

**Waubay Lake, South Dakota
Summer and Winter Angler Use and Harvest Surveys
December 2006 – August 2013**

by

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Preface

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Executive Summary

- Waubay Lake experienced variable angling pressure during the summer (May-August) and winter (December-March) survey periods from December 2006 through August 2013. Summer angling pressure steadily increased until 2010. Pressure decreased after 2010 but was higher than that observed in 2007. Winter pressure fluctuated, decreasing from 2006-2007 to 2007-2008 and remaining low until the winter of 2012-2013 when angling pressure increased. Pressure did not correspond to Yellow Perch catch and harvest rates and was likely impacted by snow conditions or other factors.
- Nonresident anglers comprised a moderate proportion of total anglers surveyed during both summer and winter surveys. Most summer anglers were fishing from boats and the proportion of winter anglers fishing from shacks was variable.
- Walleye was the most targeted species during the summer surveys. Angler preferred to target Yellow Perch during winter periods, though Walleye were moderately targeted.
- Walleye and White Bass were the largest component of angler catch during the summer surveys. Smallmouth Bass became a substantial part of the summer angler catch after 2009. Angler harvest was dominated by Walleye and White Bass. Northern Pike and Yellow Perch were periodic components of summer angler catch and harvest. Winter angler catch and harvest was dominated by Yellow Perch and Walleye were a small to moderate component.
- Summer angler satisfaction was variable and did not closely corresponded to catch and harvest rates of Walleye. Winter angler satisfaction was related to catch and harvest rates for Yellow Perch. However, the winter of 2012-2013 had the lowest angler satisfaction despite high catch rates for Yellow Perch and Walleye.
- During the summer of 2012 most anglers indicated they were satisfied with the size, number and species of fish caught.
- Anglers indicated a diversity of factors as being important when considering a fishing trip as successful. Both summer and winter anglers cited 'catching fish' most frequently.
- Both summer and winter anglers indicated strong support for the special panfish regulation in place in northeast South Dakota. Few anglers were opposed to the regulation.
- During the summer of 2012 anglers indicated moderate support for expanding Northern Pike spearing through the ice statewide.

Table of Contents

Preface.....	ii
Executive summary.....	iii
Table of Contents.....	iv
List of Tables.....	v
List of Figures.....	vii
Study Site.....	1
Methods.....	1
Results and Discussion.....	2
Angler Target Species.....	2
Fishing Pressure.....	2
Angler Demographics.....	3
Angler Catch and Harvest.....	3
Northern Pike.....	3
Smallmouth Bass.....	3
Walleye.....	4
White Bass.....	4
Yellow Perch.....	5
Other species.....	5
Angler Opinions.....	5
Angler Satisfaction.....	5
Angling Trip Success.....	6
Northeast South Dakota Panfish Regulation.....	6
Northern Pike Spearing.....	6
References.....	36

List of Tables

- Table 1. Angler primary target species (percentage) by month and overall for anglers fishing Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. ANY=anything, NOP= Northern Pike, SMB= Smallmouth Bass, WAE=Walleye, WHB=White Bass, YEP=Yellow Perch..... 7
- Table 2. Angler primary target species (percentage) by month and overall for anglers fishing Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. ANY=anything, NOP=Northern Pike, WAE=Walleye, YEP=Yellow Perch..... 9
- Table 3. Angler demographics by month and overall including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated..... 11
- Table 4. Overall angler demographics including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated..... 13
- Table 5. State residence (percentage) of anglers fishing Waubay Lake, South Dakota during the summers of 2007-2013..... 15
- Table 6. State residence (percentage) of anglers fishing Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013..... 16
- Table 7. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), White Bass (WHB) and Yellow Perch (YEP) at Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated..... 17
- Table 8. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Walleye (WAE) and Yellow Perch (YEP) at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated..... 20

Table 9. Estimated monthly and overall catch and harvest of Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), White Bass (WHB), Yellow Perch (YEP) and total at Waubay Lake, South Dakota during summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated..... 22

Table 10. Estimated monthly and overall catch and harvest Walleye (WAE), Yellow Perch (YEP) and total at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated..... 25

Table 11. Waubay Lake, South Dakota angler responses (percentage of total) during the summers of 2007-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the summers of 2007 and 2008 (*) moderately satisfied and moderately dissatisfied were not options for angler response..... 27

Table 12. Waubay Lake, South Dakota angler responses (percentage of total) during the winters of 2006-2007, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the winter of 2006-2007 (*) moderately satisfied and moderately dissatisfied were not options for angler response..... 27

Table 13. Waubay Lake, South Dakota angler responses during the summer of 2012 to the question: “Considering size, number and species of fish caught, how satisfied are you with your fishing trip today?” N is the number of responses..... 28

Table 14. Waubay Lake, South Dakota angler response (percentage of total) during the summers of 2007, 2008, 2010, 2011 and 2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses..... 28

Table 15. Waubay Lake, South Dakota angler response (percentage of total) during the winters of 2006-2007, 2010-2011, 2011-2012 and 2012-2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses..... 28

Table 16. Waubay Lake, South Dakota angler response (percentage of total) during the summer of 2009 and winter of 2009-2010 to the question: “Are you in favor of the reduced panfish limits in northeast South Dakota?” N is the number of responses..... 29

Table 17. Waubay Lake, South Dakota angler response (percentage of total) during the summer of 2012 to the question: “Would you be in favor or against allowing for northern pike spearing through the ice statewide?” N is the number of responses..... 29

List of Figures

- Figure 1. Length frequency histogram of Smallmouth Bass harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Smallmouth Bass..... 30
- Figure 2. Length frequency histogram of Walleye harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Walleye. A low proportion of Walleye larger than 62 cm in total length were harvested during the summers of (*) 2007, 2008, 2009, 2010 and 2013 and were not included in the figure..... 31
- Figure 3. Length frequency histogram of Walleyes harvested by anglers fishing Waubay Lake during the winters between 2006-2007 and 2012-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested Walleyes..... 32
- Figure 4. Length frequency histogram of White Bass harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested White Bass..... 33
- Figure 5. Length frequency histogram of Yellow Perch harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Yellow Perch..... 34
- Figure 6. Length frequency histogram of Yellow Perch harvested by anglers fishing Waubay Lake during the winters between 2006-2007 and 2012-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Yellow Perch..... 35

**Waubay Lake, South Dakota
Angler Use and Harvest Survey
December 2006 – August 2013**

Waubay Lake has become one of the most important sport fisheries in northeast South Dakota despite being a relatively new fishery. Historically, Waubay Lake was four separate lakes that were shallow and provided intermittent angling opportunities for Black Bullhead, Northern Pike and Yellow Perch. Increased precipitation since the mid-1990's joined the four lakes into one which has sufficient depth to maintain a sport fishery. South Dakota Game, Fish and Parks began stocking fish in earnest in 1995 and most recently Walleye have been stocked when deemed necessary to maintain the fishery. Walleye and Yellow Perch are the primary species sought by anglers.

The Walleye daily limit was changed in 2010 from two fish with a minimum length restriction of 356 mm (14 inches) and only one over 508 mm (20 inches) to four fish and only one may be over 508 mm (20 inches). The panfish daily limit was changed from 10 to the statewide limit of 15 in 2011. A protected slot limit was established in 2008 for black bass (Smallmouth Bass and Largemouth Bass) from 305 to 457 mm (12-18 inches) with a three fish limit, only one of which may be over 457 mm (18 inches). The regulation was changed in 2009 to conform to the Black Bass Toolbox options (Blackwell and Lucchesi 2009) which allows the harvest of five bass with none between 356 to 457 mm (14-18 inches) and only one may be over 457 mm (18 inches).

Waubay Lake was last surveyed for angler use and harvest information during the summers of 2005 and 2006 and winters of 2004-2005 and 2005-2006. Information concerning angler use and harvest is important in the ongoing fisheries management of Waubay Lake. This report summarizes summer and winter angler use and harvest surveys that were completed from December 2006 through August 2013.

Study Site

Waubay Lake is a large meandered lake (approximately 6,294 hectares; 15,540 acres) located in Day County 3.2 km (2 miles) northeast of Webster, South Dakota. The maximum depth of the lake basin is 9.4 meters (31 feet). Much of the shoreline at Waubay Lake is private and limits public access. Public access is available at two state boat ramps (one each on the north and southwest shore), three private boat ramps and access areas, and several public roads running into or along the lake shore. The Waubay National Wildlife Refuge (WNWF) covers a large area on the east side of the lake. Angler access within the WNWF is limited to ice fishing which includes a restriction prohibiting motorized vehicles on the ice within the refuge boundary. Anglers fishing within the WNWF can be on the ice beginning one hour before sunrise and must be off the ice one hour after sunset.

Methods

A roving angler use and harvest survey with two-stage stratification was completed during the summers (May – August) of 2007, 2008, 2009, 2010, 2011 and 2013, and the winters (December –

March) of 2006-2007, 2007-2008, 2008-2009, 2009-2010 and 2010-2011. The first stratification unit was between weekdays and weekend days. The second stratification unit was for the time periods that the clerk was present. Because weekends typically receive increased fishing pressure most weekend days are represented in the survey. Time periods were randomly assigned to available days with weekdays and weekend/holiday days being treated separately when time periods were assigned.

The survey utilized instantaneous angler counts combined with angler interviews. Instantaneous angler counts provided fishing pressure estimates and angler interviews provided information necessary for estimating fish species catch rates, mean angler trip length, and mean party size. Two instantaneous counts of the total number of boats/shacks and all shoreline/open anglers present were made each surveyed day. When counts were not being made, anglers were contacted and interviewed. Angler use and harvest estimates were calculated using Creel Application Software (CAS; Soupir and Brown 2002).

Additional questions asked during interviews were used to obtain angler primary residence, fish species targeted, and angler opinions. Total length (TL; mm) measurements from angler caught fish were recorded during the interview process.

The potential economic value of the Waubay Lake fishery was estimated by multiplying a daily expenditure of \$50 (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce, Bureau of Census 2011) by the estimated number of angler days.

Results and Discussion

Angler Target Species

The proportion of anglers indicating no preference for a target species during the summer ranged from 2% (2011) to 11% (2012; Table 1). Of those anglers that indicated a preference their primary target species was Walleye. The proportion of anglers targeting Walleye exceeded 83% for all summers surveyed (Table 1). Northern Pike, Smallmouth Bass, White Bass and Yellow Perch were targeted by few anglers during the summer (Table 1).

A low proportion of anglers interviewed during the winter indicated no preference for target species; the percent of anglers indicating no preference ranged from 5% (2011-2012) to 14% (2009-2010 and 2010-2011; Table 2). Of those anglers that indicated a preference, Yellow Perch was their primary target species with proportions ranging from 43% (2009-2010) to 76% of anglers (2006-2007 and 2007-2008; Table 2). Walleye were moderately popular during the winter with 10% (2007-2008) to 41% (2009-2010; Table 2) targeting them. Northern Pike were targeted by few anglers during the winter periods (Table 2).

Fishing Pressure

Summer angling pressure ranged from 28,047 (2007) to 153,417 angler hours (2010; Table 3) for each summer period. The substantial increase in angler hours observed from 2009 to 2010 corresponded to a change in the Walleye harvest regulation. The combination of increased pressure, high catch rates and removal of the minimum length limit resulted in a substantial increase in the Walleye harvest rate. Since 2010, angling pressure has declined but still remains higher than was observed during the 2007

and 2008 summer periods. Mean party size ranged from 2.34 (2011) to 2.66 (2013; Table 3) anglers. The mean trip length ranged from 4.13 (2012) to 4.93 hours (2011; Table 3). Most angler hours occurred from boats with proportions ranging from 81% (2007) to 95% (2012; Table 3) for all surveyed summers.

Angling pressure ranged from 24,765 (2010-2011) to 88,321 angler hours (2006-2007; Table 4) across the winter periods. Angling pressure did not vary with catch or harvest rates for Yellow Perch. Two of the three winter periods (2010-2011 and 2011-2012) with the lowest angling pressure had the highest catch and harvest rates for Yellow Perch. However, increased snowfall during those two winter periods likely limited access. Mean party size ranged from 1.74 (2006-2007 and 2008-2009) to 2.06 anglers (2011-2012; Table 4) and mean trip length ranged from 3.95 (2009-2010) to 5.81 hours (2011-2012; Table 4). Angler hours attributed to anglers fishing from ice shacks ranged from 69% (2009-2010) to 89% (2012-2013; Table 4) and likely varied with winter weather conditions.

Angler Demographics

South Dakota residents comprised a moderate to high proportion of the anglers utilizing Waubay Lake during the summer with overall percentages ranging from 58% (2007 and 2008) to 75% (2011; Table 5). Most nonresident anglers fishing Waubay Lake during the summer were from Iowa, Minnesota, Nebraska and North Dakota (Table 5). The proportion of South Dakota residents fishing Waubay Lake during the winter periods was higher than during the summer with overall proportion ranging from 65% (2012-2013) to 84% (2010-2011; Table 6). Most nonresident anglers fishing during the winter were from Minnesota, Iowa, Nebraska, North Dakota and Wisconsin (Table 6).

Angler Catch and Harvest

Northern Pike

Northern Pike comprised a small proportion of the summer and winter angler catch. The overall catch rates for Northern Pike were ≤ 0.02 (Table 7) per hour for all summer periods. Winter angler catch rates for Northern Pike were lower than those reported during the summer surveys and are not included in this report. Low numbers of Northern Pike harvested precluded length frequency analysis.

Smallmouth Bass

Summer anglers had variable success catching Smallmouth Bass. Overall summer catch rates ranged from 0.05 (2009 and 2010) to 0.20 Smallmouth Bass per hour (2013; Table 7). The estimated number of Smallmouth Bass caught by anglers ranged from 1,618 (2007) to 13,848 (2010; Table 9). Harvest rates were low and the estimated number harvested ranged from 58 (2008) to 1,084 (2013; Table 9). Few Smallmouth Bass were caught by anglers during the winter periods.

Length frequency analysis for Smallmouth Bass harvested during the summer periods is limited due to low numbers of fish measured. No Smallmouth Bass over 457 mm (18 inches) were recorded before 2011 but they were present in the angler harvest each year since 2011 (Figure 1). Smallmouth Bass within the protected slot limit have been harvested each year since the inception of the regulation indicating angler compliance may be an issue. Summer anglers targeted Walleye primarily and it is

likely that some of those anglers may not be aware of the black bass regulation. Smallmouth bass harvest estimates were low thus the potential impact of the observed noncompliance was minimal.

Walleye

Summer anglers had good to excellent success catching Walleye. Overall catch rates ranged from 0.37 (2013) to 1.05 Walleye per hour (2007; Table 7). The estimated number of Walleye caught during the summers ranged from 21,450 (2013) to 83,160 (2010; Table 9). A moderate proportion of Walleye caught were harvested with overall harvest rates ranging from 0.17 (2013) to 0.38 Walleye per hour (2010; Table 7). Harvest rates increased after the regulation change in 2010 despite decreased catch rates (Table 7). The estimated number of Walleye harvested each summer ranged from 5,683 (2007) to 58,429 (2010; Table 9).

Length frequency analysis indicated a slight decrease in the size structure of Walleye harvested from Waubay Lake after 2008. The mean total length of harvested Walleye decreased from 414 mm (16.3 inches) in 2008 to 398 mm (15.7 inches) in 2009 and 383 mm (15.1 inches; Figure 2) in 2010 when the regulation changed. The mean total length of harvested Walleye remained <400 mm (15.7 inches) until 2013 when mean total length increased to 405 mm (15.9 inches; Figure 2). The mean total length of harvested Walleye was higher before the regulation change which was expected with the removal of the 356 mm (14 inch) minimum length restriction.

Winter anglers had fair to good success catching Walleye. Overall catch rates ranged from 0.13 (2009-2010) to 0.42 Walleye per hour (2008-2009; Table 8). The estimated total catch of Walleye each winter ranged 3,756 (2009-2010) to 27,618 (2006-2007; Table 10). Overall harvest rates ranged from 0.03 (2006-2007) to 0.20 Walleye per hour (2011-2012; Table 8). As was observed during the summer surveys, Walleye harvest rates during the winter periods increased after the regulation change in 2010. The estimated number of Walleye harvested during the winters ranged from 1,787 (2007-2008) to 5,903 (2011-2012; Table 10).

Length frequency analysis indicated consistent size structure of Walleye harvested between the winters of 2006-2007 and 2011-2012. The mean total length of Walleye harvested during those winters ranged from 380 mm (15.0 inches, 2009-2010) to 401 mm (15.8 inches, 2008-2009; Figure 3). The size structure of Walleye harvested during the winter did not decrease when the regulation changed in 2010 as it did during the summer surveys. The mean total length increased substantially during the winter of 2012-2013 to 419 mm (16.5 inches; Figure 3).

White Bass

Summer anglers had fair to excellent success catching White Bass. Overall catch rates ranged from 0.17 (2010) to 1.33 White Bass per hour (2013; Table 7). The estimated total catch of White Bass each summer ranged from 13,574 (2007) to 76,746 (2013; Table 9). Harvest rates varied from 0.05 (2010) to 0.39 White Bass per hour (2013; Table 7). The estimated total harvest of White Bass during the summer periods ranged from 3,968 (2012) to 22,564 (2013; Table 9). Few White Bass were caught during the winter periods.

Length frequency analysis indicated the size structure of White Bass harvested during summer periods consisted of two dominant year-classes. The mean total length of harvested White Bass increased from 290 mm (11.4 inches) in 2007 to 389 mm in 2011 (15.3 inches; Figure 4). A new year

class recruited to the angler catch in 2012 decreasing the mean total length to 330 mm (13.0 inches; Figure 4).

Yellow Perch

Summer anglers had poor to fair success catching Yellow Perch. Overall catch rates were ≤ 0.10 (Table 7) for all summers surveyed. The estimated number of Yellow Perch caught each summer ranged from 90 (2008) to 8,130 (2011; Table 9). Harvest rates were moderate when anglers caught Yellow Perch. The estimated total harvest of Yellow Perch ranged from 25 (2007) to 3,890 (2011; Table 9).

Length frequency analysis indicated consistently large size structure of Yellow Perch harvested by anglers during the summer periods. The mean total length ranged from 265 mm (10.4 inches, 2010 and 2013) to 284 mm (11.2 inches, 2008; Figure 5).

Winter anglers had fair to excellent success catching Yellow Perch. Overall catch rates ranged from 0.18 (2009-2010) to 1.36 Yellow Perch per hour (2011-2012; Table 8). The estimated number of Yellow Perch caught during the winters ranged from 8,931 (2009-2010) to 83,534 (2006-2007; Table 10). A high proportion of Yellow Perch caught by anglers were harvested with the overall harvest rates ranging from 0.13 (2009-2010) to 0.95 Yellow Perch per hour (2011-2012; Table 8). The total estimated harvest of Yellow Perch during the winter surveys ranged from 6,534 (2009-2010) to 45,954 (2006-2007; Table 10).

Length frequency analysis indicated that anglers were harvesting large Yellow Perch. The mean total length of harvested Yellow Perch ranged from 256 mm (10.1 inches, 2009-2010 and 2011-2012) to 265 mm (10.4 inches, 2010-2011; Figure 6) for all winter periods.

Other species

Other species reported as being caught in low numbers during the summer and winter angler surveys at Waubay Lake include: Black Crappie, Bluegill, Common Carp, Lake Herring, Largemouth Bass, and Rock Bass.

Angler Opinions

Angler Satisfaction

During the summers of 2007-2013 and the winters of 2006-2007, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 anglers were asked to quantify angling satisfaction considering all factors. The question was changed after the summer of 2008 to include moderately satisfied and moderately dissatisfied. Overall summer angler satisfaction ranged from 55% (2007) to 86% (2011 and 2013; Table 11) of interviewed anglers. Angler dissatisfaction ranged from 7% (2013) to 27% (2012; Table 11) of interviewed anglers. Angler satisfaction appeared to increase slightly following the regulation change in 2010 which included the two summers (2011 and 2013) with the highest angler satisfaction. However, the highest angler dissatisfaction occurred after the regulation change in 2012. Summer angler satisfaction did not appear to correspond to Walleye catch and harvest rates. The summer of 2013 had the highest angler satisfaction and lowest dissatisfaction despite having the lowest catch and harvest rates for Walleye.

Angler satisfaction was lower during the winter periods than summer periods. Overall winter angler satisfaction ranged from 57% (2009-2010 and 2012-2013) to 68% (2011-2012; Table 12) of interviewed anglers. Angler dissatisfaction ranged from 19% (2011-2012) to 30% (2011-2012; Table 12) of interviewed anglers. The two highest Yellow Perch catch and harvest rates coincide with the two winters with the highest angler satisfaction (2010-2011 and 2011-2012). However, the lowest angler satisfaction occurred during the winter of 2012-2013 when Yellow Perch catch and harvest rates were high.

During the summer of 2012 anglers were asked to quantify angling satisfaction considering size, number and species of fish caught. Most anglers (80%; Table 13) indicated they were satisfied with the fish they caught. A low proportion of anglers (13%; Table 13) indicated they were not satisfied with their catch.

Angling Trip Success

During the summers of 2007, 2008, 2010, 2011 and 2013 and the winters of 2006-2007 and 2010-2011, 2011-2012 and 2012-2013 anglers were asked what the most important factor was to consider a fishing trip successful. In the summer surveys anglers most frequently indicated that 'catching fish' (ranging from 25% in 2010 to 52% in 2013; Table 14) was the most important factor. There was considerable variation in the proportion of all other possible responses among all summers surveyed.

Winter anglers cited 'catching fish' (with 38% in 2006-2007 and 47% in 2011-2012; Table 15) as the most important factor. 'Relaxation', 'participating' and 'harvesting fish' were moderately cited. 'Being with friends' and 'other' were rarely cited by winter anglers.

Northeast South Dakota Panfish Regulation

During the summer of 2009 and winter of 2009-2010 anglers fishing at Waubay Lake were asked whether they were in favor of or oppose the special panfish regulation in northeast South Dakota. Most anglers (75% in 2009 and 93% in 2009-2010; Table 16) indicated they were in favor of the special regulation. Few anglers (5% in 2009 and 2% in 2009-2010; Table 16) indicated they were opposed to the regulation.

Northern Pike Spearing

During the summer of 2012 anglers were asked whether they were in favor of or against allowing for northern pike spearing through the ice statewide. The highest proportion of anglers (49%; Table 17) indicated they were in favor of statewide Northern Pike spearing through the ice. A low proportion (15%; Table 17) of anglers were opposed to statewide Northern Pike spearing.

Table 1. Angler primary target species (percentage) by month and overall for anglers fishing Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. ANY=anything, NOP= Northern Pike, SMB= Smallmouth Bass, WAE=Walleye, WHB=White Bass, YEP=Yellow Perch.

Year	Month	Percent (%) of anglers					
		ANY	NOP	SMB	WAE	WHB	YEP
2007	May	13.8	0.0	0.0	79.3	0.0	0.0
	June	7.1	0.0	0.0	92.9	0.0	0.0
	July	0.0	0.0	0.0	100.0	0.0	0.0
	August	10.7	0.0	0.0	71.4	7.1	10.7
	Overall	8.7	0.0	0.0	86.1	1.2	1.7
2008	May	0.0	0.0	0.0	100.0	0.0	0.0
	June	2.6	0.0	1.3	85.7	9.1	0.0
	July	8.2	0.0	4.1	80.8	2.7	0.0
	August	5.6	0.0	0.0	91.7	0.0	2.8
	Overall	4.2	0.0	1.7	88.2	3.8	0.4
2009	May	4.2	0.7	0.0	95.1	0.0	0.0
	June	8.7	0.0	0.0	90.3	1.0	0.0
	July	1.6	0.0	0.0	98.4	0.0	0.0
	August	4.9	0.0	2.4	92.7	0.0	0.0
	Overall	5.2	0.3	0.3	94.0	0.3	0.0
2010	May	4.3	0.0	0.0	94.3	1.4	0.0
	June	1.2	0.0	0.0	98.2	0.6	0.0
	July	1.3	0.0	0.0	98.7	0.0	0.0
	August	2.6	0.0	2.6	94.9	0.0	0.0
	Overall	2.7	0.0	0.2	96.3	0.8	0.0
2011	May	0.0	0.0	0.0	93.2	6.8	0.0
	June	1.2	0.0	0.6	95.7	1.2	1.2
	July	1.9	0.9	0.9	92.6	0.0	0.9
	August	12.0	0.0	0.0	84.0	4.0	0.0
	Overall	2.1	0.3	0.6	93.6	1.8	0.9

Table 1. Continued.

Year	Month	Percent (%) of anglers					
		ANY	NOP	SMB	WAE	WHB	YEP
2012	May	23.5	0.0	0.0	76.5	0.0	0.0
	June	4.4	0.0	0.0	94.1	0.0	0.0
	July	11.4	0.0	0.0	81.8	6.8	0.0
	August	33.3	0.0	0.0	66.7	0.0	0.0
	Overall	11.4	0.0	0.0	85.9	2.0	0.0
2013	*May	10.0	0.0	0.0	90.0	0.0	0.0
	June	12.5	0.0	0.0	82.5	5.0	0.0
	July	2.0	0.0	0.0	94.0	2.0	2.0
	August	17.9	0.0	7.1	67.9	7.1	0.0
	Overall	9.8	0.0	1.6	83.7	4.1	0.8

Table 2. Angler primary target species (percentage) by month and overall for anglers fishing Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. ANY=anything, NOP=Northern Pike, WAE=Walleye, YEP=Yellow Perch.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2006-2007	December	12.8	1.3	22.8	63.1
	January	11.7	0.0	12.7	75.6
	February	9.6	0.7	3.7	86.0
	March	7.6	2.2	8.7	81.5
	Overall	10.9	0.9	12.5	75.8
2007-2008	December	10.2	0.5	6.1	83.2
	January	7.5	1.1	5.3	86.2
	February	22.2	1.0	14.1	62.6
	March	7.6	8.9	20.3	63.3
	Overall	11.8	2.1	10.0	76.1
2008-2009	December	10.8	0.0	9.5	79.7
	January	16.4	0.0	21.6	62.1
	February	13.8	0.0	28.7	57.5
	March	13.3	5.0	28.3	53.3
	Overall	14.0	0.9	22.1	63.1
2009-2010	December	9.7	0.0	37.1	53.2
	January	24.3	0.0	37.8	37.8
	February	7.7	0.0	76.9	15.4
	March	0.0	11.1	16.7	72.2
	Overall	14.4	1.1	41.1	43.3
2010-2011	December	11.0	0.0	27.0	62.0
	January	9.1	0.0	36.4	54.6
	February	5.3	0.0	63.2	31.6
	March	7.9	0.0	18.4	74.7
	Overall	9.5	0.0	30.5	60.0

Table 2. Continued.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2011-2012	December	2.9	0.0	8.8	88.2
	January	6.7	0.0	22.2	71.1
	February	6.3	0.0	25.0	68.8
	March	0.0	33.3	26.7	40.0
	Overall	4.6	4.6	19.1	71.8
2012-2013	December	5.6	0.0	38.9	55.6
	January	13.6	0.0	25.9	60.5
	February	4.5	0.0	11.9	83.6
	March	5.3	2.6	10.5	81.6
	Overall	8.3	0.5	19.6	71.6

Table 3. Angler demographics by month and overall including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2007	May	58	16,713 (7,837)	3,665	183,257	4.56 (1.24)	2.51 (2.02)	73.7	79.0
	June	51	5,619 (1,633)	1,544	77,184	3.64 (0.63)	2.58 (2.88)	38.2	80.6
	July	31	3,819 (743)	841	42,060	4.54 (0.31)	2.53 (0.79)	71.0	88.7
	August	28	1,896 (372)	466	23,292	4.07 (0.99)	2.29 (1.04)	50.0	81.9
	Overall	168	28,047 (8,048)	6,662	333,100	4.21 (0.44)	2.48 (0.93)	57.9	80.8
2008	May	52	16,653 (6,147)	4,337	216,836	3.84 (0.73)	2.58 (0.80)	46.2	93.7
	June	78	11,986 (2,543)	2,594	129,719	4.62 (1.57)	2.50 (0.98)	57.1	84.7
	July	73	12,020 (4,124)	2,795	139,767	4.30 (0.45)	2.66 (1.00)	65.8	95.0
	August	36	5,250 (1,407)	1,080	54,012	4.86 (---)	2.44 (0.35)	61.1	97.6
	Overall	239	45,909 (7,952)	10,434	521,693	4.40 (0.44)	2.54 (0.41)	58.0	92.1
2009	May	142	41,116 (4,975)	8,674	433,713	4.74 (0.17)	2.58 (1.06)	46.2	93.7
	June	102	23,511 (7,030)	4,929	246,447	4.77 (1.20)	2.35 (1.57)	51.5	95.5
	July	62	12,160 (2,736)	2,638	131,887	4.61 (0.76)	2.62 (0.39)	73.8	96.1
	August	41	6,289 (2,239)	1,347	67,334	4.67 (---)	2.60 (0.18)	63.4	94.1
	Overall	347	83,076 (9,310)	17,676	883,787	4.70 (0.35)	2.54 (0.48)	66.7	93.8

Table 3. Continued.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2010	May	209	73,548 (22,767)	14,171	708,555	5.19 (2.14)	2.46 (1.00)	67.3	91.5
	June	162	51,577 (13,438)	10,213	510,650	5.05 (---)	2.31 (---)	58.6	96.6
	July	77	15,686 (3,827)	3,517	175,850	4.46 (---)	2.38 (---)	68.8	97.7
	August	39	12,605 (3,542)	2,752	137,609	4.58 (---)	2.34 (0.63)	66.7	97.9
	Overall	487	153,417 (26,946)	31,829	1,591,462	4.82 (0.54)	2.37 (0.30)	64.6	94.4
2011	May	44	15,682 (4,282)	2,800	140,018	5.60 (2.32)	2.55 (0.90)	65.9	78.7
	June	164	40,865 (8,631)	8,713	435,661	4.69 (0.57)	2.54 (0.43)	76.8	94.2
	July	108	17,409 (3,825)	3,531	176,562	4.93 (---)	2.32 (0.99)	73.2	94.7
	August	25	4,875 (690)	1,091	54,530	4.47 (---)	1.96 (0.12)	84.0	98.1
	Overall	341	78,831 (10,389)	15,990	799,503	4.93 (0.60)	2.34 (0.35)	74.8	91.5
2012	May	34	19,031 (8,799)	4,395	219,757	4.33 (0.41)	2.36 (0.86)	76.5	91.5
	June	69	30,630 (6,617)	6,355	317,739	4.82 (---)	2.45 (0.78)	69.2	96.8
	July	44	9,720 (2,136)	2,298	114,894	4.23 (0.54)	2.35 (1.17)	77.3	95.1
	August	3	1,287 (782)	407	20,364	3.16 (---)	2.29 (---)	100.0	92.6
	Overall	150	60,668 (11,242)	14,690	734,479	4.13 (0.17)	2.36 (0.41)	74.0	94.8
2013	May	10	5,744 (48)	3,568	178,385	1.61 (0.27)	2.33 (0.00)	50.0	83.3
	June	40	20,771 (7,471)	4,213	210,659	4.93 (---)	2.41 (1.20)	65.0	87.6
	July	50	16,412 (3,431)	3,756	187,780	4.37 (---)	2.37 (0.29)	62.0	94.6
	August	28	14,912 (1,543)	2,793	139,626	5.34 (---)	2.95 (---)	53.6	98.3
	Overall	123	57,839 (8,365)	13,577	678,861	4.26 (---)	2.66 (0.30)	61.0	91.9

Table 4. Overall angler demographics including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2006-2007	December	149	17,025 (3,384)	4,225	211,228	4.03 (2.89)	1.75 (1.43)	81.9	73.4
	January	213	36,807 (7,057)	8,481	424,044	4.34 (1.30)	1.65 (0.73)	71.4	89.1
	February	136	13,628 (4,691)	4,595	229,747	4.54 (1.56)	1.80 (0.75)	62.5	83.4
	March	92	13,628 (4,691)	2,787	139,346	4.89 (2.69)	1.79 (1.12)	46.7	42.6
	Overall	590	88,321 (11,380)	19,847	992,371	4.45 (1.13)	1.74 (0.53)	68.1	77.6
2007-2008	December	194	18,058 (4,588)	4,200	209,977	4.30 (0.46)	1.75 (0.72)	73.7	86.3
	January	94	19,336 (8,055)	4,871	243,526	3.97 (0.47)	2.00 (0.71)	58.5	86.3
	February	99	6,443 (2,312)	1,478	73,888	4.36 (0.99)	1.57 (1.81)	73.7	71.8
	March	79	5,895 (583)	1,154	57,681	5.11 (1.21)	1.70 (2.21)	59.5	76.9
	Overall	466	49,731 (9,572)	11,201	560,034	4.44 (0.42)	1.76 (0.75)	68.2	83.3
2008-2009	December	74	12,353 (5,591)	4,077	203,845	3.03 (0.48)	1.62 (0.68)	81.1	88.7
	January	116	14,702 (5,551)	3,484	174,194	4.22 (0.74)	1.74 (0.44)	69.0	89.4
	February	94	9,616 (2,917)	1,797	89,850	5.35 (1.09)	1.92 (1.69)	55.3	73.2
	March	60	12,311 (3,474)	2,910	145,520	4.23 (0.80)	1.71 (1.34)	55.0	56.8
	Overall	344	48,982 (9,091)	11,718	585,909	4.18 (0.40)	1.74 (0.56)	65.4	77.9

Table 4. Continued.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2009-2010	December	62	5,714 (1,507)	1,614	80,706	3.54 (1.14)	1.63 (0.46)	88.7	79.1
	January	74	14,872 (4,665)	3,575	178,750	4.16 (1.17)	1.96 (0.82)	86.5	72.8
	February	26	3,511 (1,923)	687	34,354	5.11 (0.15)	2.00 (1.12)	80.8	83.3
	March	18	4,128 (1,484)	1,327	66,367	3.11 (---)	2.23 (1.01)	61.1	30.6
	Overall	180	28,224 (5,471)	7,145	357,266	3.95 (0.42)	1.96 (0.44)	83.9	69.2
2010-2011	December	100	13,765 (2,415)	3,231	161,561	4.26 (3.87)	1.71 (1.67)	74.0	90.7
	January	33	3,978 (811)	704	35,204	5.65 (---)	1.89 (0.30)	51.5	97.8
	February	19	2,489 (953)	655	32,750	3.80 (1.57)	2.19 (1.15)	79.0	88.0
	March	38	4,555 (664)	1,024	51,200	4.45 (1.58)	1.46 (0.48)	79.0	62.8
	Overall	190	24,765 (2,800)	5,431	271,546	4.56 (1.13)	1.81 (0.52)	71.6	86.5
2011-2012	December	34	7,582 (3,253)	1,964	98,212	3.86 (1.10)	2.06 (1.08)	91.2	79.4
	January	45	11,635 (1,591)	2,784	139,175	4.18 (1.59)	2.27 (1.91)	70.5	85.4
	February	16	7,850 (669)	1,225	61,232	6.41 (0.85)	1.66 (0.42)	81.3	87.4
	March	15	2,329 (899)	264	13,173	8.84 (---)	2.22 (0.15)	46.7	52.7
	Overall	110	29,396 (3,791)	5,060	252,978	5.81 (0.53)	2.06 (0.57)	75.2	81.8
2012-2013	December	18	4,868 (1,962)	1,196	59,803	4.07 (---)	1.53 (0.00)	94.4	83.3
	January	81	33,707 (9,260)	7,264	363,222	4.64 (1.66)	1.92 (0.32)	76.5	91.2
	February	67	25,290 (8,157)	6,370	318,514	3.97 (0.67)	2.04 (0.44)	59.7	93.6
	March	38	7,160 (1,830)	1,563	78,166	4.58 (1.14)	2.32 (0.83)	60.5	64.0
	Overall	204	71,024 (12,629)	16,403	820,139	4.33 (0.54)	1.95 (0.25)	69.6	88.8

Table 5. State residence (percentage) of anglers fishing Waubay Lake, South Dakota during the summers of 2007-2013.

State	Percent (%) of anglers						
	2007	2008	2009	2010	2011	2012	2013
South Dakota	57.9	58.0	66.7	64.6	74.8	74.0	61.0
Arizona	0.0	0.4	0.0	0.2	0.0	0.0	0.0
Alaska	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Colorado	0.6	0.0	0.0	0.0	0.0	0.7	0.0
Florida	0.6	0.0	0.0	0.0	0.0	0.7	0.0
Illinois	0.6	0.4	1.5	0.6	0.0	0.7	0.0
Indiana	0.0	0.8	0.6	0.4	0.0	0.0	0.0
Iowa	19.9	14.7	12.2	12.1	7.9	7.5	14.6
Kansas	0.0	0.4	0.6	0.2	0.0	0.0	0.0
Louisiana	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Minnesota	9.9	18.1	11.9	16.1	9.1	12.3	11.4
Missouri	2.3	0.0	0.3	0.2	0.0	0.0	0.0
Montana	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Nebraska	4.1	2.5	3.8	2.5	2.9	0.7	3.3
Nevada	0.0	0.0	0.0	0.0	0.0	0.0	0.8
North Dakota	2.9	1.7	0.9	1.4	4.1	3.4	7.3
Ohio	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Oklahoma	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Oregon	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Wisconsin	0.6	2.9	1.2	0.8	1.2	0.0	0.8
Wyoming	0.6	0.0	0.0	0.0	0.0	0.0	0.0

Table 6. State residence (percentage) of anglers fishing Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013.

Percent (%) of anglers							
State	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
South Dakota	68.1	68.2	65.4	83.9	71.6	75.2	69.6
Alabama	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Illinois	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Iowa	9.3	7.9	11.1	1.7	5.3	5.5	10.3
Minnesota	16.1	16.5	17.4	10.0	20.0	13.8	15.2
Missouri	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Nebraska	2.5	2.2	2.6	1.1	1.1	2.8	2.9
North Dakota	1.2	1.3	1.5	2.2	2.1	2.8	0.5
Wisconsin	2.2	3.9	1.7	0.6	0.0	0.0	1.5

Table 7. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), White Bass (WHB) and Yellow Perch (YEP) at Waubay Lake, South Dakota during the summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	NOP		SMB		WAE		WHB		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2007	May	0.03 (0.03)	<0.01 (<0.01)	0.03 (0.02)	0.00 (0.00)	1.18 (0.90)	0.24 (0.21)	0.62 (0.93)	0.52 (0.92)	0.04 (0.03)	0.00 (0.00)
	June	<0.01 (<0.01)	<0.01 (<0.01)	0.11 (0.14)	0.00 (0.00)	0.90 (1.08)	0.16 (0.15)	0.36 (0.53)	0.12 (0.05)	0.00 (0.00)	0.00 (0.00)
	July	<0.01 (<0.01)	0.00 (0.00)	0.06 (0.03)	0.01 (0.01)	0.70 (0.17)	0.12 (0.04)	0.24 (0.15)	0.00 (0.00)	0.12 (0.03)	<0.01 (<0.01)
	August	0.00 (0.00)	0.00 (0.00)	0.14 (0.09)	0.03 (0.03)	1.09 (0.76)	0.17 (0.15)	0.17 (0.10)	0.04 (0.03)	0.03 (0.03)	0.01 (0.01)
	Overall	0.02 (0.02)	<0.01 (<0.01)	0.06 (0.03)	<0.01 (<0.01)	1.05 (0.55)	0.20 (0.12)	0.48 (0.53)	0.33 (0.50)	0.04 (0.02)	<0.01 (<0.01)
2008	May	<0.01 (<0.01)	0.00 (0.00)	0.06 (0.11)	0.00 (0.00)	0.40 (0.29)	0.19 (0.17)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	June	<0.01 (<0.01)	<0.01 (<0.01)	0.18 (0.11)	<0.01 (<0.01)	1.30 (0.54)	0.23 (0.10)	2.96 (1.21)	0.41 (0.33)	0.00 (0.00)	0.00 (0.00)
	July	<0.01 (<0.01)	0.00 (0.00)	0.10 (0.08)	<0.01 (<0.01)	0.90 (0.74)	0.21 (0.20)	0.17 (0.15)	0.01 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)
	August	0.01 (0.01)	0.00 (0.00)	0.19 (0.18)	<0.01 (<0.01)	1.07 (0.64)	0.20 (0.12)	0.08 (0.04)	0.01 (<0.01)	0.01 (0.01)	0.01 (0.01)
	Overall	<0.01 (<0.01)	<0.01 (<0.01)	0.12 (0.07)	<0.01 (<0.01)	0.84 (0.28)	0.21 (0.09)	0.83 (0.58)	0.11 (0.07)	<0.01 (<0.01)	<0.01 (<0.01)
2009	May	0.02 (<0.01)	0.01 (<0.01)	0.04 (0.01)	<0.01 (<0.01)	1.00 (0.29)	0.20 (0.05)	0.43 (0.27)	0.13 (0.09)	<0.01 (<0.01)	<0.01 (<0.01)
	June	<0.01 (<0.01)	<0.01 (<0.01)	0.07 (0.05)	0.01 (0.01)	0.97 (0.62)	0.16 (0.11)	0.32 (0.25)	0.02 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)
	July	<0.01 (<0.01)	<0.01 (<0.01)	0.03 (0.02)	<0.01 (<0.01)	0.74 (0.40)	0.18 (0.10)	0.06 (0.04)	0.01 (<0.01)	0.01 (<0.01)	0.01 (<0.01)
	August	0.01 (0.01)	0.00 (0.00)	0.01 (0.01)	<0.01 (<0.01)	0.50 (---)	0.18 (---)	0.15 (0.25)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	Overall	0.01 (<0.01)	<0.01 (<0.01)	0.05 (0.01)	<0.01 (<0.01)	0.92 (0.23)	0.18 (0.04)	0.32 (0.15)	0.07 (0.04)	<0.01 (<0.01)	<0.01 (<0.01)

Table 7. Continued.

Year	Month	NOP		SMB		WAE		WHB		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2010	May	<0.01 (<0.01)	<0.01 (<0.01)	0.05 (0.02)	0.01 (<0.01)	0.54 (0.36)	0.41 (0.29)	0.28 (0.10)	0.06 (0.03)	<0.01 (<0.01)	<0.01 (<0.01)
	June	<0.01 (<0.01)	<0.01 (<0.01)	0.03 (0.02)	<0.01 (<0.01)	0.65 (0.38)	0.42 (0.26)	0.08 (0.08)	0.04 (0.06)	0.01 (0.01)	0.01 (0.01)
	July	0.01 (<0.01)	<0.01 (<0.01)	0.06 (0.04)	0.00 (0.00)	0.36 (0.21)	0.22 (0.12)	0.03 (0.02)	0.02 (0.02)	0.01 (0.01)	0.01 (0.01)
	August	<0.01 (---)	0.00 (---)	0.15 (0.08)	0.00 (0.00)	0.39 (0.28)	0.23 (0.15)	0.08 (0.05)	0.00 (0.00)	0.02 (0.01)	0.01 (0.01)
	Overall	<0.01 (<0.01)	<0.01 (<0.01)	0.05 (0.01)	<0.01 (<0.01)	0.54 (0.21)	0.38 (0.16)	0.17 (0.05)	0.05 (0.02)	0.01 (<0.01)	0.01 (<0.01)
2011	May	<0.01 (<0.01)	0.00 (0.00)	0.10 (0.05)	0.00 (0.00)	0.27 (0.12)	0.20 (0.09)	1.03 (0.56)	0.41 (0.26)	<0.01 (<0.01)	<0.01 (<0.01)
	June	0.01 (<0.01)	<0.01 (<0.01)	0.17 (0.06)	0.02 (0.01)	0.94 (0.41)	0.43 (0.18)	0.63 (0.14)	0.29 (0.23)	0.06 (0.02)	0.04 (0.01)
	July	0.02 (0.01)	0.01 (0.01)	0.19 (0.12)	0.01 (<0.01)	0.98 (0.38)	0.37 (0.14)	0.19 (0.08)	0.03 (0.02)	0.31 (0.17)	0.12 (0.06)
	August	0.02 (0.01)	0.00 (0.00)	0.46 (0.09)	<0.01 (<0.01)	0.68 (0.34)	0.20 (0.05)	0.75 (0.12)	0.01 (0.01)	0.04 (0.01)	0.02 (0.01)
	Overall	0.01 (<0.01)	<0.01 (<0.01)	0.18 (0.04)	0.01 (<0.01)	0.80 (0.22)	0.36 (0.10)	0.62 (0.13)	0.24 (0.13)	0.10 (0.04)	0.05 (0.01)
2012	May	0.01 (0.01)	<0.01 (<0.01)	0.05 (0.03)	0.01 (0.01)	0.35 (0.31)	0.29 (0.28)	0.14 (0.09)	0.03 (0.02)	0.04 (0.03)	0.03 (0.02)
	June	0.01 (0.01)	0.01 (<0.01)	0.15 (0.09)	0.01 (0.01)	0.66 (0.35)	0.38 (0.22)	0.49 (0.27)	0.06 (0.03)	0.03 (0.02)	0.01 (0.01)
	July	0.02 (0.02)	0.00 (0.00)	0.12 (0.10)	0.01 (<0.01)	0.50 (0.25)	0.35 (0.16)	1.48 (0.83)	0.15 (0.11)	0.08 (0.05)	0.08 (0.05)
	August	0.00 (0.00)	0.00 (0.00)	0.64 (---)	0.00 (---)	0.17 (---)	0.03 (---)	0.48 (---)	0.00 (---)	0.03 (---)	0.03 (---)
	Overall	0.01 (0.01)	0.01 (<0.01)	0.12 (0.05)	0.01 (<0.01)	0.53 (0.21)	0.34 (0.15)	0.54 (0.19)	0.07 (0.02)	0.04 (0.01)	0.03 (0.01)

Table 7. Continued.

Year	Month	NOP		SMB		WAE		WHB		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2013	May	0.00 (0.00)	0.00 (0.00)	0.24 (0.02)	0.00 (0.00)	0.24 (0.20)	0.14 (0.13)	0.83 (0.05)	0.57 (<0.01)	0.00 (0.00)	0.00 (0.00)
	June	0.04 (0.04)	<0.01 (<0.01)	0.14 (0.17)	0.04 (0.05)	0.41 (0.23)	0.26 (0.15)	1.28 (0.98)	0.76 (0.59)	0.01 (0.02)	0.01 (0.02)
	July	0.02 (0.01)	<0.01 (0.01)	0.20 (0.10)	0.01 (<0.01)	0.47 (0.25)	0.11 (0.07)	1.78 (0.85)	0.08 (0.04)	0.14 (0.08)	0.05 (0.03)
	August	0.01 (<0.01)	<0.01 (<0.01)	0.28 (0.05)	0.02 (0.01)	0.26 (0.11)	0.12 (0.05)	1.08 (0.53)	0.15 (0.09)	0.04 (0.01)	0.02 (0.01)
	Overall	0.02 (0.01)	<0.01 (<0.01)	0.20 (0.08)	0.02 (0.01)	0.37 (0.11)	0.17 (0.05)	1.33 (0.44)	0.39 (0.19)	0.05 (0.02)	0.03 (0.01)

Table 8. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Walleye (WAE) and Yellow Perch (YEP) at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated.

Year	Month	WAE		YEP	
		C/h	H/h	C/h	H/h
2006-2007	December	0.55 (0.13)	0.06 (---)	0.96 (0.42)	0.74 (0.33)
	January	0.28 (0.07)	0.02 (0.02)	0.55 (0.24)	0.43 (0.19)
	February	0.21 (0.13)	0.02 (0.01)	0.43 (0.26)	0.34 (0.20)
	March	0.25 (0.22)	0.05 (0.04)	0.72 (0.79)	0.53 (0.57)
	Overall	0.31 (0.07)	0.03 (0.01)	0.63 (0.19)	0.49 (0.14)
2007-2008	December	0.57 (0.30)	0.05 (0.04)	1.02 (0.48)	0.76 (0.35)
	January	0.17 (0.22)	0.02 (0.01)	0.34 (0.31)	0.31 (0.28)
	February	0.48 (0.33)	0.04 (0.04)	0.59 (0.45)	0.45 (0.34)
	March	0.19 (0.08)	0.04 (0.02)	0.28 (0.07)	0.27 (0.07)
	Overall	0.36 (0.16)	0.04 (0.02)	0.61 (0.24)	0.49 (0.18)
2008-2009	December	0.60 (0.55)	0.06 (0.05)	0.55 (0.44)	0.39 (0.33)
	January	0.24 (0.19)	0.06 (0.04)	0.14 (0.11)	0.11 (0.08)
	February	0.28 (0.25)	0.04 (0.03)	0.14 (0.13)	0.11 (0.11)
	March	0.58 (0.34)	0.08 (0.06)	0.33 (0.18)	0.24 (0.12)
	Overall	0.42 (0.17)	0.06 (0.02)	0.29 (0.11)	0.21 (0.08)
Year	Month	C/h	H/h	C/h	H/h
2009-2010	December	0.23 (0.08)	0.13 (0.07)	0.37 (0.14)	0.30 (0.12)
	January	0.10 (0.10)	0.09 (0.07)	0.09 (---)	0.08 (---)
	February	0.22 (0.21)	0.17 (0.16)	0.08 (0.08)	0.08 (0.08)
	March	0.03 (---)	0.02 (0.01)	0.30 (---)	0.15 (---)
	Overall	0.13 (0.06)	0.10 (0.04)	0.18 (---)	0.13 (---)

Table 8. Continued.

		WAE		YEP	
2010-2011	December	0.36 (0.14)	0.14 (0.06)	1.19 (0.39)	0.63 (0.18)
	January	0.15 (0.05)	0.09 (0.03)	0.87 (0.34)	0.62 (0.23)
	February	0.29 (0.39)	0.15 (0.08)	1.09 (0.45)	0.61 (0.28)
	March	0.09 (0.01)	0.03 (0.01)	0.87 (0.32)	0.47 (0.21)
	Overall	0.27 (0.08)	0.11 (0.03)	1.07 (0.23)	0.60 (0.12)
2011-2012	December	0.32 (0.29)	0.17 (0.18)	2.38 (4.84)	1.68 (3.27)
	January	0.48 (0.23)	0.36 (0.18)	1.79 (0.31)	1.22 (0.26)
	February	0.05 (0.02)	0.03 (0.01)	0.15 (0.12)	0.14 (0.11)
	March	0.09 (0.13)	0.05 (0.08)	0.00 (0.00)	0.00 (0.00)
	Overall	0.29 (0.12)	0.20 (0.09)	1.36 (1.10)	0.95 (0.74)
Year	Month	C/h	H/h	C/h	H/h
2012-2013	December	0.58 (0.44)	0.33 (0.20)	1.00 (0.45)	0.32 (0.14)
	January	0.39 (0.13)	0.07 (0.02)	0.45 (0.19)	0.39 (0.18)
	February	0.20 (0.13)	0.04 (0.03)	0.59 (0.37)	0.43 (0.28)
	March	0.35 (0.07)	0.06 (0.05)	3.07 (0.82)	1.87 (0.39)
	Overall	0.33 (0.09)	0.08 (0.02)	0.80 (0.24)	0.55 (0.17)

Table 9. Estimated monthly and overall catch and harvest of Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), White Bass (WHB), Yellow Perch (YEP) and total at Waubay Lake, South Dakota during summers of 2007-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	NOP		SMB		WAE		WHB		YEP		Total	
		C	H	C	H	C	H	C	H	C	H	C	H
2007	May	539 (385)	62 (57)	503 (215)	0 (0)	19,780 (5,781)	3,998 (1,644)	10,329 (10,574)	8,600 (11,143)	626 (407)	0 (0)	31,932 (16,008)	12,813 (12,798)
	June	16 (14)	8 (10)	630 (666)	0 (0)	5,044 (4,330)	893 (519)	1,994 (1,447)	654 (330)	0 (0)	0 (0)	7,775 (7,563)	1,556 (605)
	July	16 (16)	0 (0)	230 (135)	29 (22)	2,660 (854)	474 (254)	932 (505)	0 (0)	440 (329)	8 (9)	4,278 (1,482)	511 (255)
	August	0 (0)	0 (0)	256 (109)	59 (38)	2,058 (1,182)	318 (246)	319 (186)	73 (64)	55 (35)	17 (9)	2,687 (1,136)	467 (186)
	Overall	572 (386)	70 (58)	1,618 (721)	88 (44)	29,542 (7,369)	5,683 (1,759)	13,574 (10,686)	9,327 (11,148)	1,122 (524)	25 (12)	46,671 (17,802)	15,346 (12,816)
2008	May	18 (23)	0 (0)	1,006 (656)	0 (0)	6,735 (2,535)	3,086 (1,439)	0 (0)	0 (0)	0 (0)	0 (0)	7,759 (2,876)	3,086 (1,439)
	June	45 (30)	12 (14)	2,188 (1,095)	29 (23)	15,543 (1,293)	2,745 (382)	35,478 (29,046)	4,861 (2,780)	0 (0)	0 (0)	53,530 (28,910)	7,645 (3,182)
	July	48 (19)	0 (0)	1,138 (567)	18 (17)	10,773 (4,998)	2,577 (1,389)	2,009 (899)	90 (66)	33 (20)	12 (10)	14,241 (6,429)	2,937 (1,488)
	August	27 (17)	0 (0)	991 (467)	12 (15)	5,630 (1,773)	1,060 (336)	411 (132)	51 (46)	57 (30)	45 (28)	7,163 (2,276)	1,168 (346)
	Overall	138 (46)	12 (14)	5,323 (1,472)	58 (32)	38,681 (6,019)	9,468 (2,063)	37,897 (29,060)	5,001 (2,782)	90 (36)	57 (30)	82,692 (29,842)	14,836 (3,812)
2009	May	726 (137)	236 (60)	1,593 (483)	101 (44)	41,172 (10,695)	8,111 (1,219)	17,636 (8,693)	5,292 (2,737)	31 (27)	31 (27)	61,511 (9,550)	13,772 (3,283)
	June	189 (82)	18 (0)	1,676 (537)	180 (76)	22,905 (7,974)	3,856 (1,426)	7,534 (3,871)	431 (184)	53 (31)	53 (31)	32,392 (11,486)	4,537 (1,502)
	July	61 (33)	20 (18)	348 (184)	10 (9)	8,932 (2,623)	2,240 (620)	782 (292)	83 (38)	83 (41)	73 (40)	10,258 (3,075)	2,445 (668)
	August	67 (82)	0 (0)	85 (42)	19 (0)	3,155 (1,736)	1,114 (640)	937 (1,510)	0 (0)	0 (0)	0 (0)	4,254 (2,370)	1,133 (641)
	Overall	1,043 (182)	273 (62)	3,703 (747)	310 (88)	76,164 (13,706)	15,322 (2,077)	26,890 (9,640)	5,806 (2,744)	167 (58)	157 (57)	108,415 (15,434)	21,888 (3,728)

Table 9. Continued.

Year	Month	NOP		SMB		WAE		WHB		YEP		Total	
		C	H	C	H	C	H	C	H	C	H	C	H
2010	May	231 (98)	107 (56)	3,306 (1,888)	418 (247)	39,333 (12,224)	30,402 (9,516)	20,426 (1,178)	4,537 (452)	233 (76)	180 (65)	63,564 (22,180)	35,678 (10,339)
	June	168 (73)	45 (29)	1,370 (489)	22 (21)	33,325 (9,823)	21,652 (6,387)	3,853 (2,298)	2,101 (1,825)	477 (226)	359 (182)	39,266 (11,735)	24,202 (7,580)
	July	73 (38)	23 (25)	994 (376)	0 (0)	5,642 (2,078)	3,509 (1,223)	440 (301)	272 (294)	146 (69)	113 (66)	7,318 (2,612)	3,916 (1,369)
	August	13 (---)	0 (---)	1,887 (796)	0 (0)	4,860 (2,065)	2,867 (1,146)	1,002 (552)	0 (0)	247 (145)	93 (82)	8,068 (2,694)	2,973 (1,219)
	Overall	486 (128)	174 (68)	7,556 (2,140)	440 (248)	83,160 (15,953)	58,429 (11,583)	25,721 (2,657)	6,910 (1,903)	1,103 (287)	745 (220)	118,216 (25,372)	66,769 (12,951)
2011	May	38 (25)	0 (0)	1,493 (504)	0 (0)	4,283 (1,434)	3,117 (1,011)	16,137 (7,728)	6,420 (3,592)	38 (25)	38 (25)	21,988 (6,738)	9,575 (4,243)
	June	234 (140)	10 (12)	6,872 (1,500)	690 (264)	38,333 (11,781)	17,447 (5,643)	25,689 (814)	11,915 (9,167)	2,456 (1,193)	1,656 (753)	73,725 (12,758)	31,718 (10,848)
	July	283 (104)	168 (69)	3,259 (1,092)	148 (86)	16,990 (3,898)	6,458 (1,530)	3,333 (1,108)	572 (252)	5,437 (2,598)	2,101 (790)	29,343 (10,109)	9,468 (3,178)
	August	80 (44)	0 (0)	2,225 (584)	16 (15)	3,329 (1,923)	971 (249)	3,654 (454)	32 (30)	200 (24)	96 (14)	9,487 (2,961)	1,115 (292)
	Overall	635 (181)	178 (70)	13,848 (2,009)	854 (278)	62,935 (12,639)	27,992 (5,939)	48,812 (7,863)	18,940 (9,849)	8,130 (2,859)	3,890 (1,092)	134,543 (17,864)	51,875 (12,077)
2012	May	123 (124)	62 (62)	869 (514)	123 (116)	6,610 (3,420)	5,557 (3,244)	2,562 (1,603)	527 (394)	660 (358)	472 (358)	10,824 (4,680)	6,740 (3,795)
	June	337 (119)	209 (120)	4,431 (1,691)	203 (127)	20,309 (6,166)	11,726 (4,221)	15,121 (6,622)	1,951 (512)	835 (409)	272 (140)	41,101 (6,331)	14,361 (4,660)
	July	184 (199)	0 (0)	1,196 (539)	54 (18)	4,882 (2,036)	3,428 (1,199)	14,394 (5,852)	1,491 (711)	758 (317)	732 (319)	21,543 (7,585)	5,704 (1,577)
	August	0 (0)	0 (0)	827 (---)	0 (---)	217 (---)	38 (---)	620 (---)	0 (---)	38 (---)	38 (---)	1,702 (---)	76 (---)
	Overall	644 (263)	271 (136)	7,323 (1,848)	380 (172)	32,017 (7,339)	20,748 (5,457)	32,697 (8,982)	3,968 (961)	2,291 (630)	1,513 (500)	75,171 (10,932)	26,881 (6,213)

Table 9. Continued.

Year	Month	NOP		SMB		WAE		WHB		YEP		TOTAL	
		C	H	C	H	C	H	C	H	C	H	C	H
2013	May	0 (0)	0 (0)	1,350 (94)	0 (0)	1,379 (1,120)	820 (747)	4,784 (282)	3,245 (0)	0 (0)	0 (0)	7,513 (749)	4,065 (747)
	June	774 (717)	62 (49)	2,883 (1,708)	751 (488)	8,544 (3,006)	5,492 (1,924)	26,664 (14,289)	15,855 (9,023)	288 (283)	288 (283)	39,249 (15,276)	22,511 (8,645)
	July	395 (117)	64 (41)	3,228 (1,239)	89 (52)	7,640 (1,922)	1,777 (647)	29,172 (7,204)	1,259 (345)	2,300 (1,170)	771 (224)	43,015 (10,977)	3,992 (1,071)
	August	115 (51)	62 (39)	4,191 (736)	244 (122)	3,887 (1,240)	1,709 (644)	16,127 (6,476)	2,205 (1,059)	535 (133)	364 (61)	24,780 (7,697)	4,584 (1,683)
	Overall	1,284 (729)	189 (75)	11,651 (9,091)	1,084 (506)	21,450 (3,939)	9,798 (2,257)	76,746 (17,266)	22,564 (9,091)	3,123 (1,211)	1,423 (366)	114,757 (20,338)	35,152 (8,903)

Table 10. Estimated monthly and overall catch and harvest Walleye (WAE), Yellow Perch (YEP) and total at Waubay Lake, South Dakota during the winters between 2006-2007 and 2012-2013. One standard error is provided in parentheses when calculated.

Year	Month	WAE		YEP		TOTAL	
		C	H	C	H	C	H
2006-2007	December	9,395 (2,405)	1,058 (293)	16,368 (4,619)	12,661 (3,416)	25,835 (6,939)	13,791 (3,661)
	January	10,359 (1,597)	661 (516)	20,319 (7,869)	15,910 (6,512)	30,716 (9,438)	16,608 (6,340)
	February	4,438 (1,380)	420 (156)	9,053 (3,013)	7,097 (2,269)	13,563 (4,231)	7,517 (2,326)
	March	3,426 (1,677)	659 (405)	9,810 (6,050)	7,280 (4,389)	13,420 (7,168)	8,039 (4,571)
	Overall	27,618 (3,613)	2,798 (735)	55,551 (11,355)	42,947 (8,859)	83,534 (14,370)	45,954 (8,939)
2007-2008	December	10,228 (4,466)	948 (616)	18,494 (6,476)	13,707 (4,459)	28,732 (10,115)	14,655 (4,904)
	January	3,358 (2,247)	326 (220)	6,480 (1,139)	6,042 (601)	9,837 (3,694)	6,368 (595)
	February	3,116 (1,022)	261 (125)	3,785 (1,689)	2,920 (1,182)	6,935 (2,765)	3,192 (1,292)
	March	1,122 (303)	252 (68)	1,652 (198)	1,573 (189)	2,823 (420)	1,841 (243)
	Overall	17,823 (5,112)	1,787 (670)	30,412 (6,792)	24,241 (4,656)	48,327 (11,126)	26,056 (5,112)
2008-2009	December	7,379 (3,064)	785 (342)	6,848 (3,181)	4,763 (2,115)	14,402 (6,109)	5,593 (2,428)
	January	3,559 (1,158)	873 (330)	2,069 (1,242)	1,563 (921)	5,758 (2,172)	2,566 (1,188)
	February	2,647 (1,473)	347 (204)	1,373 (827)	1,089 (741)	4,190 (2,271)	1,437 (825)
	March	7,176 (2,747)	956 (602)	4,046 (1,800)	2,978 (1,207)	11,321 (3,275)	3,933 (1,349)
	Overall	20,762 (4,522)	2,961 (793)	14,336 (3,948)	10,394 (2,707)	35,671 (7,610)	13,629 (3,131)
2009-2010	December	1,333 (153)	754 (204)	2,117 (889)	1,716 (747)	3,559 (1,066)	2,514 (961)
	January	1,521 (917)	1,280 (623)	1,319 (20)	1,157 (20)	2,840 (1,527)	2,437 (1,354)
	February	784 (617)	578 (472)	282 (246)	263 (235)	1,098 (888)	842 (702)
	March	120 (73)	96 (53)	1,244 (938)	598 (490)	1,435 (1,089)	741 (587)
	Overall	3,756 (1,118)	2,708 (810)	4,963 (1,316)	3,733 (924)	8,931 (2,333)	6,534 (1,896)

Table 10. Continued.

Year	Month	WAE		YEP		TOTAL	
		C	H	C	H	C	H
2010-2011	December	5,011 (1,385)	1,893 (647)	16,366 (4,827)	8,675 (2,847)	21,563 (5,736)	10,690 (2,977)
	January	573 (201)	353 (113)	3,441 (780)	2,455 (676)	4,022 (887)	2,808 (729)
	February	729 (373)	381 (211)	2,712 (414)	1,519 (371)	3,998 (795)	1,934 (673)
	March	407 (59)	140 (43)	3,954 (1,548)	2,120 (1,010)	4,432 (1,592)	2,298 (1,007)
	Overall	6,719 (1,450)	2,767 (691)	26,473 (5,146)	14,676 (3,118)	34,014 (6,070)	17,730 (3,295)
2011-2012	December	2,407 (1,332)	1,314 (687)	18,019 (24,733)	12,761 (16,762)	20,925 (27,400)	14,075 (18,061)
	January	5,594 (2,834)	4,202 (2,318)	20,828 (5,930)	14,231 (4,527)	27,657 (7,328)	18,710 (5,927)
	February	398 (158)	264 (108)	1,160 (832)	1,058 (752)	1,593 (886)	1,321 (721)
	March	199 (133)	123 (81)	0 (0)	0 (0)	353 (172)	227 (109)
	Overall	8,597 (3,138)	5,903 (2,421)	40,006 (25,447)	28,049 (17,379)	50,528 (28,528)	34,333 (19,023)
2012-2013	December	2,822 (1,283)	1,597 (620)	4,882 (335)	1,542 (182)	8,297 (1,692)	3,389 (801)
	January	13,167 (2,368)	2,436 (722)	15,079 (4,782)	13,070 (4,657)	29,066 (7,398)	15,598 (5,280)
	February	5,119 (1,789)	900 (316)	14,940 (4,753)	10,885 (3,591)	20,288 (6,438)	11,859 (3,829)
	March	2,501 (1,209)	453 (182)	21,957 (10,300)	13,364 (5,881)	24,615 (12,723)	13,879 (6,558)
	Overall	23,609 (3,452)	5,387 (1,019)	56,858 (12,315)	38,861 (8,318)	82,265 (16,152)	44,725 (9,284)

Table 11. Waubay Lake, South Dakota angler responses (percentage of total) during the summers of 2007-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the summers of 2007 and 2008 (*) moderately satisfied and moderately dissatisfied were not options for angler response.

Response	Percent (%) of anglers						
	2007* N=167	2008* N=235	2009 N=173	2010 N=486	2011 N=340	2012 N=34	2013 N=121
Very Satisfied	29.3	53.2	26.6	31.9	52.1	23.5	41.4
Moderately Satisfied	-----	-----	28.3	25.1	24.7	17.7	25.9
Slightly Satisfied	25.8	21.7	13.9	13.8	9.1	26.5	19.0
Neutral	23.4	15.3	14.5	11.7	6.5	5.9	6.9
Slightly Dissatisfied	15.0	8.9	6.9	8.6	5.0	17.7	5.2
Moderately Dissatisfied	-----	-----	5.2	5.1	1.2	5.9	1.7
Very Dissatisfied	6.6	0.9	4.6	3.7	1.5	2.9	0.0

Table 12. Waubay Lake, South Dakota angler responses (percentage of total) during the winters of 2006-2007, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the winter of 2006-2007 (*) moderately satisfied and moderately dissatisfied were not options for angler response.

Response	Percent (%) of anglers				
	2006-2007* N=444	2009-2010 N=155	2010-2011 N=179	2011-2012 N=95	2012-2013 N=170
Very Satisfied	40.5	29.0	35.2	35.8	19.4
Moderately Satisfied	-----	16.1	14.5	20.0	28.2
Slightly Satisfied	21.6	12.3	15.6	12.6	9.4
Neutral	15.8	12.9	15.1	12.6	15.3
Slightly Dissatisfied	9.9	13.6	6.7	8.4	10.0
Moderately Dissatisfied	-----	9.7	11.7	7.4	8.8
Very Dissatisfied	12.2	6.5	1.1	3.2	8.8

Table 13. Waubay Lake, South Dakota angler responses during the summer of 2012 to the question: “Considering size, number and species of fish caught, how satisfied are you with your fishing trip today?” N is the number of responses.

Response	Percent (%) of anglers
	2012 N=98
Very Satisfied	24.5
Moderately Satisfied	34.7
Slightly Satisfied	20.4
Neutral	7.1
Slightly Dissatisfied	6.1
Moderately Dissatisfied	3.1
Very Dissatisfied	4.1

Table 14. Waubay Lake, South Dakota angler response (percentage of total) during the summers of 2007, 2008, 2010, 2011 and 2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses.

Response	Percent (%) of anglers				
	2007 N=167	2008 N=234	2010 N=486	2011 N=340	2013 N=121
Relaxation	18.0	12.4	37.2	32.4	6.9
Harvesting Fish	18.6	31.2	3.9	2.9	8.6
Participate	20.4	6.0	8.0	5.9	16.4
Catching Fish	27.5	43.2	25.3	28.8	51.7
Being with Friends	13.8	3.9	17.9	15.3	6.9
Other	1.8	3.4	7.6	14.7	9.5

Table 15. Waubay Lake, South Dakota angler response (percentage of total) during the winters of 2006-2007, 2010-2011, 2011-2012 and 2012-2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses.

Response	Percent (%) of anglers			
	2006-2007 N=444	2010-2011 N=179	2011-2012 N=94	2012-2013 N=166
Relaxation	13.5	12.3	5.3	12.7
Harvesting Fish	9.2	14.0	12.8	24.1
Participate	36.7	22.9	24.5	13.3
Catching Fish	37.8	44.7	46.8	45.2
Being with Friends	1.6	2.2	6.4	1.8
Other	1.1	3.9	4.3	3.0

Table 16. Waubay Lake, South Dakota angler response (percentage of total) during the summer of 2009 and winter of 2009-2010 to the question: “Are you in favor of the reduced panfish limits in northeast South Dakota?” N is the number of responses.

Response	Percent (%) of anglers	
	2009-2010 N=166	2009 N=173
Yes	93.4	74.6
No Opinion	4.2	20.2
No	2.4	4.6

Table 17. Waubay Lake, South Dakota angler response (percentage of total) during the summer of 2012 to the question: “Would you be in favor or against allowing for northern pike spearing through the ice statewide?” N is the number of responses.

Response	Percent (%) of anglers
	2012 N=98
In Favor	49.0
Opposed	15.3
No Opinion	35.7

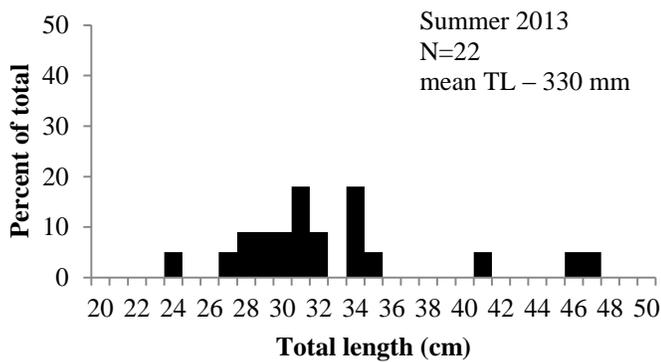
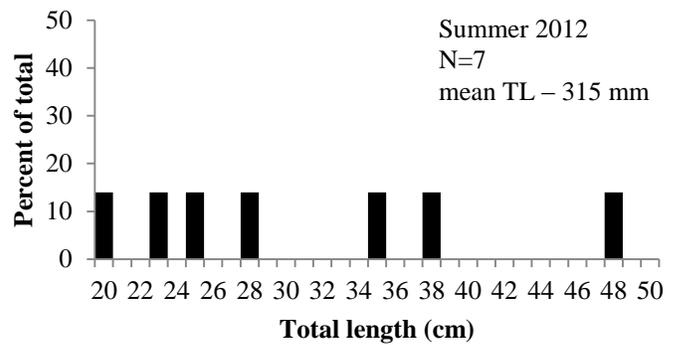
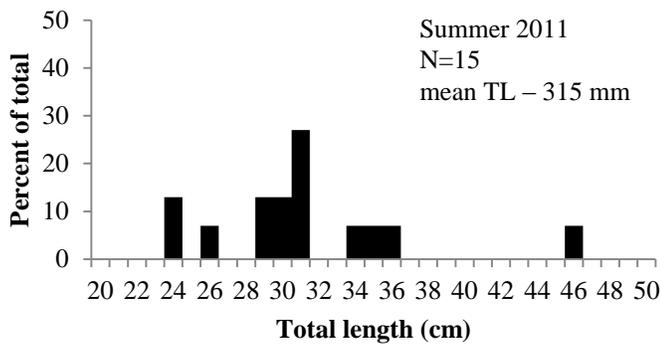
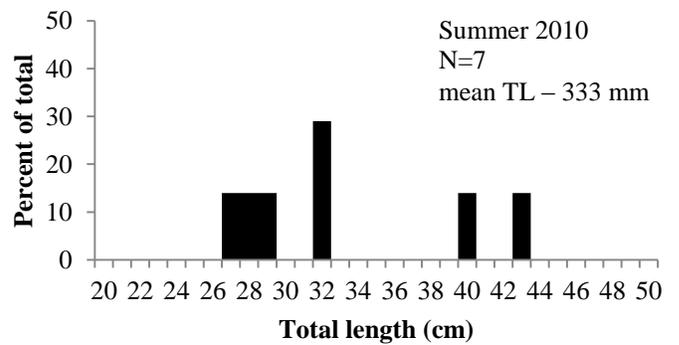
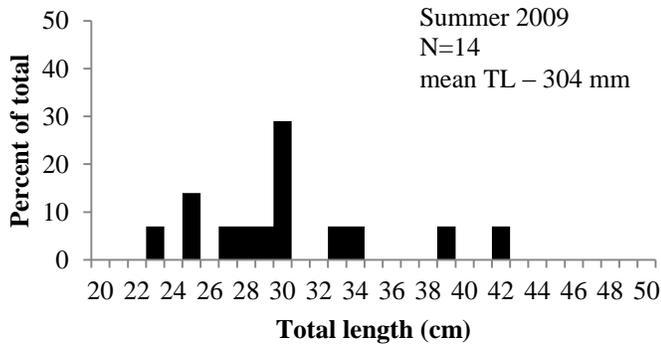
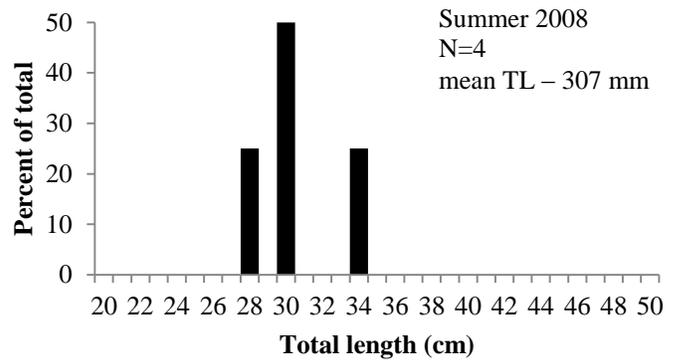
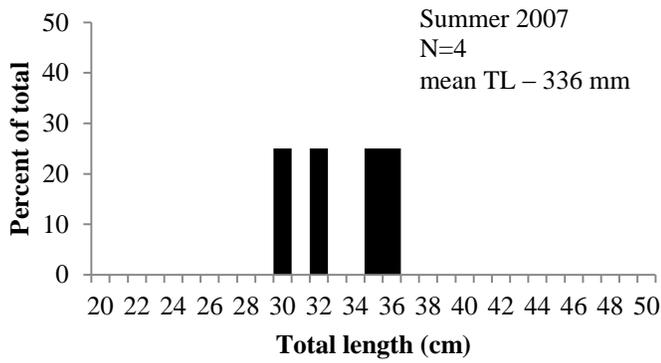


Figure 1. Length frequency histogram of Smallmouth Bass harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Smallmouth Bass.

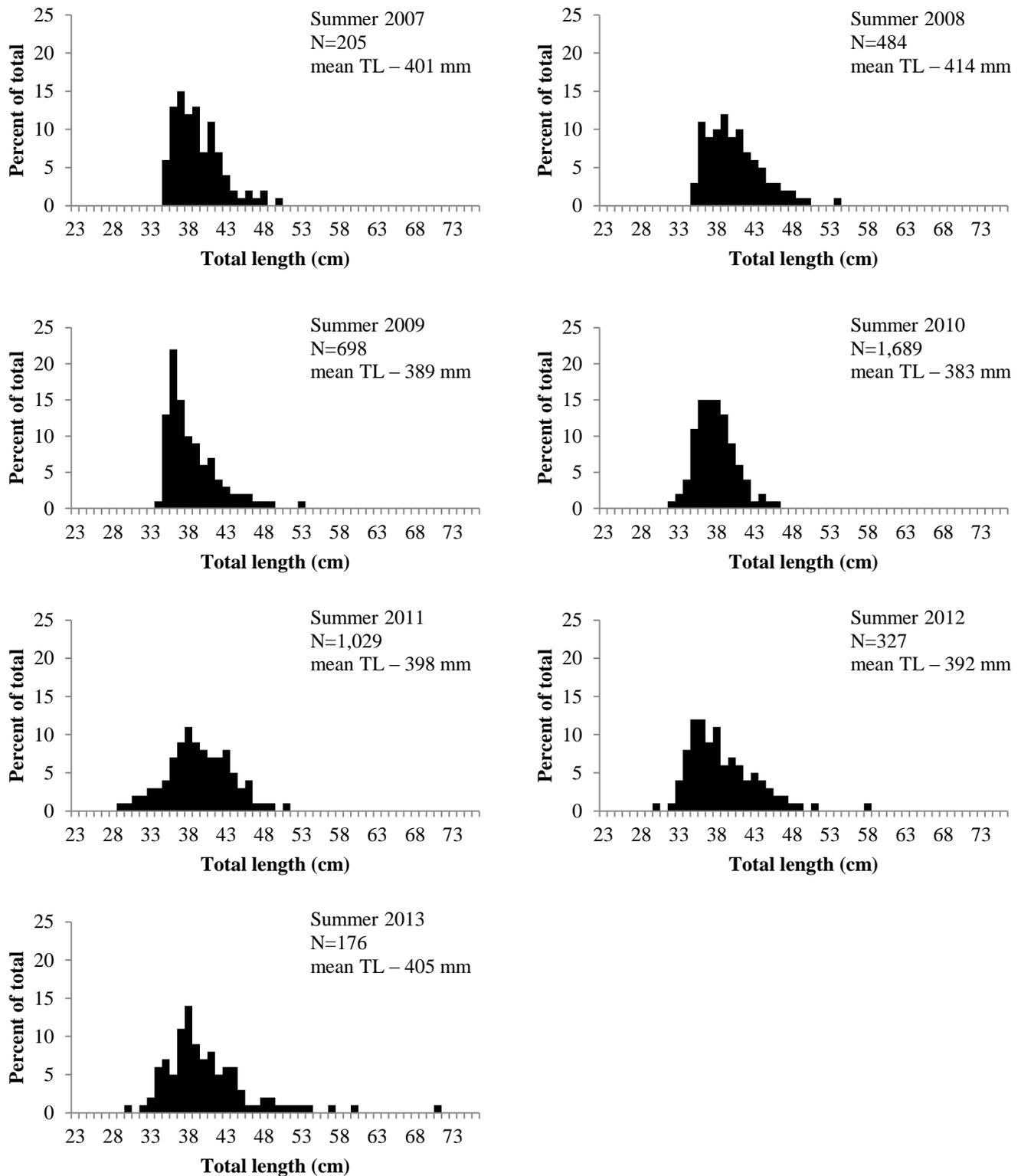


Figure 2. Length frequency histogram of Walleye harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Walleye.

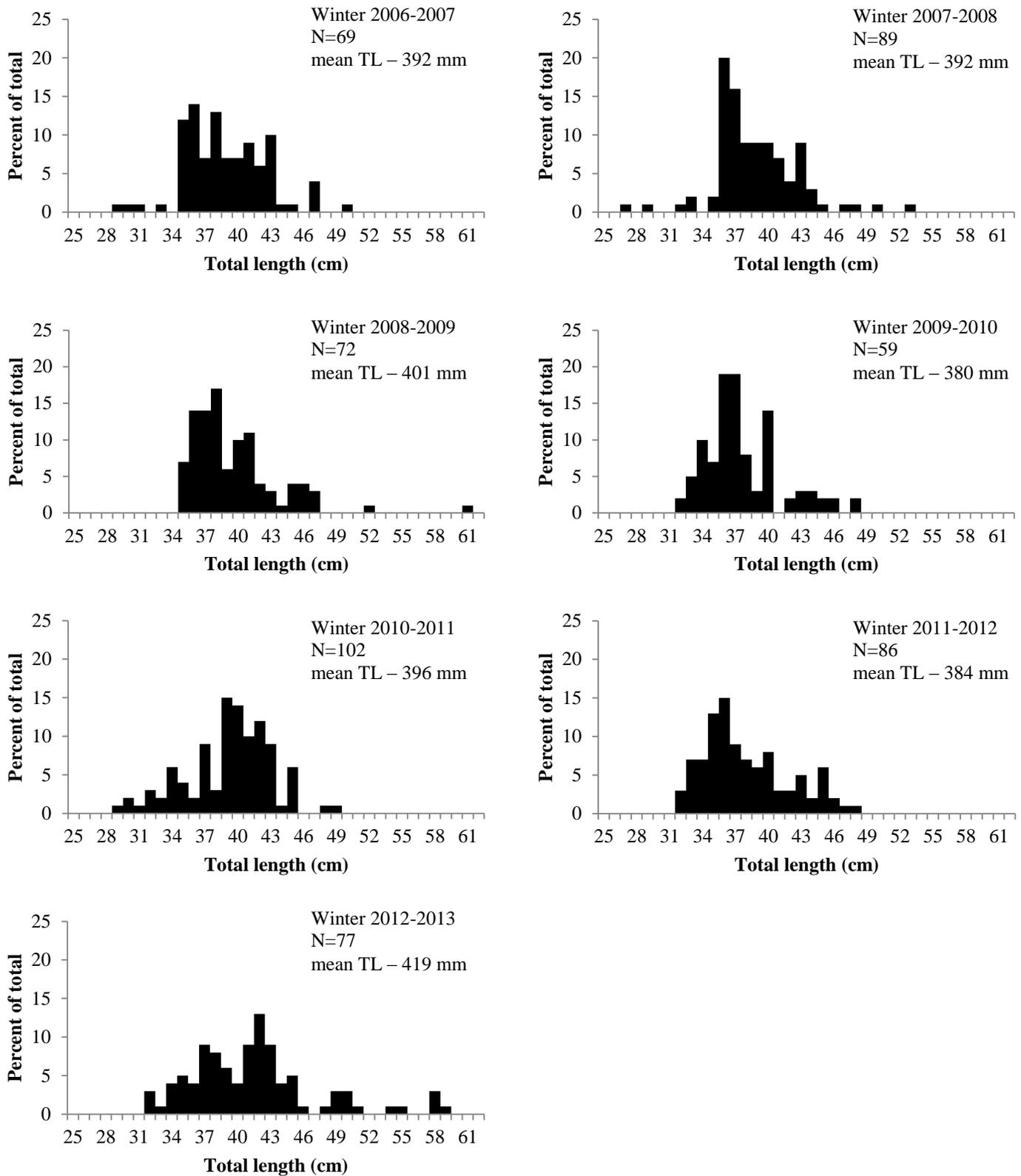


Figure 3. Length frequency histogram of Walleyes harvested by anglers fishing Waubay Lake during the winters between 2006-2007 and 2012-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested Walleyes.

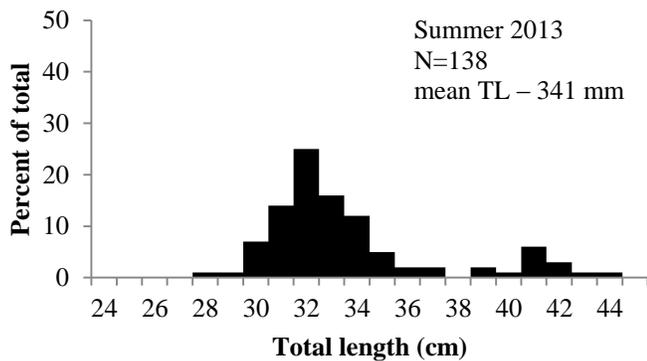
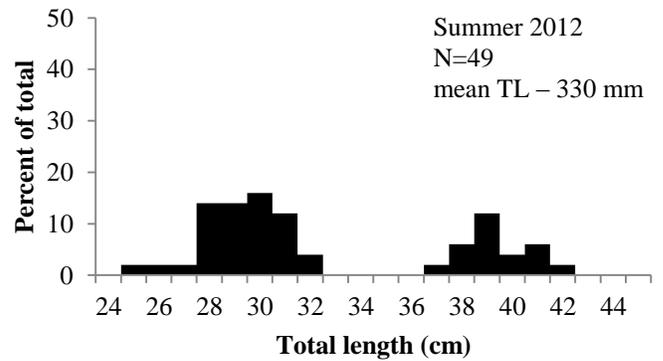
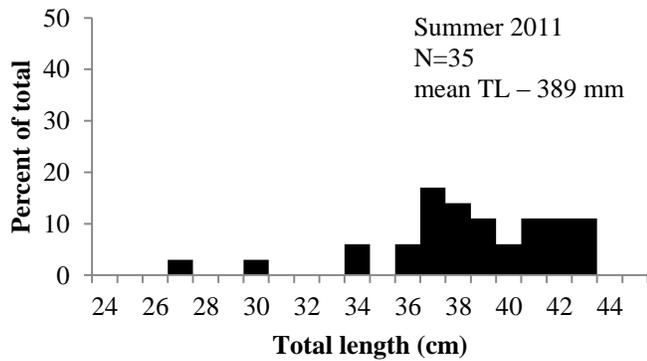
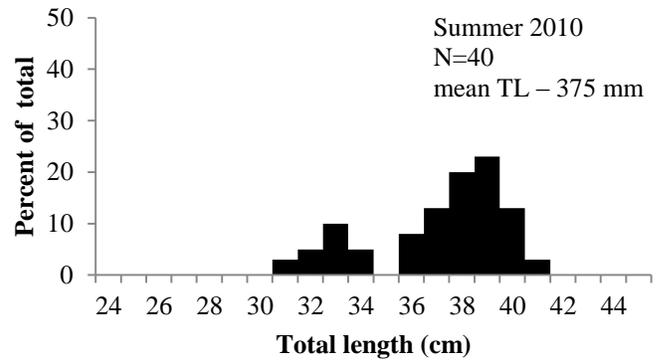
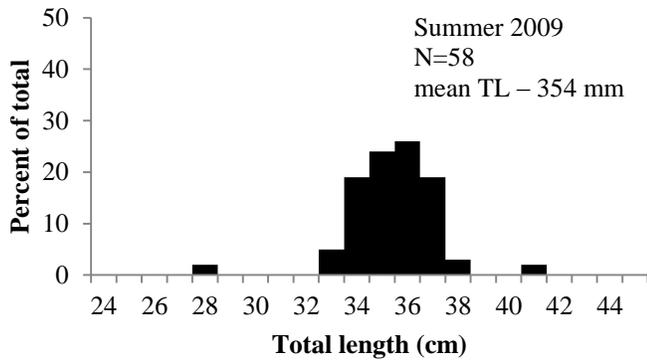
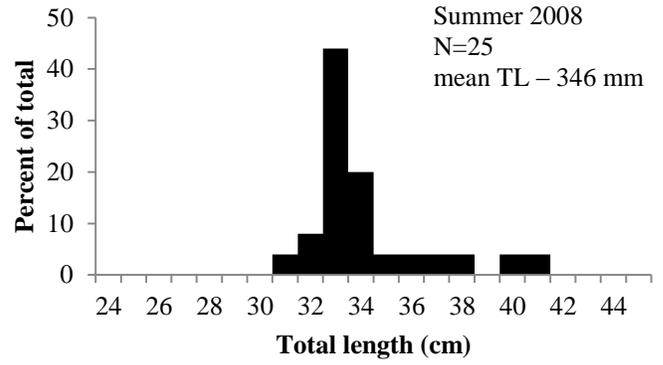
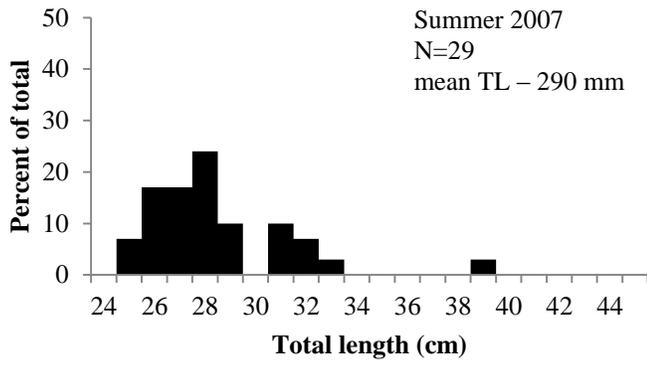


Figure 4. Length frequency histogram of White Bass harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested White Bass.

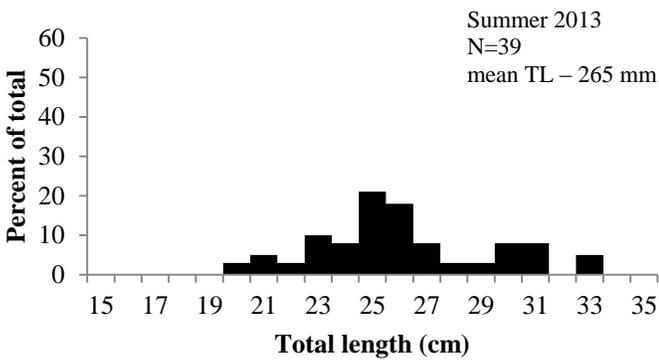
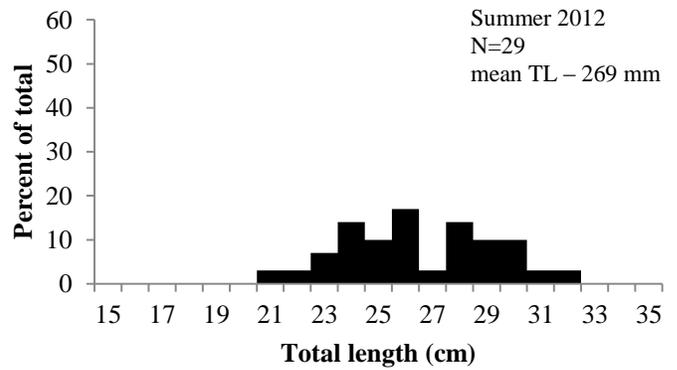
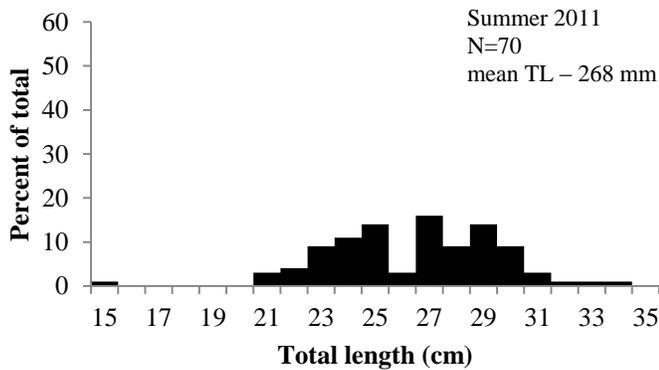
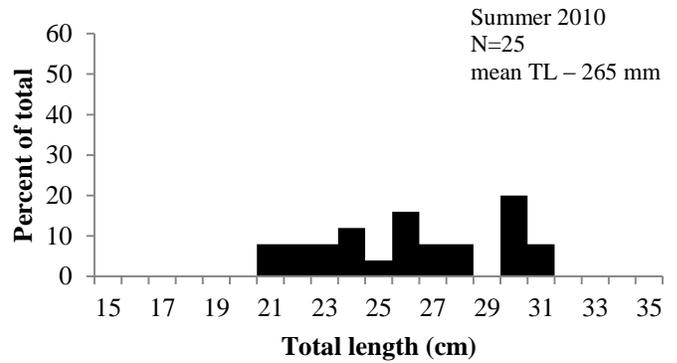
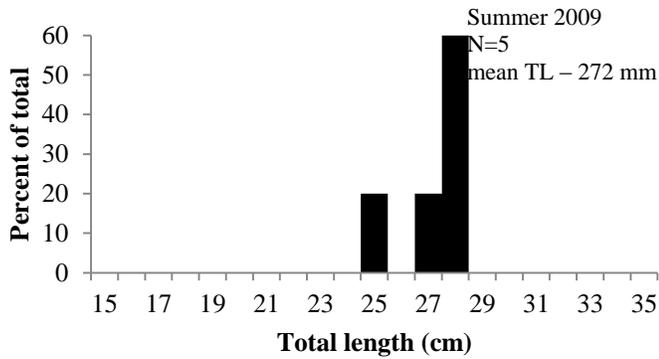
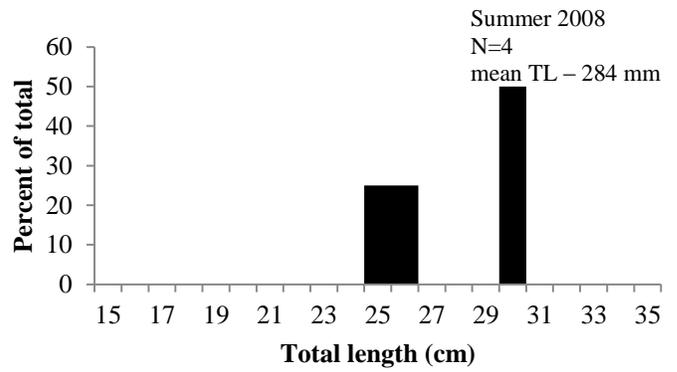
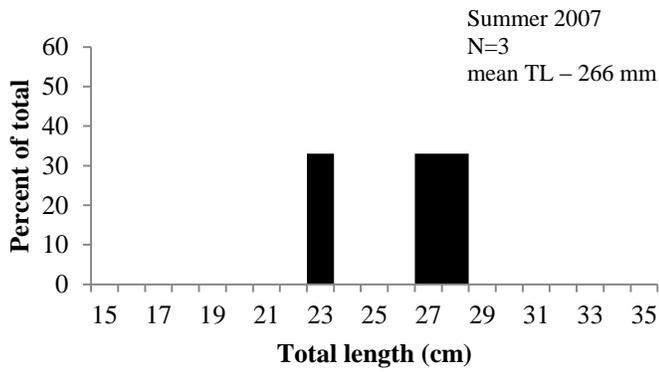


Figure 5. Length frequency histogram of Yellow Perch harvested by anglers fishing Waubay Lake during the summers of 2007-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Yellow Perch.

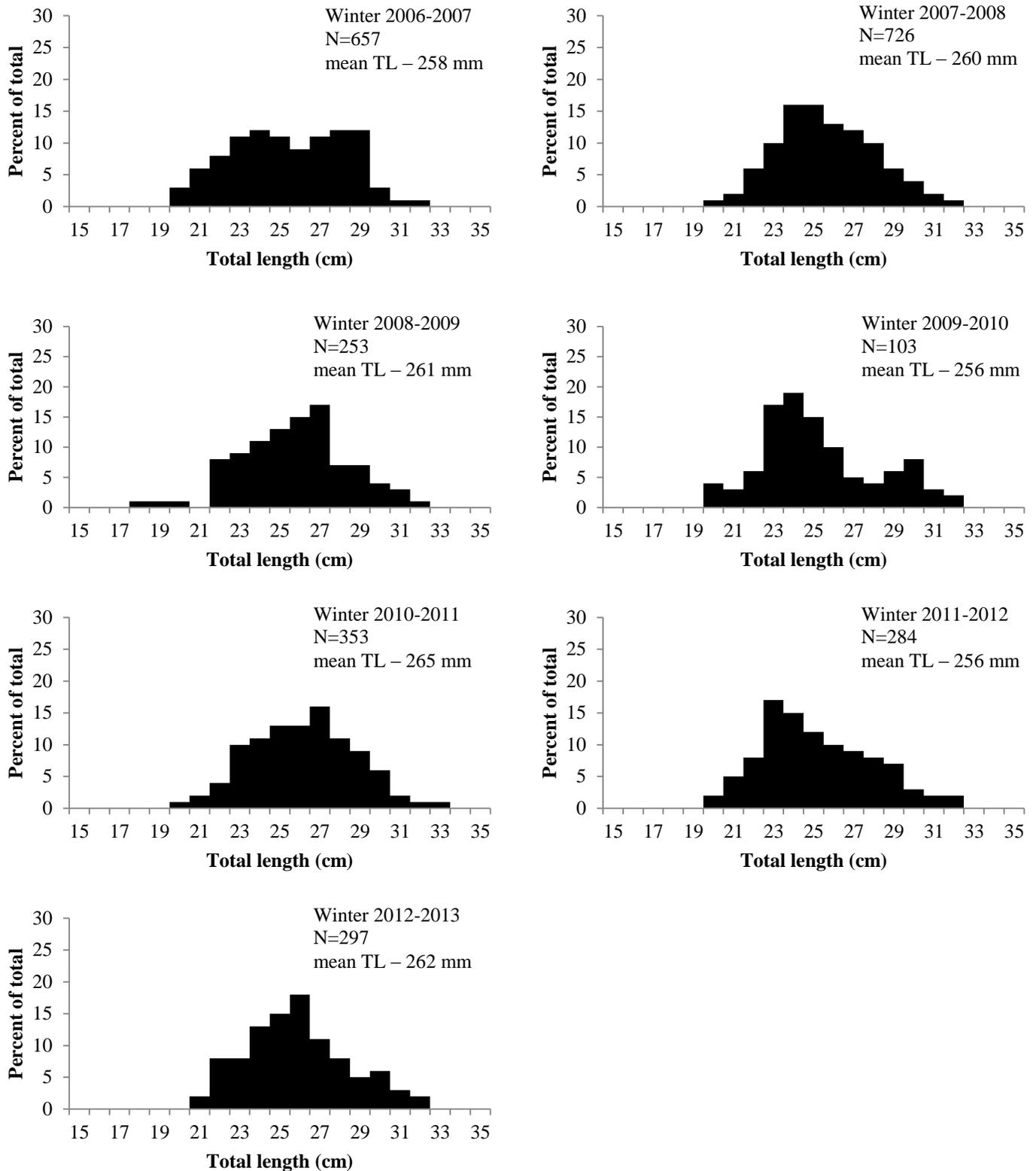


Figure 6. Length frequency histogram of Yellow Perch harvested by anglers fishing Waubay Lake during the winters between 2006-2007 and 2012-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Yellow Perch.

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