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DAKOTA

FISHERIES

**ANGLER USE AND HARVEST SURVEYS
ON LAKE MADISON, LAKE COUNTY,
SOUTH DAKOTA, MAY 1998 – AUGUST 2008**

**South Dakota
Department of
Game, Fish and Parks**
Wildlife Division
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Pierre, South Dakota 57501-3182

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Angler Use and Harvest Surveys on Lake Madison,
Lake County, South Dakota
May 1998 – August 2008

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Preface

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Executive Summary

Lake Madison is second in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. Located about 45 miles northwest of Sioux Falls, the lake is a popular destination for anglers and boaters. Lake Madison contains a diverse fish community and provides angling opportunities for walleye, yellow perch, northern pike, white bass, black crappie, bluegill and black bullheads.

The South Dakota Department of Game, Fish and Parks (SDGFP) maintains the Lake Madison walleye population with frequent stockings. A 356-mm (14-inch) minimum length limit (MLL), implemented in 1992, was removed in 2000 after evaluation found that walleye growth had slowed and fish were stockpiling under the minimum harvestable length.

The objective of this 11-year creel survey (May 1998-August 2008) was to document long-term trends in angling use, catch and harvest rates, and catch and harvest of walleyes and other species in this important fishery. Summer and winter surveys allowed the comparison of angler use and harvest during these periods. As part of a South Dakota State University PhD study to examine yellow perch population dynamics, the fishery was creel surveyed in September and October of 2005 through 2008 to quantify angler use and yellow perch catch and harvest during the fall. Finally, this survey allowed the documentation of changes in the walleye fishery after the removal of the 356-mm (14-inch) MLL in 2000.

Lake Madison summer anglers primarily targeted walleyes while fall anglers primarily targeted yellow perch. Yellow perch anglers comprised the second largest group during the summer while generalist anglers were the second largest group in the fall. Winter anglers targeted yellow perch in 2002-03 and 2003-04, then walleyes for the rest of the survey period.

Fishing pressure throughout the survey period on Lake Madison was similar to other large natural-lake fisheries in eastern South Dakota. Summer fishing pressure

varied from 11,477 hours (10.7 hours/hectare) in 2001 to 36,903 hours (34.5 hours/hectare) in 2004. Peak summer fishing pressure in 2004 coincided with the highest walleye harvest. However, summer fishing pressure also appeared to closely track yellow perch and black crappie abundance. Thus, it may be correlated to more than one type of fishery. Fishing pressure in the summer of 1987 (60,929 hours) was 65% above the peak pressure in 2004. Summer fishing pressure in 1994 (25,614 hours) was similar to estimates for the recent survey period.

Fall fishing pressure comprised 27% to 34% of the total annual fishing pressure from 2005 through 2008 and 25% of the annual pressure in 1987. Fishing pressure was always higher in September than October. This indicates that fall creel surveys need to be conducted on lakes with high-quality yellow perch fisheries to avoid underestimation of fishing pressure and harvest.

The mean contribution of the winter fishery to annual fishing pressure was 23% during the 6 years of winter surveys. Winter fishing pressure varied greatly from 1,962 hours during the winter of 2007-08 to 28,759 hours in the winter of 2002-03. Exceptional yellow perch fishing explains the high pressure documented in 2002-03. Low fishing pressure in 2006-07 and 2007-08 was caused by poor ice fishing success.

About 95% of angling parties participating in the summer and winter fisheries were South Dakota residents. Participation by non-residents was higher (14%) with the fall yellow perch fishery. Residents of Minnehaha County comprised the largest percentage of resident anglers (> 50%) followed by anglers from Lake County (> 30%). Current participation by Minnehaha and Lake County residents was similar to that for the 1987 fishery. The Lake Madison fishery had an estimated average annual economic impact of about \$730,000 based on a value of \$61 per trip.

Summer catch and harvest rates for walleyes over the 11-year period averaged 0.26 walleyes/hour and 0.07 walleyes/hour, respectively (Appendix 4). These were at the low end of the range for popular eastern South Dakota fisheries. Annual harvest rates

never exceeded the South Dakota Game, Fish and Parks (SDGFP 1994) objective of 0.15 walleyes/hour. For comparison, anglers harvested 0.09 walleyes/hour in 1987; however, the harvest was mostly comprised of smaller fish (< 356 mm or 14 in long), while the 1994 summer fishery supported a harvest of 0.12 walleyes/hour. Fall and winter harvest rates were consistently low.

Annual walleye harvest as a percentage of catch increased with the removal of the MLL in 2000. This was due, in part, to the harvest of smaller fish as about 25% of the walleyes harvested were less than 356 mm (14-in) long. However, the percentage of harvested walleyes less than 14 inches was substantially lower on Lake Madison than Brant Lake (> 50%). In contrast, nearly half of the walleyes harvested in the 1987 Lake Madison summer fishery were less than 305 mm (12 in) long. In recent surveys on many eastern South Dakota waters, only a small percentage (> 5%) of the harvest consisted of walleyes less than 305 mm (12 in). This indicates that although minimum length limits have been removed from many walleye fisheries, they apparently had a lasting influence on angler willingness to harvest small fish.

The mean summer, winter and total walleye angling yields over the 11-year period on Lake Madison were estimated at 0.80, 0.11 and 0.91 kg/ha, respectively. The mean summer walleye yield was similar to Lake Herman but substantially lower than yields for other premier walleye fisheries in eastern South Dakota.

Catch and harvest rates for northern pike were low throughout the survey period. Most northern pike were caught incidentally while fishing for walleyes. About 40% of the pike caught during the summer were harvested, while winter anglers harvested nearly all the pike they caught.

Catch and harvest of yellow perch peaked in the winter of 2002-03 and summer 2003 after the exceptional 2001 year class recruited to the fishery. Although catch and harvest declined after 2003, consistent recruitment supported a good perch fishery through the remainder of the survey period. Summer harvest and harvest rates commonly

peaked in August as fast-growing age-1+ yellow perch recruited to the fishery. Good fishing extended into the fall with the majority of the annual harvest (70-84%) occurring in September and October. This demonstrates the importance of conducting fall creel surveys for yellow perch fisheries like Lake Madison. Most of the yellow perch harvested were 200 to 300 mm (7.9-11.8 in) long.

The black crappie fishery took off in 2004 after providing little fishing opportunity for 10 years. Although angler and survey frame net catches peaked in 2004, good fishing continued through 2007, and high numbers of young black crappies are observed each year during fall electrofishing. Harvest rates for black crappies in 2004-2008 were better than 1987 and 1994, and similar to 1955. May and June were the best summer months to fish for black crappies, but fall anglers targeting yellow perch also had good crappie fishing. Anglers harvested two of three crappies caught and most measured between 200 and 300 mm (7.9-11.8 in).

Lake Madison supports a limited bluegill fishery with an average catch rate of less than 0.01 fish/hour. No bluegills were observed in the creel until 2002, and most were caught by anglers targeting yellow perch and black crappies. The importance of bluegills to the summer fishery has varied from no harvest in 1955 and 1994 to over 1,400 fish harvested in 1987. In 1987, Lake Madison yielded 50 trophy angler bluegills in a 3 week period, and the lake had a reputation for providing large bluegills in the late-1980s and early-1990s.

Black bullhead catch and harvest peaked in 2003 and could probably be attributed to strong production in 2001 when water levels were high. Nearly all of the black bullheads harvested were 200 to 300 mm (7.9 to 11.8 in) long.

More than 62% of angling parties interviewed in the summers of 2002 and 2003 were satisfied with their fishing trip. The top reason given by summer and winter anglers for choosing to fish Lake Madison over other waters was closeness to home (34-47%).

Second for summer angling parties was hearing about a bite (25%). Hearing about a bite (9-22%) and “other” reasons (16-21%) were popular responses with winter anglers.

In summer 2003, three of four angling parties indicated current fishing regulations were easy to understand. However, 25% indicated that current regulations were at least somewhat difficult to understand, similar to the response given by Brant Lake anglers (24%), but higher than Lake Thompson anglers (14%).

Several questions about walleye harvest and regulations were asked during the survey period. In the summer of 1999, over 57% of parties interviewed favored removing the 14-inch minimum length limit on the Madison area lakes. In winter 2003-04 and summer 2004, about 60% of parties indicated they would rather harvest three 14-inch walleyes over one 17-inch walleye (16-19%) or four 13-inch walleyes (13-28%). Winter anglers favored harvesting higher numbers of smaller fish more than summer anglers. Although a majority of anglers preferred three 14-inch walleyes over the other options, they opposed (61-71%) a daily limit reduction from four to three. Response to a reduction in the northern pike daily limit was neutral.

Responses concerning satisfaction with panfish harvest and regulations were variable. The largest percentage of parties interviewed during the summer and fall of 2005 and winter of 2005-06 opposed a reduction in daily panfish limits to 10. In the winter of 2007-08, a panfish limit of 10 (47%) was the most preferred while 25 fish was the most popular choice with summer (35%) and fall anglers (51%). High summer and fall catch rates and an extremely low winter catch rate for yellow perch may have influenced angler response.

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Introduction

Lake Madison is second in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. Located about 45 miles northwest of Sioux Falls, the lake is a popular destination for anglers and boaters. Lake Madison contains a diverse fish community and provides angling opportunities for walleye, yellow perch, northern pike, white bass, black crappie, bluegill and black bullheads.

The South Dakota Department of Game, Fish and Parks (SDGFP) maintains the Lake Madison walleye population with frequent stockings. A 356-mm (14-inch) minimum length limit (MLL), implemented in 1992, was removed in 2000 after evaluation found that walleye growth had slowed and fish were stockpiling under the minimum harvestable length.

Lake Madison has one of the better yellow perch and black crappie fisheries in eastern South Dakota. Recently, these fisheries have been supported by relatively consistent natural production. The best yellow perch fishing typically occurs in the fall, while late-May and early June are often best for black crappie.

The objective of this 11-year creel survey (May 1998-August 2008) was to document long-term trends in angling use, catch and harvest rates, and catch and harvest of walleyes and other species in this important fishery. Summer and winter surveys allowed the comparison of angler use and harvest during these periods. As part of a South Dakota State University PhD study to examine yellow perch population dynamics, the fishery was creel surveyed in September and October of 2005 through 2008 to quantify angler use and yellow perch catch and harvest during the fall. Finally, this survey allowed the documentation of changes in the walleye fishery after the removal of the 356-mm (14-inch) MLL in 2000.

Study Site

Lake Madison is a 1,070 ha (2,642 acre) natural lake located in southeastern Lake County, South Dakota. It was named for the 1875 town of Madison which was originally

located on the south shore of the lake. William Van Eps, the surveyor who platted the original town, named it Madison because he thought it resembled his hometown of Madison, Wisconsin. Inflows to Lake Madison consist of the overflow from Lake Herman via Silver Creek and drainage from agricultural lands and the City of Madison. The outflow, located at the southeast end of the lake, spills directly into Round Lake. Lake Madison has a maximum depth of about 4.9 m (16 feet) and a mean depth of 3.0 m (9.7 feet).

SDGFP owns and manages access areas on the south, west and north shores of the lake. The Payne Access Area on the west side of Lake Madison has a double lane boat ramp with a dock, public toilet and excellent shore fishing access. The Johnson Point Access Area on the north side of the lake has a double wide boat ramp with a dock, public toilet, a handicapped-accessible fishing dock and excellent shore fishing access. The Stratton Access Area is located on the north shore of the lake and offers limited shore fishing opportunity. The Walker's Point Recreation Area on the south shore of the lake offers a double wide boat ramp with a dock, fish cleaning station, public toilets, and camping facilities with electric hookups as well as excellent shore fishing areas.

Methods

A stratified, access-point angler use and harvest survey was conducted from May through August of 1998-2008 and December through March of 2002-2008. The close proximity of Brant, Madison and Herman permitted the surveying of two waters (4-h shift each) within an 8-h day during the summer survey. This design allowed three waters to be creeled with a single clerk in a 40-h work week. Within each 4-h shift, two instantaneous counts of boat and shore anglers were made from various access points around the lake. Angling parties were also interviewed at these access points.

For the winter survey, the monthly schedule was divided evenly between Lake Thompson and Lakes Madison and Brant. Within an 8-h shift, two instantaneous counts of ice shacks and open-ice anglers were done consecutively for Brant Lake and Lake Madison and the clerk was permitted to rove between lakes to collect interviews.

Interviews were conducted on the ice and at access points during the winter creel survey. Brant Lake was surveyed at least 10 days each month.

The summer and winter surveys were stratified by weekend and weekdays because the highest pressure typically occurs on weekend days. At least one weekend day was assigned each week. Eight-hour shifts were divided between morning and evening periods so that all daylight hours were surveyed.

Interviews provided information necessary for estimating fish species catch and harvest rates, mean angler trip length, mean party size, percent of anglers targeting various species, residency, and angler opinions. Total length (TL; mm) measurements from angler-caught fish were recorded during the interview process. Angler use, catch and harvest estimates, and other statistics were computed using the Creel Application Software (CAS) designed by Craig Soupir (Soupir and Brown 2002).

Results and Discussion

Summer

Fishing Pressure

Lake Madison summer anglers primarily targeted walleyes in eight of the 11 survey years (Table 1). Yellow perch were the primary target of anglers during the summers of 2002 and 2007. In 2001, there was a relatively even split between anglers targeting walleye, yellow perch and any species (generalists; Table 1). Overall, anglers targeting yellow perch comprised the second largest group followed by generalists then those targeting black crappies.

The percentage of Lake Madison summer anglers targeting walleyes was lower than with other popular walleye fisheries like Lake Thompson (Lucchesi 2009), Brant Lake (Lucchesi 2011), Lake Herman (unpublished data) and Bitter Lake (Blackwell 2005a), but similar to diverse northeastern South Dakota fisheries such as Pickerel Lake (Blackwell et al. 2007a) and Enemy Swim Lake (Blackwell et al. 2007b). Walleye

Table 1. Percent of angling parties interviewed primarily targeting a species (or any species) during the summer fishery on Lake Madison, 1998-2008.

<i>Year</i>	<i>Percent of anglers targeting</i>					
	<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern Pike</i>	<i>Black Bullhead</i>	<i>Any species</i>
1998	60	23	1	0	2	14
1999	56	20	0	0	5	19
2000	61	13	0	1	1	24
2001	34	27	0	4	0	35
2002	32	60	2	1	1	4
2003	51	36	1	1	1	10
2004	57	28	13	0	1	1
2005	51	19	10	0	1	19
2006	61	4	17	0	0	18
2007	15	68	1	0	0	16
2008	54	13	11	0	0	22

catch rates were generally lower on Lake Madison than these other fisheries which may explain the lower participation by walleye anglers.

A higher percentage of Lake Madison summer anglers targeted yellow perch than on Lake Herman (unpublished data) and Brant Lake (Lucchesi 2011) as well as on popular northeastern yellow perch fisheries including Waubay Lake (Blackwell and Hubers 2003; Blackwell 2005a) and Bitter Lake (Blackwell 2005b; Blackwell et al. 2007c). A majority (62%) of summer anglers targeted yellow perch on Cattail-Kettle Lake in 1999; however, that percentage decreased to less than 1% in 2000 and 2004 (Blackwell 2005d).

The percentage of anglers targeting black crappies increased in 2004 with an increase in crappie abundance. The percentage of generalist anglers was similar between Madison (17%), Brant (18%) and Herman (22%). The percentage of generalist anglers was lower on the Madison area lakes than on Pickerel Lake (Blackwell et al. 2007a), but similar to Enemy Swim Lake (Blackwell et al. 2007b).

Summer fishing pressure was highly variable by year on Lake Madison (Table 2 and Figure 1) and ranged from 11,477 hours (10.7 hours/hectare) in 2001 to 36,903 (34.5 hours/hectare) in 2004 (Table 2). Overall fishing pressure was highest from 2003 to 2005 (Figure 1) and peaked in 2004 which also coincided with the highest walleye harvest (Table 4). Fishing pressure also appeared to track yellow perch and black crappie abundance (Figures 2 and 3) and may be correlated to more than one type of fishery.

Anglers spent over 60,000 hours fishing Lake Madison during the summer of 1987 (Jacobson and Knapp 1988) which was more than 65% greater than the peak summer pressure (2004) recorded during this survey period. Surprisingly, although fishing pressure was higher in 1987, harvest rates for walleye and yellow perch were similar to those from this survey period. Some of the additional pressure in 1987 can be attributed to bullhead fishing when anglers harvested over 8,000 fish, nearly seven times the highest summer harvest recorded in this survey.

Angler use totaled 25,614 hours during summer 1994 (unpublished data), about 25% higher than the average pressure (20,595 h) documented during the current period.

Table 2. Summer totals for the number of interviews and estimates for fishing pressure (h) and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Lake Madison, May through August, 1998-2008 (80% confidence interval).

<i>Year</i>	<i>Number of interviews</i>	<i>Angler hours</i>	<i>Angler hours/ hectare</i>	<i>Angler days</i>	<i>Economic value</i>
1998	207	18,374 (2,669)	17.2 (2.5)	4,711	\$287,388
1999	152	12,141 (1,261)	11.3 (1.2)	3,736	\$227,877
2000	112	18,660 (3,060)	17.4 (2.9)	5,183	\$316,163
2001	82	11,477 (1,545)	10.7 (1.4)	3,690	\$225,112
2002	139	14,632 (2,256)	13.7 (2.1)	4,180	\$255,014
2003	276	32,116 (6,050)	30.0 (5.7)	10,005	\$610,304
2004	470	36,903 (4,662)	34.5 (4.4)	9,390	\$572,794
2005	314	28,694 (3,814)	26.8 (3.6)	8,341	\$508,801
2006	216	21,792 (3,139)	20.4 (2.9)	6,156	\$375,512
2007	133	13,232 (2,431)	12.4 (2.3)	3,305	\$185,127
2008	142	18,521 (4,470)	17.3 (4.2)	5,545	\$338,245

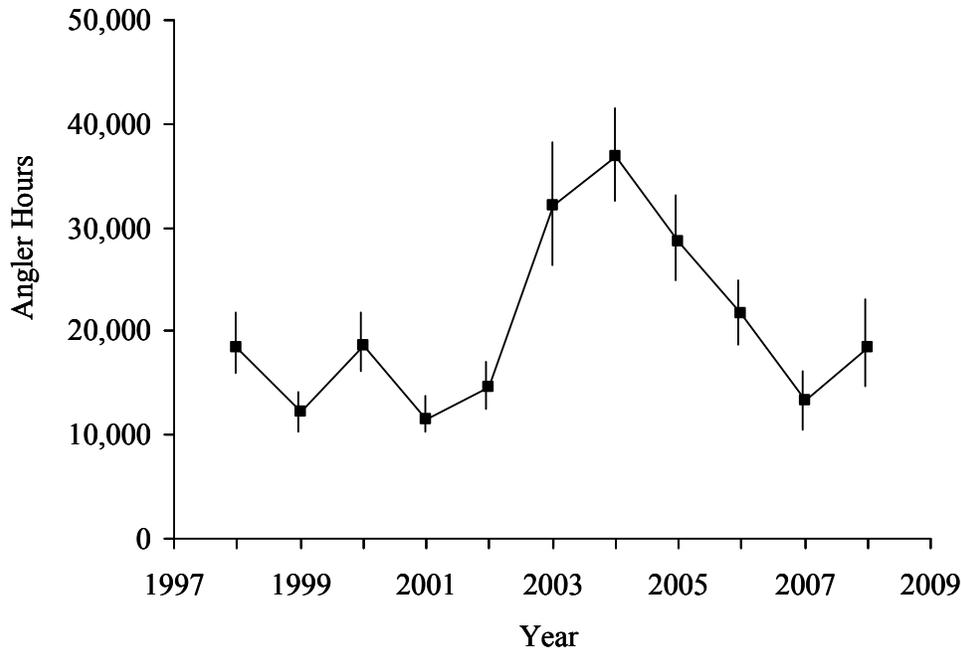


Figure 1. Estimated summer fishing pressure measured in angler hours on Lake Madison, 1998-2008 (bars represent an 80% confidence interval).

Over 45% of the fishing pressure occurred in May when anglers harvested about 0.20 walleyes/hour. Fishing was generally slow during the rest of the summer.

Summer fishing pressure on Lake Madison was similar to other large natural-lake fisheries in eastern South Dakota (Table 3). From 1998-2008, it averaged 19.2 hours per hectare, similar to Lake Herman, but less than Brant (Table 3). Sinai and Enemy Swim, lakes of comparable size, respectively supported over one and one-half and two times more summer fishing pressure than Lake Madison. The highest angler use in South Dakota has been recorded on smaller natural waters, small impoundments (> 200 h/ha; Neumann et al. 1993; Lucchesi et al. 2004) and urban lakes (> 1,000 h/ha; Greiner 2011).

Mean monthly fishing pressure was highest in May followed closely by June (Figure 4). Boat fishing pressure showed a gradual decline from May through August, while shore fishing pressure dropped off substantially in July and August (Figure 4). May was the month of peak fishing pressure on Lake Herman and on popular

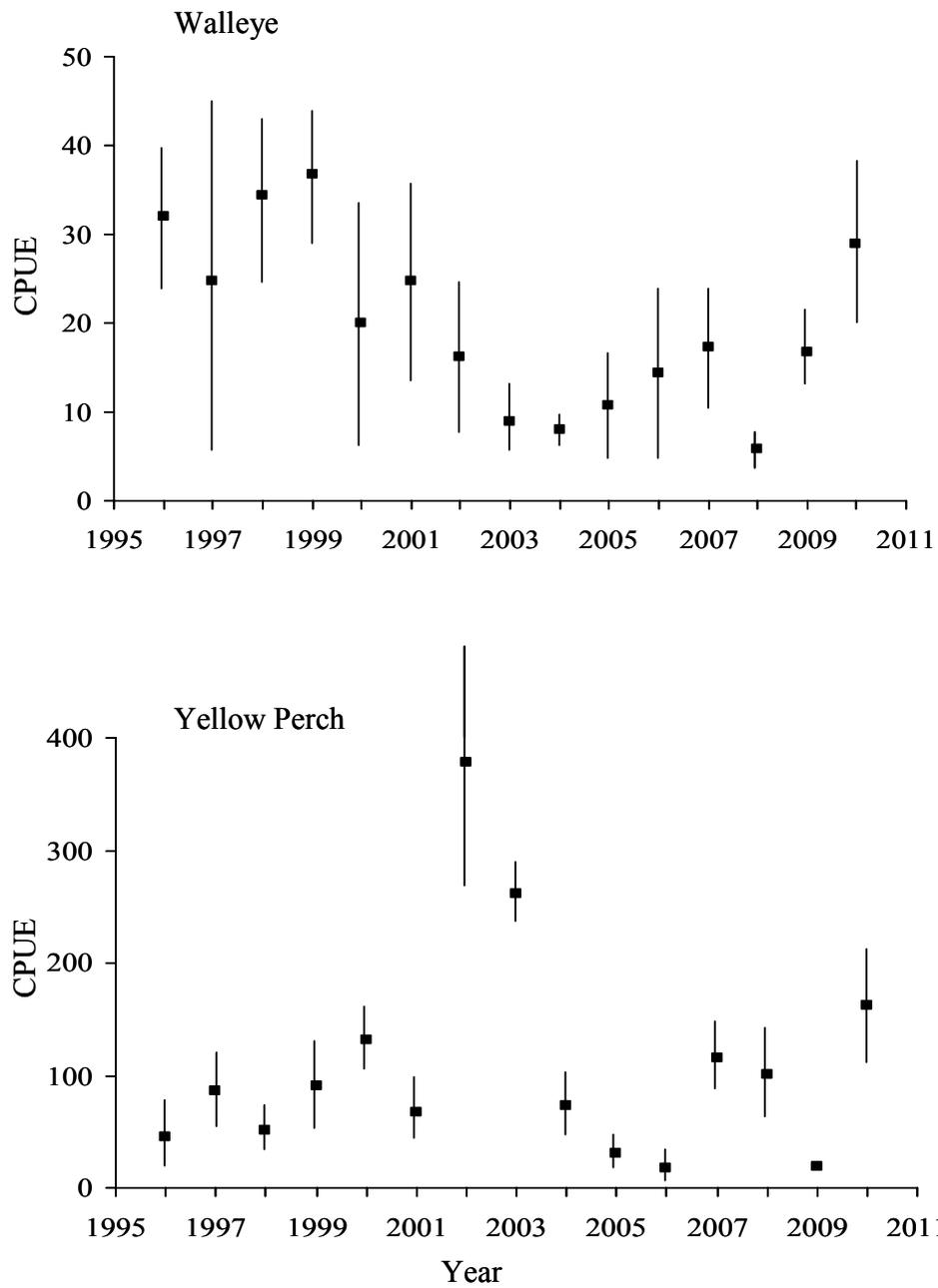


Figure 2. Catch per unit effort (CPUE) of walleye and yellow perch in 45.7 m (150 ft) experimental-mesh gill nets set during summer fisheries surveys on Lake Madison, 1996-2010 (bars represent an 80% confidence interval).

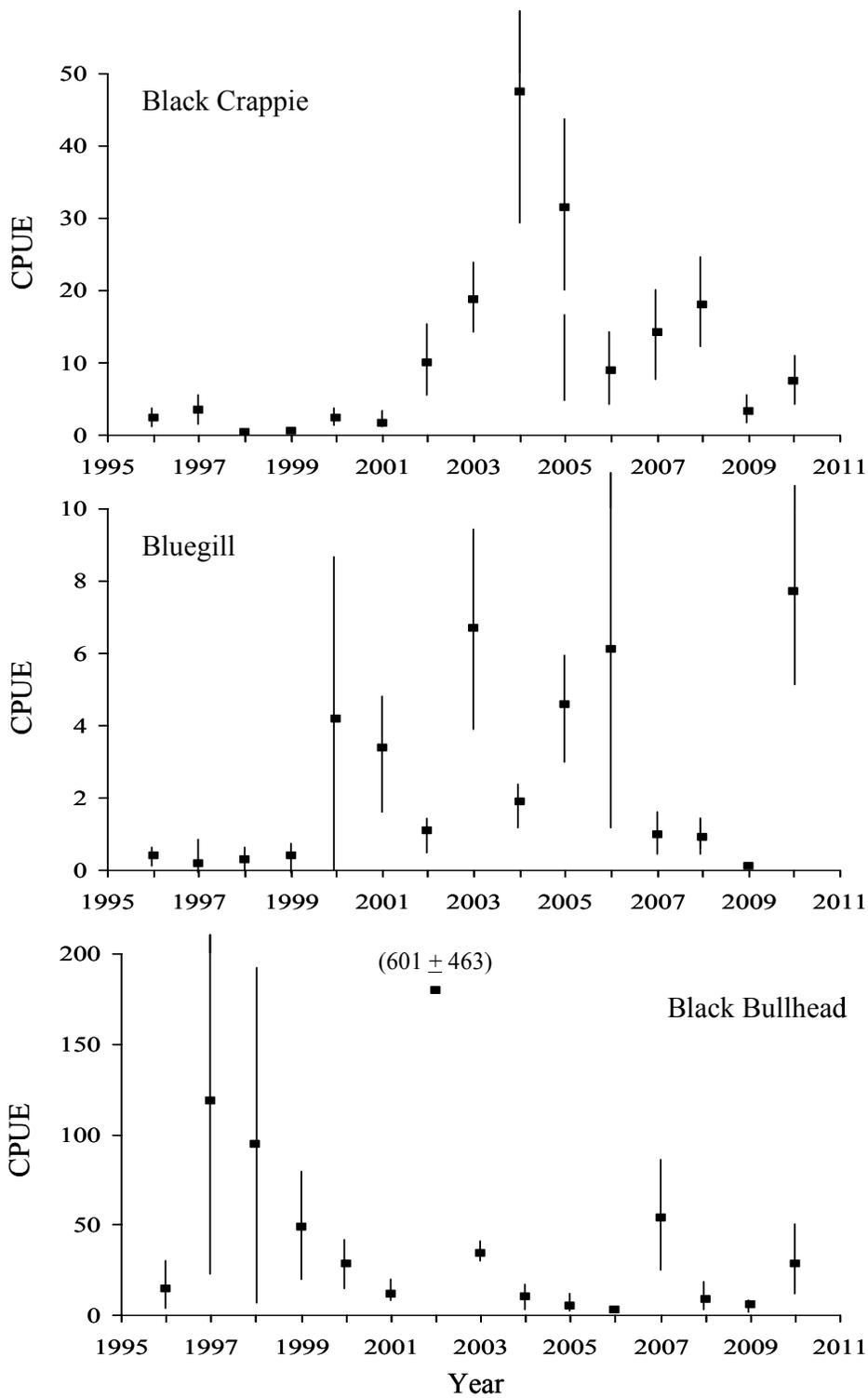


Figure 3. Catch per unit effort (CPUE; one overnight set) of black crappie, bluegill and black bullhead captured frame nets (19-mm bar-mesh netting; 0.9 m high x 1.5 m wide frames and 18.3 m long leads) set during summer fisheries surveys on Brant Lake, 1996-2010 (bars represent an 80% confidence interval).

Table 3. Mean fishing pressure (h and h/ha) and mean catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008.

<i>Lake/season</i>	<i>County</i>	<i>Period</i>	<i>Surface area (ha)</i>	<i>Fishing pressure</i>			<i>Walleye</i>			<i>Yellow perch</i>			<i>Northern pike</i>		
				<i>(h)</i>	<i>(h/ha)</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	
Summer															
Bitter	Day	2000-2008	4,010	46,950	11.7	0.84	0.28	3.24	0.01	0.01	0.07	0.21	0.04	0.48	
Brant	Lake	1998-2008	420	25,293	60.2	0.35	0.09	5.71	0.13	0.10	7.69	0.01	0.003	0.16	
Enemy Swim	Day	a	870	35,910	41.3	0.26	0.07	2.72	0.18	0.04	1.53	0.04	0.01	0.29	
Herman	Lake	1998-2008	521	9,420	18.1	0.28	0.09	1.54	0.05	0.04	0.62	0.01	0.003	0.06	
Madison	Lake	1998-2008	1,070	20,595	19.2	0.26	0.07	1.33	0.43	0.22	4.20	0.01	0.002	0.05	
Pickerel	Day	b	377	21,285	56.5	0.34	0.09	5.14	0.14	0.04	2.28	0.17	0.03	1.73	
Poinsett	Hamlin	1997-2004	3,200	57,786	18.1	0.41	0.13	2.27	0.03	0.02	0.42	0.07	0.01	0.20	
Sinai	Brookings	2005-2008	696	19,902	28.6	0.49	0.11	3.10	0.31	0.20	5.97	0.002	0.001	0.02	
Thompson	Kingsbury	1997-2008	e	120,383	21.0	0.65	0.27	5.56	0.06	0.04	0.81	0.10	0.02	0.31	
Waubay	Day	1997-2008	6,289	108,841	17.3	0.98	0.21	3.60	0.52	0.20	3.53	0.14	0.03	0.48	
Fall															
Madison	Lake	2005-2008	1,070	12,717	11.9	0.42	0.02	0.31	1.05	0.77	7.98	0.002	0.001	0.01	
Winter															
Bitter	Day	1999-2008	4,010	17,657	4.4	0.29	0.10	0.93	0.18	0.14	0.64	0.20	0.12	0.52	
Brant	Lake	2002-2008	420	5,060	12.0	0.18	0.04	0.62	0.01	0.01	0.19	0.003	0.001	0.01	
Enemy Swim	Day	c	870	13,781	15.8	0.12	0.04	0.65	0.40	0.11	1.82	0.07	0.04	0.66	
Madison	Lake	2002-2008	1,070	10,229	9.6	0.06	0.03	0.26	0.99	0.38	8.58	0.004	0.004	0.07	
Pickerel	Day	d	377	7,235	19.2	0.06	0.02	0.59	0.71	0.32	8.73	0.02	0.001	0.17	
Poinsett	Hamlin	1997-2002	3,200	20,771	6.5	0.55	0.11	0.89	0.23	0.21	1.63	0.03	0.02	0.12	
Thompson	Kingsbury	1997-2008	e	26,255	4.8	0.20	0.08	0.38	0.07	0.06	0.30	0.03	0.01	0.07	
Waubay	Day	1997-2008	6,289	105,473	16.8	0.34	0.07	1.14	1.24	0.86	14.50	0.06	0.04	0.60	

a. 1997-1998, 2000-2008

b. 1997-1998, 2000-2001, 2006-2008

c. 1997-1998, 2000-2008

d. 1997-1998, 2000-2001, 2006-2008

e. Surface area decreased from about 6,576 ha to 4,559 ha from 1997 to 2000

northeastern walleye fisheries, Waubay Lake and Bitter Lake (Blackwell and Hubers 2003; Blackwell et al. 2007c). Peak fishing pressure occurred in June on Brant Lake (Lucchesi 2011), Lake Thompson (Lucchesi 2009), Pickerel Lake (Blackwell et al. 2007a) and Enemy Swim Lake (Blackwell et al. 2007b). Good fishing for walleyes and black crappies in May and for yellow perch in August undoubtedly influenced the monthly pattern of fishing pressure on Lake Madison.

Shore fishing pressure made up about 28% of the total summer fishing pressure on Lake Madison (Figure 4) and comprised a similar percentage on Brant Lake. However, shore fishing made up over 50% of the total fishing pressure on Lake Herman and only a small fraction of the pressure on Lake Thompson (Lucchesi 2009). The large contribution of shore fishing pressure to total fishing pressure on the Madison area lakes likely reflects the excellent access available to shore anglers. The highest shore fishing pressure usually occurred in May when walleye and black crappie were most accessible to shore anglers.

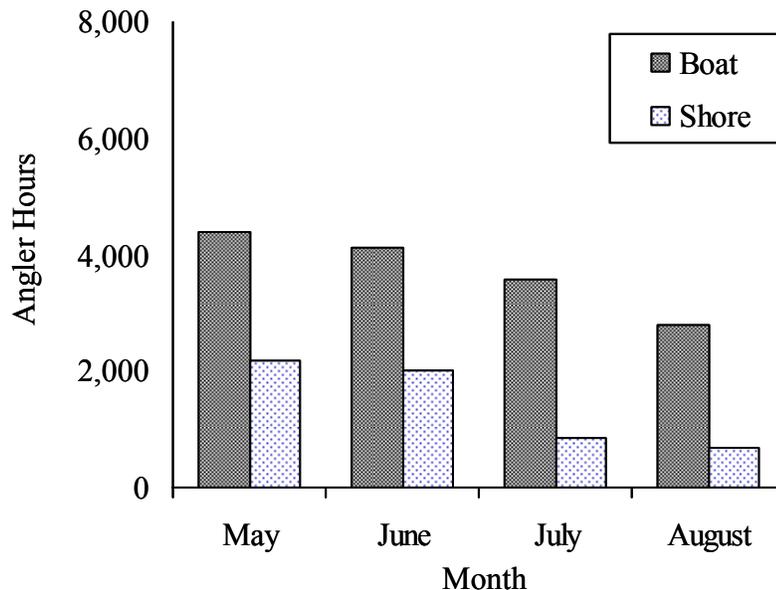


Figure 4. Mean monthly summer fishing pressure by boat and shore anglers on Lake Madison, 1998-2008.

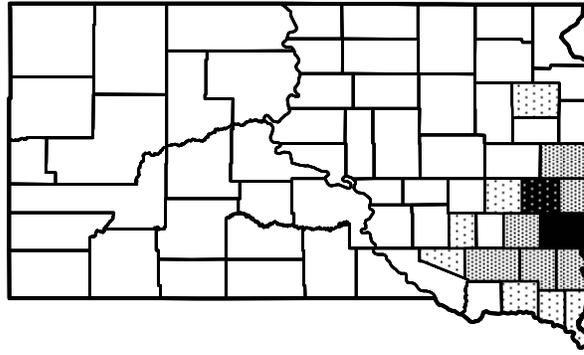
Angler Demographics

About 95% of angling parties fishing Lake Madison were South Dakota residents (Appendix 2). Non-residents exceeded 10% in only one of the 44 summer months surveyed. Non-residents comprised a similar percentage of the total annual fishing pressure on Lake Madison in 1987 (4%, Jacobson and Knapp 1988) and 1994 (5%, unpublished data). Non-resident use on nearby Herman and Brant was also less than 10% (unpublished data).

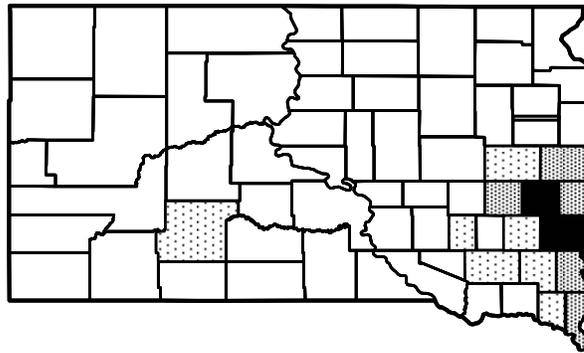
Comparable fisheries in northeastern South Dakota typically see higher non-resident use. Non-resident anglers fishing Enemy Swim and Pickerel Lake increased from around 10% in the late-1990s to over 30% since 2000 (Blackwell 2005c; Blackwell et al. 2007a; Blackwell et al. 2007b). Large-lake walleye fisheries like Thompson (Lucchesi 2009), Bitter (Blackwell et al. 2007c) and Waubay (Blackwell 2005a) also attract a substantially higher percentage of non-resident anglers than the Madison area lakes in the summer.

Residents of Minnehaha County comprised about 50% of angling parties interviewed on Brant Lake during the summers of 2002 through 2008 (Figure 5). Not surprisingly, most Minnehaha County residents were from Sioux Falls. Lake County was the only other county contributing a large percentage of anglers. Annual variation in the percentage of anglers using Lake Madison by county was relatively small (Figure 5). Minnehaha and Lake County residents contributed 52% and 31%, respectively, to the annual fishing pressure in 1987 (Jacobson and Knapp 1988). The mean annual economic impact of the Lake Madison summer fishery was estimated at about \$354,000 based on a value of \$61 per trip (U.S. Department of the Interior, Fish and Wildlife Service, U.S. Bureau of Commerce Bureau of Census 2007).

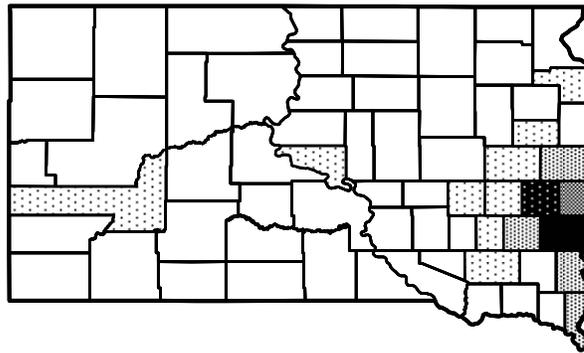
Summer 2002



Summer 2003



Summer 2004



Summer 2005

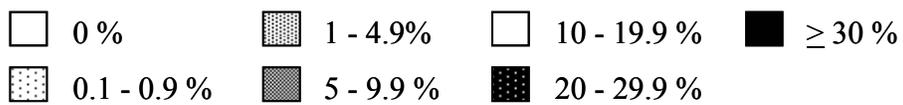
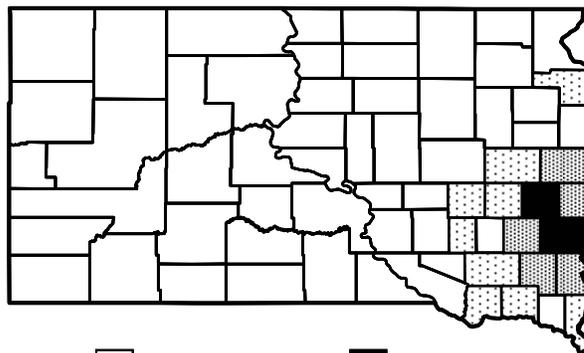
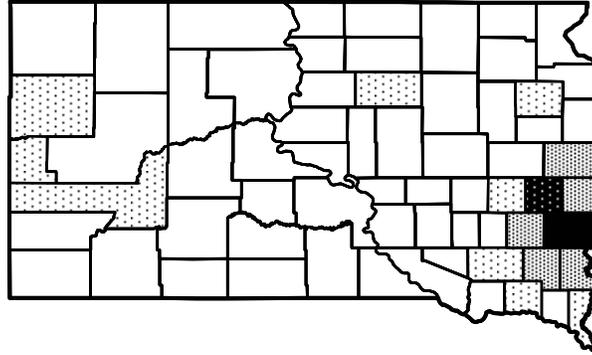
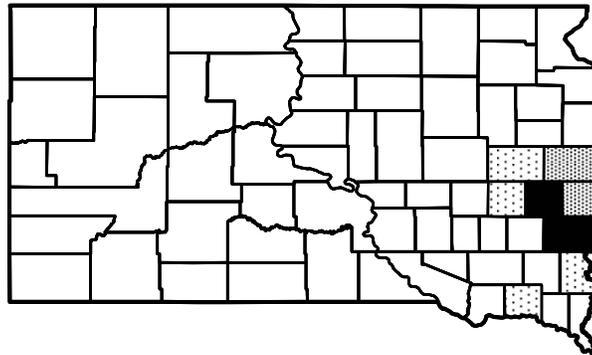


Figure 5. South Dakota county of residence for summer (May-August) resident anglers fishing Lake Madison, South Dakota from 2002 through 2008.

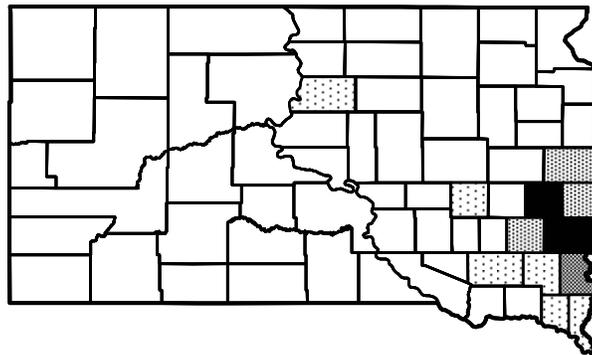
Summer 2006



Summer 2007



Summer 2008



Summers 2002-08
pooled

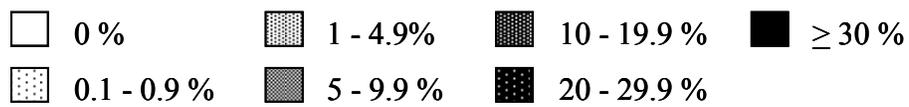
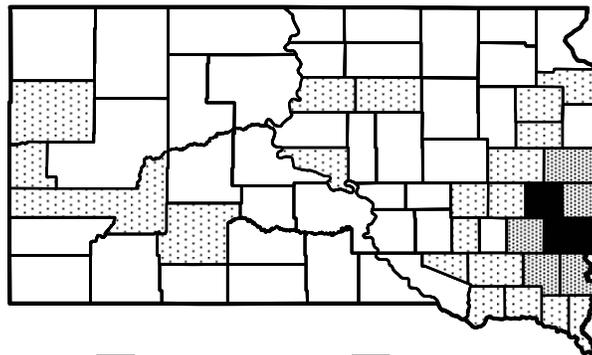


Figure 5. Continued

Angler Catch and Harvest

Walleye

Summer catch and harvest rates for walleyes over the 11-year period averaged 0.26 walleyes/hour and 0.07 walleyes/hour, respectively (Appendix 4). Annual harvest rates never exceeded the South Dakota Game, Fish and Parks (SDGFP 1994) objective of 0.15 walleyes/hour (Table 4). Summer walleye harvest rates were 0.09 fish/h in 1987 (Jacobson and Knapp 1988) and 0.12 fish/h in 2004 (unpublished data). Harvest rates for these two years were at the upper end of rates documented over the recent 11-year period.

Annual catch rates varied greatly ranging from 0.04 walleyes/h (2001 and 2002) to 0.60 walleyes/h in 1999 under the 356 mm (14-inch) minimum length limit (MLL). Under the MLL, walleye growth slowed and a large percentage of walleyes caught were less than 356 mm (14-inches) long. Anglers were generally dissatisfied with the small walleyes and with having to release over 85% of their catch so they supported the removal of the MLL.

The mean catch rate of 0.26 walleyes/h and harvest rate of 0.07 walleyes/h on Lake Madison were at the low end of the range for walleye fisheries in eastern South Dakota (Table 3). Summer catch and harvest rates ranged from 0.26-0.98 fish/h and 0.07-0.28 fish/h, respectively, for 10 surveyed fisheries (Table 3). Among those fisheries, Enemy Swim and Madison had the lowest catch and harvest rates.

Over the 11-year survey period, summer anglers on Lake Madison caught and harvested an estimated 55,018 and 15,576 walleyes, respectively (Appendix 3). Annual walleye harvest as a percentage of catch increased with the removal of the MLL in 2000 (Table 4). This increase was, in part, due to the harvest of smaller fish as about 25% of the walleyes harvested were less than 356 mm (14-in). However, the percentage of harvested walleyes less than 14 inches was substantially lower on Lake Madison than on Brant Lake (> 50%; Lucchesi 2011). Similar to the Brant Lake fishery, very few walleyes less than 305 mm (12 in) long were harvested on Lake Madison (Figure 6).

Table 4. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	5,971 (1,021)	981 (428)	0.33 (0.10)	0.05 (0.03)
1999	7,233 (2,358)	422 (246)	0.60 (0.20)	0.03 (0.02)
2000	8,809 (2,446)	2,013 (679)	0.47 (0.14)	0.11 (0.04)
2001	471 (340)	117 (116)	0.04 (0.03)	0.01 (0.01)
2002	596 (268)	192 (111)	0.04 (0.03)	0.01 (0.01)
2003	4,016 (1,311)	2,782 (1,021)	0.13 (0.06)	0.09 (0.05)
2004	6,968 (1,368)	5,894 (2,376)	0.19 (0.05)	0.07 (0.02)
2005	7,232 (1,381)	1,078 (493)	0.25 (0.08)	0.04 (0.02)
2006	3,043 (762)	2,122 (521)	0.14 (0.05)	0.10 (0.03)
2007	5,511 (1,607)	2,566 (501)	0.41 (0.18)	0.19 (0.07)
2008	5,168 (2,218)	725 (312)	0.28 (0.14)	0.04 (0.01)

Small walleyes made up a greater percentage of the Lake Madison harvest in the summer of 1987 than in the current survey period (Jacobson and Knapp 1988). Nearly 66% of the fish harvested in 1987 were less than 356 mm (14 in) compared to 25% in this survey. Moreover, nearly half of the walleyes harvested in 1987 were less than 305 mm (12 in) while less than 5% were less than 305 mm (12 in) during recent surveys on Madison, Brant (Lucchesi 2011), Thompson (Lucchesi 2009) and other eastern South Dakota waters. Thus, the willingness of anglers to harvest small walleyes may help to

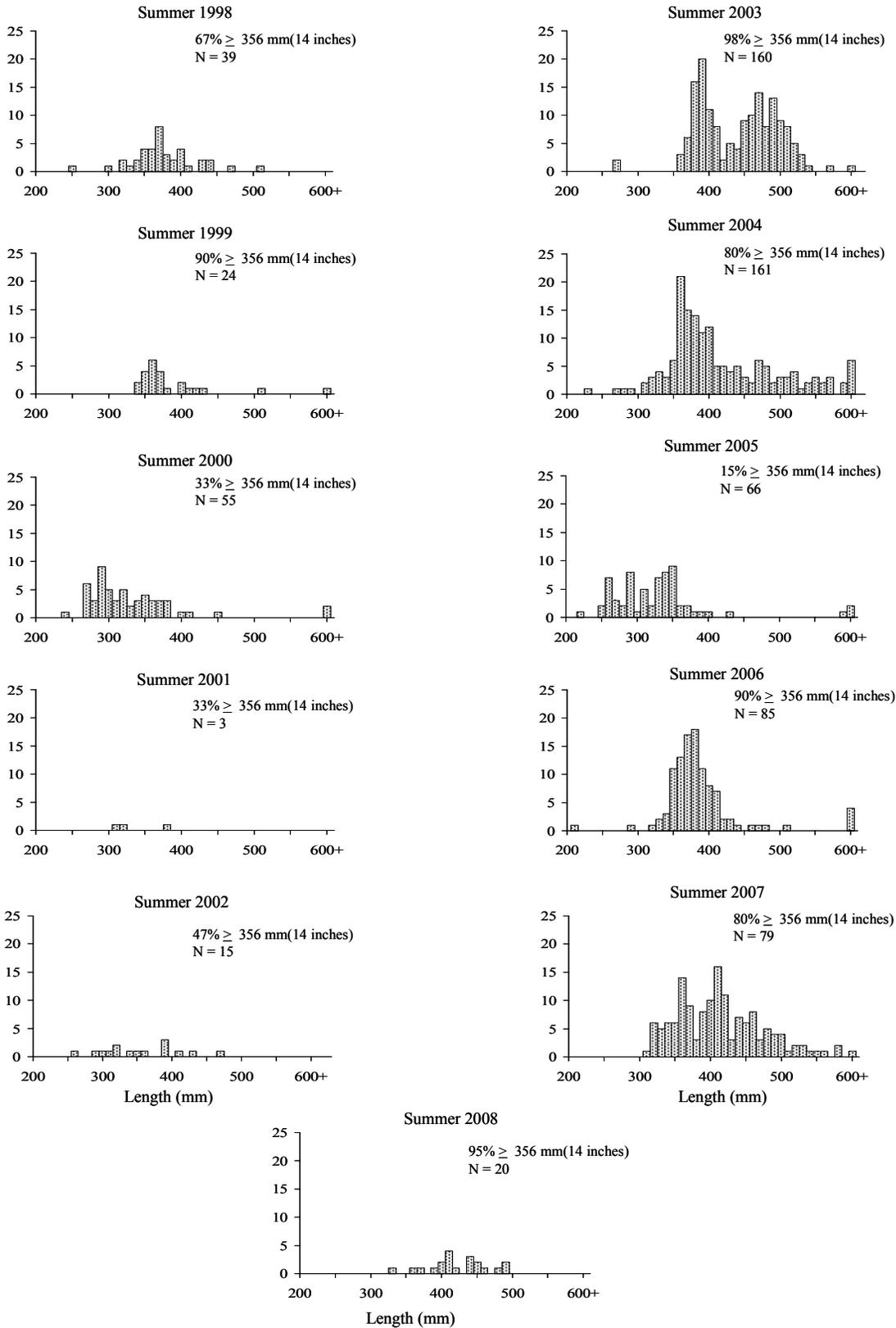


Figure 6. Length frequency of angler-harvested walleyes measured by the creel clerk during summer creel surveys on Lake Madison, 1998-2008.

explain the high harvest rate in 1987 relative to the recent survey period. Although the 356 mm (14 in) MLL has been removed from nearly all southeastern South Dakota walleye fisheries, it apparently has reduced angler's willingness to harvest small fish.

Mean lengths of walleyes harvested from Lake Madison were similar to those documented for other southeastern South Dakota fisheries managed under statewide regulations (Table 5). Mean lengths of walleyes harvested from Madison were similar to Lake Thompson and less than those on lakes Sinai, Herman and Brant. Mean lengths for harvested walleyes on northeastern South Dakota waters managed under 356-mm (14-inch, lakes Enemy Swim, Pickerel, Poinsett and Waubay (2004-2008)) and 406-mm (16-inch, Bitter Lake and Waubay Lake (1997-2003)) MLL were larger as expected.

Table 5. Mean total lengths (mm) of walleyes harvested by summer anglers on eastern South Dakota lakes, 1997-2008.

Year	<i>Enemy</i>									
	<i>Bitter</i>	<i>Brant</i>	<i>Swim</i>	<i>Herman</i>	<i>Madison</i>	<i>Pickerel</i>	<i>Poinsett</i>	<i>Sinai</i>	<i>Thompson</i>	<i>Waubay</i>
1997			403			398	403		386	414
1998		374	399	355	376	383	392		355	406
1999		393		407	386		387		392	455
2000	424	339	379	344	326	431	414		386	478
2001	434	386	388	324	333	375	455		384	489
2002	429	396	399	369	355		383		373	473
2003	437	301	403	395	439		424		397	446
2004	438	338	406	403	419		480		384	384
2005	438	388	418	320	330			375	387	387
2006	458	413	401	314	387	400		338	383	385
2007	465	405	428	380	413	402		375	378	401
2008	448	343	446	376	423	402		348	398	414
Mean	441	371	406	362	381	399	417	359	384	428

Mean summer, winter and total walleye angling yields over the 11-year period on Lake Madison were estimated at 0.80, 0.11 and 0.91 kg/ha, respectively (Table 6). Mean summer walleye yields were similar for Lakes Herman and Madison and substantially lower than yields for other walleye fisheries in eastern South Dakota (Table

6). Interestingly, walleye gill net CPUE for Lake Madison (Figure 2) and Brant Lake (Lucchesi 2011) were similar, and yet, yield was three times greater in Brant. This suggests that Lake Madison walleyes are less vulnerable to angling or that there is a lake-specific bias in walleye gill net sampling effectiveness. A significantly higher yellow perch gill-net CPUE and the observation of abundant fathead minnows during fall electrofishing indicate that forage abundance may negatively impact angler success and walleye yield on Lake Madison.

Baccante and Colby (1996) described walleye yield in terms of quartiles based on data from 168 North American walleye populations. The 25% quartile corresponded to a 0.50 kg/ha yield, 50% to a 1.24 kg/ha yield and 75% to a 2.95 kg/ha yield. The walleye yield for Lake Madison was below the 50% quartile. Walleye yields for eight other South Dakota populations were at or above the 50% quartile, and yields for the four best fisheries were at or above the 75% quartile. Yields for Missouri River Reservoirs were also above the 50% quartile.

Table 6. Mean number and weight of walleyes harvested per surface hectare (ha) of water for the summer, winter and combined fisheries on eastern South Dakota lakes. Means were calculated over the time periods presented in Table 3.

<i>Lake</i>	<i>County</i>	<i>Mean summer yield</i>		<i>Mean winter yield</i>		<i>Mean total yield</i>	
		<i>Number per ha</i>	<i>Weight per ha (kg)</i>	<i>Number per ha</i>	<i>Weight per ha (kg)</i>	<i>Number per ha</i>	<i>Weight per ha (kg)</i>
Bitter	Day	3.24	2.65	0.93	0.41	4.17	3.06
Brant	Lake	6.84	2.90	0.80	0.34	7.64	3.24
Enemy Swim	Day	2.72	1.54	0.65	0.39	3.37	1.93
Herman	Lake	1.93	0.89				
Madison	Lake	1.44	0.80	0.20	0.11	1.64	0.91
Pickerel	Day	5.14	3.03	0.59	0.30	5.73	3.33
Poinsett	Hamlin	2.27	1.50	0.89	0.49	3.16	1.99
Sinai	Brookings	3.31	1.32				
Thompson	Kingsbury	5.56	2.84	0.38	0.20	5.76	3.04
Waubay	Day	3.60	2.66	1.14	0.24	4.74	2.90

Northern Pike

During the survey period, catch and harvest rates for northern pike on Lake Madison (Table 7) were low when compared to other eastern South Dakota lakes. Only an estimated 1,363 northern pike were caught in 11 years with 605 harvested (Appendix 3). Catch and harvest rates were similar to those observed on Lake Herman and Brant Lake (Table 3), but lower than those recorded on newly-filled waters like Bitter Lake (Blackwell 2005b), Cattail-Kettle Lake (Blackwell 2005d) or Pickerel Lake (Blackwell et al. 2007a). Most northern pike were caught while fishing for walleyes since few anglers indicated they were primarily targeting them and less than 25% of the pike caught were harvested (Table 3).

Yellow Perch

Summer catch and harvest of yellow perch on Lake Madison peaked in 2003 when the exceptional 2001 year class fully recruited to the fishery (Table 8). Although catch and harvest declined after 2003, consistent recruitment maintained a good fishery through the remainder of the survey period. Summer harvest and harvest rates commonly peaked in August (Appendices 3 and 4) as fast-growing age-1+ yellow perch were recruited to the fishery (Schoenebeck 2009), and fishing often improved into September. A similar pattern of high harvest rates in August and September occurred in 1987 (Jacobson and Knapp 1988). Anglers harvested about 54% of their catch and nearly all of these fish were 200 to 300 mm (7.9-11.8 in) long (Figure 7).

The Lake Madison yellow perch fishery supported the highest average harvest rate among eastern South Dakota summer fisheries (Table 3). Average summer yield was at the upper end of the range and surpassed only by the Brant and Sinai fisheries. Lake Madison has produced summer harvest rates greater than 0.10 fish/h in 9 of 11 years surveyed. This harvest rate was met or exceeded in only 3 of 11 years on Brant (Lucchesi 2011) and 3 of 12 years on Thompson (Lucchesi 2009).

Table 7. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	8 (11)	0	0.0004 (0.0006)	0
1999	17 (23)	17 (23)	0.001 (0.002)	0.001 (0.002)
2000	0	0	0	0
2001	0	0	0	0
2002	194 (57)	183 (56)	0.01 (0.004)	0.01 (0.004)
2003	333 (184)	74 (46)	0.01 (0.01)	(0.002) (0.002)
2004	556 (310)	279 (132)	0.02 (0.008)	0.008 (0.002)
2005	8 (11)	0	0.0003 (0.0004)	0
2006	13 (18)	0	0.0006 (0.0008)	0
2007	103 (49)	30 (31)	0.008 (0.004)	0.002 (0.002)
2008	138 (72)	27 (29)	0.008 (0.004)	0.002 (0.002)

Black Crappie

The black crappie fishery finally improved in 2004 after providing little opportunity for 10 years (Table 9). The resurgence of the 2004 crappie fishery coincided with a significant increase in frame net CPUE (Table 3). Although angler catch rates and survey net catches peaked in 2004 (Table 9 and Figure 3), good fishing continued through 2007 (Table 9), and high numbers of young black crappies are still observed each year during fall electrofishing. Harvest rates for the 2004-2008 black crappie fishery were better than 1987 (Jacobson and Knapp 1988) and 1994 (unpublished data), and similar to 1955 (Clothier 1956). Factors influencing the rise in crappie abundance are

Table 8. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	3,968 (1,824)	3,008 (1,415)	0.22 (0.11)	0.17 (0.07)
1999	2,296 (1,071)	1,541 (651)	0.19 (0.09)	0.13 (0.05)
2000	722 (380)	599 (373)	0.04 (0.03)	0.03 (0.02)
2001	6,244 (1,737)	3,473 (691)	0.54 (0.25)	0.30 (0.08)
2002	20,981 (7,144)	9,199 (4,263)	1.43 (0.68)	0.63 (0.38)
2003	26,510 (8,552)	15,295 (5,995)	0.83 (0.37)	0.48 (0.24)
2004	8,770 (4,017)	5,893 (2,376)	0.24 (0.11)	0.16 (0.07)
2005	4,240 (1,055)	3,729 (874)	0.15 (0.05)	0.13 (0.04)
2006	549 (95)	415 (80)	0.03 (0.006)	0.02 (0.004)
2007	6,722 (2,367)	2,632 (934)	0.51 (0.24)	0.20 (0.08)
2008	10,278 (4,686)	3,372 (1,024)	0.55 (0.34)	0.18 (0.09)

not well understood. However, decreased walleye abundance after the removal of the 14 inch MLL and an increase in submergent vegetation after 2001 may be contributing factors.

May and June were generally the best summer months to fish for black crappies on Lake Madison (Appendix 4). However, the highest catch rate was recorded in August 2007 by anglers who were primarily targeting yellow perch (Appendix 1). Anglers harvested about 67% of their catch and nearly all of these fish were 200 to 300 mm (7.9-11.8 in) long (Figure 8).

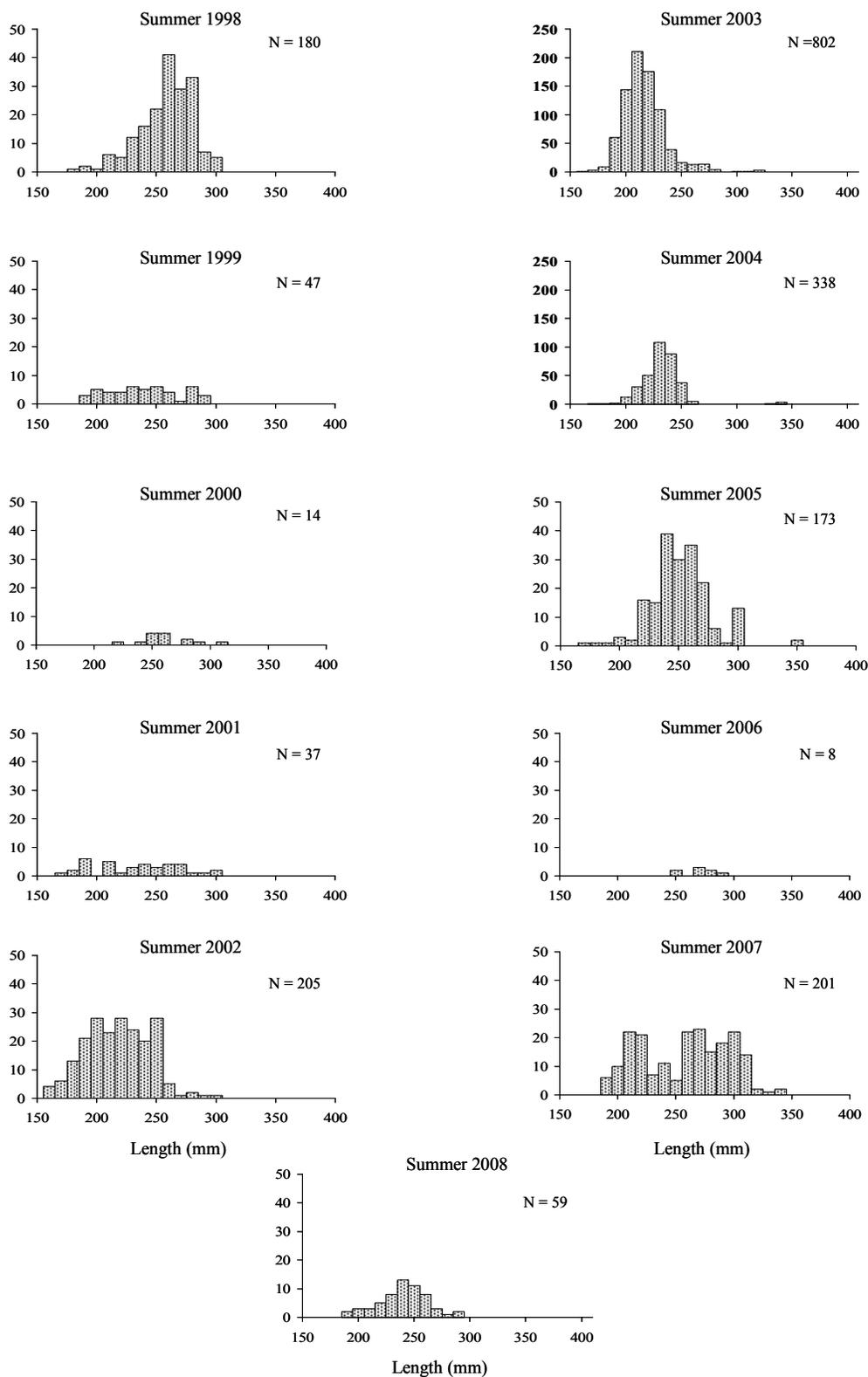


Figure 7. Length frequency of angler-harvested yellow perch measured by the creel clerk during summer creel surveys on Lake Madison, 1998-2008.

Table 9. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	0	0	0	0
1999	441 (370)	0	0.04 (0.03)	0
2000	0	0	0	0
2001	0	0	0	0
2002	88 (46)	65 (38)	0.006 (0.003)	0.004 (0.003)
2003	320 (183)	309 (179)	0.01 (0.006)	0.01 (0.006)
2004	7,740 (1,320)	6,697 (1,106)	0.21 (0.07)	0.18 (0.05)
2005	3,570 (1,222)	2,981 (1,121)	0.12 (0.04)	0.10 (0.03)
2006	4,582 (5,386)	3,258 (3,405)	0.21 (0.25)	0.15 (0.16)
2007	3,318 (1,471)	1,371 (512)	0.25 (0.17)	0.10 (0.07)
2008	358 (73)	120 (80)	0.28 (0.02)	0.12 (0.04)

Bluegill

Lake Madison has a limited bluegill fishery with an average catch rate of less than 0.01 fish/h (Table 10). No bluegills were observed in the creel until 2002 and most were caught by anglers targeting yellow perch and black crappies. The importance of bluegills to the summer fishery has varied from no harvest in 1955 (Clothier 1956) and 1994 (unpublished data) to over 1,400 fish harvested in 1987 (Jacobson and Knapp 1988). The lake had a reputation for providing large bluegills in the late-1980s and early-

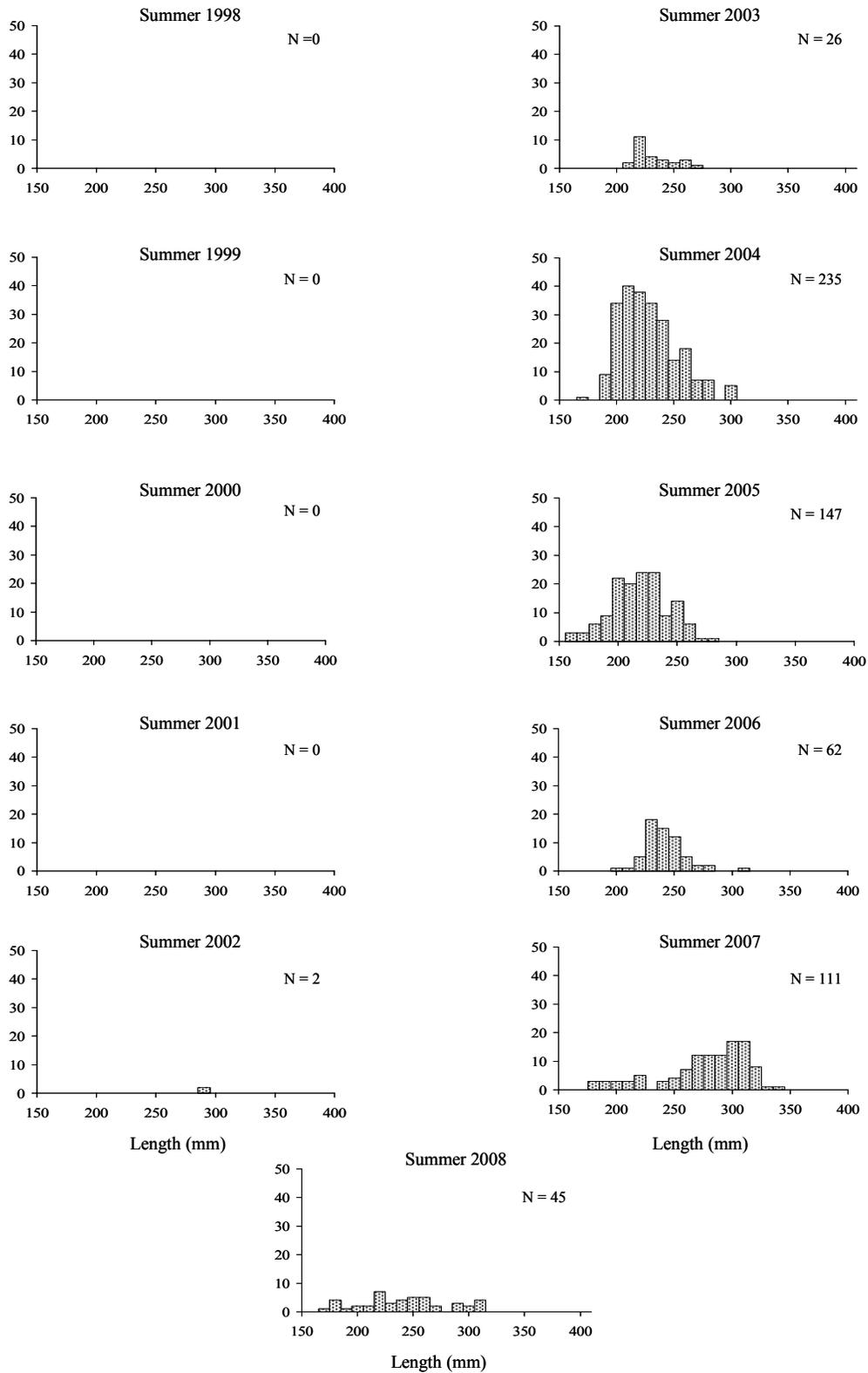


Figure 8. Length frequency of angler-harvested black crappie measured by the creel clerk during summer creel surveys on Lake Madison, 1998-2008.

Table 10. Estimated number and rate (number per hour) of bluegill caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	0	0	0	0
1999	0	0	0	0
2000	0	0	0	0
2001	0	0	0	0
2002	97 (56)	36 (42)	0.007 (0.004)	0.002 (0.003)
2003	180 (188)	22 (19)	0.006 (0.006)	0.0007 (0.0006)
2004	157 (81)	99 (66)	0.004 (0.002)	0.003 (0.002)
2005	178 (76)	105 (55)	0.006 (0.003)	0.004 (0.002)
2006	0	0	0	0
2007	55 (--)	55 (--)	0.004 (--)	0.004 (--)
2008	31 (39)	31 (39)	0.002 (0.002)	0.002 (0.002)

1990s and in 1987, yielded 50 trophy angler fish in a 3 week period (Jacobson and Knapp 1988). Coincidentally, water levels were low and aquatic vegetation abundance was very high during this period.

Black bullhead

Black bullhead catch and harvest on Lake Madison peaked in 2003 and 2004 (Table 11) which was similar to the fisheries on lakes Brant and Herman. The 2003 fishery was likely produced in 2001 when water levels were high. Harvest rates during

Table 11. Estimated number and rate (number per hour) of black bullhead caught and harvested by anglers during the summer fishery on Lake Madison, South Dakota, 1998-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
1998	2,519 (1,539)	353 (258)	0.14 (0.11)	0.02 (0.02)
1999	1,545 (729)	1,018 (619)	0.13 (0.08)	0.08 (0.06)
2000	2,799 (1,298)	604 (373)	0.15 (--)	0.03 (--)
2001	172 (135)	0	0.02 (0.01)	0.003 (0.006)
2002	4,815 (671)	467 (194)	0.33 (0.11)	0.03 (0.02)
2003	5,974 (1,625)	1,023 (647)	0.19 (0.06)	0.03 (0.02)
2004	3,507 (1,174)	1,191 (809)	0.10 (0.03)	0.03 (0.02)
2005	825 (283)	0	0.03 (0.01)	0
2006	385 (109)	80 (98)	0.02 (0.007)	0.004 (0.005)
2007	168 (103)	109 (94)	0.01 (0.008)	0.008 (0.007)
2008	125 (81)	20 (29)	0.007 (0.005)	0.001 (0.002)

the current survey period were lower than 1955 (Clothier 1956) and 1987 (Jacobson and Knapp 1988). Furthermore, Jacobson and Knapp (1987) commented that the bullhead harvest in 1987 was unusually small compared to observations made over the past several years. Undoubtedly, the percentage of anglers targeting bullheads has decreased since the 1980s although no supporting information is available. Nearly all of the black bullheads harvested were 200 to 300 mm (7.9 to 11.8 in) long (Figure 9).

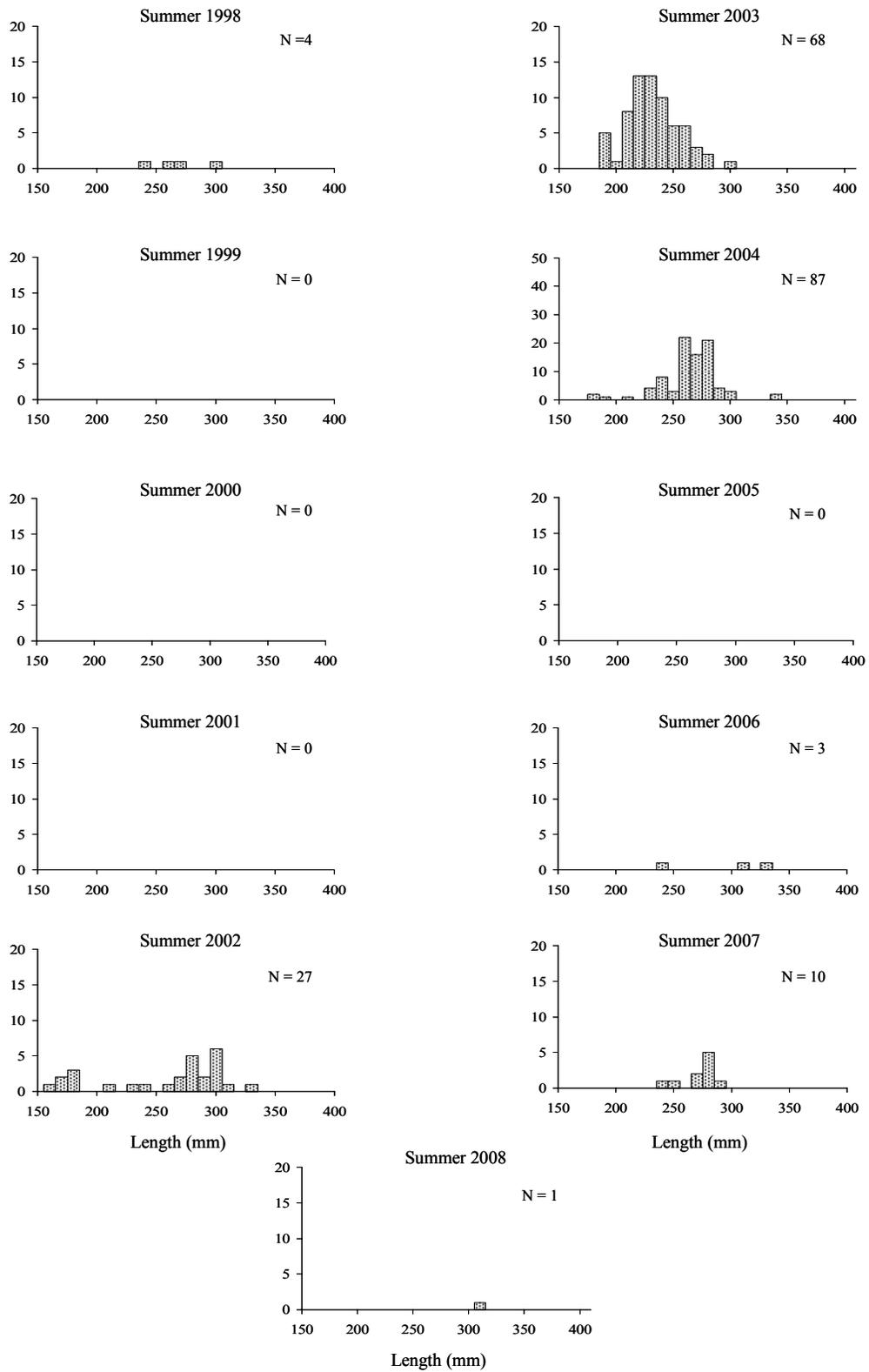


Figure 9. Length frequency of angler-harvested black bullhead measured by the creel clerk during summer creel surveys on Lake Madison, 1998-2008.

Fall

Fishing Pressure

Lake Madison fall anglers primarily targeted yellow perch (Table 12). In three of four survey years, about two-thirds of the anglers interviewed targeted yellow perch. Generalist anglers comprised the second largest group followed closely by anglers targeting walleyes. Anglers targeting black crappie (15%) were a substantial component of the 2006 fall fishery.

Fishing pressure in September and October varied from 8,194 h in 2007 to 21,231 h in 2005 (Table 13). Fall fishing pressure comprised 27% to 34% of total annual fishing pressure. A good yellow perch fishery in September and October of 1987 produced 24,359 hours of fishing pressure (Jacobson and Knapp 1988) comprising 25% of total fishing pressure for that year. Few yellow perch were caught in the fall of 1994 and that fishery only provided about 5,000 hours of angling pressure (unpublished data). Based on these results from fall surveys on Lake Madison, Schoenebeck et al. (2010) recommended fall creel surveys on lakes with high-quality yellow perch fisheries to avoid underestimation of effort and harvest.

Fishing pressure was always higher in September than October (Appendix 6) even in 2007 and 2008 when yellow perch catch rates were highest in October. Angling from boats was the preferred method for yellow perch fishing, and accordingly, boat fishing

Table 12. Percent of angling parties interviewed primarily targeting a species (or any species) during the fall fishery on Lake Madison, 2005-2008.

<i>Year</i>	<i>Percent of anglers targeting</i>					
	<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern Pike</i>	<i>Black Bullhead</i>	<i>Any species</i>
2005	16	66	4	1	0	13
2006	19	39	15	0	1	26
2007	17	69	1	0	1	12
2008	10	63	1	0	0	26

Table 13. Fall totals for the number of interviews and estimates for fishing pressure (h) and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Lake Madison, September through October, 2005-2008 (80% confidence interval).

<i>Year</i>	<i>Number of interviews</i>	<i>Angler hours</i>	<i>Angler hours/ hectare</i>	<i>Angler days</i>	<i>Economic value</i>
2005	247	21,231 (3,954)	19.8 (3.7)	4,044	\$246,684
2006	140	11,042 (3,314)	10.3 (3.1)	2,921	\$178,191
2007	97	8,194 (2,556)	7.7 (2.4)	2,049	\$124,989
2008	178	10,415 (2,212)	9.7 (2.1)	2,473	\$150,906

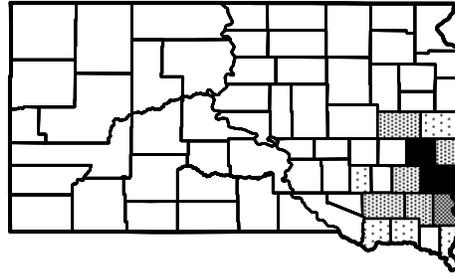
pressure comprised over 85% of total fishing pressure (Appendix 6). The percentage of boat anglers was substantially higher in the fall than in the summer. Over half of the fishing pressure occurred on weekdays.

Angler Demographics

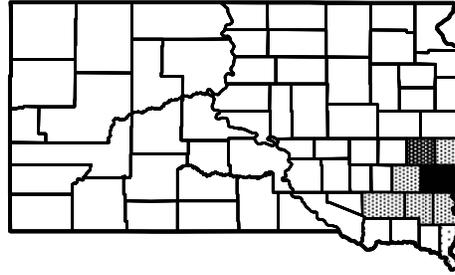
About 86% of fall parties fishing Lake Madison were South Dakota residents (Appendix 6). Non-resident participation in the fall yellow perch fishery was higher than the summer fisheries on lakes Madison, Herman or Brant. Non-resident participation in eastern South Dakota fisheries is often highest when panfishing is exceptional, especially during the winter months (Blackwell and Hubers 2003; Blackwell 2005a; Blackwell et al. 2007a).

Minnehaha County residents comprised over 60% of angling parties interviewed on Lake Madison during the fall of 2005 through 2008 (Figure 10) and most were from Sioux Falls. Lake County was the only other county contributing a large percentage of anglers (22%). Annual variation in the percentage of anglers using Lake Madison by county was relatively small (Figure 10). Participation by Minnehaha County residents in the 1987 fishery (December 1986-November 1987) was similar at 52% although figures for participation in the fall fishery were not readily accessible. The mean annual economic impact of the Lake Madison fall fishery was estimated at

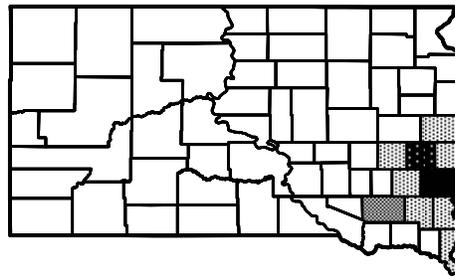
Fall 2005



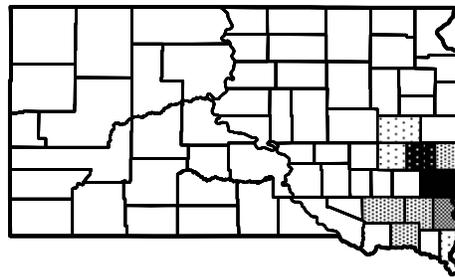
Fall 2006



Fall 2007



Fall 2008



Falls 2002-08
pooled

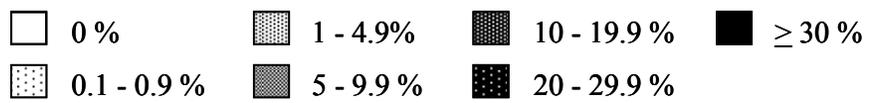
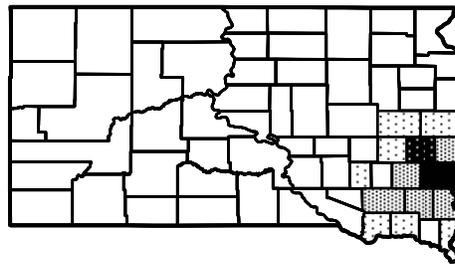


Figure 10. South Dakota county of residence for fall (September-October) resident anglers fishing Lake Madison, South Dakota from 2005 through 2008.

\$175,000 based on a value of \$61 per trip (U.S. Department of the Interior, Fish and Wildlife Service, U.S. Bureau of Commerce Bureau of Census 2007).

Angler Catch and Harvest

Walleye

Fall catch rates for walleye varied from 0.04 fish/h in 2006 to 1.17 fish/h in 2007 (Table 14). Harvest rates were low (0.005-0.04 fish/h) because the majority of walleyes caught were small and released (Table 14). A large percentage of walleyes harvested were less than 356 mm (14 in) (Figure 11). Fall walleye harvest rates were higher in 1987 (0.06 fish/h; Jacobson and Knapp 1988) and 1994 (0.26 fish/h).

Northern Pike

Fall catch and harvest rates for northern pike were extremely low (Table 15). Fall anglers harvested a higher percentage of northern pike caught (54%) than summer anglers (44%). Northern pike harvest was similar in the fall of 1994 (unpublished data) but significantly greater in the fall of 1987 (Jacobson and Knapp 1988).

Yellow Perch

The majority of the annual yellow perch harvest from 2005 through 2008 occurred during the fall (Tables 3 and 16). Fall harvest estimates varied from 1,578 fish in 2006 to 13,671 fish in 2007 (Table 16) and represented 70% (2008) to 84% (2007) of the annual harvest. Similarly, fall harvest represented 72% of the total harvest in 1987 (Jacobson and Knapp 1988). Summer and fall harvest were low in 1994 (unpublished data).

High fall harvest of yellow perch on Lake Madison is partially related to fast growth and late-summer recruitment of large year classes to the fishery (Guy and Willis 1991; Schoenebeck 2009). Late-summer recruitment gives fall anglers the first opportunity to catch and harvest these young fish. Additionally, increases in fall movement likely associated with increased feeding activity were documented with Lake

Table 14. Estimated number and rate (number per hour) of walleye caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	5,072 (1,582)	917 (362)	0.24 (0.13)	0.04 (0.02)
2006	407 (301)	238 (166)	0.04 (0.03)	0.02 (0.02)
2007	9,549 (3,663)	37 (42)	1.17 (0.77)	0.005 (0.008)
2008	2,400 (880)	290 (145)	0.23 (0.15)	0.03 (0.02)

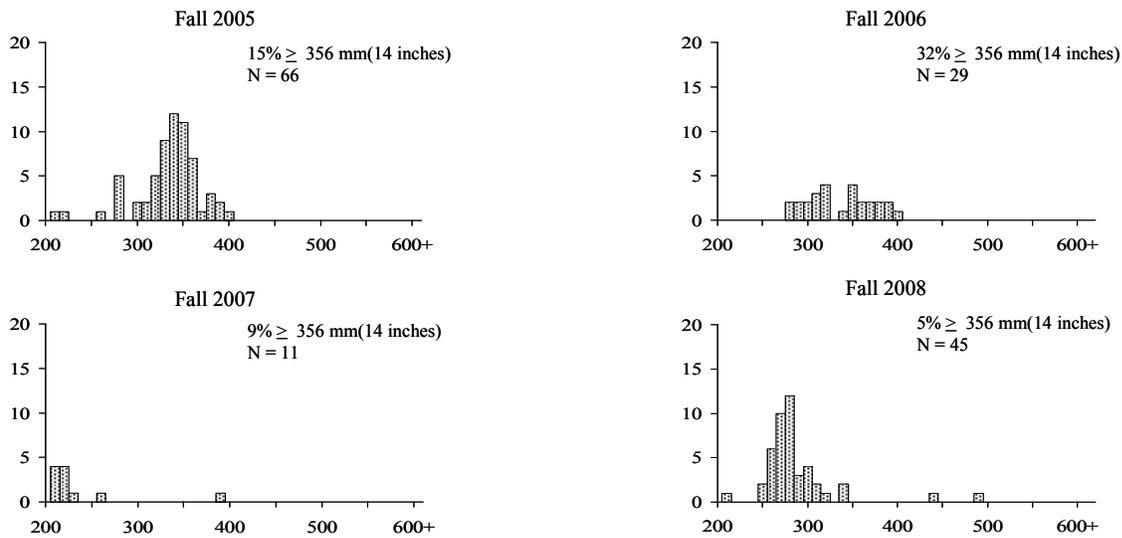


Figure 11. Length frequency of angler-harvested walleyes measured by the creel clerk during fall creel surveys on Lake Madison, 2005-2008.

Table 15. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	32 (36)	21 (24)	0.002 (0.002)	0.001 (0.001)
2006	11 (16)	0	0.001 (0.002)	0
2007	0	0	0	0
2008	37 (23)	22 (18)	0.004 (0.002)	0.002 (0.002)

Table 16. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	13,000 (3,337)	10,942 (2,664)	0.61 (0.25)	0.52 (0.21)
2006	1,779 (900)	1,578 (835)	0.16 (0.15)	0.14 (0.14)
2007	20,813 (9,021)	13,671 (5,621)	2.54 (1.56)	1.67 (1.21)
2008	9,346 (2,217)	7,860 (1,906)	0.90 (0.51)	0.75 (0.42)

Madison yellow perch (Radabaugh et al. 2010). Increased feeding activity could translate into higher susceptibility and increased catch rates in the fall (Radabaugh et al. 2010).

Prior to conducting fall creel surveys on Lake Madison, it was believed that annual mortality in yellow perch could almost entirely be attributed to natural causes. However, Schoenebeck (2009) demonstrated that angling mortality was responsible for

the decline in the Lake Madison population from 2005 to 2006 with 73% of the angler harvest occurring in the fall. In contrast, mortality was more evenly split between natural and angling components from 2006 to 2007. He concluded that mortality for a high-quality yellow perch population, like the one in Lake Madison, is compensatory, and thus, more conservative harvest regulations may not reduce total mortality (Schoenebeck and Brown 2011).

Fall anglers harvested about 76% of their catch and the majority of these fish were 200 to 300 mm (7.9-11.8 in) long (Figure 12). During late-summer and fall of 2006 and 2007, anglers demonstrated size selective harvest as they removed the larger fish. The percentage of smaller fish in the population increased and subsequently, angler harvest of small fish also increased (Schoenebeck 2009).

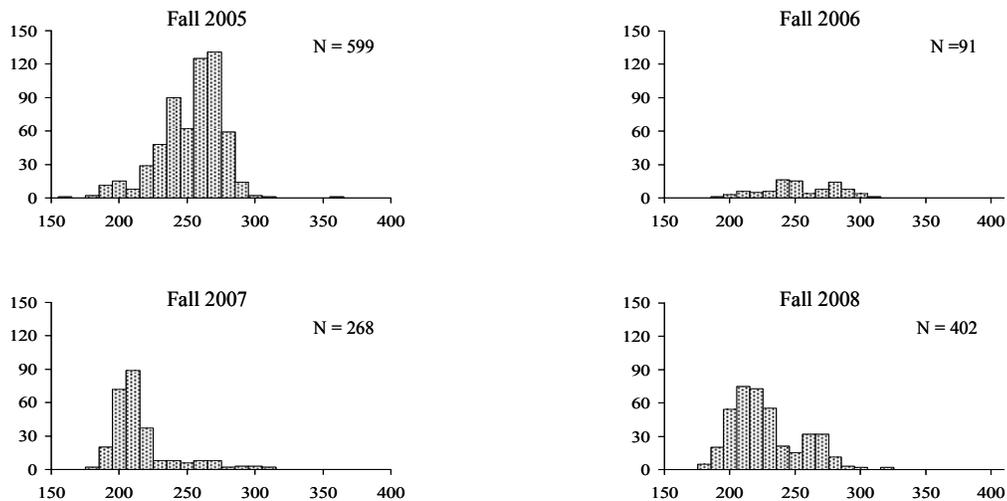


Figure 12. Length frequency of angler-harvested yellow perch measured by the creel clerk during fall creel surveys on Lake Madison, 2005-2008.

Black Crappie

Yellow perch anglers also enjoyed good fall fishing for black crappies (Table 17). Black crappie harvest rates varied from 0.03 fish/h in 2007 to 0.18 fish/hour in 2005. Fall catch and harvest rates were often similar to those in the peak summer months of May and June. Substantially fewer crappies were harvested in the falls of 1987 (Jacobson and Knapp 1988) and 1994 (unpublished data) than in the recent survey period. Anglers harvested about 68% of crappies caught and most fish were 200 to 300 mm (7.9-11.8 in) long (Figure 13).

Other

A few bluegills and black bullheads were also caught by fall anglers targeting yellow perch (Tables 18 and 19). Fall harvest and harvest rates for bluegill were substantially higher in 1987 (Jacobson and Knapp 1988). Jacobson and Knapp (1988) reported over 50 trophy angler bluegills (fish \geq 1 lb) caught in early September 1987.

Table 17. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	4,275 (1,294)	3,725 (1,191)	0.20 (0.12)	0.18 (0.10)
2006	3,904 (2,157)	1,869 (963)	0.35 (0.28)	0.17 (0.14)
2007	771 (402)	275 (176)	0.09 (0.07)	0.03 (0.03)
2008	1,424 (633)	1,164 (571)	0.14 (0.09)	0.11 (0.07)

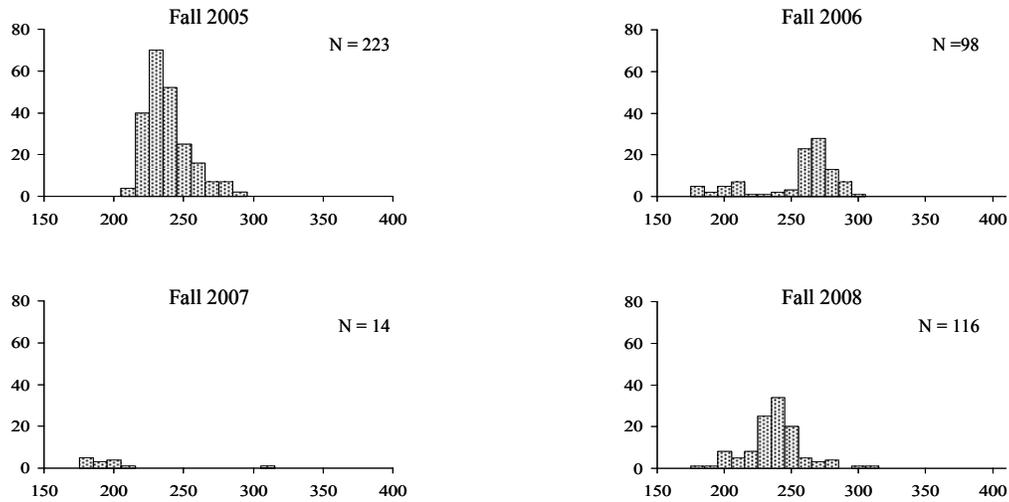


Figure 13. Length frequency of angler-harvested black crappie measured by the creel clerk during fall creel surveys on Lake Madison, 2005-2008.

Table 18. Estimated number and rate (number per hour) of bluegill caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	164 (97)	82 (26)	0.008 (0.007)	0.004 (0.002)
2006	141 (76)	118 (80)	0.01 (0.01)	0.01 (0.01)
2007	145 (118)	33 (23)	0.02 (0.01)	0.004 (0.003)
2008	58 (55)	22 (27)	0.006 (0.007)	0.002 (0.003)

Table 19. Estimated number and rate (number per hour) of black bullhead caught and harvested by anglers during the fall fishery on Lake Madison, South Dakota, 2005-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2005	6 (10)	0	0.0003 (0.0005)	0
2006	266 (227)	36 (29)	0.02 (0.04)	0.003 (0.005)
2007	62 (86)	42 (21)	0.008 (0.01)	0.002 (0.003)
2008	119 (117)	15 (17)	0.01 (0.01)	0.001 (0.001)

Winter

Fishing Pressure

Lake Madison anglers targeted yellow perch in the winters of 2002-03 and 2003-04, and walleyes for the rest of the survey period (Table 20). In the winter of 2003-04, exceptional perch fishing before ice up attracted ice anglers to the lake but the winter perch fishery never developed.

Winter fishing pressure varied greatly from 1,962 hours during the winter of 2007-08 to 28,759 hours in the winter of 2002-03 (Table 21 and Figure 14). Excellent yellow perch fishing produced the high fishing pressure in the winter of 2002-03. Low fishing pressure in the winters of 2006-07 and 2007-08 was the result of poor ice fishing success. The mean contribution of the winter fishery to annual fishing pressure was 23% during the 6 years of winter surveys and varied from 6% in the winter of 2007-2008 to 47% in the winter of 2002-03.

If the exceptional winter fishery of 2002-03 is excluded, the contribution of winter fishing to annual fishing pressure on Lake Madison was similar to Brant Lake (16%; Lucchesi 2011) and Lake Thompson (19%; Lucchesi 2009). Winter fisheries on Bitter, Enemy Swim, Pickerel and Poinsett generated 20% to 30% of the annual fishing pressure

Table 20. Percent of angling parties interviewed primarily targeting a species (or any species) during the winter fishery on Lake Madison, 2002-2008.

<i>Year</i>	<i>Percent of anglers targeting</i>					
	<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern pike</i>	<i>Bluegill</i>	<i>Any species</i>
2002-03	2	95	0	0	0	3
2003-04	18	74	0	0	0	8
2004-05	53	25	2	2	1	17
2005-06	54	22	3	0	0	21
2006-07	62	14	5	3	0	10
2007-08	41	33	3	0	0	23

Table 21. Winter totals for the number of interviews and estimates for fishing pressure and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Lake Madison, December through March, 2002-2008.

<i>Year</i>	<i>Number of interviews</i>	<i>Angler hours</i>	<i>Angler hours/ hectare</i>	<i>Angler days</i>	<i>Economic value</i>
2002-03	426	28,759 (6,880)	26.9 (6.4)	8,959	\$546,511
2003-04	103	4,614 (1,197)	4.3 (1.1)	1,703	\$103,858
2004-05	328	14,923 (5,097)	13.9 (4.8)	4,693	\$286,259
2005-06	155	8,307 (1,947)	7.8 (1.8)	2,778	\$169,473
2006-07	86	2,810 (882)	2.6 (0.8)	817	\$49,828
2007-08	64	1,962 (465)	1.8 (0.4)	433	\$26,420

and the winter perch fishery on Waubay Lake was nearly 50% of the total. Lakes with good winter panfisheries generally produced higher fishing pressure (Table 3).

Peak winter fishing pressure on Lake Madison occurred in January (Figure 15). Thicker ice in January and February made for safer vehicle travel and allowed the use of permanent shacks. December and January had the highest percentage of anglers fishing in ice shacks (78%; Figure 15), and on average, 74% of the winter fishing pressure was

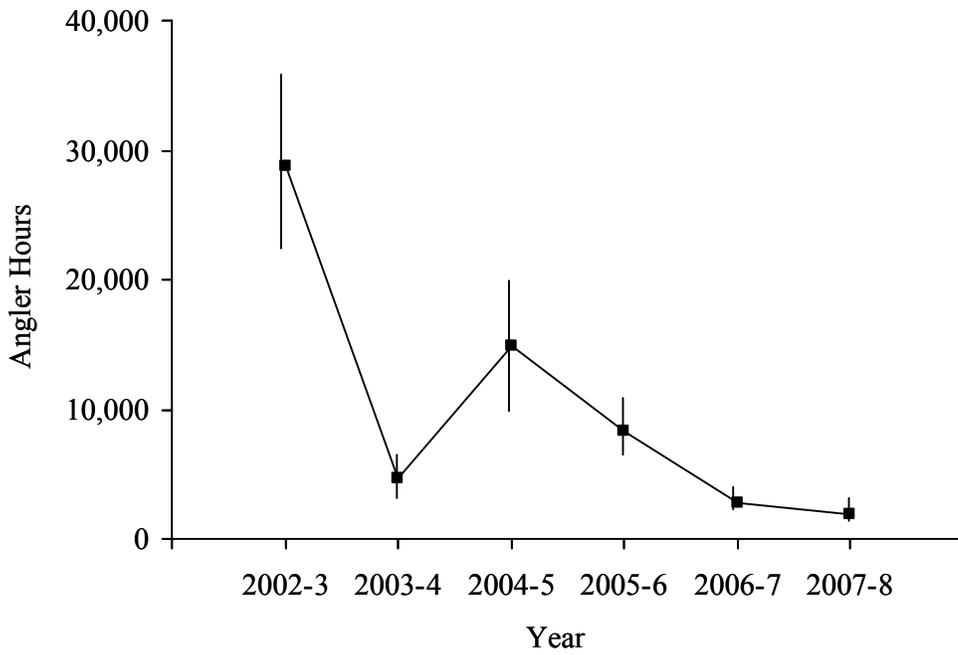


Figure 14. Estimated winter fishing pressure measured in angler hours on Lake Madison, 2002-2008 (bars represent an 80% confidence interval).

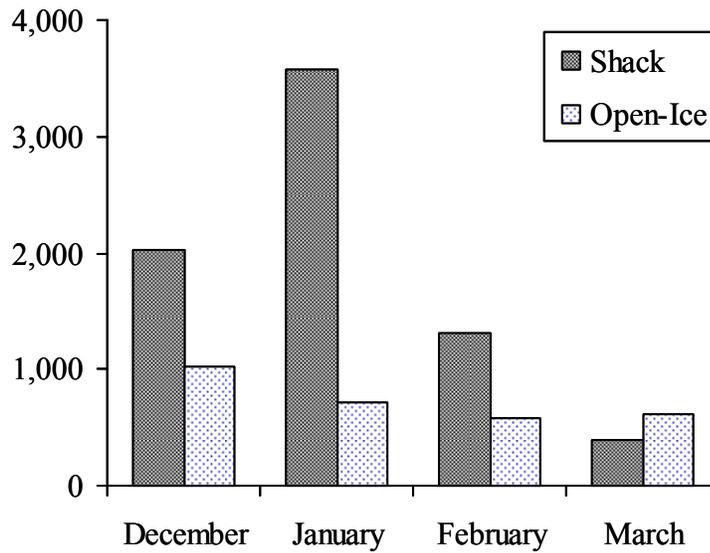


Figure 15. Mean monthly winter fishing pressure for shack and open-ice anglers on Lake Madison, 2002-2008.

done from a shack. The percentages of shack and open-ice anglers were similar on Brant Lake (Lucchesi 2011) and Lake Thompson (Lucchesi 2009).

Angler Demographics

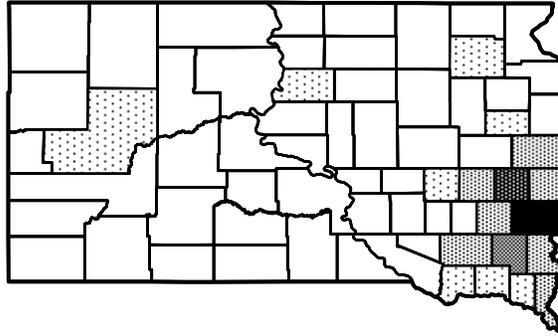
Throughout the survey period, about 95% of winter anglers on Lake Madison were South Dakota residents. The highest percentage of non-resident anglers (8%) occurred in the winter of 2002-03 when there was exceptional yellow perch fishing (Appendix 10). Winter participation by non-residents on Brant Lake was less than 5% over the 11-year survey period (Lucchesi 2011).

Non-resident participation in winter fisheries has been higher on other eastern South Dakota lakes than on Madison. From 1997-2008, about 20% of winter anglers on Lake Thompson were non-residents (Lucchesi 2009). Non-resident participation on Enemy Swim Lake reached 42% during the winter of 2003-04 when a majority of anglers were targeting bluegills (Blackwell 2005c). Non-resident participation on Waubay Lake varied between 20% and 40% from 1999 through 2004 (Blackwell and Hubers 2003; Blackwell 2005a). Non-residents comprised more 55% of the anglers during the winter 2005-06 bluegill and black crappie fishery on Pickerel Lake. About 40% of these angling parties were from Minnesota (Blackwell et al. 2007a). Nearly all winter fisheries with high non-resident participation provided excellent panfishing opportunity.

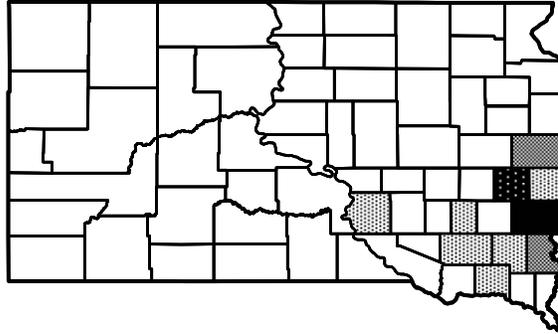
Like the summer fishery, Minnehaha County residents comprised a large percentage (46%) of the parties fishing Lake Madison in the winter (Figure 16). The only other county contributing a large percentage of anglers was Lake (33%). Annual variation in percentage of anglers by county was low (Figure 13).

The mean annual economic impact of the Brant Lake winter fishery was estimated at about \$200,000 based at a value of \$61 per trip (U.S. Department of the Interior, Fish and Wildlife Service, U.S. Bureau of Commerce Bureau of Census 2007).

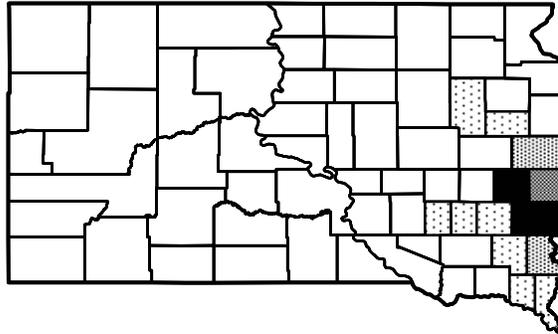
Winter 2002-03



Winter 2003-04



Winter 2004-05



Winter 2005-06

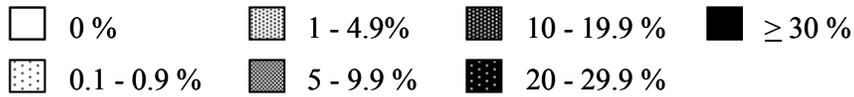
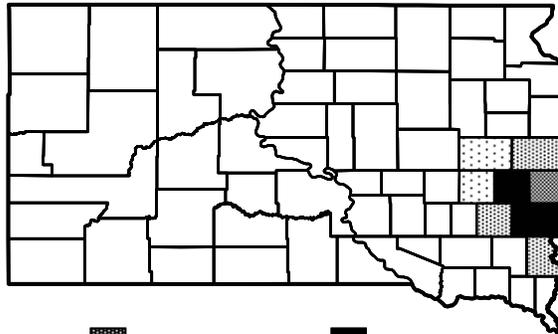
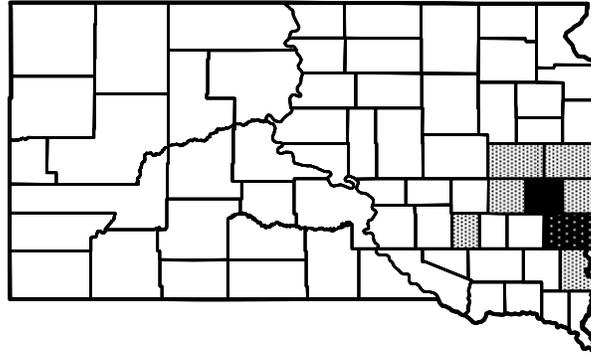
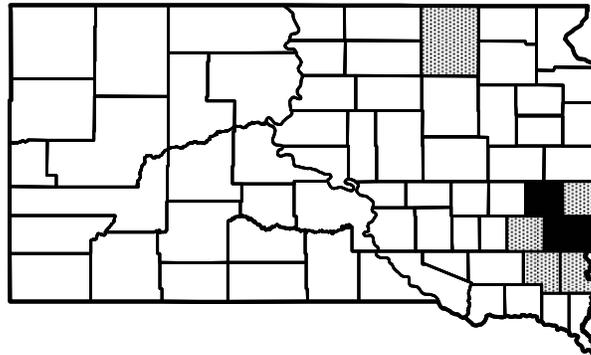


Figure 16. South Dakota county of residence for winter (December-March) resident anglers fishing Lake Madison, South Dakota from 2002 through 2008.

Winter 2006-07



Winter 2007-08



Winter 2001-08
pooled

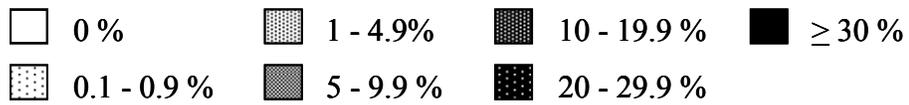
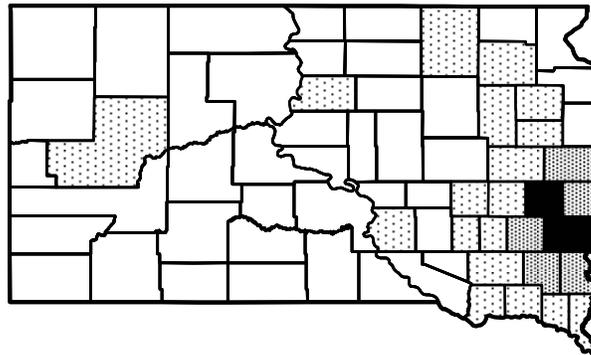


Figure 16. Continued

Angler Catch and Harvest

Walleye

Walleye catch and harvest rates on Lake Madison averaged 0.06 walleyes/hour and 0.02 walleyes/hour, respectively (Table 22), well below the SDGFP harvest rate objective of 0.15 walleyes/h. None of the annual winter harvest rates exceeded the objective during the survey period. Walleye harvest rates remained low (0.02-0.05 fish/h) throughout the survey, and winter harvest comprised only a small percentage (about 3%) of the total harvest. Winter walleye harvest comprised the same proportion (3%) of the total harvest in 1987 (Jacobson and Knapp 1988).

Other species

Northern pike catch and harvest rates during the winter fishery were low and similar to the summer and fall fisheries (Table 23). However, unlike the summer fishery, anglers harvest nearly all the pike they catch during the winter.

Table 22. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the winter fishery on Lake Madison, South Dakota, 2002-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2002-03	258 (225)	82 (23)	0.009 (0.01)	0.003 (0.001)
2003-04	236 (193)	211 (187)	0.05 (0.05)	0.05 (0.04)
2004-05	1,890 (670)	342 (131)	0.13 (0.08)	0.02 (0.02)
2005-06	571 (262)	142 (73)	0.07 (0.06)	0.02 (0.02)
2006-07	190 (74)	143 (56)	0.07 (0.04)	0.05 (0.03)
2007-08	48 (45)	0	0.02 (0.03)	0

Winter yellow perch catch and harvest rates varied greatly during the survey period (Table 24). Peak catch and harvest rates occurred during the winter of 2002-03 when the large 2001 year class recruited to the fishery then decreased significantly by the winter of 2003-04. Although fall fishing for yellow perch was good in 2005 and 2007, the subsequent winter fisheries were poor (Table 24). Except for the winter of 2002-03, anglers harvested nearly all of their catch and the majority of these fish were 200 to 300 mm (7.9-11.8 in) long (Figure 17).

Catchability of yellow perch and other fish species in the winter appears to be highly variable among lakes. Aside from high catch rates during the winter of 2002-2003 (Isermann et al. 2005), low winter “catchability” seems especially evident on Lake Madison. Despite a mean gill-net CPUE of 120 over the past 10 years, winter perch fishing was poor (Schoenebeck 2009). A similar situation existed on Brant Lake where open-water anglers enjoyed good fishing for yellow perch and black crappie immediately following slow winter periods. Reasons behind low winter catchability are not well understood.

The winter fishery for black crappie provided low catch and harvest rates (Table 25) and anglers harvested nearly all of their catch (Table 25).

Angler Opinions

Anglers were asked a variety of questions about angler satisfaction and preference with respect to regulations and harvest options during the survey period (Appendix 13). The majority of anglers interviewed were satisfied with their fishing trip in the summers of 2002 (62%) and 2003 (76%; Appendix 13, Questions 3, and 5). High catch and harvest rates for yellow perch may be responsible. Angler satisfaction was also high on Brant Lake (Lucchesi 2011), which had a good fishery for walleye, yellow perch and black crappie, but varied more on Lake Thompson, with only 38% satisfied in 2002 and 85% satisfied in 2003 (Lucchesi 2009). The top reason given by summer and winter anglers for choosing to fish Lake Madison over other waters was closeness to home (34-

Table 23. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the winter fishery on Lake Madison, South Dakota, 2002-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2002-03	335 (97)	335 (97)	0.01 (0.006)	0.01 (0.006)
2003-04	0	0	0	0
2004-05	213 (84)	174 (67)	0.01 (0.009)	0.01 (0.008)
2005-06	6 (9)	6 (9)	0.0007 (0.001)	0.0007 (0.001)
2006-07	11 (9)	0	0.004 (0.004)	0
2007-08	0	0	0	0

Table 24. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the winter fishery on Lake Madison, South Dakota, 2002-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2002-03	157,007 (49,904)	76,296 (11,815)	5.46 (3.12)	1.84 (0.85)
2003-04	2,012 (1,425)	1,785 (1,229)	0.44 (0.35)	0.39 (0.30)
2004-05	274 (174)	254 (157)	0.02 (0.01)	0.02 (0.01)
2005-06	65 (40)	65 (40)	0.008 (0.005)	0.008 (0.005)
2006-07	7 (0)	0	0.003 (0.0001)	0
2007-08	13 (19)	0	0.007 (0.01)	0

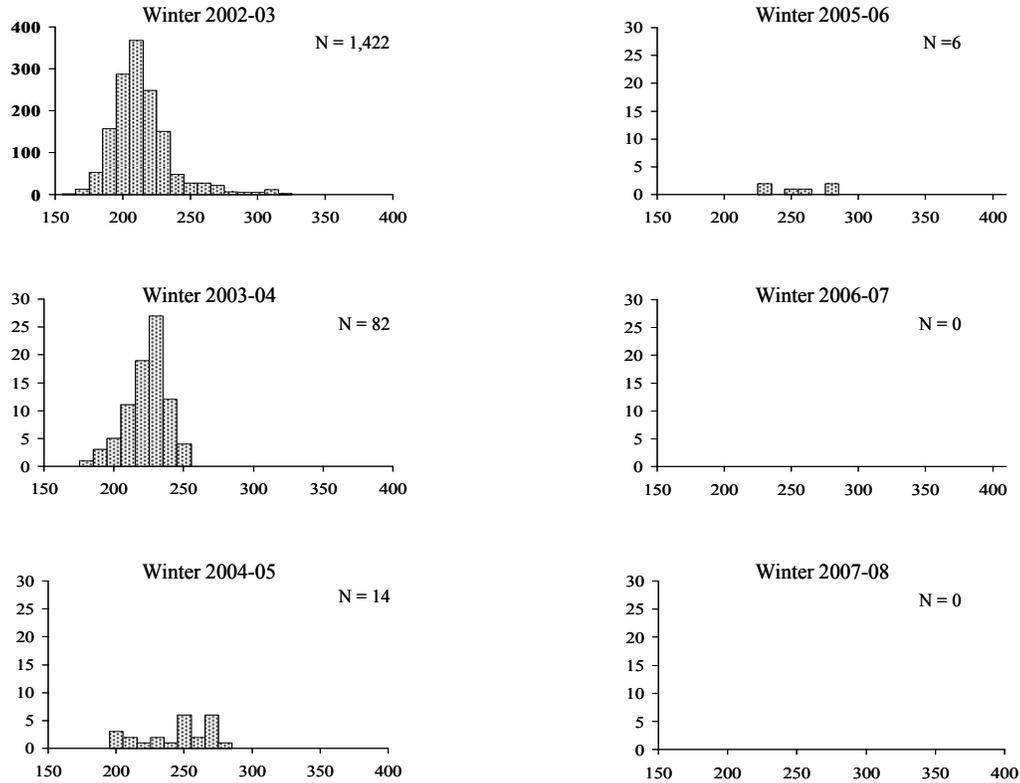


Figure 17. Length frequency of angler-harvested yellow perch measured by the creel clerk during winter creel surveys on Lake Madison, 2002-2008.

47%) (Appendix 13, Question 8). The second highest reason for summer angling parties was hearing about a bite (25%). Winter anglers chose to fish Lake Madison because they heard about a bite (9-22%) and for “other” reasons (16-21%). In comparison to Madison, a higher percentage of Brant Lake angling parties gave closeness to home as the reason for choosing to fish even though both lakes are a similar distance from Sioux Falls.

In summer 2003, nearly 75% of angling parties indicated current fishing regulations were easy to understand (Appendix 13, Question 6). However, 25% indicated that current regulations were at least somewhat difficult to understand which was similar to Brant (24%, Lucchesi 2011), but higher than Thompson (14%, Lucchesi 2009).

Table 25. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the winter fishery on Lake Madison, South Dakota, 2002-2008. (80% confidence interval).

<i>Year</i>	<i>Catch</i>	<i>Harvest</i>	<i>Catch rate</i>	<i>Harvest rate</i>
2002-03	24 (16)	24 (16)	0.0008 (0.0006)	0.0008 (0.0006)
2003-04	0	0	0	0
2004-05	282 (171)	211 (154)	0.02 (0.04)	0.01 (0.04)
2005-06	283 (230)	267 (229)	0.03 (0.03)	0.03 (0.02)
2006-07	33 (23)	26 (19)	0.01 (0.008)	0.009 (0.006)
2007-08	6 (10)	0	0.003 (0.004)	0

Several questions about walleye harvest and regulations were asked during the survey period (Appendix 13, Questions 1, 7, 9, 10,11 and 12). In the summer of 1999, 57% of parties interviewed stated they would favor removing the 14-inch MLL on the Madison area lakes. In winter 2003-04 and summer 2004, about 60% of parties indicated they would prefer to harvest three 14-inch walleyes versus one 17-inch walleye (16-19%) or four 13-inch walleyes (13-28%). Winter anglers favored harvesting higher numbers of smaller fish over summer anglers. Although a majority of anglers preferred three 14-inch walleyes over the other options, they opposed (about 61-71%) a reduction in walleye limits from four to three. Most anglers were neutral toward a reduction in the northern pike daily limit.

Responses concerning satisfaction with panfish harvest and regulations were variable (Appendix 9, Questions 10-13). The largest percentage of parties interviewed during summer 2005, fall 2005 and winter 2005-06 opposed a reduction in daily panfish limits to 10 but summer anglers on Lake Thompson and Brant Lake favored it (Lucchesi

2009, 2011). In 2007-08, a panfish limit of 10 (47%) was most commonly selected as the preferred panfish limit while 25 was the most popular choice with summer (35%) and fall anglers (51%). Higher summer and fall catch rates and an extremely low winter catch rate for yellow perch may have influenced angler response.

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Appendix 1. Summer angler target species frequency totaled by month and over the summer for parties interviewed by the creel clerk during summer creel surveys on Lake Madison, 1998-2008.

<i>Year</i>	<i>Month</i>	Percent of anglers targeting					<i>Any species</i>
		<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern pike</i>	<i>Black Bullhead</i>	
1998	May	76	8	0	0	0	16
	June	70	13	2	0	6	9
	July	40	38	0	0	2	20
	August	57	28	0	0	1	14
	Total	60	23	1	0	2	14
1999	May	54	11	0	0	6	29
	June	63	14	0	0	4	19
	July	52	26	0	0	7	15
	August	48	30	0	0	0	22
	Total	56	20	0	0	5	19
2000	May	76	5	0	0	0	19
	June	68	3	0	3	3	23
	July	52	19	0	0	0	29
	August	19	44	0	0	0	37
	Total	61	13	0	1	1	24
2001	May	29	0	0	12	0	59
	June	52	0	0	5	0	43
	July	44	25	0	0	0	31
	August	16	68	0	0	0	16
	Total	34	27	0	4	0	35
2002	May	92	0	0	8	0	0
	June	33	58	6	0	0	3
	July	34	61	0	3	0	2
	August	16	76	2	0	4	2
	Total	32	60	2	1	1	4
2003	May	71	16	2	0	0	11
	June	43	39	3	1	3	11
	July	21	71	0	0	3	5
	August	13	71	0	0	0	16
	Total	51	36	1	1	1	10
2004	May	80	12	5	0	2	1
	June	56	12	30	0	2	0
	July	58	31	11	0	0	2
	August	21	71	0	0	0	0
	Total	57	28	13	0	1	1
2005	May	72	3	6	0	1	18
	June	54	0	24	0	0	22
	July	59	12	12	0	0	17
	August	20	56	1	0	0	23
	Total	51	19	10	0	1	19

Appendix 1. Continued

<i>Year</i>	<i>Month</i>	Percent of anglers targeting					<i>Any species</i>
		<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern pike</i>	<i>Black Bullhead</i>	
2006	May	63	0	22	0	0	15
	June	59	5	17	0	0	19
	July	69	12	0	0	0	19
	August	33	20	13	0	0	34
	Total	61	4	17	0	0	18
2007	May	54	0	33	0	4	9
	June	83	0	13	0	0	4
	July	77	0	0	0	0	23
	August	14	55	9	0	0	22
	Total	15	68	1	0	0	16
2008	May	69	0	8	0	0	23
	June	56	3	22	0	0	19
	July	50	21	4	0	0	25
	August	29	42	10	0	0	19
	Total	54	13	11	0	0	22

Appendix 2. Monthly and total (May through August) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by boat and percent of angling activity that occurred during weekends/holidays on Lake Madison, South Dakota (80% confidence interval).

<i>Year</i>	<i>Month</i>	<i># Int</i>	<i>Angler hours</i>	<i>Angler days</i>	<i>Economic value</i>	<i>Trip length (h)</i>	<i>Party size</i>	<i>% SD residents</i>	<i>% boat anglers</i>	<i>% weekends or holidays</i>
1998	May	37	6,700 (2,096)	1,942	\$118,463	3.45 (2.07)	2.21 (2.12)	97	68	71
	June	53	3,992 (1,227)	1,150	\$70,176	3.47 (--)	2.05 (0.59)	96	62	55
	July	45	3,628 (651)	905	\$55,189	4.01 (--)	1.86 (1.55)	100	77	44
	August	72	4,054 (896)	870	\$53,067	4.66 (2.42)	1.95 (2.71)	99	83	44
	Total	207	18,374 (2,669)	4,711	\$287,388	3.90 (0.80)	2.02 (0.96)	98	72	56
1999	May	35	3,840 (419)	1,230	\$75,077	3.12 (0.81)	1.77 (1.08)	100	57	84
	June	48	3,425 (814)	1,376	\$83,905	2.49 (--)	2.07 (1.06)	100	71	51
	July	42	2,194 (530)	677	\$41,307	3.24 (0.58)	1.93 (1.04)	93	62	66
	August	27	2,683 (865)	651	\$39,724	4.12 (--)	2.02 (0.81)	93	69	59
	Total	152	12,141 (1,261)	3,736	\$227,877	3.25 (0.25)	1.95 (0.50)	97	65	66
2000	May	38	9,214 (2,697)	2,298	\$140,178	4.01 (1.56)	1.85 (1.48)	100	67	84
	June	37	3,831 (1,015)	885	\$53,985	4.33 (--)	2.12 (0.50)	95	43	39
	July	21	3,315 (887)	1,151	\$70,211	2.88 (0.24)	1.86 (0.92)	100	74	67
	August	16	2,300 (522)	714	\$43,554	3.22 (0.36)	2.64 (0.72)	100	65	43
	Total	112	18,660 (3,060)	5,183	\$316,163	3.60 (0.41)	2.11 (0.75)	98	63	67
2001	May	17	2,004 (426)	777	\$47,381	2.58 (--)	2.06 (0.78)	88	40	65
	June	21	3,078 (758)	882	\$53,799	3.49 (--)	2.16 (0.68)	100	50	60
	July	16	3,230 (692)	743	\$45,294	4.35 (--)	2.15 (0.93)	100	70	47
	August	28	3,165 (1,073)	1,297	\$79,125	2.44 (--)	2.02 (0.72)	92	66	37
	Total	82	11,477 (1,545)	3,690	\$225,112	3.11 (--)	2.10 (0.39)	95	58	51
2002	May	13	1,901 (728)	629	\$38,398	3.02 (--)	1.90 (0.52)	92	64	58
	June	33	3,776 (962)	1,134	\$69,170	3.33 (1.02)	2.10 (1.92)	100	86	63
	July	38	3,997 (632)	1,253	\$76,432	3.19 (1.03)	2.04 (1.14)	95	74	30
	August	55	4,958 (1,799)	1,109	\$67,660	4.47 (2.63)	2.25 (1.54)	96	93	59
	Total	139	14,632 (2,256)	4,180	\$255,014	3.50 (0.59)	2.07 (0.68)	96	77	52
2003	May	140	17,327 (5,321)	4,300	\$262,269	4.03 (3.53)	2.12 (3.73)	98	72	37
	June	67	8,895 (2,628)	2,824	\$172,252	3.15 (1.76)	2.27 (1.97)	94	66	45
	July	38	3,076 (879)	1,135	\$69,238	2.71 (0.54)	2.19 (1.06)	97	40	45
	August	31	2,817 (782)	955	\$58,250	2.95 (0.44)	2.01 (1.40)	100	64	38
	Total	276	32,116 (6,050)	10,005	\$610,304	3.21 (1.00)	2.15 (1.14)	97	67	40

Appendix 2. Continued

<i>Year</i>	<i>Month</i>	<i># Int</i>	<i>Angler hours</i>	<i>Angler days</i>	<i>Economic value</i>	<i>Trip length (h)</i>	<i>Party size</i>	<i>% SD residents</i>	<i>% boat anglers</i>	<i>% weekends or holidays</i>
2004	May	130	4,970 (1,799)	1,708	\$104,182	2.91 (1.04)	1.77 (1.68)	94	65	70
	June	146	15,110 (3,310)	3,161	\$192,826	4.78 (2.90)	2.37 (3.11)	95	65	48
	July	113	12,353 (2,558)	2,537	\$154,730	4.87 (0.92)	2.21 (3.56)	97	85	48
	August	81	4,470 (998)	1,388	\$84,680	3.22 (1.15)	1.86 (2.36)	94	79	61
	Total	470	36,903 (4,662)	9,390	\$572,794	3.93 (0.55)	2.05 (1.38)	95	73	53
2005	May	97	6,939 (1,977)	1,938	\$118,218	3.58 (2.81)	1.93 (2.21)	98	68	69
	June	71	9,308 (2,694)	3,397	\$207,222	2.74 (2.50)	2.22 (2.66)	99	72	47
	July	59	6,030 (884)	1,693	\$103,323	3.56 (1.05)	2.00 (1.17)	98	89	41
	August	87	6,418 (1,611)	1,658	\$101,162	3.87 (3.15)	1.91 (3.63)	94	82	47
	Total	314	28,694 (3,814)	8,341	\$508,801	3.44 (1.25)	2.02 (1.28)	97	76	51
2006	May	117	9,697 (2,525)	2,811	\$171,454	3.45 (1.07)	1.80 (1.41)	95	61	61
	June	59	6,280 (1,658)	1,909	\$116,438	3.29 (0.55)	2.07 (2.09)	98	71	35
	July	25	4,254 (700)	903	\$55,094	4.71 (--)	2.15 (0.52)	96	93	53
	August	15	1,561 (490)	587	\$35,797	2.66 (--)	1.69 (0.39)	100	80	53
	Total	216	21,792 (3,139)	6,156	\$375,512	3.54 (0.30)	1.93 (0.65)	96	71	51
2007	May	48	3,248 (1,402)	1,120	\$68,320	2.90 (1.15)	1.73 (1.51)	96	64	74
	June	47	3,679 (870)	854	\$52,069	4.31 (1.68)	1.72 (0.71)	98	89	74
	July	13	3,746 (1,460)	751	\$45,793	4.99 (--)	1.68 (--)	92	99	69
	August	25	2,558 (1,027)	488	\$29,778	5.24 (1.23)	1.72 (0.68)	95	94	34
	Total	133	13,232 (2,431)	3,305	\$185,127	4.36 (0.59)	1.71 (0.45)	96	87	65
2008	May	15	6,402 (4,149)	2,771	\$169,031	2.31 (1.96)	1.77 (1.59)	100	75	87
	June	36	5,777 (1,312)	1,463	\$89,243	3.95 (--)	2.69 (1.70)	97	65	77
	July	24	2,985 (799)	769	\$46,909	3.88 (--)	1.91 (0.55)	100	92	59
	August	31	3,357 (638)	1,030	\$62,830	3.26 (--)	2.41(1.18)	84	93	70
	Total	142	18,521 (4,470)	5,545	\$338,245	3.34 (0.49)	2.19 (0.66)	97	77	76

Appendix 3. Estimated number of walleye, northern pike, yellow perch and black crappie bluegill, black bullhead and other species (white sucker and common carp) caught and harvested by month and year during the summer fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Walleye	1998	2,181 (568)	565 (413)	1,616 (597)	162 (63)	1,021 (326)	114 (58)	1,154 (507)	140 (71)	5,972 (1,021)	981 (428)
	1999	2,513 (1,798)	170 (220)	2,973 (1,278)	141 (87)	575 (525)	57 (58)	1,171 (647)	54 (38)	7,232 (2,358)	422 (246)
	2000	6,385 (2,222)	1,367 (632)	734 (205)	299 (178)	1,140 (962)	98 (85)	550 (280)	249 (151)	8,809 (2,446)	2,013 (679)
	2001	23 (20)	0	310 (339)	101 (113)	122 (0)	0	16 (28)	16 (28)	471 (340)	117 (116)
	2002	0	0	119 (109)	106 (99)	89 (89)	0	389 (228)	86 (51)	597 (268)	192 (111)
	2003	3,797 (1,306)	2,690 (1,019)	22 (26)	8 (12)	88 (83)	52 (53)	108 (62)	32 (27)	4,015 (1,311)	2,782 (1,021)
	2004	344 (170)	185 (139)	3,060 (958)	1,692 (479)	3,011 (931)	636 (284)	552 (239)	66 (47)	6,967 (1,368)	2,579 (576)
	2005	1,685 (655)	180 (135)	3,807 (1,197)	543 (431)	672 (198)	61 (65)	1,068 (81)	293 (187)	7,232 (1,381)	1,077 (493)
	2006	1,084 (406)	960 (373)	554 (348)	485 (296)	1,161 (511)	528 (208)	245 (182)	149 (46)	3,044 (762)	2,122 (521)
	2007	612 (442)	463 (441)	909 (267)	636 (209)	2,563 (112)	1,402 (97)	1,426 (1,518)	64 (56)	5,510 (1,607)	2,565 (501)
	2008	357 (291)	259 (241)	672 (327)	181 (137)	541 (298)	33 (26)	3,599 (2,154)	253 (142)	5,169 (2,218)	726 (312)
Total	18,981	6,839	14,776	4,354	10,983	2,981	10,278	1,402	55,018	15,576	

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Northern Pike	1998	0	0	0	0	0	0	8 (11)	0	8 (11)	0
	1999	17 (23)	17 (23)	0	0	0	0	0	0	17 (23)	17 (23)
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	130 (0)	130 (0)	0	0	36 (55)	36 (55)	22 (13)	11 (6)	194 (57)	183 (56)
	2003	309 (181)	74 (46)	24 (29)	0	0	0	0	0	333 (184)	74 (46)
	2004	91 (238)	23 (24)	211 (135)	147 (78)	236 (147)	109 (104)	17 (14)	0	556 (310)	279 (132)
	2005	0	0	0	0	8 (11)	0	0	0	8 (11)	0
	2006	13 (18)	0	0	0	0	0	0	0	13 (18)	0
	2007	59 (42)	22 (29)	44 (26)	9 (11)	0	0	0	0	103 (49)	30 (31)
	2008	43 (48)	7 (7)	40 (39)	20 (29)	17 (18)	0	38 (32)	0	138 (72)	27 (29)
	Total	662	273	319	176	297	145	85	11	1,363	605

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Yellow Perch	1998	49 (38)	49 (38)	744 (474)	675 (414)	1,074 (1,204)	1,074 (1,204)	2,101 (1,285)	1,211 (606)	3,968 (1,824)	3,008 (1,415)
	1999	718 (571)	549 (429)	185 (97)	165 (79)	208 (97)	172 (92)	1,185 (896)	655 (475)	2,296 (1,071)	1,541 (651)
	2000	22 (24)	22 (24)	98 (78)	21 (30)	381 (365)	381 (365)	220 (69)	174 (69)	722 (380)	599 (373)
	2001	0	0	42 (56)	42 (56)	2,926 (125)	2,021 (95)	3,276 (1,736)	1,410 (682)	6,244 (1,737)	3,473 (691)
	2002	0	0	1,968 (1,257)	983 (570)	5,978 (3,279)	1,059 (665)	13,035 (6,222)	7,157 (4,172)	20,981 (7,144)	9,199 (4,263)
	2003	13,425 (4,692)	6,416 (3,042)	5,895 (6,491)	3,424 (4,519)	4,399 (2,516)	3,255 (2,219)	2,791 (1,632)	2,200 (1,157)	26,510 (8,552)	15,295 (5,995)
	2004	415 (183)	215 (145)	1,348 (354)	1,208 (360)	5,689 (3,771)	3,529 (2,095)	1,318 (1,324)	941 (1,051)	8,770 (4,017)	5,893 (2,376)
	2005	132 (103)	95 (68)	0	0	769 (455)	769 (455)	3,339 (946)	2,865 (742)	4,240 (1,055)	3,729 (874)
	2006	13 (18)	13 (18)	62 (35)	34 (30)	99 (47)	74 (39)	375 (72)	294 (0)	549 (95)	415 (80)
	2007	0	0	137 (106)	137 (106)	352 (42)	288 (29)	6,233 (2,364)	2,207 (928)	6,722 (2,367)	2,632 (934)
	2008	0	0	253 (140)	121 (53)	259 (157)	101 (85)	9,766 (4,681)	3,150 (1,019)	10,278 (4,686)	3,372 (1,024)
	Total	14,774	7,359	10,732	6,810	22,134	12,723	43,639	22,264	91,279	49,156

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Black Crappie	1998	0	0	0	0	0	0	0	0	0	0
	1999	441 (370)	0	0	0	0	0	0	0	441 (370)	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	12 (12)	0	76 (44)	65 (38)	88 (46)	65 (38)
	2003	163 (139)	152 9134)	61 (60)	61 (60)	82 (101)	82 (101)	14 (21)	14 (21)	320 (183)	309 (179)
	2004	634 (827)	273 (275)	6,125 (612)	5,567 (649)	866 (823)	821 (851)	116 (74)	36 (36)	7,741 (1,320)	6,697 (1,106)
	2005	467 (256)	321 (226)	1,930 (1,098)	1,710 (1,015)	218 (212)	183 (209)	955 (421)	767 (364)	3,570 (1,222)	2,981 (1,121)
	2006	4,143 (5,376)	2,867 (3,396)	377 (328)	329 (245)	62 (40)	62 (40)	0	0	4,582 (5,386)	3,258 (3,405)
	2007	623 (377)	593 (380)	111 (46)	111 (46)	0	0	2,583 (1,422)	668 (340)	3,317 (1,471)	1,372 (512)
	2008	2,508 (2,960)	1,212 (1,497)	2,284 (2,059)	829 (751)	50 (53)	0	358 (73)	120 (80)	5,200 (3,607)	2,161 (1,677)
	Total	8,979	5,418	10,888	8,607	1,290	1,148	4,102	1,670	25,259	16,843

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Bluegill	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	36 (42)	36 (42)	61 (37)	0	97 (56)	36 (42)
	2003	0	0	46 (34)	22 (19)	134 (185)	0	0	0	180 (188)	22 (19)
	2004	0	0	119 (55)	73 (53)	38 (59)	26 (40)	0	0	157 (81)	99 (66)
	2005	16 (18)	0	0	0	0	0	162 (74)	105 (55)	178 (76)	105 (55)
	2006	0	0	0	0	0	0	0	0	0	0
	2007	0	0	0	0	0	0	55 (--)	55 (--)	55 (--)	55 (--)
	2008	0	0	0	0	0	0	31 (39)	31 (39)	31 (39)	31 (39)
	Total	16	0	165	95	208	62	309	191	698	348

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Black Bullhead	1998	634 (814)	172 (247)	953 (1,258)	85 (55)	438 (155)	53 (44)	495 (316)	43 (31)	2,520 (1,539)	353 (258)
	1999	736 (593)	714 (593)	458 (347)	215 (150)	110 (107)	89 (98)	240 (219)	0	1,544 (729)	1,018 (619)
	2000	1,520 (1,256)	353 (313)	571 (216)	153 (180)	211 (178)	37 (54)	497 (170)	61 (75)	2,799 (1,298)	604 (373)
	2001	172 (135)	0	0	0	0	0	0	0	172 (135)	0
	2002	100 (71)	100 (71)	1,058 (590)	196 (123)	3,112 (211)	71 (100)	546 (227)	100 (87)	4,816 (671)	467 (194)
	2003	1,991 (720)	319 (340)	2,420 (1,253)	273 (234)	389 (194)	79 (94)	1,175 (717)	352 (489)	5,975 (1,625)	1,023 (647)
	2004	609 (421)	384 (369)	1,760 (967)	681 (712)	1,108 (514)	126 (107)	30 (22)	0	3,507 (1,174)	1,191 (809)
	2005	103 (60)	0	4 (7)	0	336 (207)	0	381 (184)	0	824 (283)	0
	2006	26 (20)	0	112 (103)	68 (97)	247 (31)	12 (16)	0	0	385 (109)	80 (98)
	2007	72 (76)	40 (63)	69 (57)	43 (57)	0	0	27 (40)	27 (40)	168 (103)	110 (94)
	2008	7 (7)	0	20 (29)	20 (29)	98 (75)	0	0	0	125 (81)	20 (29)
	Total		5,970	2,082	7,425	1,734	6,049	467	3,391	583	22,835

Appendix 3. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Other	1998	0	0	5 (7)	5 (7)	0	0	0	0	5 (7)	5 (7)
	1999	28 (27)	0	0	0	0	0	0	0	28 (27)	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	11 (14)	0	16 (18)	0	22 (15)	11 (6)	49 (31)	11 (6)
	2003	140 (77)	34 (48)	141 (107)	0	275 (380)	0	9 (11)	0	565 (518)	34 (48)
	2004	25 (18)	0	38 (25)	0	0	0	8 (9)	0	71 (32)	0
	2005	173 (236)	0	16 (23)	0	0	0	6 (7)	0	195 (237)	0
	2006	60 (49)	0	16 (25)	0	12 (16)	0	0	0	88 (57)	0
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	30 (42)	0	0	0	0	0	30 (42)	0
	Total		426	34	257	5	303	0	45	11	1,031

Appendix 4. Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch, black crappie, bluegill, black bullhead and other species (white sucker and common carp) by month and year during the summer fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Walleye	1998	0.33 (0.23)	0.08 (0.09)	0.40 (0.16)	0.04 (0.02)	0.28 (0.11)	0.03 (0.01)	0.28 (0.18)	0.03 (0.03)	0.33 (0.10)	0.05 (0.03)
	1999	0.65 (0.46)	0.04 (0.06)	0.87 (0.32)	0.04 (0.02)	0.26 (0.29)	0.03 (0.03)	0.44 (0.30)	0.02 (0.02)	0.60 (0.20)	0.03 (0.02)
	2000	0.69 (0.25)	0.15 (0.07)	0.19 (0.13)	0.08 (0.08)	0.34 (0.31)	0.03 (0.03)	0.24 (0.22)	0.11 (0.07)	0.47 (0.14)	0.11 (0.04)
	2001	0.01 (0.01)	0	0.10 (0.12)	0.03 (0.04)	0.04 (0.008)	0	0.005 (0.009)	0.005 (0.009)	0.04 (0.03)	0.01 (0.01)
	2002	0	0	0.03 (0.05)	0.03 (0.05)	0.02 (0.02)	0	0.08 (0.08)	0.02 (0.02)	0.04 (0.03)	0.01 (0.01)
	2003	0.22 (0.14)	0.16 (0.11)	0.003 (0.002)	0.0009 (0.001)	0.03 (0.02)	0.02 (0.008)	0.04 (0.03)	0.01 (0.01)	0.13 (0.06)	0.09 (0.05)
	2004	0.07 (0.06)	0.04 (0.04)	0.20 (0.09)	0.11 (0.05)	0.24 (0.10)	0.05 (0.03)	0.12 (0.06)	0.01 (0.01)	0.19 (0.05)	0.07 (0.02)
	2005	0.24 (0.16)	0.03 (0.02)	0.41 (0.22)	0.06 (0.06)	0.11 (0.03)	0.01 (0.01)	0.17 (0.09)	0.05 (0.04)	0.25 (0.08)	0.04 (0.02)
	2006	0.11 (0.05)	0.10 (0.05)	0.09 (0.07)	0.08 (0.06)	0.27 (0.15)	0.12 (0.06)	0.16 (0.13)	0.10 (0.04)	0.14 (0.05)	0.10 (0.03)
	2007	0.19 (0.23)	0.14 (0.21)	0.25 (0.12)	0.17 (0.09)	0.68 (0.32)	0.37 (0.19)	0.54 (0.78)	0.02 (0.02)	0.41 (0.18)	0.19 (0.07)
	2008	0.06 (0.04)	0.04 (0.03)	0.12 (0.10)	0.03 (0.02)	0.18 (0.21)	0.01 (0.01)	1.07 (0.71)	0.08 (0.04)	0.28 (0.14)	0.04 (0.01)
	Mean	0.23	0.07	0.24	0.06	0.22	0.06	0.29	0.04	0.26	0.07

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Northern Pike	1998	0	0	0	0	0	0	0.002 (0.003)	0	0.0004 (0.0006)	0
	1999	0.004 (0.006)	0.004 (0.006)	0	0	0	0	0	0	0.001 (0.002)	0.001 (0.002)
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0.07 (0.03)	0.07 (0.03)	0.002 (0.002)	0.002 (0.002)	0.009 (0.01)	0.009 (0.01)	0.004 (0.003)	0.002 (0.002)	0.01 (0.004)	0.01 (0.004)
	2003	0.02 (0.02)	0.004 (0.005)	0.002 (0.003)	0	0	0	0	0	0.01 (0.01)	0.002 (0.002)
	2004	0.02 (0.06)	0.005 (0.005)	0.01 (--)	0.01 (--)	0.02 (0.01)	0.009 (0.01)	0.004 (0.002)	0	0.02 (0.008)	0.008 (0.002)
	2005	0	0	0	0	0.001 (0.002)	0	0	0	0.0003 (0.0004)	0
	2006	0.001 (0.002)	0	0	0	0	0	0	0	0.0006 (0.0008)	0
	2007	0.02 (0.02)	0.007 (0.009)	0.01 (0.01)	0.002 (0.003)	0	0	0	0	0.008 (0.004)	0.002 (0.002)
	2008	0.007 (0.009)	0.001 (0.001)	0.007 (0.007)	0.004 (0.005)	0.006 (0.006)	0	0.01 (0.01)	0	0.008 (0.004)	0.002 (0.002)
	Mean	0.01	0.008	0.003	0.002	0.003	0.002	0.002	0.0002	0.005	0.002

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Yellow Perch	1998	0.007 (0.007)	0.007 (0.007)	0.19 (0.14)	0.17 (0.11)	0.30 (0.37)	0.30 (0.37)	0.52 (0.36)	0.30 (0.19)	0.22 (0.11)	0.17 (0.07)
	1999	0.19 (0.14)	0.14 (0.11)	0.05 (0.03)	0.05 (0.02)	0.09 (0.03)	0.08 (0.03)	0.44 (0.34)	0.24 (0.18)	0.19 (0.09)	0.13 (0.05)
	2000	0.002 (0.003)	0.002 (0.003)	0.03 (0.05)	0.006 (0.008)	0.11 (0.11)	0.11 (0.11)	0.10 (0.08)	0.08 (0.08)	0.04 (0.03)	0.03 (0.02)
	2001	0	0	0.01 (0.02)	0.01 (0.02)	0.91 (0.21)	0.63 (0.14)	1.04 (1.14)	0.45 (0.29)	0.54 (0.25)	0.30 (0.08)
	2002	0	0	0.52 (0.36)	0.26 (0.17)	1.50 (0.95)	0.26 (0.17)	2.63 (2.24)	1.44 (1.42)	1.43 (0.68)	0.63 (0.38)
	2003	0.77 (0.46)	0.37 (0.25)	0.66 (0.81)	0.38 (0.55)	1.43 (1.67)	1.06 (1.37)	0.99 (0.73)	0.78 (0.54)	0.83 (0.37)	0.48 (0.24)
	2004	0.08 (0.04)	0.04 (0.03)	0.09 (0.03)	0.08 (0.02)	0.46 (0.32)	0.29 (0.18)	0.29 (0.31)	0.21 (0.25)	0.24 (0.11)	0.16 (0.07)
	2005	0.02 (0.02)	0.01 (0.01)	0	0	0.13 (0.08)	0.13 (0.08)	0.52 (0.28)	0.45 (0.23)	0.15 (0.05)	0.13 (0.04)
	2006	0.001 (0.002)	0.001 (0.002)	0.01 (0.007)	0.005 (0.006)	0.02 (0.01)	0.02 (0.01)	0.24 (0.02)	0.19 (0.06)	0.03 (0.006)	0.02 (0.004)
	2007	0	0	0.04 (0.05)	0.04 (0.05)	0.09 (0.07)	0.08 (--)	2.37 (1.81)	0.84 (0.54)	0.51 (0.24)	0.20 (0.08)
	2008	0	0	0.04 (0.03)	0.02 (0.01)	0.09 (0.13)	0.03 (0.05)	2.91 (2.76)	0.94 (0.68)	0.55 (0.34)	0.18 (0.09)
Mean		0.10	0.05	0.15	0.09	0.47	0.27	1.10	0.54	0.43	0.22

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Black Crappie	1998	0	0	0	0	0	0	0	0	0	0
	1999	0.11 (0.10)	0	0	0	0	0	0	0	0.04 (0.03)	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0.003 (0.003)	0	0.02 (0.01)	0.01 (0.009)	0.006 (0.003)	0.004 (0.003)
	2003	0.009 (0.009)	0.009 (0.008)	0.007 (0.006)	0.007 (0.006)	0.03 (0.03)	0.03 (0.03)	0.005 (0.007)	0.005 (0.007)	0.01 (0.006)	0.01 (0.006)
	2004	0.13 (0.28)	0.05 (0.10)	0.41 (0.09)	0.37 (0.08)	0.07 (0.09)	0.07 (0.09)	0.03 (0.03)	0.008 (0.01)	0.21 (0.07)	0.18 (0.05)
	2005	0.07 (--)	0.05 (--)	0.21 (0.08)	0.18 (0.07)	0.04 (--)	0.03 (0.007)	0.15 (0.14)	0.12 (0.09)	0.12 (0.04)	0.10 (0.03)
	2006	0.43 (0.57)	0.30 (0.36)	0.06 (0.08)	0.05 (0.06)	0.01 (0.01)	0.01 (0.01)	0	0	0.21 (0.25)	0.15 (0.16)
	2007	0.19 (0.22)	0.18 (0.22)	0.03 (0.03)	0.03 (0.03)	0	0	0.98 (1.23)	0.25 (0.41)	0.25 (0.17)	0.10 (0.07)
	2008	0.39 (--)	0.19 (--)	0.40 (0.45)	0.14 (0.17)	0.02 (0.02)	0	0.11 (0.07)	0.04 (0.02)	0.28 (0.02)	0.12 (0.04)
	Mean	0.12	0.07	0.10	0.07	0.02	0.01	0.12	0.04	0.10	0.06

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Bluegill	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0.009 (0.008)	0.009 (0.008)	0.01 (0.009)	0	0.007 (0.004)	0.002 (0.003)
	2003	0	0	0.005 (0.004)	0.003 (0.002)	0.04 (0.06)	0	0	0	0.006 (0.006)	0.0007 (0.0006)
	2004	0	0	0.008 (0.006)	0.005 (0.003)	0.003 (0.005)	0.002 (0.003)	0	0	0.004 (0.002)	0.003 (0.002)
	2005	0.002 (0.003)	0	0	0	0	0	0.03 (0.01)	0.02 (0.005)	0.006 (0.003)	0.004 (0.002)
	2006	0	0	0	0	0	0	0	0	0	0
	2007	0	0	0	0	0	0	0.02 (--)	0.02 (--)	0.004 (--)	0.004 (--)
	2008	0	0	0	0	0	0	0.009 (0.01)	0.009 (0.01)	0.002 (0.002)	0.002 (0.002)
	Mean	0.0002	0	0.001	0.0007	0.005	0.001	0.006	0.005	0.003	0.001

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Black Bullhead	1998	0.09 (0.21)	0.03 (0.06)	0.24 (0.26)	0.02 (0.02)	0.12 (0.09)	0.01 (0.01)	0.12 (0.08)	0.01 (0.008)	0.14 (0.11)	0.02 (0.02)
	1999	0.19 (0.18)	0.19 (0.18)	0.13 (0.16)	0.06 (0.08)	0.05 (0.09)	0.04 (0.09)	0.09 (0.09)	0	0.13 (0.08)	0.08 (0.06)
	2000	0.17 (--)	0.04 (--)	0.15 (--)	0.04 (--)	0.06 (0.02)	0.01 (0.009)	0.22 (0.28)	0.03 (0.03)	0.15 (--)	0.03 (--)
	2001	0.09 (0.07)	0.02 (0.03)	0	0	0	0	0	0	0.02 (0.01)	0.003 (0.006)
	2002	0.05 (0.04)	0.05 (0.04)	0.28 (0.18)	0.05 (0.04)	0.78 (0.48)	0.02 (0.03)	0.11 (0.09)	0.02 (0.02)	0.33 (0.11)	0.03 (0.02)
	2003	0.11 (0.07)	0.02 (0.02)	0.27 (--)	0.03 (0.03)	0.13 (0.06)	0.03 (0.02)	0.42 (0.42)	0.13 (0.19)	0.19 (0.06)	0.03 (0.02)
	2004	0.12 (0.11)	0.08 (0.09)	0.12 (0.08)	0.05 (0.05)	0.09 (0.03)	0.01 (0.01)	0.007 (0.007)	0	0.10 (0.03)	0.03 (0.02)
	2005	0.01 (0.01)	0	0.0005 (0.0007)	0	0.06 (0.03)	0	0.06 (0.07)	0	0.03 (0.01)	0
	2006	0.003 (0.003)	0	0.02 (0.02)	0.01 (0.02)	0.06 (0.01)	0.003 (0.004)	0	0	0.02 (0.007)	0.004 (0.005)
	2007	0.02 (0.02)	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	0	0	0.01 (0.02)	0.01 (0.02)	0.01 (0.008)	0.008 (0.007)
	2008	0.001 (0.001)	0	0.004 (0.005)	0.004 (0.005)	0.03 (0.03)	0	0	0	0.007 (0.005)	0.001 (0.002)
	Mean	0.08	0.04	0.11	0.02	0.13	0.01	0.09	0.02	0.10	0.02

Appendix 4. Continued

<i>Species</i>	<i>Year</i>	<i>May</i>		<i>June</i>		<i>July</i>		<i>August</i>		<i>Total</i>	
		<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>	<u>C/h</u>	<u>H/h</u>
Other	1998	0	0	0.001 (0.001)	0.001 (0.001)	0	0	0	0	0.0003 (0.0004)	0.0003 (0.0004)
	1999	0.007 (0.007)	0	0	0	0	0	0	0	0.002 (0.002)	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0.003 (0.004)	0	0.004 (0.005)	0	0.004 (0.003)	0.002 (0.002)	0.003 (0.002)	0.0007 (0.0004)
	2003	0.008 (0.007)	0.002 (0.002)	0.02 (0.01)	0	0.09 (0.13)	0	0.003 (0.004)	0	0.02 (0.02)	0.001 (0.002)
	2004	0.005 (0.004)	0	0.003 (0.002)	0	0	0	0.002 (0.002)	0	0.002 (0.001)	0
	2005	0.03 (0.03)	0	0.002 (0.003)	0	0	0	0.0009 (0.001)	0	0.007 (0.008)	0
	2006	0.006 (0.004)	0	0.003 (0.004)	0	0.003 (0.004)	0	0	0	0.004 (0.002)	0
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	0.005 (0.007)	0	0	0	0	0	0.002 (0.002)	0
	Mean	0.005	0.0002	0.003	0.0001	0.009	0	0.0009	0.0002	0.004	0.0001

Appendix 5. Fall angler target species frequency totaled by month and over the fall for parties interviewed by the creel clerk during summer creel surveys on Lake Madison, 2005-2008.

<i>Year</i>	<i>Month</i>	Percent of anglers targeting					<i>Any species</i>
		<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern pike</i>	<i>Bluegill</i>	
2005	September	9	72	5	1	0	13
	October	22	62	3	2	0	11
	Total	16	66	4	1	0	13
2006	September	19	38	20	0	1	22
	October	21	41	3	0	0	35
	Total	19	39	15	0	1	26
2007	September	15	68	1	0	1	15
	October	21	71	0	0	0	8
	Total	17	69	1	0	1	12
2008	September	10	71	0	0	0	19
	October	10	50	2	0	0	38
	Total	10	63	1	0	0	26

Appendix 6. Monthly and total (September and October) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by boat and percent of angling activity that occurred during weekends/holidays on Lake Madison, South Dakota (80% confidence interval).

<i>Year</i>	<i>Month</i>	<i># Int</i>	<i>Angler hours</i>	<i>Angler days</i>	<i>Economic value</i>	<i>Trip length (h)</i>	<i>Party size</i>	<i>% SD residents</i>	<i>% boat anglers</i>	<i>% weekends or holidays</i>
2005	September	116	11,755 (2,552)	2,044	\$124,705	5.75 (2.26)	2.05 (2.01)	78	85	26
	October	131	9,475 (3,020)	1,986	\$121,169	4.77 (2.27)	1.89 (2.23)	85	88	61
	Total	247	21,231 (3,954)	4,044	\$246,684	5.25 (1.60)	1.97 (1.50)	81	86	41
2006	September	102	8,656 (3,179)	1,792	\$109,320	4.83 (0.69)	2.06 (2.29)	91	89	48
	October	38	2,386 (937)	864	\$52,734	2.76 (0.87)	2.20 (0.94)	87	71	36
	Total	140	11,042 (3,314)	2,921	\$178,191	3.78 (0.56)	2.13 (1.22)	90	85	45
2007	September	74	6,504 (2,479)	1,527	\$93,147	4.26 (1.93)	1.83 (2.08)	92	86	44
	October	23	1,690 (625)	451	\$27,511	3.75 (0.03)	1.94 (0.97)	88	84	50
	Total	97	8,194 (2,556)	2,049	\$124,989	4.00 (0.95)	1.89 (1.14)	91	86	45
2008	September	109	7,311 (1,941)	1,542	\$94,062	4.74 (3.72)	2.01 (2.30)	88	86	54
	October	69	3,104 (1,062)	841	\$51,301	3.69 (1.91)	1.70 (1.82)	87	83	11
	Total	178	10,415 (2,212)	2,473	\$150,906	4.21 (2.07)	1.85 (1.46)	88	85	41

Appendix 7. Estimated number of walleye, northern pike, yellow perch and black crappie, bluegill and black bullhead caught and harvested by month and year during the fall fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>September</i>		<i>October</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Walleye	2005	2,088 (1,495)	372 (262)	2,984 (518)	545 (250)	5,072 (1,582)	917 (362)
	2006	197 (135)	148 (119)	210 (269)	90 (115)	407 (301)	238 (166)
	2007	7,387 (3,637)	22 (35)	2,161 (431)	15 (23)	9,549 (3,663)	37 (42)
	2008	1,902 (865)	224 (138)	498 (160)	66 (45)	2,400 (880)	290 (145)
	Total	11,574	766	5,853	716	17,428	1,482
Northern Pike	2005	32 (36)	21 (24)	0	0	32 (36)	21 (24)
	2006	11 (16)	0	0	0	11 (16)	0
	2007	0	0	0	0	0	0
	2008	26 (21)	14 (16)	11 (10)	8 (10)	37 (23)	22 (18)
	Total	69	35	11	8	80	43
Yellow Perch	2005	9,604 (3,097)	7,839 (2,363)	3,396 (1,244)	3,103 (1,230)	13,000 (3,337)	10,942 (2,664)
	2006	1,699 (898)	1,537 (833)	79 (69)	41 (47)	1,779 (900)	1,578 (835)
	2007	15,302 (7,932)	10,039 (4,586)	5,511 (4,297)	3,632 (3,250)	20,813 (9,021)	13,671 (5,621)
	2008	6,192 (1,297)	5,102 (1,198)	3,155 (1,799)	2,758 (1,482)	9,346 (2,217)	7,860 (1,906)
	Total	32,797	24,517	12,141	9,534	44,938	34,172

Appendix 7. Continued

<i>Species</i>	<i>Year</i>	<i>September</i>		<i>October</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Black Crappie	2005	2,216 (689)	1,881 (837)	2,059 (947)	1,844 (848)	4,275 (1,294)	3,725 (1,191)
	2006	3,904 (2,157)	1,869 (963)	0	0	3,904 (2,157)	1,869 (963)
	2007	771 (402)	275 (176)	0	0	771 (402)	275 (176)
	2008	1,290 (628)	1,031 (565)	133 (83)	133 (83)	1,424 (633)	1,164 (571)
	Total	8,181	5,056	2,192	1,977	10,374	7,033
Bluegill	2005	164 (97)	82 (26)	0	0	164 (97)	82 (26)
	2006	141 (76)	118 (80)	0	0	141 (76)	118 (80)
	2007	145 (118)	33 (23)	0	0	145 (118)	33 (23)
	2008	23 (17)	5 (6)	35 (53)	17 (26)	58 (55)	22 (27)
	Total	473	238	35	17	508	255
Black Bullhead	2005	0	0	6 (10)	0	6 (10)	0
	2006	266 (227)	36 (29)	0	0	266 (227)	36 (29)
	2007	62 (86)	42 (21)	0	0	62 (86)	42 (21)
	2008	114 (117)	9 (13)	5 (10)	5 (10)	119 (117)	15 (17)
	Total	442	87	11	5	453	93

Appendix 8. Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch, black crappie, bluegill and black bullhead by month and year during the fall fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>September</i>		<i>October</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Walleye	2005	0.18 (0.16)	0.03 (0.03)	0.31 (0.24)	0.06 (0.04)	0.24 (0.13)	0.04 (0.02)
	2006	0.02 (0.02)	0.02 (0.02)	0.09 (0.12)	0.04 (0.05)	0.04 (0.03)	0.02 (0.02)
	2007	1.14 (0.92)	0.003 (0.009)	1.28 (1.13)	0.009 (0.01)	1.17 (0.77)	0.005 (0.008)
	2008	0.26 (0.22)	0.03 (0.03)	0.16 (0.08)	0.02 (0.01)	0.23 (0.15)	0.03 (0.02)
	Mean	0.40	0.02	0.46	0.03	0.42	0.02
Northern Pike	2005	0.003 (0.003)	0.002 (0.002)	0	0	0.002 (0.002)	0.001 (0.001)
	2006	0.001 (0.002)	0	0	0	0.001 (0.002)	0
	2007	0	0	0	0	0	0
	2008	0.004 (0.003)	0.002 (0.002)	0.004 (0.003)	0.003 (0.003)	0.004 (0.002)	0.002 (0.002)
	Mean	0.002	0.001	0.001	0.0008	0.002	0.0008
Yellow Perch	2005	0.82 (0.41)	0.67 (0.34)	0.36 (0.24)	0.33 (0.22)	0.61 (0.25)	0.52 (0.21)
	2006	0.20 (0.20)	0.18 (0.19)	0.03 (0.06)	0.02 (0.03)	0.16 (0.15)	0.14 (0.14)
	2007	2.35 (1.59)	1.54 (1.28)	3.26 (4.53)	2.15 (3.15)	2.54 (1.56)	1.67 (1.21)
	2008	0.85 (0.47)	0.70 (0.38)	1.02 (1.32)	0.89 (1.13)	0.90 (0.51)	0.75 (0.42)
	Mean	1.06	0.77	1.17	0.85	1.05	0.77

Appendix 8. Continued

<i>Species</i>	<i>Year</i>	<i>September</i>		<i>October</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Black Crappie	2005	0.19 (0.11)	0.16 (0.10)	0.22 (0.24)	0.19 (0.19)	0.20 (0.12)	0.18 (0.10)
	2006	0.45 (0.39)	0.22 (0.20)	0	0	0.35 (0.28)	0.17 (0.14)
	2007	0.12 (0.10)	0.04 (0.05)	0	0	0.09 (0.07)	0.03 (0.03)
	2008	0.18 (0.13)	0.14 (0.11)	0.04 (0.03)	0.04 (0.03)	0.14 (0.09)	0.11 (0.07)
	Mean	0.23	0.14	0.07	0.06	0.20	0.12
Bluegill	2005	0.01 (0.01)	0.007 (0.005)	0	0	0.008 (0.007)	0.004 (0.002)
	2006	0.02 (0.02)	0.01 (0.02)	0	0	0.01 (0.01)	0.01 (0.01)
	2007	0.02 (0.02)	0.005 (0.004)	0	0	0.02 (0.01)	0.004 (0.003)
	2008	0.003 (0.005)	0.0006 (0.0007)	0.01 (0.02)	0.006 (0.009)	0.006 (0.007)	0.002 (0.003)
	Mean	0.01	0.006	0.003	0.002	0.01	0.005
Black Bullhead	2005	0	0	0.0007 (0.001)	0	0.0003 (0.0005)	0
	2006	0.03 (0.05)	0.004 (0.006)	0	0	0.02 (0.04)	0.003 (0.005)
	2007	0.01 (0.01)	0.002 (0.003)	0	0	0.008 (0.01)	0.002 (0.003)
	2008	0.02 (0.02)	0.001 (0.0009)	0.002 (0.0030)	0.002 (0.003)	0.01 (0.01)	0.001 (0.001)
	Mean	0.02	0.002	0.0007	0.0005	0.01	0.002

Appendix 9. Winter angler target species frequency total by month and over the winter for parties interviewed by the creel clerk during winter creel surveys on Lake Madison, 2002-2008.

<i>Year</i>	<i>Month</i>	Percent of anglers targeting					<i>Any species</i>
		<i>Walleye</i>	<i>Yellow perch</i>	<i>Black crappie</i>	<i>Northern pike</i>	<i>Bluegill</i>	
2002-03	December	1	97	0	0	0	2
	January	3	94	0	0	0	3
	February	2	96	0	0	0	2
	March	0	94	0	0	0	6
	Total	2	95	0	0	0	3
2003-04	December	14	80	0	0	0	6
	January	16	79	0	0	0	5
	February	15	70	0	0	0	15
	March	63	37	0	0	0	0
	Total	18	74	0	0	0	8
2004-05	December	29	51	0	0	0	20
	January	57	28	0	1	0	14
	February	46	10	6	4	1	33
	March	81	7	0	4	0	8
	Total	53	25	2	2	1	17
2005-06	December	31	33	3	0	0	33
	January	46	26	4	0	0	24
	February	67	13	4	0	0	16
	March	94	6	0	0	0	0
	Total	54	22	3	0	0	21
2006-07	December	57	29	10	0	0	4
	January	73	7	0	0	0	20
	February	49	14	5	5	0	27
	March	92	0	0	8	0	0
	Total	62	14	5	3	0	16
2007-08	December	29	42	4	0	0	25
	January	55	41	4	0	0	0
	February	35	12	0	0	0	53
	March	100	0	0	0	0	0
	Total	41	33	3	0	0	23

Appendix 10. Monthly and total (December through March) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by shack and percent of angling activity that occurred during weekends/holidays at Lake Madison, South Dakota (80% confidence interval).

<i>Year</i>	<i>Month</i>	<i># Int</i>	<i>Angler hours</i>	<i>Angler days</i>	<i>Economic value</i>	<i>Trip length (h)</i>	<i>Party size</i>	<i>% SD residents</i>	<i>% shack anglers</i>	<i>% weekends or holidays</i>
2002	December	128	11,103 (5,033)	2,825	\$172,337	3.93 (1.93)	2.10 (1.69)	92	58	49
2003	January	143	9,759 (3,936)	3,485	\$212,607	2.80 (1.50)	1.70 (1.67)	92	85	49
2003	February	90	4,250 (1,607)	1,060	\$64,651	4.01 (--)	1.92 (1.11)	92	63	65
2003	March	65	3,667 (1,986)	1,567	\$95,593	2.34 (--)	2.41 (2.14)	95	47	48
	Total	426	28,759 (6,880)	8,959	\$546,511	3.21 (0.58)	2.02 (0.82)	92	66	51
2003	December	49	2,333 (986)	851	\$51,939	2.74 (0.20)	1.77 (1.64)	90	71	39
2004	January	19	1,085 (537)	259	\$15,796	4.19 (--)	1.70 (0.20)	95	69	47
2004	February	27	924 (390)	268	\$16,348	3.45 (--)	1.73 (1.08)	100	43	85
2004	March	8	271 (143)	182	\$11,095	1.49 (--)	2.11 (--)	100	15	64
	Total	103	4,614 (1,197)	1,703	\$103,858	2.71 (0.06)	1.83 (0.49)	94	62	52
2004	December	35	1,299 (678)	616	\$37,554	2.11 (0.58)	1.98 (1.01)	97	89	32
2005	January	186	10,013 (4,867)	3,159	\$192,699	3.17 (1.55)	1.68 (1.63)	99	85	61
2005	February	80	2,490 (1,105)	630	\$38,453	3.95 (--)	1.55 (1.72)	95	63	48
2005	March	27	1,121 (778)	303	\$18,481	3.70 (--)	1.54 (0.56)	100	45	32
	Total	328	14,923 (5,097)	4,693	\$286,259	3.18 (0.45)	1.69 (0.65)	98	79	60
2005	December	39	1,965 (950)	809	\$49,327	2.43 (1.73)	1.89 (1.14)	87	79	38
2006	January	54	3,641 (1,265)	708	\$43,210	5.14 (2.83)	2.00 (1.65)	100	83	79
2006	February	45	2,090 (1,005)	606	\$35,954	3.45 (1.35)	1.34 (0.54)	96	87	20
2006	March	17	612 (527)	262	\$15,954	2.34 (--)	1.49 (--)	100	14	38
	Total	155	8,307 (1,947)	2,778	\$169,473	2.99 (0.77)	1.69 (0.53)	95	78	57
2006	December	21	710 (256)	161	\$9,843	4.40 (0.22)	1.62 (0.56)	95	86	56
2007	January	15	579 (360)	298	\$18,206	1.94 (--)	1.43 (0.49)	100	65	34
2007	February	37	1,111 (737)	289	\$17,603	3.85 (--)	1.74 (0.75)	97	91	75
2007	March	13	410 (201)	114	\$6,947	3.60 (0.14)	1.65 (0.19)	100	0	79
	Total	86	2,810 (882)	817	\$49,828	3.44 (0.07)	1.61 (0.26)	98	74	62
2007	December	24	921 (289)	495	\$30,205	1.86 (--)	2.19 (0.67)	92	85	47
2008	January	22	607 (258)	87	\$5,312	6.97 (--)	1.40 (0.76)	100	80	50
2008	February	17	409 (256)	86	\$5,219	4.78 (--)	1.62 (0)	100	85	82
2008	March	1	24 (31)			--	4.00 (--)	100	100	100
	Total	64	1,962 (465)	433	\$26,420	4.53 (--)	1.98 (0.31)	97	84	56

Appendix 11. Estimated number of walleye, northern pike, yellow perch and black crappie caught and harvested by month and year during the winter fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>December</i>		<i>January</i>		<i>February</i>		<i>March</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Walleye	2002-03	136 (219)	0	51 (50)	11 (15)	10 (16)	10 (16)	61 (8)	61 (8)	258 (225)	82 (23)
	2003-04	179 (184)	155 (178)	51 (56)	51 (56)	6 (11)	6 (11)	0	0	236 (193)	211 (187)
	2004-05	35 (39)	4 (5)	1,482 (608)	219 (111)	140 (59)	49 (30)	234 (247)	70 (62)	1,890 (670)	342 (131)
	2005-06	164 (19)	18 (42)	297 (255)	56 (40)	94 (53)	53 (43)	16 (11)	16 (11)	571 (262)	142 (73)
	2006-07	22 (28)	11 (14)	78 (49)	78 (49)	40 (29)	18 (12)	49 (38)	36 (19)	190 (74)	143 (56)
	2007-08	22 (21)	0	26 (40)	0	0	0	0	0	48 (45)	0
	Total	558	188	1,985	415	290	136	360	183	3,193	922
Northern Pike	2002-03	219 (62)	166 (72)	73 (70)	73 (70)	34 (22)	27 (20)	9 (13)	9 (13)	335 (97)	335 (97)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	136 (74)	97 (54)	44 (29)	44 (29)	33 (26)	33 (26)	213 (84)	174 (67)
	2005-06	0	0	6 (9)	6 (9)	0	0	0	0	6 (9)	6 (9)
	2006-07	0	0	0	0	11 (9)	0	0	0	11 (9)	0
	2007-08	0	0	0	0	0	0	0	0	0	0
	Total	219	166	215	176	89	71	42	42	565	515

Appendix 11. Continued

<i>Species</i>	<i>Year</i>	<i>December</i>		<i>January</i>		<i>February</i>		<i>March</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Yellow Perch	2002-03	90,825 (40,347)	23,192 (6,759)	36,016 (27,824)	15,424 (8,932)	17,926 (9,026)	7,868 (3,581)	12,240 (2,630)	6,584 (1,157)	157,007 (49,904)	53,068 (11,815)
	2003-04	1,421 (1,380)	1,274 (1,190)	578 (353)	511 (308)	13 (15)	0	0	0	2,012 (1,425)	1,785 (1,229)
	2004-05	10 (16)	10 (16)	264 (173)	244 (156)	0	0	0	0	274 (174)	254 (157)
	2005-06	20 (19)	20 (19)	38 (34)	38 (34)	7 (8)	7 (8)	0	0	65 (40)	65 (40)
	2006-07	7 (0)	0	0	0	0	0	0	0	7 (0)	0
	2007-08	0	0	13 (19)	0	0	0	0	0	13 (19)	0
	Total	92,283	24,496	36,909	16,217	17,946	7,875	12,240	6,584	159,378	55,172
Black Crappie	2002-03	18 (13)	18 (13)	0	0	0	0	6 (8)	6 (8)	24 (16)	24 (16)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	191 (149)	120 (129)	91 (83)	91 (83)	0	0	282 (171)	211 (154)
	2005-06	54 (127)	54 (127)	53 (40)	47 (35)	176 (188)	166 (187)	0	0	283 (230)	267 (229)
	2006-07	11 (14)	4 (5)	0	0	22 (18)	22 (18)	0	0	33 (23)	26 (19)
	2007-08	0	0	6 (10)	0	0	0	0	0	6 (10)	0
	Total	83	76	250	167	289	279	6	6	628	528

Appendix 12. Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch and black crappie by month and year during the winter fishery at Lake Madison, South Dakota. (80% confidence interval).

<i>Species</i>	<i>Year</i>	<i>December</i>		<i>January</i>		<i>February</i>		<i>March</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Walleye	2002-03	0.01 (0.02)	0	0.005 (0.01)	0.001 (0.002)	0.002 (0.004)	0.002 (0.004)	0.02 (0.01)	0.02 (0.01)	0.009 (0.01)	0.003 (0.001)
	2003-04	0.08 (0.09)	0.07 (0.08)	0.05 (0.06)	0.05 (0.06)	0.0006 (0.01)	0.0006 (0.01)	0	0	0.05 (0.05)	0.05 (0.04)
	2004-05	0.03 (0.04)	0.003 (0.004)	0.15 (0.10)	0.02 (0.02)	0.06 (0.05)	0.02 (0.02)	0.21 (0.82)	0.06 (0.22)	0.13 (0.08)	0.02 (0.02)
	2005-06	0.08 (0.15)	0.009 (0.04)	0.08 (0.11)	0.02 (0.02)	0.05 (0.04)	0.03 (0.03)	0.03 (0.06)	0.03 (0.06)	0.07 (0.06)	0.02 (0.02)
	2006-07	0.03 (0.07)	0.02 (0.04)	0.14 (0.10)	0.14 (0.10)	0.04 (0.03)	0.02 (0.02)	0.12 (0.16)	0.09 (0.10)	0.07 (0.04)	0.05 (0.03)
	2007-08	0.10 (0.09)	0	0.04 (0.07)	0	0	0	0	0	0.02 (0.03)	0
	Mean	0.06	0.02	0.08	0.04	0.03	0.01	0.06	0.03	0.06	0.02
Northern Pike	2002-03	0.02 (0.02)	0.01 (0.02)	0.008 (0.008)	0.008 (0.008)	0.008 (0.008)	0.006 (0.003)	0.003 (0.004)	0.003 (0.004)	0.01 (0.006)	0.01 (0.006)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	0.01 (0.01)	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)	0.07 (--)	0.07 (--)	0.01 (0.009)	0.01 (0.008)
	2005-06	0	0	0.002 (0.003)	0.002 (0.003)	0	0	0	0	0.0007 (0.001)	0.0007 (0.001)
	2006-07	0	0	0	0	0.01 (0.01)	0	0	0	0.004 (0.004)	0
	2007-08	0	0	0	0	0	0	0	0	0	0
	Mean	0.003	0.002	0.003	0.003	0.006	0.004	0.01	0.01	0.004	0.003

Appendix 12. Continued

<i>Species</i>	<i>Year</i>	<i>December</i>		<i>January</i>		<i>February</i>		<i>March</i>		<i>Total</i>	
		<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>	<u>catch</u>	<u>harvest</u>
Yellow Perch	2002-03	8.18 (7.46)	2.09 (1.52)	3.69 (4.42)	1.58 (1.55)	4.22 (3.73)	1.85 (1.52)	3.34 (4.38)	1.80 (2.01)	5.46 (3.12)	1.84 (0.85)
	2003-04	0.61 (0.69)	0.55 (0.61)	0.53 (0.43)	0.47 (0.38)	0.01 (0.02)	0	0	0	0.44 (0.35)	0.39 (0.30)
	2004-05	0.03 (0.10)	0.03 (0.10)	0.03 (0.02)	0.02 (0.02)	0 (0)	0 (0)	0 (0)	0 (0)	0.02 (0.01)	0.02 (0.01)
	2005-06	0.03 (0.04)	0.03 (0.04)	0.01 (0.01)	0.01 (0.01)	0.003 (0.004)	0.003 (0.004)	0	0	0.008 (0.005)	0.008 (0.005)
	2006-07	0.01 (--)	0	0	0	0	0	0	0	0.003 (0.0001)	0
	2007-08	0	0	0.02 (0.03)	0	0	0	0	0	0.007 (0.01)	0
	Mean	1.48	0.45	0.71	0.35	0.71	0.31	0.56	0.30	0.99	0.38
Black Crappie	2002-03	0.002 (0.001)	0.002 (0.001)	0	0	0	0	0.002 (0.002)	0.002 (0.002)	0.0008 (0.0006)	0.0008 (0.0006)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	0.02 (0.06)	0.01 (0.05)	0.04 (0.07)	0.04 (0.07)	0	0	0.02 (0.04)	0.01 (0.04)
	2005-06	0.03 (0.07)	0.03 (0.07)	0.01 (0.01)	0.01 (0.01)	0.003 (0.004)	0.003 (0.004)	0	0	0.03 (0.03)	0.03 (0.02)
	2006-07	0.02 (0.02)	0.005 (0.007)	0	0	0.02 (0.01)	0.02 (0.01)	0	0	0.01 (0.008)	0.009 (0.006)
	2007-08	0	0	0.01 (0.01)	0	0	0	0	0	0.003 (0.004)	0
	Mean	0.009	0.006	0.007	0.003	0.01	0.01	0	0	0.01	0.008

Appendix 13. Questions asked during interviews to obtain angler opinions on regulations and trip satisfaction.

Question 1. Response of Lake Madison, South Dakota angling parties interviewed during the summer 1999 creel survey to the question: “Are you in favor of removing the 14-inch minimum size limit on walleyes on lakes Brant, Madison and Herman?” (n is the number of responses)

Response	<i>Percent (%)</i> <i>(n = 152)</i>
Yes	57
No	22
Undecided	21

Question 2. Response of Lake Madison, South Dakota angling parties interviewed during the summer 1999 creel survey to the question: “Given the numbers and size of fish caught, how satisfied are you with your fishing trip today?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i> <i>(n = 185)</i>
Satisfied	64
Somewhat satisfied	5
Neutral	5
Somewhat dissatisfied	1
Dissatisfied	2
No opinion	23

Question 3. Response of Lake Madison, South Dakota angling parties interviewed during the summer 2002 creel survey to the question: “How satisfied are you with your fishing trip today considering all factors?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i> <i>(n = 139)</i>
Very satisfied	14
Satisfied	48
Neutral	21
Dissatisfied	12
Very dissatisfied	4
Not answered	1

Question 4. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2002-03 creel survey to the question: “How many yellow perch would it take for you to consider it a good fishing day?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i> <i>(n = 426)</i>
1-5	10
6-10	32
11-15	23
16-20	11
21-25	16
More than 25	1
No answer	7

Question 5. Response of Lake Madison, South Dakota angling parties interviewed during the summer 2003 creel survey to the question: “How satisfied are you with your fishing trip today?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i> <i>(n = 276)</i>
Satisfied	61
Somewhat satisfied	15
Neutral	11
Somewhat dissatisfied	7
Dissatisfied	5
No opinion	1

Question 6. Response of Lake Madison, South Dakota angling parties interviewed during the summer 2003 creel survey to the question: “In your opinion, would you say that the current South Dakota fishing regulations are...” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i> <i>(n = 285)</i>
Very easy to understand	52
Somewhat easy to understand	20
Somewhat difficult to understand	14
Very difficult to understand	11
No opinion	3

Question 7. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2003-04 and summer 2004 creel surveys to the question: “On a typical fishing trip, would you rather catch and keep four 13-inch; three 14-inch or 1 17-inch walleye?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i>	
	<i>Winter 2003-04</i> <i>(n = 103)</i>	<i>Summer 2004</i> <i>(n = 469)</i>
Four 13-inch walleyes	28	13
Three 14-inch walleyes	56	68
One 17-inch walleye	16	19

Question 8. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2003-04, summer 2004 and winter 2004-05 creel surveys to the question: “Why did you choose this lake over other lakes?” (n is the number of responses)

<i>Response</i>	<i>Percent (%)</i>		
	<i>Winter 2003-04</i> <i>(n = 103)</i>	<i>Summer 2004</i> <i>(n = 469)</i>	<i>Winter 2004-05</i> <i>(n = 328)</i>
Closeness to home	41	34	47
Heard targeted fish were biting	9	25	22
Chance to catch bigger fish	3	1	0
Chance to catch a lot of fish	23	3	1
Familiarity with the lake	3	13	14
Other	21	24	16

Question 9. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2004-05 creel survey to the question: “How many walleyes over 20 inches were released?”

<i>Number released</i>	<i>Number</i>	<i>Percent (%)</i>
0	328	100
1	0	0
2	0	0

Question 10. Response of Lake Madison, South Dakota angling parties interviewed during the summer 2005 creel survey to four questions concerning potential regulation changes (n is the number of responses)

<i>Question</i>	<i>n</i>	<i>Percent (%)</i>		
		<i>Favor</i>	<i>Neutral</i>	<i>Oppose</i>
What is your opinion on making the one walleye over 20 inches restriction statewide regulation?	141	69	13	18
What is your opinion on reducing the statewide daily walleye limit from four to three?	141	18	11	71
What is your opinion on reducing the daily panfish limit from 25 to 10?	129	34	21	45
What is your opinion on reducing the statewide daily northern pike limit from six to three?	129	31	40	29

Question 11. Response of Lake Madison, South Dakota angling parties interviewed during the fall 2005 creel survey to four questions concerning potential regulation changes (n is the number of responses)

<i>Question</i>	<i>n</i>	<i>Percent (%)</i>		
		<i>Favor</i>	<i>Neutral</i>	<i>Oppose</i>
What is your opinion on making the one walleye over 20 inches restriction statewide regulation?	141	69	18	13
What is your opinion on reducing the statewide daily walleye limit from four to three?	141	23	16	61
What is your opinion on reducing the daily panfish limit from 25 to 10?	129	37	17	46
What is your opinion on reducing the statewide daily northern pike limit from six to three?	129	26	47	27

Question 12. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2005-06 creel survey to three questions concerning potential regulation changes (n is the number of responses)

<i>Question</i>	<i>n</i>	<i>Percent (%)</i>		
		<i>Favor</i>	<i>Neutral</i>	<i>Oppose</i>
What is your opinion on reducing the statewide daily walleye limit from four to three?	47	17	23	60
What is your opinion on reducing the daily panfish limit from 25 to 10?	106	33	30	37
What is your opinion on reducing the statewide daily northern pike limit from six to three?	106	26	42	34

Question 13. Response of Lake Madison, South Dakota angling parties interviewed during the winter 2007-08, summer 2008 and fall 2008 creel surveys to the question, "What would you consider to be the best daily limit for panfish (perch, crappies and bluegills)." The number of responses is in parentheses.

<i>Response</i>	<i>Percent (%)</i>		
	<i>Winter 2007-08</i> <i>(n =64)</i>	<i>Summer 2008</i> <i>(n =142)</i>	<i>Fall 2008</i> <i>(n =177)</i>
5	0	2	0
10	47	31	11
15	19	14	23
20	3	5	10
25	25	35	51
25+	0	4	0
No Opinion	6	9	5

Appendix 14. Yearly fishing pressure (h and h/ha) and catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008. Creel data for the Brant, Herman, Madison and Sinai fisheries were rerun using a corrected version of the CAS program, and therefore, values for catch and harvest rates will be lower than those reported in Lucchesi (2009).

Lake	County	Season	Year	Surface			Walleye			Yellow perch			Northern pike		
				area (ha)	Fishing pressure (h)	(h/ha)	Catch rate	Harvest rate	per ha	Catch rate	Harvest rate	per ha	Catch rate	Harvest rate	per ha
Bitter	Day	Summer	2000	4,010	48,062	12.0	1.2	0.32	3.84	0.01	0.01	0.12	0.44	0.09	1.08
Bitter	Day	Summer	2001	4,010	42,775	10.7	1.1	0.27	2.88	0.01	0.01	0.11	0.38	0.05	0.53
Bitter	Day	Summer	2002	4,010	56,655	14.1	0.94	0.25	3.53	0.01	0.01	0.14	0.36	0.05	0.71
Bitter	Day	Summer	2003	4,010	50,510	12.6	0.95	0.23	2.90	0.01	0.01	0.13	0.22	0.04	0.50
Bitter	Day	Summer	2004	4,010	41,665	10.4	0.79	0.31	3.22	0.01	0.01	0.10	0.24	0.05	0.52
Bitter	Day	Summer	2005	4,010	65,927	16.4	0.58	0.27	4.44	0.001	0.001	0.02	0.07	0.02	0.33
Bitter	Day	Summer	2006	4,010	31,115	7.8	0.32	0.2	1.55	0.001	0.001	0.01	0.15	0.06	0.47
Bitter	Day	Summer	2007	4,010	33,369	8.3	0.94	0.19	1.58	0.001	0.001	0.01	0.03	0.01	0.08
Bitter	Day	Summer	2008	4,010	52,469	13.1	0.66	0.4	5.23	0.001	0.001	0.01	0.03	0.01	0.13
Brant	Lake	Summer	1998	420	14,257	33.9	0.48	0.03	1.02	0.02	0.02	0.68	0.05	0.01	0.34
Brant	Lake	Summer	1999	420	13,634	32.5	0.56	0.06	1.95	0.05	0.02	0.65	0.03	0.008	0.26
Brant	Lake	Summer	2000	420	17,966	42.8	0.42	0.13	5.56	0.14	0.12	5.13	0.004	0.001	0.04
Brant	Lake	Summer	2001	420	29,843	71.1	0.20	0.11	7.82	0.01	0.004	0.28	0.0004	0.002	0.14
Brant	Lake	Summer	2002	420	44,346	105.6	0.24	0.07	7.39	0.59	0.46	48.57	0.02	0.003	0.32
Brant	Lake	Summer	2003	420	28,220	67.2	0.79	0.10	6.72	0.34	0.25	16.80	0.004	0.002	0.13
Brant	Lake	Summer	2004	420	30,658	73.0	0.22	0.12	8.76	0.08	0.08	5.84	0.003	0.001	0.07
Brant	Lake	Summer	2005	420	31,760	75.6	0.15	0.12	9.07	0.06	0.05	3.78	0.001	0	0
Brant	Lake	Summer	2006	420	22,053	52.5	0.27	0.07	3.68	0.05	0.02	1.05	0.009	0.003	0.16
Brant	Lake	Summer	2007	420	14,857	35.4	0.18	0.12	4.24	0.03	0.03	1.06	0.008	0.004	0.14
Brant	Lake	Summer	2008	420	30,627	72.9	0.31	0.09	6.56	0.01	0.01	0.73	0.02	0.002	0.15
Enemy Swim	Day	Summer	1997	870	16,518	19.0	0.99	0.06	1.14	0.44	0.02	0.38	0.26	0.03	0.57
Enemy Swim	Day	Summer	1998	870	21,232	24.4	0.36	0.11	2.68	0.19	0.06	1.46	0.07	0.01	0.24
Enemy Swim	Day	Summer	1999	870	53,004	60.9	0.41	0.1	6.09	0.29	0.09	5.48	0.05	0.01	0.61
Enemy Swim	Day	Summer	2000	870	56,553	65.0	0.17	0.05	3.25	0.22	0.07	4.55	0.03	0.01	0.65
Enemy Swim	Day	Summer	2001	870	36,350	41.8	0.13	0.04	1.67	0.2	0.01	0.42	0.03	0.01	0.42
Enemy Swim	Day	Summer	2002	870	41,369	47.6	0.37	0.09	4.28	0.13	0.04	1.90	0.03	0.01	0.48
Enemy Swim	Day	Summer	2003	870	45,705	52.5	0.22	0.06	3.15	0.16	0.02	1.05	0.03	0	0.00
Enemy Swim	Day	Summer	2004	870	38,274	44.0	0.14	0.02	0.88	0.1	0.02	0.88	0.02	0.001	0.04
Enemy Swim	Day	Summer	2005	870	38,253	44.0	0.17	0.09	3.96	0.09	0.01	0.44	0.01	0.001	0.04
Enemy Swim	Day	Summer	2006	870	26,757	30.8	0.17	0.06	1.85	0.18	0.007	0.22	0.02	0.004	0.12
Enemy Swim	Day	Summer	2007	870	20,993	24.1	0.05	0.04	0.97	0.05	0.001	0.02	0.01	0.001	0.02
Enemy Swim	Day	Summer	2008	870	16,518	19.0	0.99	0.06	1.14	0.44	0.02	0.38	0.26	0.03	0.57
Herman	Lake	Summer	1998	521	17,128	32.9	0.48	0.03	0.99	0.05	0.03	0.99	0.01	0.01	0.33
Herman	Lake	Summer	1999	521	5,038	9.7	0.57	0.03	0.29	0.08	0.05	0.48	0	0	0
Herman	Lake	Summer	2000	521	11,483	22.0	0.16	0.07	1.54	0.08	0.07	1.54	0.002	0	0

Appendix 14 Continued.

<i>Lake</i>	<i>County</i>	<i>Season</i>	<i>Year</i>	<i>Surface</i>			<i>Walleye</i>			<i>Yellow perch</i>			<i>Northern pike</i>		
				<i>area (ha)</i>	<i>Fishing pressure (h)</i>	<i>(h/ha)</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>
Herman	Lake	Summer	2001	521	14,265	27.38	0.12	0.05	1.37	0.01	0.006	0.16	0.007	0.001	0.03
Herman	Lake	Summer	2002	521	11,837	22.72	0.18	0.08	1.82	0.06	0.04	0.91	0.01	0.001	0.01
Herman	Lake	Summer	2003	521	11,189	21.48	0.32	0.23	4.94	0.02	0.02	0.43	0.02	0.007	0.15
Herman	Lake	Summer	2004	521	8,259	15.85	0.29	0.09	1.43	0.10	0.10	1.59	0.01	0.003	0.05
Herman	Lake	Summer	2005	521	6,074	11.66	0.29	0.02	0.23	0.006	0.006	0.07	0.002	0	0
Herman	Lake	Summer	2006	521	5,114	9.82	0.09	0.04	0.39	0.008	0.008	0.08	0.004	0	0
Herman	Lake	Summer	2007	521	4,229	8.12	0.34	0.14	1.14	0.08	0.07	0.57	0.05	0.01	0.08
Herman	Lake	Summer	2008	521	9,009	17.29	0.28	0.16	2.77	0.009	0.002	0.03	0.03	0.002	0.03
Madison	Lake	Summer	1998	1,070	18,374	17.2	0.33	0.05	0.86	0.22	0.17	2.92	0.001	0	0
Madison	Lake	Summer	1999	1,070	12,141	11.3	0.60	0.03	0.34	0.19	0.13	1.48	0.001	0.001	0.01
Madison	Lake	Summer	2000	1,070	18,660	17.4	0.47	0.11	1.92	0.04	0.03	.052	0	0	0
Madison	Lake	Summer	2001	1,070	11,477	10.7	0.04	0.01	0.11	0.54	0.30	3.22	0	0	0
Madison	Lake	Summer	2002	1,070	14,632	13.7	0.04	0.01	0.14	1.43	0.63	8.62	0.01	0.01	0.14
Madison	Lake	Summer	2003	1,070	32,116	30.0	0.13	0.09	2.70	0.83	0.48	14.41	0.01	0.002	0.06
Madison	Lake	Summer	2004	1,070	36,903	34.5	0.19	0.07	2.41	0.24	0.16	5.52	0.02	0.008	0.28
Madison	Lake	Summer	2005	1,070	28,694	26.8	0.25	0.04	1.07	0.15	0.13	3.49	0.0003	0	0
Madison	Lake	Summer	2006	1,070	21,792	20.4	0.14	0.10	2.04	0.03	0.02	0.41	0.0006	0	0
Madison	Lake	Summer	2007	1,070	13,231	12.4	0.41	0.19	2.35	0.51	0.2	2.47	0.008	0.002	0.02
Madison	Lake	Summer	2008	1,070	18,521	17.3	0.28	0.04	0.69	0.55	0.18	3.12	0.008	0.002	0.03
Pickerel	Day	Summer	1997	377	11,733	31.1	0.5	0.05	1.56	0.15	0.12	3.73	0.49	0.13	4.05
Pickerel	Day	Summer	1998	377	17,076	45.3	0.34	0.15	6.79	0.12	0.01	0.45	0.36	0.08	3.62
Pickerel	Day	Summer	2000	377	22,461	59.6	0.73	0.14	8.34	0.14	0.05	2.98	0.27	0.02	1.19
Pickerel	Day	Summer	2001	377	10,315	27.4	0.15	0.03	0.82	0.18	0.07	1.92	0.09	0.003	0.08
Pickerel	Day	Summer	2006	377	31,409	83.3	0.23	0.08	6.67	0.21	0.06	5.00	0.05	0.01	0.83
Pickerel	Day	Summer	2007	377	31,713	84.1	0.24	0.11	9.25	0.16	0.02	1.68	0.08	0.02	1.68
Pickerel	Day	Summer	2008	377	24,285	64.4	0.28	0.04	2.58	0.04	0.003	0.19	0.11	0.01	0.64
Poinsett	Hamlin	Summer	1997	3,200	62,987	19.7	0.68	0.14	2.76	0.06	0.04	0.79	0.08	0.02	0.39
Poinsett	Hamlin	Summer	1998	3,200	69,844	21.8	0.67	0.08	1.75	0.03	0.03	0.65	0.07	0.01	0.22
Poinsett	Hamlin	Summer	1999	3,200	47,733	14.9	0.46	0.12	1.79	0.02	0.005	0.07	0.05	0.006	0.09
Poinsett	Hamlin	Summer	2000	3,200	98,907	30.9	0.49	0.25	7.73	0.07	0.05	1.55	0.02	0.001	0.02
Poinsett	Hamlin	Summer	2001	3,200	47,583	14.9	0.15	0.04	0.59	0.01	0.005	0.07	0.04	0.01	0.15
Poinsett	Hamlin	Summer	2002	3,200	48,398	15.1	0.2	0.08	1.21	0.02	0.01	0.15	0.15	0.02	0.30
Poinsett	Hamlin	Summer	2003	3,200	56,888	17.8	0.17	0.1	1.78	0.01	0.004	0.07	0.09	0.02	0.36
Poinsett	Hamlin	Summer	2004	3,200	29,951	9.4	0.09	0.06	0.56	0.004	0.002	0.02	0.06	0.01	0.09
Sinai	Brookings	Summer	2005	696	20,541	29.5	0.24	0.05	1.48	0.52	0.42	12.40	0.004	0.001	0.02
Sinai	Brookings	Summer	2006	696	20,947	30.1	0.74	0.09	2.71	0.40	0.28	8.43	0.0009	0	0
Sinai	Brookings	Summer	2007	696	18,031	25.9	0.46	0.15	3.89	0.06	0.04	1.04	0.004	0.002	0.05

Appendix 14 Continued.

Lake	County	Season	Year	Surface			Walleye			Yellow perch			Northern pike		
				area (ha)	Fishing pressure (h)	(h/ha)	Catch rate	Harvest rate	per ha	Catch rate	Harvest rate	per ha	Catch rate	Harvest rate	per ha
Sinai	Brookings	Summer	2008	696	20,090	28.9	0.50	0.15	4.33	0.26	0.07	2.02	0.001	0.001	0.009
Thompson	Kingsbury	Summer	1997	6,576	178,061	27.1	1.01	0.31	8.39	0.06	0.05	1.35	0.23	0.04	1.08
Thompson	Kingsbury	Summer	1998	6,576	162,913	24.8	0.91	0.32	7.93	0.07	0.06	1.49	0.14	0.02	0.50
Thompson	Kingsbury	Summer	1999	6,576	182,813	27.8	0.75	0.37	10.29	0.06	0.05	1.39	0.1	0.03	0.83
Thompson	Kingsbury	Summer	2000	6,576	130,175	19.8	0.73	0.26	5.15	0.15	0.11	2.18	0.1	0.01	0.20
Thompson	Kingsbury	Summer	2001	6,576	124,233	18.9	0.44	0.13	2.46	0.03	0.02	0.38	0.05	0.01	0.19
Thompson	Kingsbury	Summer	2002	5,731	117,502	20.5	0.65	0.26	5.33	0.11	0.06	1.23	0.06	0.01	0.21
Thompson	Kingsbury	Summer	2003	4,886	135,476	27.7	0.62	0.26	7.21	0.04	0.03	0.83	0.08	0.01	0.28
Thompson	Kingsbury	Summer	2004	4,886	114,142	23.4	0.56	0.23	5.37	0.008	0.006	0.14	0.07	0.01	0.23
Thompson	Kingsbury	Summer	2005	4,886	79,613	16.3	0.28	0.17	2.77	0.03	0.03	0.49	0.02	0.007	0.11
Thompson	Kingsbury	Summer	2006	4,886	71,517	14.6	0.62	0.24	3.51	0.009	0.006	0.09	0.007	0.001	0.01
Thompson	Kingsbury	Summer	2007	4,886	78,520	16.1	0.43	0.25	4.02	0.01	0.008	0.13	0.01	0.003	0.05
Thompson	Kingsbury	Summer	2008	4,559	69,634	15.3	0.87	0.28	4.28	0.004	0.003	0.05	0.01	0.001	0.02
Waubay	Day	Summer	1997	6,289	26,959	4.3	0.31	0.14	0.60	0	0	0.00	0.44	0.12	0.51
Waubay	Day	Summer	1998	6,289	117,764	18.7	0.52	0.35	6.55	0.44	0.17	3.18	0.24	0.04	0.75
Waubay	Day	Summer	1999	6,289	260,228	41.4	0.48	0.31	12.83	1.25	0.28	11.59	0.29	0.05	2.07
Waubay	Day	Summer	2000	6,289	174,526	27.8	0.43	0.11	3.05	0.86	0.39	10.82	0.22	0.04	1.11
Waubay	Day	Summer	2001	6,289	111,723	17.8	0.62	0.07	1.24	0.69	0.43	7.64	0.1	0.03	0.53
Waubay	Day	Summer	2002	6,289	139,769	22.2	1.22	0.06	1.33	0.34	0.25	5.56	0.05	0.01	0.22
Waubay	Day	Summer	2003	6,289	143,826	22.9	2.18	0.05	1.14	0.13	0.1	2.29	0.02	0.01	0.23
Waubay	Day	Summer	2004	6,289	121,922	19.4	2.3	0.38	7.37	0.07	0.06	1.16	0.01	0.01	0.19
Waubay	Day	Summer	2005	6,289	70,398	11.2	0.9	0.4	4.48	0.003	0.002	0.02	0.01	0.008	0.09
Waubay	Day	Summer	2006	6,289	65,029	10.3	0.84	0.24	2.48	0.01	0.01	0.10	0.003	0.002	0.02
Waubay	Day	Summer	2007	6,289	28,047	4.5	0.82	0.16	0.71	0.04	0.003	0.01	0.007	0.001	0.00
Waubay	Day	Summer	2008	6,289	45,909	7.3	0.8	0.2	1.46	0.002	0.001	0.01	0.003	0.001	0.00
Madison	Lake	Fall	2005	1,070	21,231	19.8	0.24	0.04	0.79	0.61	0.52	10.32	0.002	0.001	0.02
Madison	Lake	Fall	2006	1,070	11,041	10.3	0.04	0.02	0.21	0.16	0.14	1.44	0.001	0	0
Madison	Lake	Fall	2007	1,070	8,194	7.7	1.17	0.005	0.04	2.54	1.67	12.8	0	0	0
Madison	Lake	Fall	2008	1,070	10,402	9.7	0.23	0.02	0.19	0.90	0.76	7.39	0.004	0.002	0.02
Bitter	Day	Winter	1999-00	4,010	14,719	3.7	0.43	0.11	0.40	0.39	0.33	1.21	0.58	0.27	0.99
Bitter	Day	Winter	2000-01	4,010	2,355	0.6	0.12	0.02	0.01	0.07	0.03	0.02	0.35	0.26	0.15
Bitter	Day	Winter	2001-02	4,010	26,684	6.7	0.34	0.1	0.67	0.17	0.15	1.00	0.19	0.08	0.53
Bitter	Day	Winter	2002-03	4,010	23,241	5.8	0.34	0.1	0.58	0.15	0.08	0.46	0.26	0.14	0.81
Bitter	Day	Winter	2003-04	4,010	31,386	7.8	0.46	0.17	1.33	0.19	0.17	1.33	0.18	0.12	0.94
Bitter	Day	Winter	2004-05	4,010	25,146	6.3	0.21	0.11	0.69	0.1	0.09	0.56	0.06	0.05	0.31

Appendix 14 Continued.

Lake	County	Season	Year	Surface			Walleye			Yellow perch			Northern pike		
				area (ha)	Fishing pressure (h)	(h/ha)	Catch rate	rate	per ha	Catch rate	rate	per ha	Catch rate	rate	per ha
Bitter	Day	Winter	2005-06	4,010	14,238	3.6	0.07	0.03	0.11	0.19	0.17	0.60	0.19	0.19	0.67
Bitter	Day	Winter	2006-07	4,010	8,932	2.2	0.04	0.01	0.02	0.23	0.18	0.40	0.09	0.09	0.20
Bitter	Day	Winter	2007-08	4,010	12,212	3.0	0.11	0.07	0.21	0.06	0.05	0.15	0.03	0.03	0.09
Brant	Lake	Winter	2002-03	420	8,098	19.3	0.48	0.07	1.35	0.05	0.05	0.96	0.005	0	0
Brant	Lake	Winter	2003-04	420	7,651	18.2	0.14	0.07	1.28	0	0	0	0.004	0.004	0.07
Brant	Lake	Winter	2004-05	420	1,561	3.7	0	0	0	0	0	0	0.003	0.003	0.01
Brant	Lake	Winter	2005-06	420	1,606	3.8	0	0	0	0.006	0.006	0.02	0	0	0
Brant	Lake	Winter	2006-07	420	6,642	15.8	0.36	0.07	1.10	0.003	0.001	0.02	0.001	0	0
Brant	Lake	Winter	2007-08	420	4,799	11.4	0.09	0.03	0.34	0.01	0.01	0.11	0.002	0	0
Enemy Swim	Day	Winter	1997-98	870	5,251	6.0	0.22	0.07	0.42	0.5	0.15	0.91	0.05	0.04	0.24
Enemy Swim	Day	Winter	2000-01	870	18,904	21.7	0.2	0.06	1.30	0.9	0.32	6.95	0.04	0.02	0.43
Enemy Swim	Day	Winter	2001-02	870	9,519	10.9	0.09	0.05	0.55	0.66	0.3	3.28	0.05	0.01	0.11
Enemy Swim	Day	Winter	2002-03	870	13,453	15.5	0.15	0.05	0.77	0.36	0.16	2.47	0.11	0.05	0.77
Enemy Swim	Day	Winter	2003-04	870	21,974	25.3	0.17	0.06	1.52	0.19	0.05	1.26	0.13	0.06	1.52
Enemy Swim	Day	Winter	2004-05	870	25,361	29.2	0.04	0.01	0.29	0.11	0.03	0.87	0.07	0.06	1.75
Enemy Swim	Day	Winter	2005-06	870	8,737	10.0	0.08	0.05	0.50	0.21	0.01	0.10	0.08	0.06	0.60
Enemy Swim	Day	Winter	2006-07	870	12,035	13.8	0.05	0.03	0.42	0.73	0.03	0.42	0.03	0.03	0.42
Enemy Swim	Day	Winter	2007-08	870	8,792	10.1	0.08	0.006	0.06	0.18	0.008	0.08	0.02	0.01	0.10
Madison	Lake	Winter	2002-03	1,070	28,759	26.9	0.009	0.003	0.81	5.46	1.84	49.50	0.01	0.01	0.27
Madison	Lake	Winter	2003-04	1,070	4,614	4.3	0.05	0.05	0.22	0.44	0.39	1.68	0	0	0
Madison	Lake	Winter	2004-05	1,070	14,923	13.9	0.13	0.02	0.28	0.02	0.02	0.28	0.01	0.01	0.14
Madison	Lake	Winter	2005-06	1,070	8,307	7.8	0.07	0.02	0.16	0.008	0.008	0.062	0.001	0.001	0.005
Madison	Lake	Winter	2006-07	1,070	2,810	2.6	0.07	0.05	0.13	0.003	0	0	0.004	0	0
Madison	Lake	Winter	2007-08	1,070	1,962	1.8	0.02	0	0	0.007	0	0	0	0	0
Pickerel	Day	Winter	1997-98	377	2,610	6.9	0.39	0.1	0.69	0.19	0.12	0.83	0.07	0.04	0.28
Pickerel	Day	Winter	2000-01	377	1,400	3.7	0.71	0.02	0.07	0.18	0.15	0.56	0.16	0.02	0.07
Pickerel	Day	Winter	2005-06	377	22,137	58.7	0.02	0.01	0.59	0.86	0.37	21.73	0.01	0.001	0.06
Pickerel	Day	Winter	2006-07	377	12,024	31.9	0.05	0.03	0.96	0.62	0.27	8.61	0.02	0.004	0.13
Pickerel	Day	Winter	2007-08	377	12,472	33.1	0.01	0.02	0.66	0.71	0.36	11.91	0.02	0.01	0.33
Poinsett	Hamlin	Winter	1997-98	3,200	24,747	7.7	1.22	0.11	0.85	0.2	0.19	1.47	0.02	0.008	0.06
Poinsett	Hamlin	Winter	1998-99	3,200	28,664	9.0	0.71	0.12	1.07	0.48	0.43	3.85	0.08	0.04	0.36
Poinsett	Hamlin	Winter	1999-00	3,200	40,218	12.6	0.26	0.15	1.89	0.16	0.15	1.89	0.01	0.007	0.09
Poinsett	Hamlin	Winter	2000-01	3,200	18,802	5.9	0.33	0.07	0.41	0.05	0.04	0.24	0.02	0.01	0.06
Poinsett	Hamlin	Winter	2001-02	3,200	12,192	3.8	0.14	0.06	0.23	0.22	0.18	0.69	0.02	0.01	0.04
Thompson	Kingsbury	Winter	1997-98	6,576	44,477	6.8	0.35	0.12	0.81	0.04	0.02	0.14	0.11	0.11	0.74
Thompson	Kingsbury	Winter	1998-99	6,576	20,801	3.2	0.21	0.07	0.22	0.03	0.01	0.03	0.23	0.18	0.57
Thompson	Kingsbury	Winter	1999-00	6,576	15,066	2.3	0.27	0.09	0.21	0.05	0.02	0.05	0.06	0.03	0.07

Appendix 14 Continued.

<i>Lake</i>	<i>County</i>	<i>Season</i>	<i>Year</i>	<i>Surface</i>			<i>Walleye</i>			<i>Yellow perch</i>			<i>Northern pike</i>		
				<i>area (ha)</i>	<i>Fishing pressure (h)</i>	<i>(h/ha)</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>	<i>Catch rate</i>	<i>rate</i>	<i>per ha</i>
Thompson	Kingsbury	Winter	2000-01	4,010	14,238	3.6	0.07	0.03	0.11	0.19	0.17	0.60	0.19	0.19	0.67
Thompson	Kingsbury	Winter	2001-02	4,010	8,932	2.2	0.04	0.01	0.02	0.23	0.18	0.40	0.09	0.09	0.20
Thompson	Kingsbury	Winter	2002-03	4,010	12,212	3.0	0.11	0.07	0.21	0.06	0.05	0.15	0.03	0.03	0.09
Thompson	Kingsbury	Winter	2003-04	4,010	17,690	2.7	0.38	0.12	0.32	0.06	0.04	0.11	0.04	0.03	0.08
Thompson	Kingsbury	Winter	2004-05	4,010	12,011	1.8	0.13	0.04	0.07	0.005	0.002	0.00	0.07	0.07	0.13
Thompson	Kingsbury	Winter	2005-06	4,010	29,021	5.1	0.28	0.12	0.61	0.03	0.02	0.10	0.03	0.02	0.10
Thompson	Kingsbury	Winter	2006-07	4,010	27,401	5.6	0.25	0.09	0.50	0.04	0.02	0.11	0.01	0.01	0.06
Thompson	Kingsbury	Winter	2007-08	4,010	28,202	5.8	0.09	0.07	0.40	0.03	0.02	0.12	0.06	0.05	0.29
Waubay	Day	Winter	1996-97	6,289	5,890	0.9	0.02	0.01	0.01	0	0	0.00	0.33	0.33	0.31
Waubay	Day	Winter	1997-98	6,289	19,935	3.2	0.17	0.11	0.35	0.42	0.39	1.24	0.17	0.15	0.48
Waubay	Day	Winter	1998-99	6,289	91,058	14.5	0.09	0.06	0.87	2.44	0.94	13.61	0.11	0.07	1.01
Waubay	Day	Winter	1999-00	6,289	82,172	13.1	0.12	0.04	0.52	2.43	1.47	19.21	0.26	0.15	1.96
Waubay	Day	Winter	2000-01	6,289	81,169	12.9	0.33	0.01	0.13	1.35	1.06	13.68	0.2	0.12	1.55
Waubay	Day	Winter	2001-02	6,289	115,486	18.4	0.42	0.02	0.37	1.76	1.28	23.50	0.06	0.05	0.92
Waubay	Day	Winter	2002-03	6,289	158,167	25.1	0.32	0.02	0.50	1.86	1.36	34.20	0.04	0.02	0.50
Waubay	Day	Winter	2003-04	6,289	245,088	39.0	0.7	0.2	7.79	1.18	0.91	35.46	0.01	0.01	0.39
Waubay	Day	Winter	2004-05	6,289	184,594	29.4	0.17	0.05	1.47	0.47	0.41	12.03	0.003	0.002	0.06
Waubay	Day	Winter	2005-06	6,289	144,061	22.9	0.25	0.05	1.15	0.6	0.52	11.91	0.002	0.002	0.05
Waubay	Day	Winter	2006-07	6,289	88,321	14.0	0.27	0.02	0.28	0.54	0.43	6.04	0.002	0.001	0.01
Waubay	Day	Winter	2007-08	6,289	49,731	7.9	0.29	0.03	0.24	0.48	0.39	3.08	0.0009	0.001	0.00