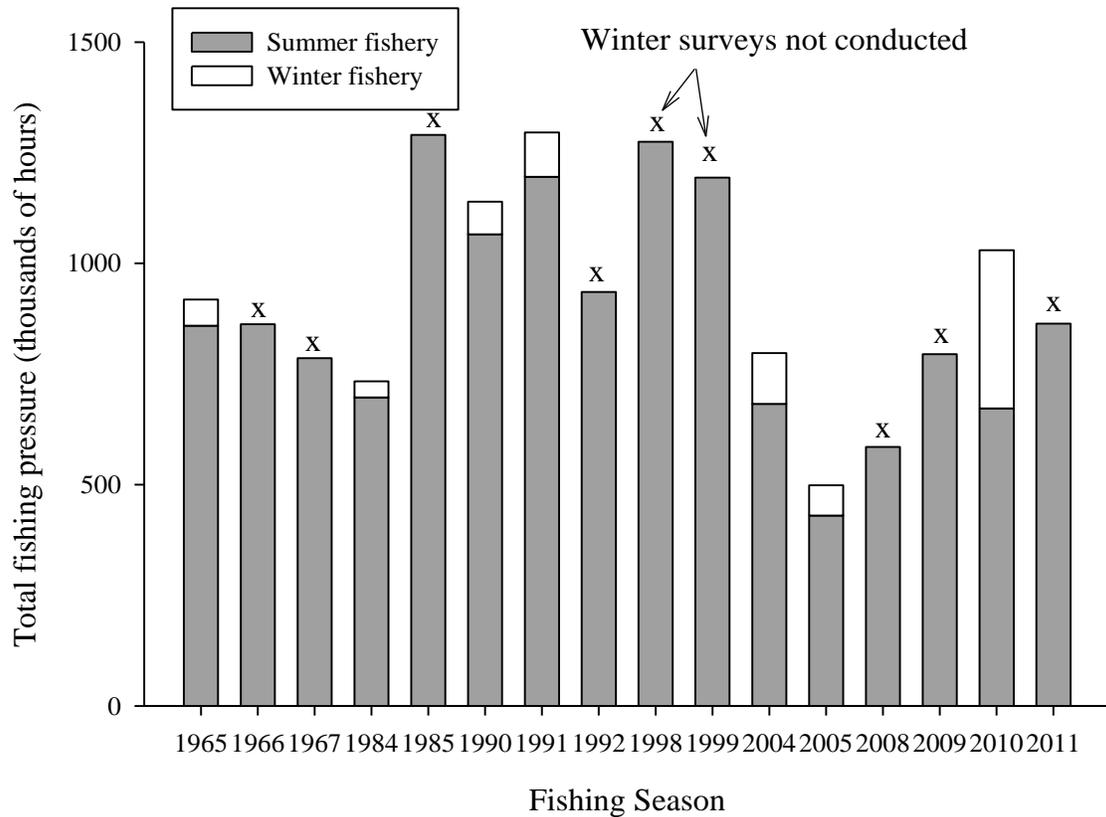


Figure 6. Total fishing pressure (angler-hours x 1,000) by Leech Lake anglers throughout the summer and winter seasons, 1965-2011.

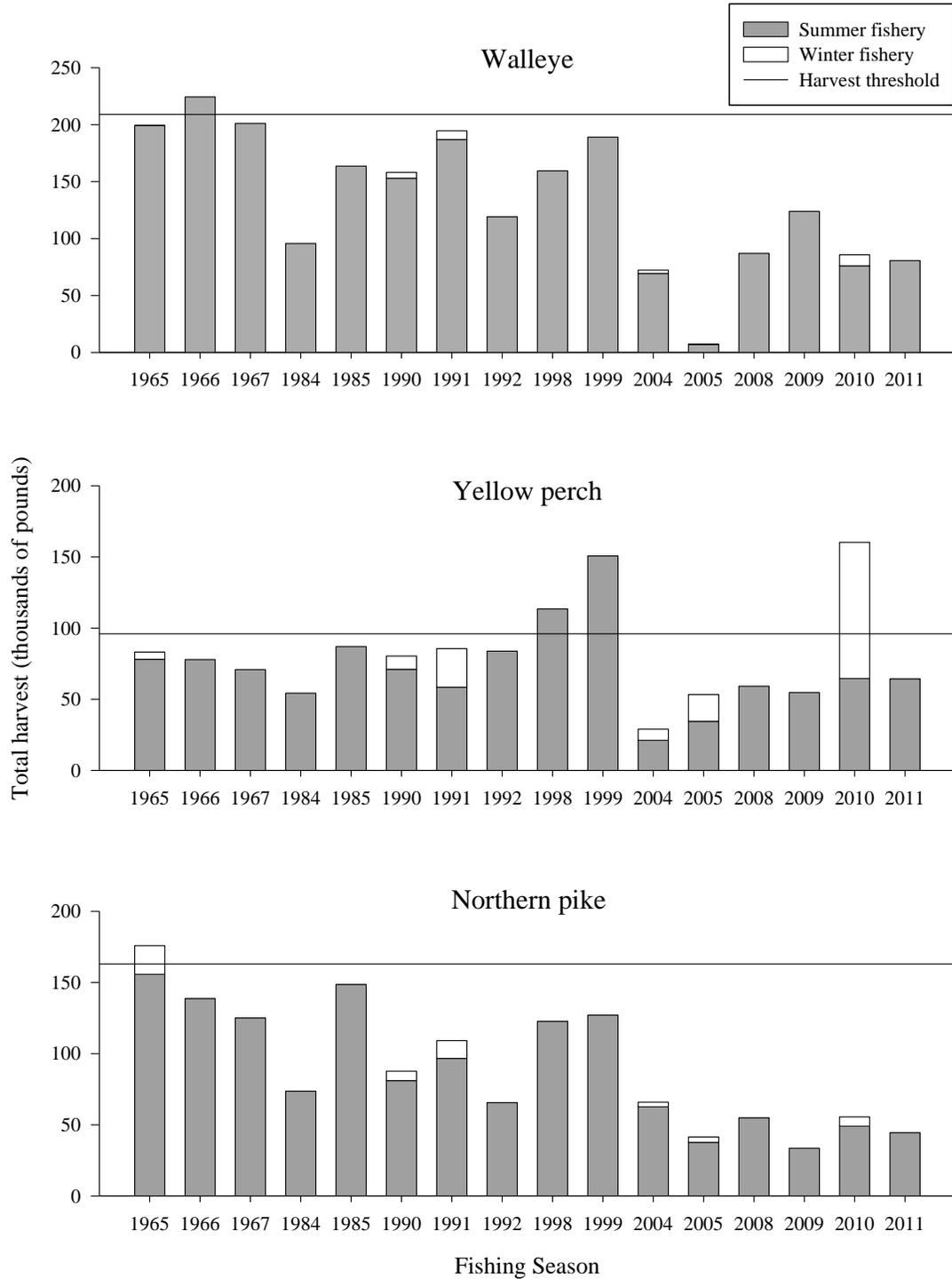


Figure 7. Total harvest (pounds x 1,000) of walleye, yellow perch, and northern pike by Leech Lake anglers throughout the summer and winter seasons, 1965-2011. Horizontal lines represent the safe harvest threshold. Harvest above the threshold could be a precursor to population responses.

## **APPENDIX**

Table A1. Creel survey sampling summary and angling pressure estimates by month and basin for Leech Lake, Minnesota, 15 May – 30 September, 2011. Standard errors appear in parentheses.

<i>Western Bays</i>	Stratum					
	May	June	July <sup>1</sup>	August	September	Season
N Interviews/refusals	56/0	110/0	38/0	128/0	99/0	431/0
Mean anglers/boat	2.10 (0.44)	2.22 (0.17)	2.13 (0.38)	2.35 (0.33)	2.17 (0.26)	2.21 (0.14)
Mean trip length	4.07 (2.00)	3.89 (0.75)	3.74 (1.25)	3.97 (1.36)	4.02 (1.00)	3.95 (1.23)
Total angler hours	20,265 (3,811)	37,334 (3,832)	21,453 (3,139)	39,119 (2,863)	45,749 (3,023)	163,919 (7,510)
Total hours per acre	6.9 (1.30)	12.7 (1.31)	7.3 (1.07)	13.3 (0.98)	15.6 (1.03)	55.8 (2.56)
<i>Main Lake</i>						
N Interviews/refusals	428/0	282/0	60/0	140/0	176/0	1086/0
Mean anglers/boat	2.44 (0.34)	2.37 (0.40)	2.17 (0.33)	2.17 (0.26)	2.27 (0.32)	2.28 (0.15)
Mean trip length	4.78 (1.09)	4.26 (1.14)	3.40 (0.85)	3.61 (1.16)	4.36 (1.35)	4.09 (1.15)
Total angler hours	157,314 (12,662)	122,530 (12,987)	37,042 (3,849)	65,510 (6,686)	82,690 (4,692)	465,086 (20,261)
Total hours per acre	10.2 (0.82)	8.0 (0.84)	2.4 (0.25)	4.3 (0.43)	5.4 (0.31)	30.2 (1.32)

<sup>1</sup> July data only include time period surveyed from July 21-31. The 2011 creel survey did not occur from July 1-20 due to state shutdown.

Table A2. Catch and harvest estimates by month in the western bays basin (17,927 acres) of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Number Caught per Acre</i>						
Bowfin	0.006 (0.003)	- -	- -	- -	- -	0.006 (0.003)
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.555 (0.105)	1.641 (0.348)	0.495 (0.243)	1.425 (0.423)	1.640 (0.392)	5.755 (0.724)
Muskellunge	- -	0.021 (<0.001)	0.048 (0.027)	0.103 (0.020)	0.007 (0.008)	0.179 (0.034)
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	0.222 (0.086)	1.580 (0.353)	0.775 (0.515)	0.811 (0.206)	0.178 (0.102)	3.566 (0.671)
Sunfish spp.	0.587 (0.295)	0.164 (0.128)	1.444 (0.977)	2.095 (0.770)	1.377 (1.499)	5.667 (1.974)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	0.013 (0.007)	0.461 (0.367)	0.349 (0.218)	0.540 (0.104)	0.265 (0.153)	1.628 (0.465)
Black crappie	0.443 (0.201)	0.418 (0.266)	0.021 0.026	0.041 (0.051)	- -	0.923 (0.339)
Yellow perch	2.669 (1.216)	8.231 (2.191)	1.157 (0.599)	7.958 (1.081)	26.638 (7.259)	46.652 (7.778)
Walleye	2.331 (0.227)	4.595 (1.132)	0.376 (0.258)	2.530 (0.570)	0.870 (0.197)	10.703 (1.328)
Cisco/Whitefish	- -	- -	- -	- -	- -	- -
Overall	6.824 (1.402)	17.111 (2.987)	4.664 (2.080)	15.503 (1.825)	30.975 (7.897)	75.077 (8.995)
<i>Number Harvested per Acre</i>						
Bowfin	- -	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.028 (0.020)	0.074 (0.035)	0.176 (0.115)	0.311 (0.175)	0.584 (0.204)	1.173 (0.295)
Muskellunge	- -	- -	- -	- -	- -	- -
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	- -	0.533 (0.192)	- -	0.113 (0.071)	0.120 (0.100)	0.766 (0.227)
Sunfish spp.	0.311 (0.253)	- -	1.104 (0.943)	0.768 (0.278)	0.184 (0.188)	2.367 (1.032)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	- -	0.034 (0.029)	0.081 (0.084)	- -	- -	0.115 (0.089)
Black crappie	0.221 (0.094)	0.221 (0.224)	- -	0.041 (0.051)	- -	0.483 (0.249)
Yellow perch	0.366 (0.204)	2.045 (0.712)	0.107 (0.070)	1.504 (0.392)	6.383 (2.032)	10.405 (2.199)
Walleye	0.647 (0.053)	0.989 (0.292)	0.161 (0.147)	0.759 (0.186)	0.282 (0.106)	2.838 (0.394)
Cisco/Whitefish	- -	- -	- -	- -	- -	- -
Overall	1.574 (0.275)	3.896 (1.097)	1.629 (1.145)	3.496 (0.665)	7.555 (2.120)	18.148 (2.743)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.

Table A3. Catch and harvest estimates by month in the main lake basin (93,914 acres) of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Number Caught per Acre</i>						
Bowfin	0.002 (<0.001)	- -	- -	- -	- -	0.002 (<0.001)
Bullhead spp.	0.006 (0.006)	0.005 (-)	- -	- -	- -	0.011 (0.006)
Northern pike	0.564 (0.098)	0.684 (0.133)	0.243 (0.103)	0.540 (0.109)	0.766 (0.135)	2.798 (0.261)
Muskellunge	- -	0.003 (0.003)	0.011 (0.009)	0.029 (0.012)	0.029 (0.004)	0.075 (0.016)
Burbot	- -	0.006 (-)	- -	- -	- -	0.006 (-)
Rock bass	0.277 (0.197)	0.590 (0.173)	0.037 (0.018)	0.099 (0.039)	0.238 (0.122)	1.241 (0.292)
Sunfish spp.	0.808 (0.524)	0.307 (0.201)	0.387 (0.381)	0.195 (0.003)	0.006 (0.003)	1.703 (0.679)
Smallmouth bass	0.003 (0.003)	- -	- -	- -	- -	0.003 (0.003)
Largemouth bass	0.029 (0.016)	0.037 (0.022)	0.011 (0.004)	0.063 (0.035)	0.142 (0.058)	0.282 (0.073)
Black crappie	0.725 (0.484)	0.016 (0.013)	0.018 (0.010)	0.028 (0.024)	0.042 (0.019)	0.828 (0.485)
Yellow perch	4.626 (0.884)	2.702 (0.627)	0.550 (0.227)	2.267 (0.505)	12.457 (2.342)	22.602 (2.639)
Walleye	3.501 (0.696)	2.793 (0.476)	0.184 (0.061)	0.415 (0.097)	0.552 (0.128)	7.445 (0.860)
Cisco/Whitefish	- -	0.002 (0.002)	0.008 (0.008)	- -	- -	0.010 (0.010)
Overall	10.544 (1.739)	7.144 (1.083)	1.447 (0.572)	3.636 (0.678)	14.233 (2.284)	37.006 (3.194)
<i>Number Harvested per Acre</i>						
Bowfin	- -	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.095 (0.024)	0.181 (0.052)	0.075 (0.030)	0.136 (0.036)	0.169 (0.051)	0.656 (0.090)
Muskellunge	- -	- -	- -	0.008 (0.008)	- -	0.008 (0.008)
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	0.075 (0.076)	0.025 (0.022)	- -	0.012 (0.009)	0.114 0.067	0.226 (0.104)
Sunfish spp.	0.431 (0.269)	0.152 (0.098)	- -	0.090 (0.002)	- -	0.673 (0.286)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	- -	0.007 (0.007)	- -	- -	0.017 (0.012)	0.024 (0.014)
Black crappie	0.478 (0.293)	0.016 (0.013)	- -	0.028 (0.024)	0.042 (0.019)	0.564 (0.295)
Yellow perch	1.630 (0.365)	0.582 (0.140)	0.056 (0.036)	0.902 (0.288)	4.174 (0.786)	7.343 (0.925)
Walleye	1.477 (0.227)	0.808 (0.143)	0.093 (0.044)	0.149 (0.048)	0.178 (0.047)	2.704 (0.280)
Cisco/Whitefish	- -	0.002 (0.002)	- -	- -	- -	0.002 (0.002)
Overall	4.186 (0.725)	1.772 (0.281)	0.223 (0.088)	1.325 (0.325)	4.693 (0.845)	12.199 (1.196)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.

Table A4. Monthly estimates of catch and harvest rates of all anglers in the western bays basin of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Catch per Angler Hour</i>						
Bowfin	<0.001 (<0.001)	- -	- -	- -	- -	<0.001 (<0.001)
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.080 (0.026)	0.129 (0.036)	0.068 (0.041)	0.107 (0.030)	0.105 (0.029)	0.103 (0.015)
Muskellunge	- -	0.002 (<0.001)	0.007 (0.004)	0.008 (0.002)	<0.001 (<0.001)	0.003 (0.001)
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	0.032 (0.014)	0.124 (0.044)	0.106 (0.052)	0.061 (0.039)	0.011 (0.007)	0.064 (0.015)
Sunfish spp.	0.085 (0.041)	0.013 (0.010)	0.198 (0.142)	0.157 (0.061)	0.088 (0.096)	0.101 (0.036)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	0.002 (0.001)	0.036 (0.029)	0.048 (0.035)	0.041 (0.009)	0.017 (0.010)	0.029 (0.009)
Black crappie	0.064 (0.032)	0.033 (0.021)	0.003 (0.004)	0.003 (0.004)	- -	0.017 (0.006)
Yellow perch	0.387 (0.209)	0.647 (0.167)	0.158 (0.084)	0.597 (0.137)	1.709 (0.434)	0.835 (0.141)
Walleye	0.338 (0.059)	0.361 (0.137)	0.051 (0.036)	0.190 (0.050)	0.056 (0.014)	0.192 (0.030)
Cisco/Whitefish	- -	- -	- -	- -	- -	- -
Overall	0.989 (0.340)	1.345 (0.329)	0.638 (0.290)	1.163 (0.234)	1.988 (0.477)	1.345 (0.178)
<i>Harvest per Angler Hour</i>						
Bowfin	- -	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.004 (0.003)	0.006 (0.003)	0.024 (0.013)	0.023 (0.013)	0.037 (0.014)	0.021 (0.005)
Muskellunge	- -	- -	- -	- -	- -	- -
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	- -	0.042 (0.019)	- -	0.009 (0.011)	0.008 (0.006)	0.014 (0.005)
Sunfish spp.	0.045 (0.035)	- -	0.151 (0.130)	0.058 (0.026)	0.012 (0.012)	0.042 (0.019)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	- -	0.003 (0.002)	0.011 (0.012)	- -	- -	0.002 (0.002)
Black crappie	0.032 (0.015)	0.017 (0.018)	- -	0.003 (0.004)	- -	0.009 (0.004)
Yellow perch	0.053 (0.034)	0.161 (0.062)	0.015 (0.010)	0.113 (0.035)	0.410 (0.123)	0.186 (0.040)
Walleye	0.094 (0.019)	0.078 (0.029)	0.022 (0.019)	0.057 (0.015)	0.018 (0.007)	0.051 (0.008)
Cisco/Whitefish	- -	- -	- -	- -	- -	- -
Overall	0.228 (0.075)	0.306 (0.104)	0.223 (0.160)	0.262 (0.071)	0.485 (0.129)	0.325 (0.053)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.

Table A5. Monthly estimates of catch and harvest rates of all anglers in the main lake basin of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Catch per Angler Hour</i>						
Bowfin	<0.001 (<0.001)	- -	- -	- -	- -	0.006 (0.003)
Bullhead spp.	0.001 (0.001)	0.001 (-)	- -	- -	- -	<0.001 <0.001
Northern pike	0.055 (0.013)	0.086 (0.025)	0.101 (0.046)	0.127 (0.028)	0.143 (0.020)	0.093 (0.011)
Muskellunge	- -	<0.001 (<0.001)	0.005 (0.004)	0.007 (0.004)	0.005 (0.001)	0.002 (0.001)
Burbot	- -	0.001 (-)	- -	- -	- -	<0.001 (-)
Rock bass	0.027 (0.019)	0.074 (0.027)	0.015 (0.005)	0.023 (0.009)	0.044 (0.023)	0.041 (0.010)
Sunfish spp.	0.079 (0.051)	0.039 (0.026)	0.161 (0.159)	0.046 (0.005)	0.001 (0.001)	0.056 (0.023)
Smallmouth bass	<0.001 (<0.001)	- -	- -	- -	- -	0.003 (0.003)
Largemouth bass	0.003 (0.002)	0.005 (0.002)	0.004 (0.002)	0.015 (0.008)	0.026 (0.011)	0.009 (0.002)
Black crappie	0.071 (0.049)	0.002 (0.002)	0.007 (0.005)	0.006 (0.006)	0.008 (0.004)	0.027 (0.016)
Yellow perch	0.452 (0.102)	0.339 (0.165)	0.228 (0.126)	0.532 (0.147)	2.317 (0.409)	0.747 (0.109)
Walleye	0.342 (0.085)	0.351 (0.125)	0.076 (0.032)	0.097 (0.021)	0.103 (0.040)	0.246 (0.041)
Cisco/Whitefish	- -	<0.001 (<0.001)	0.003 (0.003)	- -	- -	<0.001 (<0.001)
Overall	1.031 (0.217)	0.897 (0.289)	0.601 (0.305)	0.854 (0.131)	2.647 (0.416)	1.224 (0.143)
<i>Harvest per Angler Hour</i>						
Bowfin	- -	- -	- -	- -	- -	- -
Bullhead spp.	- -	- -	- -	- -	- -	- -
Northern pike	0.009 (0.002)	0.023 (0.008)	0.031 (0.016)	0.032 (0.010)	0.031 (0.010)	0.022 (0.003)
Muskellunge	- -	- -	- -	0.002 (0.002)	- -	<0.001 <0.001
Burbot	- -	- -	- -	- -	- -	- -
Rock bass	0.007 (0.007)	0.003 (0.003)	- -	0.003 (0.002)	0.021 0.013	0.007 (0.003)
Sunfish spp.	0.042 (0.026)	0.019 (0.012)	- -	0.021 (0.003)	- -	0.022 (0.009)
Smallmouth bass	- -	- -	- -	- -	- -	- -
Largemouth bass	- -	0.001 (0.001)	- -	- -	0.003 (0.002)	0.001 <0.001
Black crappie	0.047 (0.030)	0.002 (0.002)	- -	0.006 (0.006)	0.008 (0.004)	0.019 (0.010)
Yellow perch	0.159 (0.039)	0.073 (0.018)	0.023 (0.020)	0.212 (0.072)	0.776 (0.143)	0.243 (0.032)
Walleye	0.144 (0.028)	0.101 (0.036)	0.038 (0.022)	0.035 (0.009)	0.033 (0.011)	0.089 (0.013)
Cisco/Whitefish	- -	<0.001 (<0.001)	- -	- -	- -	<0.001 (<0.001)
Overall	0.409 (0.084)	0.222 (0.060)	0.093 (0.049)	0.311 (0.053)	0.873 (0.153)	0.403 (0.046)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.

Table A6. Monthly estimates of catch and harvest rates of targeting anglers in the western bays basin of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Catch per Angler Hour</i>						
Northern pike	0.458 (0.373)	0.680 0.507	0.577 0.227	0.939 1.185	0.399 0.491	0.649 (0.377)
Muskellunge	- -	0.014 (-)	(0.052) (0.047)	0.043 (0.045)	0.003 0.009	0.026 (0.017)
Rock bass	- -	- -	- -	- -	- -	- -
Sunfish spp.	2.981 (3.575)	0.964 (0.099)	3.326 (-)	3.323 (2.058)	7.164 (-)	2.913 (0.926)
Largemouth bass	- -	1.436 (3.970)	0.543 (0.992)	1.259 (1.802)	0.619 (0.280)	1.006 (1.019)
Black crappie	1.448 (1.266)	1.922 (-)	0.150 (-)	1.263 (-)	- -	1.188 (0.373)
Yellow perch	4.434 (4.413)	5.289 (5.909)	- -	4.343 (2.083)	7.109 (3.684)	4.949 (1.983)
Walleye	0.712 (0.906)	1.058 (0.758)	0.227 (0.303)	0.802 (0.511)	0.214 (0.355)	0.636 (0.274)
<i>Harvest per Angler Hour</i>						
Northern pike	0.125 (0.160)	0.043 0.052	0.256 0.464	0.296 0.454	0.170 0.181	0.184 (0.152)
Muskellunge	- -	- -	- -	- -	- -	- -
Rock bass	- -	- -	- -	- -	- -	- -
Sunfish spp.	2.981 (3.575)	- -	0.988 (-)	1.075 (0.744)	0.896 (-)	1.056 (0.563)
Largemouth bass	- -	0.058 (0.230)	0.148 (0.480)	- -	- -	0.029 (0.073)
Black crappie	0.748 (0.595)	1.922 (-)	- -	1.263 (-)	- -	0.942 (0.176)
Yellow perch	0.945 (1.071)	2.231 (2.103)	- -	1.380 (0.830)	1.954 (1.562)	1.584 (0.735)
Walleye	0.213 (0.099)	0.221 (0.231)	0.057 (0.349)	0.233 (0.171)	0.049 (0.110)	0.161 (0.088)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.

Table A7. Monthly estimates of catch and harvest rates of targeting anglers in the main lake basin of Leech Lake, 15 May – 30 September 2011.

Species	May	June	July <sup>1</sup>	August	September	Season <sup>2</sup>
<i>Catch per Angler Hour</i>						
Northern pike	0.344 (0.309)	0.513 0.603	0.585 0.550	0.653 1.079	0.928 0.816	0.632 (0.371)
Muskellunge	- -	- -	0.046 (0.054)	0.046 (0.047)	0.076 (0.015)	0.038 (0.018)
Rock bass	0.578 (-)	4.000 (-)	- -	- -	- -	2.289 (-)
Sunfish spp.	6.552 (1.950)	4.517 (-)	- -	5.479 (-)	- -	4.911 (0.503)
Largemouth bass	2.000 (-)	0.188 (0.736)	0.124 (0.238)	0.504 (0.104)	0.711 (0.294)	0.535 (0.161)
Black crappie	1.972 (2.458)	0.223 (0.237)	- -	1.818 (-)	0.444 (-)	0.949 (0.780)
Yellow perch	4.079 (9.725)	3.509 (3.075)	0.875 (-)	5.315 (3.533)	9.012 (5.162)	5.022 (2.193)
Walleye	0.760 (0.438)	0.880 (0.673)	0.218 (0.209)	0.344 (0.234)	0.407 (0.747)	0.532 (0.258)
<i>Harvest per Angler Hour</i>						
Northern pike	0.023 (0.131)	0.299 0.307	0.217 0.318	0.246 0.191	0.429 0.386	0.267 (0.135)
Muskellunge	- -	- -	- -	0.012 (0.026)	- -	0.004 (0.009)
Rock bass	0.578 (-)	4.000 (-)	- -	- -	- -	2.289 (-)
Sunfish spp.	3.464 (0.954)	2.238 (-)	- -	2.158 (-)	- -	2.355 (0.246)
Largemouth bass	- -	- -	- -	- -	0.069 (0.253)	0.021 (0.075)
Black crappie	1.522 (1.269)	0.223 (0.237)	- -	1.818 (-)	0.444 (-)	0.807 (0.409)
Yellow perch	1.733 (1.569)	0.871 (1.214)	- -	2.447 (3.216)	2.943 (1.619)	1.772 (0.961)
Walleye	0.357 (0.265)	0.253 (0.183)	0.121 (0.173)	0.125 (0.158)	0.143 (0.176)	0.193 (0.085)

<sup>1</sup> July-1 catch and harvest rate estimate data is only based on the July 21-31, 2011 time period due to the state shutdown.

<sup>2</sup> Season catch and harvest rate estimate data excludes the July 1-20, 2011 time period due to the state shutdown.



**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 2011

**Angling Pressure**

Angler-hours	696,536
Angler-hours/acre	6.24
Anglers/boat	2.25
Mean Trip Length (h)	4.02

Species	Catch (number)		Harvest (number)		Harvest (pounds)	
	Total N	N/acre	Total N	N/acre	Total lbs.	lbs./acre
Bowfin	45	<0.001	-	-	-	-
Bullhead spp.	167	0.001	-	-	-	-
Northern pike	65,563	0.588	15,133	0.136	44,490	0.399
Muskellunge	1,843	0.017	116	0.001	2,181	0.020
Burbot	129	0.001	-	-	-	-
Rock bass	33,549	0.301	6,098	0.055	5,603	0.050
Sunfish spp.	49,465	0.443	19,664	0.176	10,366	0.093
Smallmouth bass	51	<0.001	-	-	-	-
Largemouth bass	9,769	0.088	851	0.008	2,086	0.019
Black crappie	15,614	0.140	10,085	0.090	73,266	0.657
Yellow perch	506,118	4.536	146,774	1.315	64,275	0.576
Walleye	160,345	1.437	54,967	0.493	69,740	0.625
Cisco/Whitefish	221	0.002	42	<0.001	85	0.001
<b>All species</b>	<b>842,879</b>	<b>7.554</b>	<b>253,731</b>	<b>2.274</b>	<b>272,093</b>	<b>2.438</b>

Species	Catch Rate (fish/hour)		Harvest Rate (fish/hour)	
	Angler Type		Angler Type	
	All	Targeting	All	Targeting
Bowfin	<0.001	-	-	-
Bullhead spp.	<0.001	-	-	-
Northern pike	0.095	0.640	0.021	0.228
Muskellunge	0.003	0.032	<0.001	0.002
Burbot	<0.001	-	-	-
Rock bass	0.047	2.289	0.009	2.289
Sunfish spp.	0.068	3.779	0.027	1.619
Smallmouth bass	<0.001	-	-	-
Largemouth bass	0.014	0.792	0.001	0.025
Black crappie	0.025	1.072	0.016	0.877
Yellow perch	0.770	4.988	0.228	1.682
Walleye	0.232	0.584	0.079	0.177
Cisco/Whitefish	<0.001	-	<0.001	-

## Creel Survey Summary for Leech Lake, Minnesota

### Length Frequency Summary for the estimated number of fish harvested (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
Bowfin								
Bullhead spp.								
Northern pike				93	4,137	6,415	2,417	465
Muskellunge								116
Burbot								
Rock bass		869	4,859					
Sunfish spp.		13,717	3,581					
Smallmouth bass								
Largemouth bass				270	431			
Black crappie			8,688	1,397				
Yellow perch	639	16,222	125,900	724				
Walleye		144	4,615	40,449	12,726	469	324	
Cisco/Whitefish					28			

Comments:

Citation: Ward, M. C. and D.W. Schultz. 2012. Summer creel survey for Leech Lake, 2011. Minnesota Department of Natural Resources, Section of Fisheries, Study 4, Job 860.