SOUTH DAKOTA FISHERIES

ANNUAL FISH POPULATION AND ANGLER USE, HARVEST, AND PREFERENCE SURVEYS ON LAKE OAHE, SOUTH DAKOTA, 2012

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ANNUAL FISH POPULATION
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ON
LAKE OAHE, SOUTH DAKOTA, 2012

By

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PREFACE

Information collected during 2012 is summarized in this report. Copies of this report and references to the data can be made with permission from the authors or the Director of the Division of Wildlife, South Dakota Department of Game, Fish, and Parks, 523 E. Capitol, Pierre, SD 57501.

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EXECUTIVE SUMMARY

This report includes data collected from annual fish population surveys and angler use and harvest surveys collected during 2012 on Lake Oahe, South Dakota. Fish population data and angler use and harvest survey data from previous years are referenced in this report. Results of these surveys are used to evaluate progress towards strategic plan objectives as outlined in the Missouri River Fisheries Program Strategic Plan.

Walleye comprised 42% and channel catfish comprised 33% of the fish caught in the 2012 coolwater gill net survey. Seventeen species were captured in the coolwater gill net survey in 2012. Mean catch per unit effort (CPUE) for all species collected in 2012 was higher than previous years. Black crappie were the most abundant species captured during the August seining survey. Also abundant in 2012 were whitebass and emerald shiners.

Age-0 gizzard shad were the most abundant species in seining survey catches from 2003 to 2009; however, catches have been declining since 2006, and no gizzard shad have been captured during seining surveys since 2009. In 2012, an intensive gizzard shad stocking program was completed and age-0 gizzard shad were once again captured in shoreline seining surveys and coolwater gillnet surveys.

Mean walleye gillnet CPUE in 2012 was reduced compared to 2011, but similar to years prior in the middle and upper zones. In 2012, the number of stock-quality sized fish was well above the five year average; however, the numbers of quality-preferred and preferred-memorable size walleye had declined. Although relative weight (*Wr*) has generally increased since 2007, it was dramatically lower in 2012 than previous years. Length-at-age-at-capture was generally smaller in 2012 compared to the five-year average. Additionally, walleye growth varied among zones and mean length-at-time-of-capture was generally lower in the lower zone of Lake Oahe. Mean annual incremental growth for age-5 to age-10 walleye was considerably slower in 2012 compared to the five-year average.

Estimated fishing pressure for the South Dakota portion of Lake Oahe for 2012 was 1,209,091 h, the second highest estimated since 1998 and approximately 15% higher than 2010. The highest estimated fishing pressure for the April-October period occurred in 1996 at 1,968,525 h. An estimated 2,190,003 walleye were caught in Lake Oahe during the May-October 2011 survey, the highest ever recorded. Of those, 636,054 walleye were harvested again surpassing the highest walleye harvest observed in 2001 at 627,435 walleye harvested.

In 2012, resident anglers represented 76% of the parties interviewed on Lake Oahe. Of the nonresidents, four states represented the majority of home states and included Nebraska, Minnesota, Iowa and North Dakota. In 2012, 41% of anglers traveled >200 miles (one way) and 64% of anglers traveled >100 miles (one way) to fish Lake Oahe. Although high compared to other water bodies across the state, this number is below the five year average.

Overall satisfaction on Lake Oahe during the May-October period of 2012 was at 91%, not including neutral or no opinion. Median satisfaction rating for angling parties that harvested zero to two walleye per person was “moderately satisfied”, while for parties harvesting three to four walleyes per person, median rating was “highly satisfied”.

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INTRODUCTION

Lake Oahe is one of the largest and most economically important fisheries in the State of South Dakota with angler's averaging 176,000 trips annually over the last ten years. Anglers often travel more than 200 miles, one-way, to take advantage of the fishing opportunities in Lake Oahe. The Lake Oahe fishery had an estimated direct economic impact of over $25 million for the April-October 1998 daylight period (US Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 1998). Approximately 257,254 trips occurred during the April-October 2012 daylight period on Lake Oahe, for an estimated economic input of ~$20.3 million (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007).

Because the Lake Oahe fishery is an important resource to the state of South Dakota, its resources must be effectively managed to produce optimal recreational benefits. A prerequisite to the development of effective management strategies is the acquisition and analysis of data describing fish communities and population parameters, angler preference, use and harvest, and angler satisfaction data. These surveys provide information used to evaluate progress towards objectives of the South Dakota Department of Game, Fish and Parks Missouri River Program Strategic Plan and more specifically, the Lake Oahe Strategic Plan.

STUDY AREA

Lake Oahe is a mainstem Missouri River storage reservoir located in north-central South Dakota, downstream from Lake Sakakawea and upstream of Lake Sharpe. Lake Oahe is a large reservoir with a surface area of 110,660 ha, 3,620 km of shoreline and mean and maximum depths of 18.3 and 62.5 m, respectively (Table 1; Michaletz et al. 1986, Warnick 1987). Lake Oahe has been separated into three zones for survey purposes. Each zone includes approximately four sampling locations, with the exception of the lower zone, which was split in half for angler use and harvest surveys (Figure 1).

Because Lake Oahe is a storage reservoir, the elevation of the reservoir, and therefore surface area and volume of the reservoir, change over time (Figure 2). Consequently, sampled habitats are not the same each August when the coolwater gill net survey is conducted. For example, the average August surface elevation decreased from 1603.5 msl in 2000 to 1571.6 msl in 2006 and increased to 1613 msl in 2009. Additionally, Lake Oahe water elevation fluctuations can have dramatic effects on aquatic habitat, lake productivity, water temperatures, water residency time, and many other physical variables. Drastic changes in water elevation likely influence year-to-year variation of surveys.

Table 1. Physical characteristics and management classification of Lake Oahe, South Dakota.

Oahe Dam closed in:	1958	***Reservoir length:**	372 km
Elevation at full pool:	1617 msl.	***Shoreline length:**	3,620 km
Surface area (SD portion):	110,660 ha	**Shoreline development index:**	26.4
Water volume:	2.9×10^3 L	**Drainage area:**	630,639 km^2
***+Coldwater habitat**	47,755 ha	***Average depth:**	18.3 m
Trophic status:	Oligo/meso	***Maximum depth:**	62.5 m
Bottom composition:	Sand, gravel, clay, and shale	**Morpho-edaphic index:**	28.4
Management classification:	Cold, cool, and warmwater permanent	**Water source:**	Missouri River and tributaries

*Denotes values for water elevation at full pool.
+Denotes upper surface area of water $\leq 15^{o}$C in August.

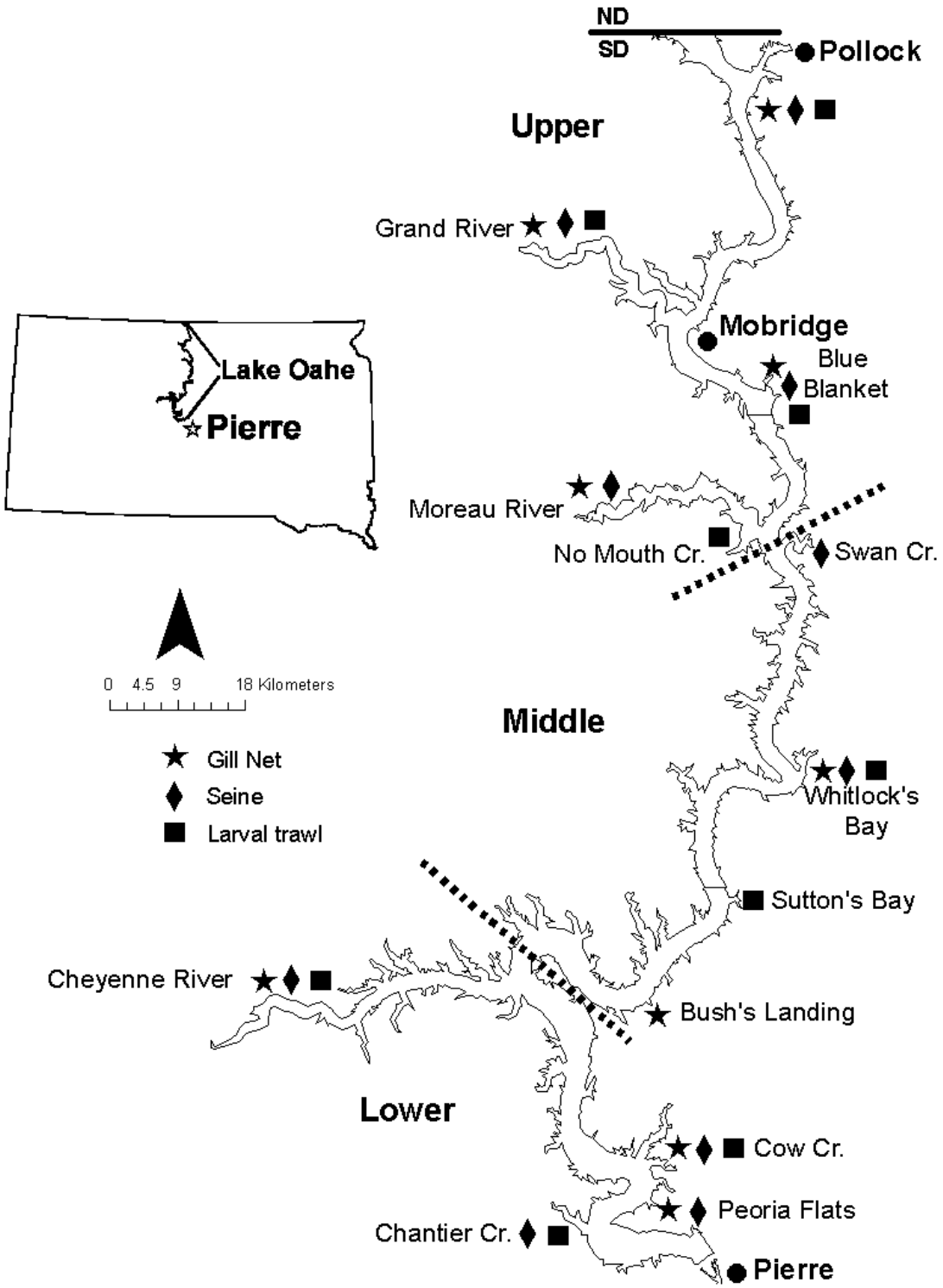

Figure 1. 2012 reservoir zones and fish population sampling locations on Lake Oahe, South Dakota.

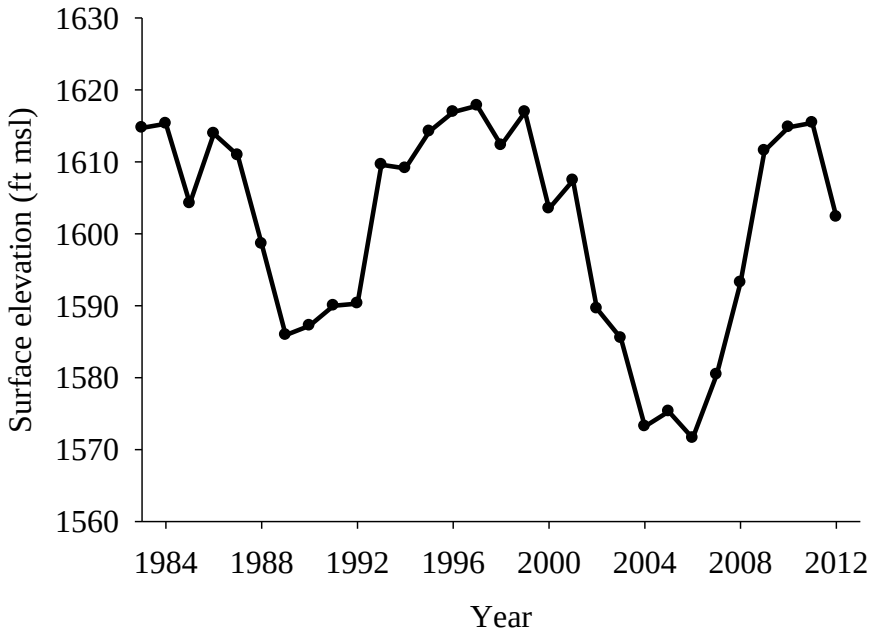

Figure 2. Average August elevation of Lake Oahe for the 1983-2012 period.

REGULATION HISTORY

Walleye harvest regulations for Lake Oahe have differed from standard statewide regulations since 1990. Initially, a 356-mm (14-in) minimum length limit was placed on lakes Oahe, Sharpe, and Francis Case from April through June and a daily limit of four fish (Table 2). In 1999, the harvest regulations were amended so one fish in the daily limit could be 457-mm (18-in) or longer and the April through June minimum length limit was removed. The objective of this regulation change was to concentrate harvest on abundant walleye less than 381-mm (15-in) and reduce harvest of larger walleye to maintain a quality fishery with a high size structure.

The daily walleye bag limit on Lake Oahe was increased from four to 14 fish in 2001 of which, at most, four fish could be 381-mm (15-in) and one fish could be over 457-mm (18-in). The objective of this regulation was to two-fold: to reduce predation on rainbow smelt, which saw rapid population declines in the late 1990's and to reduce the high abundance of walleye less than 381-mm (15-in; Lott et al. 2002).

Following liberalization of the Lake Oahe walleye fishery, a decrease in angler satisfaction was associated with anglers unable to attain high daily limits, as hourly catch rates declined (Lott et al. 2004). Thus, the daily limit was reduced to ten fish for 2002 and 2003 and six fish for 2004 and 2005. The daily limit was reduced to the statewide daily limit of four fish with only one fish allowed over 508-mm (20-in) beginning 1-January, 2006, while the possession limit of 12 fish was reduced to align with the statewide possession limit of eight fish on 1-January, 2007.

Table 2. History of harvest regulations for walleye on Lake Oahe, South Dakota, 1968 through 2012.

Species	Period	Daily limit	Possession limit	Length restrictions
Walleye, sauger, and hybrids, in combination	1968-1983	8	16	None
	1984-1989	6	12	None
	1990-1998	4	8	• April-June 356-mm minimum length (14-in)
	1999-2000	4	8	• At most one equal to or longer than 457-mm (18-in)
	2001	14	42	• At most four equal to or longer than 381-mm (15-in) • At most one equal to or longer than 457-mm (18-in)
	2002-2003	10	30	• At most four equal to or longer than 381-mm (15-in) • At most one equal to or longer than 457-mm (18-in)
	2004-2005	6	18	• At most four equal to or longer than 381-mm (15-in) • At most one equal to or longer than 508-mm (20-in)
	2006	4	12	• At most one equal to or longer than 508-mm (20-in)
	2007-2012	4	8	• At most one equal to or longer than 508-mm (20-in)

SAMPLING METHODS

Fish Population Surveys

Data Collection

A suite of gears was used to collect fish throughout the summer of 2012 in Lake Oahe. The standard coolwater fish population survey consists of setting three standard gill nets overnight (approximately 20 h). Gill nets were placed on the bottom in each depth zone (where possible), for a total of six or nine nets at each station (depending on water levels). A standard gill net of multifilament nylon was 91.4 m long by 1.8 m deep, with 15.2 m panels of the following bar mesh sizes: 12.7 mm, 19.1 mm, 25.4 mm, 31.8 mm, 38.1 mm, and 50.8 mm.

All walleye collected during standard coolwater gill net survey were measured for total length (mm) and weighed (g). Attempts were made to remove sagittal otoliths from ten fish within each 25-mm length class for walleye, sauger, and hybrids captured at each sampling station. When possible, representative samples (at least 50 individuals per sampling station) of all other species were measured and weighed. Due to low catch rates and fluctuating water levels, deep water gill nets have been analyzed independently from standard gill nets.

A 6.4-mm nylon mesh bag seine, measuring 30.5-m long by 2.4-m deep with a 1.8-m by 1.8-m bag, was used to collect age-0 and small-bodied littoral fishes. A quarter-arc seine haul was accomplished using methods described in Martin et al. (1981). Four seine hauls were made at each sampling station. All fish collected were identified, enumerated and classified by age.

Age was estimated using whole otoliths from walleye and sauger less than 300-mm. Otoliths were viewed submersed in water in a black dish with an overhead light source. For fish greater than 300-mm, otoliths were cracked through the focus and charred using a propane torch prior to age-estimation. Otoliths were read independently by at least two experienced readers.

Data Analysis

Relative abundance of fish species is expressed as mean CPUE for gill net (No./net night) and seine (No./haul) catches. Standard error values were calculated for gill net and seining CPUE as a measure of sample variance. Incremental growth rates were estimated by subtracting the mean length of fish from a year class at the time of capture from the mean length at capture of the same year class the previous year. Age distributions were developed by assigning ages to all walleye captured during the survey, based on length-at-capture information.

Proportional size distribution (PSD; Anderson and Weithman 1978; Willis et al 1991) was calculated for channel catfish, smallmouth bass, white bass, walleye and yellow perch (Gabelhouse 1984; Appendix 2). Relative weight (*Wr;* Anderson 1980) was calculated using standard-weight (*Ws*) equations developed for walleye (Murphy et al. 1990), yellow perch (Willis et al. 1991), channel catfish (Brown et al. 1995) and white

bass (Brown and Murphy 1991). Proportional size distribution and *Wr* were calculated using the WinFin software package developed by Francis (2000).

Acoustic surveys have been conducted since the late 1980's to monitor cold water species that are less susceptible to coolwater gillnet surveys, primarily rainbow smelt. Equipment specification used during the 2003 -2005 surveys can be found in Nelson-Stastny (2001). Data from 2008-2012 were collected with Biosonics equipment. Acoustic data were processed using EchoView™ Ver. 4.9 (Myriax Software Pty Ltd.) independently for each year, both above and below the thermocline. Based on visual inspection of the acoustic data, files were processed using echo integration techniques or fish trace counting. Higher density files were analyzed using echo integration because echograms could not be processed using fish trace counting due to overlapping fish traces..

Separation of rainbow smelt age classes was based on size ranges determined from fish collected in historic mid-water trawl surveys (Table 3). Fish lengths were converted to expected target strength using the empirical formula from Love (1977). The bottom line and thermocline depth line were identified for each file. Bottom lines were adjusted as needed to account for submerged structures along the bottom. Thermocline depths were chosen by creating a fixed depth line in the echogram that was: 1) near the depth region of the thermocline in the nearest available temperature profile and 2) separated the vertically stratified fish targets visually identified in the echogram. Each echogram was horizontally subdivided into 100-m intervals for the analysis, and targets enumerated.

For echo integration in 2009 through 2012, the expected mean target strength below the thermocline was -44.4 dB. Since the species composition above the thermocline is unknown, the expected mean target strength for above the thermocline was left as the default value (-40 dB). The estimates of year class densities were calculated by averaging the back scattering cross section for each transect, converting to target strength and computing length using the empirical formula from Love (1977). Back scattering cross section for individual echoes was converted into target strength by:

$$TS = 10\text{Log}\ (\sigma_{bs})$$

where TS = target strength (dB), σ_{bs} = back scattering cross section. Target strength to length was calculated from Love's equation:

$$TS = 19.1\ \text{Log}\ (L) - 0.9(F) - 62$$

where TS = target strength (dB), L = fish length (cm) and F = acoustic frequency. The proportion of each age/size class was then calculated (number of echoes in size class "X" / total number of echoes) for each transect. The proportions of each age class were multiplied by the estimated overall density to derive densities for each individual age class.

Angler Use, Sportfish Harvest and Preference Surveys

Data Collection

Angler use and sport fish harvest surveys conducted on Lake Oahe are patterned after a study designed by Schmidt (1975) for Lake Sharpe. Sampling includes aerial counts of boat and shore anglers to estimate fishing pressure, and angler interviews at lake access areas to estimate harvest rates, catch rates, release rates, mean party size,

mean angler day length, target species, and angler state of residency. Flight dates and interview dates were selected using a stratified random design based on the assumption of different levels of fishing pressure for weekdays and weekend days/holidays. Lake access areas for angler interviews were also assigned using a stratified random design with probabilities of assignment differing by access area and month (Stone et al. 1994).

Sampling was conducted from 1-April, 2012 through 31-October, 2012, for the sunrise to sunset period. Angler satisfaction and attitude questions were included in angler interviews in 2012. In addition to asking anglers how satisfied they were with their fishing trip, anglers were asked questions pertaining to potential changes to current spearfishing regulations and questions regarding aquatic nuisance species. A complete list of satisfaction, attitude and preference questions asked in conjunction with the 2012 angler use and harvest survey appears in (Appendix 3).

Data Analysis

Pressure count and angler interview data were entered and analyzed using the Creel Application Software package (Soupir and Brown 2002) and 80% confidence intervals were calculated for estimates of fishing pressure and harvest.

Table 3. Rainbow smelt age and size classes used for size classification of hydroacoustic assesment.

Age class	**Size range**	**Target strength range**
Age-0	21-79 mm	-57.9 - -46.9 dB
Age-1+	80-180 mm	-46.8 - -40.1 dB
>180mm	>180 mm	> -40.0 dB

RESULTS AND DISCUSSION

Fish Population Surveys

Species Composition and Relative Abundance

Catch per unit effort has historically been used as an index of population abundance or density; however, changes in fish behavior can also affect CPUE of gill nets (Hubert 1996). Therefore, caution should be used when inferring density or abundance of fish species captured in the standard gill net survey from CPUE compared temporally. Eighteen species were captured in the coolwater gill net survey samples in 2012 (Table 5). Walleye comprised 42% and channel catfish comprised 33% of all fish caught in the 2012 coolwater gill net survey (Table 4). Mean CPUE for all species collected in 2012 were similar to past years. Walleye CPUE was high compared to previous years and to the CPUE measured in the 1990s (Wickstrom et al. 1993; Johnson et al. 1999; Lott et al. 2007; Adams et al. 2009, Longhenry et al. 2011).

Ten species were collected in the deepwater gillnet survey in 2012 (Table 7). In general, relative catch of all species was reduced compared to 2011. Similar to 2011, walleye was the most abundant fish species captured in the 2012 deepwater gill net survey with a mean CPUE of 8.7 walleye/net night.

Black crappie was the most abundant species captured during the August seine survey, with a mean CPUE of 21.3 fish/haul (Table 6). Also abundant in 2012 were white bass and emerald shiners with CPUE of 15.1 and 14.3, respectively. Age-0 gizzard shad were the most abundant species in seine survey catches from 2003 to 2009; however, catches have been declining since 2006, and no gizzard shad have been captured during seine surveys since 2009. In 2012, an intensive gizzard shad stocking program was completed and age-0 gizzard shad were once again captured in shoreline seining surveys and coolwater gillnet surveys.

Population Characteristics of Walleye

Mean CPUE of walleye captured in gillnets in 2012 was lower than CPUE in 2011 (Figure 3). Similar to 2011, CPUE of stock-quality sized fish in 2012 was greater than the five year average (Table 8); however, CPUE of quality-preferred and preferred-memorable size classes declined. Walleye PSD and PSD-P in 2012 were the lowest since 2008 across all zones of Lake Oahe (Table 9).

Although relative weight (*Wr*) has generally increased since 2007, it was lower in 2012 than previous years (Table 10). Relative weight was greater in the upper zone (82) compared to the middle (76) and lower (76) zones. Relative weight was generally greater for stock-quality (79) size fish compared to quality-preferred (76) or preferred (71). Length-at-age-at-capture was generally smaller in 2012 compared to the five-year average (Table 11). Only age-5 and age-9 walleye were longer than the five year average. Additionally, walleye growth varied among zones and mean length-at-time-of-capture was generally smaller in the lower zone of Lake Oahe particularly for age-5 and older walleye (Table 12).

Mean annual incremental growth of walleye was considerably slower in 2012 than in the previous five years (Table 13). Age 2-3 walleye exhibited the largest reduction (~50%) in growth compared to previous years. Twelve year classes were represented in

2012 with a strong age-3 year class (2009 year class; Table 14). The age-3 year class represented 76% of the 2012 gill net sample and was the largest year class for the third year in a row. Walleye production in 2011 and 2012 appears similar to the five year average.

Similar to 2011, 254- to 381-mm TL (10- to15-in) walleye composed the highest percentage of the population in 2012 (Figure 4). Catch of fish larger than 508-mm (20-in) was greater in 2012 than between 2000-2002 period. However, the number of large (>508-mm) walleye captured in 2012 remains below the level recorded in the late 1990's. The lower zone continued to produce more walleye greater than preferred length than the middle and upper zones (Figure 5). Numbers of walleye below 254-mm were again lower in the lower part of Lake Oahe, suggesting poor recruitment in this zone. As in previous years, walleye production in the lower zone of Lake Oahe has been low and growth is generally faster than the other two zones of the reservoir (Longhenry et al. 2010).

Population Characteristics of Channel Catfish

Channel catfish in Lake Oahe were more abundant and exhibited larger size structure in 2012 than 2011. Catch per unit effort of channel catfish increased from 12.7 in 2011 to 16.3 in 2012 (Figure 6). Proportional size distribution of channel catfish increased from 48 in 2011 to 55 in 2012. However, *Wr* decreased from 2011 to 2012, and is the lowest observed since 2008 (Table 15).

Table 4. Relative species composition, expressed as percent of total catch by number of fish species collected during August standard coolwater gill net survey from 2008 through 2012.

Species	Year				
	2008	**2009**	**2010**	**2011**	**2012**
Channel catfish	41	29	29	21	33
Walleye	27	21	24	41	42
Gizzard shad	4	0	0	0	0
Freshwater drum	4	3	3	2	2
River carpsucker	2	2	1	1	2
Yellow perch	6	26	32	11	1
Common carp	3	5	4	2	2
Goldeye	2	0	1	2	2
White bass	2	1	1	6	3
Other	8	13	14	13	13

Table 5. Mean catch per unit effort (CPUE; No./net-night) and standard error values (SE) for selected fish species collected with standard coolwater gill nets in 2008-2012. Trace (T) indicates values less than 0.05.

Species	Year									
	2008		2009		2010		2011		2012	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0.4	0.1	T	--	0.2	0.1	T	--	0.0	--
Black bullhead	0.0	---	T	--	0.0	0.0	T	--	0.0	--
Bluegill	0.1	0.0	0.5	0.3	0.2	0.1	T	--	T	--
Channel catfish	28.0	2.3	16.2	1.7	14.7	1.3	12.7	1.3	16.3	1.6
Chinook salmon	T	---	T	--	0.0	--	T	--	0.0	--
Common carp	2.0	0.3	3.0	0.4	2.7	0.3	1.5	0.2	1.1	0.2
Freshwater drum	2.0	0.5	1.5	0.3	2.3	0.3	1.5	0.3	0.8	0.1
Gizzard shad	2.0	0.7	0.2	0.1	0.0	--	0.0	--	0.1	0.1
Goldeye	1.2	0.3	0.1	0.1	0.5	0.2	1.4	0.3	1.1	0.3
Lake herring	0.0	---	T	--	T	--	0.1	0.1	0.0	--
Northern pike	0.1	0.0	0.5	0.1	1.5	0.3	2.0	0.3	1.7	0.2
Paddlefish	T	---	0.0	0.0	0.0	0.0	0.0	--	0.0	--
Rainbow smelt	0.4	0.2	0.3	0.1	T	--	0.0	--	0.0	--
River carpsucker	1.0	0.2	1.0	0.3	1.1	0.3	0.5	0.2	1.1	0.2
Sauger	1.0	0.2	0.9	0.2	0.6	0.2	0.3	0.1	0.3	0.1
Shorthead redhorse	0.1	0.1	0.2	0.1	0.6	0.2	0.6	0.2	0.8	0.3
Shortnose gar	0.2	0.1	0.1	0.1	T	--	T	--	0.3	0.2
Smallmouth bass	1.0	0.5	2.3	0.5	4.2	0.7	1.6	0.3	1.7	0.5
Smallmouth buffalo	0.2	0.1	0.3	0.1	0.2	0.1	0.1	0.1	0.3	0.1
Spottail shiner	0.1	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0	--
Walleye	14.0	2.0	12.1	1.9	18.4	1.9	25.1	2.0	20.4	1.6
White bass	1.0	0.4	0.6	0.2	1.1	0.2	3.8	0.7	1.4	0.3
White crappie	0.2	0.1	1.6	0.7	1.4	0.3	2.7	1.7	0.7	0.2
White sucker	0.1	0.1	0.4	0.1	0.6	0.2	0.4	0.1	0.2	0.1
Yellow perch	3.0	1.0	14.6	3.5	24.0	4.5	7.2	0.8	0.3	0.1

Table 6. Mean catch per unit effort (CPUE; No./haul) and standard error (SE) values for fish species collected during the standard August seine survey, 2008-2012. Catches are for age-0 fishes except where noted. Trace (T) indicates values less than 0.05.

Species	Year									
	2008		2009		2010		2011		2012	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0.0	--	0.0	--	0.1	0.1	0.0	--	0.0	--
Black crappie	T	--	9.1	9.1	3.9	2.4	21.0	20.6	21.3	20.6
Bluntnose minnow	0.0	--	0.7	0.7	0.0	--	0.0	--	0.0	--
Brassy minnow*	T	--	0.1	0.1	0.7	0.4	0.3	0.3	0.0	--
Channel catfish	2.0	1.8	0.0	--	0.0	--	T	--	0.0	--
Common carp	1.0	0.5	0.6	0.4	0.2	0.1	0.5	0.3	0.1	0.1
Emerald shiner*	12.0	8.1	14.6	6.1	7.9	3.6	60.3	45.9	14.3	6.3
Fathead minnow*	0.0	--	0.1	0.1	20.9	14.2	0.3	0.2	0.1	0.1
Freshwater drum	0.3	0.1	0.0	--	0.1	0.1	2.2	1.4	1.6	0.6
Gizzard shad	76.0	31.0	22.0	13.7	0.0	--	0.0	--	2.5	2.5
Goldeye	0.5	0.2	0.0	--	0.0	--	0.0	--	0.0	--
Johnny darter*	T	--	0.4	0.2	1.1	0.4	1.0	0.3	0.3	0.2
Lake herring	0.2	0.2	0.1	--	0.0	0.0	0.0	--	0.0	--
Largemouth bass	0.5	0.3	0.0	--	0.3	0.2	T	--	0.0	--
Northern pike	0.1	0.1	0.4	0.2	0.0	--	T	--	0.0	--
River carpsucker	1.0	0.5	2.3	1.7	0.8	0.5	0.3	0.2	0.1	0.1
Silvery minnow	0.0	--	0.0	--	0.1	0.1	0.0	--	0.0	--
Smallmouth bass	37.0	14.0	8.3	2.3	7.9	2.0	10.4	2.3	5.6	1.8
Smallmouth buffalo	0.0	--	4.8	1.9	T	--	0.0	--	T	--
Spottail shiner*	2.0	0.5	6.3	3.4	12.7	5.3	3.0	1.5	1.8	0.7
Walleye	0.2	0.1	1.3	0.7	0.2	0.1	0.2	0.2	0.3	0.2
White bass	20.0	4.7	135.0	56.9	38.9	17.5	42.1	19.5	15.1	9.7
White crappie	15.0	5.1	13.5	6.3	28.9	27.0	10.1	6.3	7.2	4.7
White sucker	1.0	0.4	2.4	2.3	0.3	0.2	T	--	0.1	0.1
Yellow perch	35.0	17.0	393.0	217.0	44.8	27.1	20.0	7.6	8.6	7.3

* Includes all ages.

Table 7. Mean catch per unit effort (CPUE; No./net) and standard error (SE) values for all fish species collected during the standard August deep water gill net survey, 2008-2012. Trace (T) indicates values less than 0.05.

Species	Year									
	2008		2009		2010		2011		2012	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0.1	0.1	0.0	--	0.0	--	0.0	--	0.0	--
Burbot	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Channel catfish	14.7	3.7	3.9	1.0	9.8	3.0	4.2	0.6	2.4	1.1
Chinook salmon	1.3	0.5	0.3	0.1	0.7	0.3	0.1	0.1	0.0	--
Common carp	0.2	0.1	0.1	0.1	0.7	0.4	0.3	0.1	0.0	--
Freshwater drum	0.0	--	0.0	--	0.0	--	1.9	0.6	0.2	0.1
Gizzard shad	0.1	0.1	0.0	--	0.0	--	0.0	--	0.0	--
Goldeye	0.0	--	0.0	--	0.5	0.4	0.5	0.1	0.0	--
Lake herring	10.8	2.5	6.8	1.9	7.9	2.2	1.3	0.6	0.1	0.1
Northern pike	0.0	--	T	--	0.0	--	1.1	0.4	0.3	0.2
Rainbow smelt	1.3	0.6	10	3	8.7	2.9	T	--	0.0	--
River carpsucker	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Sauger	0.2	0.1	0.1	0.1	0.0	--	0.1	0.1	0.1	0.1
Smallmouth bass	0.0	--	0.0	--	0.3	0.2	T	--	0.1	0.1
Walleye	8	2.6	2.2	0.7	5.4	1.5	26	4.6	8.7	2.6
White bass	0.0	--	0.0	--	0.1	0.1	T	0	0.1	0.1
White crappie	0.0	--	0.0	--	0.0	--	0.1	0.1	0.0	--
White sucker	0.0	--	0.2	0.1	1	0.3	T	--	0.1	0.1
Yellow perch	1.7	0.9	0.5	0.3	9.5	2.7	1.7	0.6	0.1	0.1

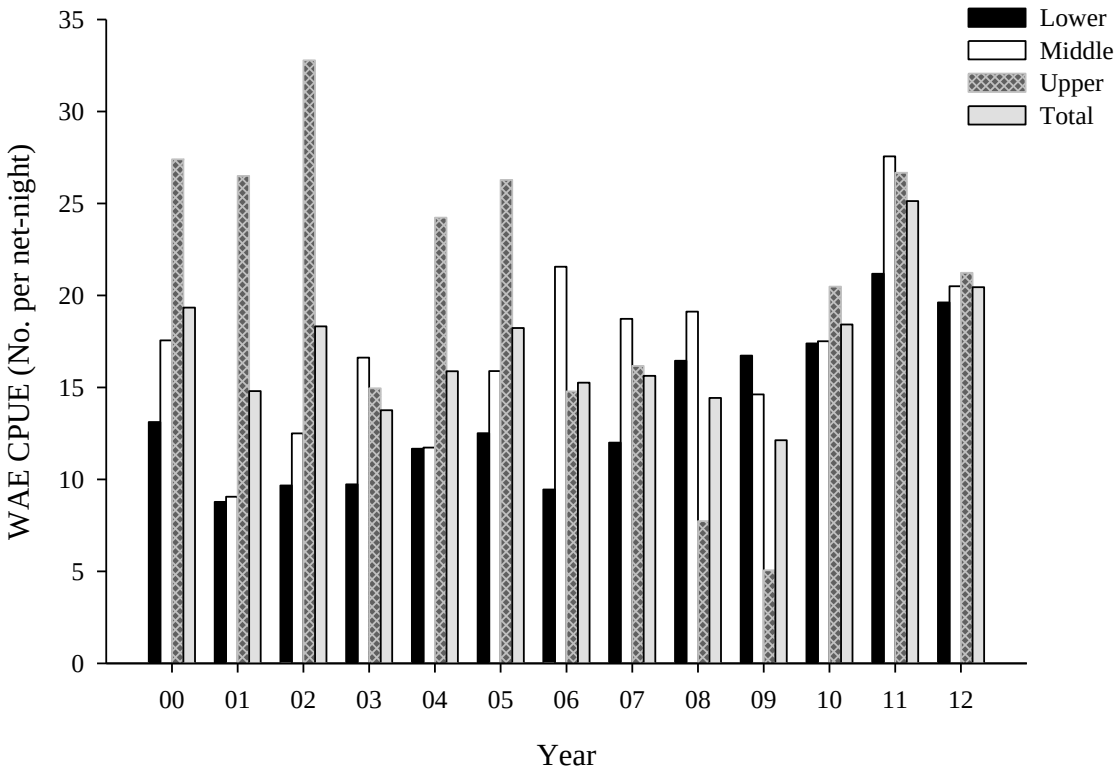

Figure 3. Mean walleye catch per unit effort (No. net-night) in the coolwater gill net survey for lower, middle, and upper zones of Lake Oahe, South Dakota, 2000-2012.

Table 8. Mean walleye catch per unit effort (No./net-night) in the standard coolwater gill net survey, by year and length group, for 2008-2012.

Year	Length group				
	Substock	**Stock-quality**	**Quality-preferred**	**Preferred-memorable**	**Total**
2008	1	7	5	2	14.4
2009	2	10	8	2	12.1
2010	6	8	3	2	18.4
2011	5	15	4	1	25.1
2012	2	15	2	1	20.5

Table 9. Walleye proportional size distributions (PSD, PSD-P, PSD-M), by reservoir zone, for fish collected during the standard coolwater gill net, 2008-2012.

Year	Zone											
	Lower			Middle			Upper			Total		
	PSD	PSD-P	PSD-M	PSD	PSD-P	PSD-M	PSD	PSD-P	PSD-M	PSD	PSD-P	PSD-M
2008	68	18	2	29	6	0	58	13	0	49	12	1
2009	90	24	3	55	8	1	72	9	0	76	19	2
2010	43	18	1	33	7	0	40	8	1	39	12	0
2011	51	15	1	17	4	0	19	5	1	29	8	1
2012	32	7	1	14	4	1	8	3	0	18	4	1

Table 10. Mean relative weight (*Wr*) of walleye by length group and reservoir zone from 2008-2012. No. is number of stock-length fish in a sample.

Zone/Year	Length group							
	Stock-quality		Quality-preferred		Preferred		Total sample	
	Wr	No.	Wr	No.	Wr	No.	Wr	No.
Lower								
2008	88	92	89	89	89	52	88	292
2009	89	28	92	90	90	69	91	290
2010	89	173	92	91	91	55	90	308
2011	86	173	91	90	90	54	88	358
2012	77	222	76	72	72	22	76	326
Middle								
2008	86	224	87	72	83	19	86	315
2009	91	95	94	98	90	18	92	211
2010	87	134	89	54	87	14	87	202
2011	81	349	84	57	81	18	81	424
2012	76	271	75	32	68	13	76	316
Upper								
2008	88	49	87	55	83	15	87	119
2009	90	15	94	33	91	5	93	53
2010	83	89	87	48	85	12	85	149
2011	84	205	89	41	83	15	85	261
2012	83	301	76	18	72	9	82	328
Total								
2008	88	366	88	274	84	80	87	769
2009	90	138	93	326	90	80	91	556
2010	87	407	90	182	89	78	88	659
2011	83	729	89	229	87	79	84	1045
2012	79	794	76	132	71	41	78	970

Table 11. Mean length-at-age at time of capture (mm), sample size (No.) and standard error (SE) for walleye collected in the standard August coolwater gill net survey, from 2008-2012.

Year		Length at age at capture (mm)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2008	**Mean**	251	349	431	478	512	517	532	555	561	544	564	600
	No.	79	307	171	16	24	33	48	10	10	4	4	6
	SE	3.0	1.6	2.2	7.5	8.0	7.7	5.6	16.3	17.2	26.4	28.4	35.7
2009	**Mean**	248	363	431	487	513	542	543	532	574	617	524	558
	No.	83	124	208	86	2	7	12	31	6	9	2	3
	SE	3.8	2.6	1.9	3.4	33.0	8.8	17.7	8.5	15.7	17.7	22.0	5.8
2010	**Mean**	248	339	433	488	516	494	602	596	555	557	514	570
	No.	439	177	81	93	58	4	2	4	5	2	1	1
	SE	2.2	3.0	3.6	3.3	7.3	22.7	13	28.7	17.6	56	---	---
2011	**Mean**	196	303	400	478	514	547	534	564	559	619	596	581
	No.	45	1007	116	44	50	29	1	3	4	3	2	2
	SE	4	2	5	6	7	8	--	16	26	29	25	21
2012	**Mean**	215	258	338	444	526	525	540	550	582	---	637	---
	No.	69	52	426	21	7	21	7	1	3	0	2	0
	SE	3.1	3.1	2.3	11.1	20.5	12.6	22.9	---	28.3	---	37	---
Five year Mean		232	322	407	475	516	525	550	559	566	584	567	577

Table 12. Mean length-at-time of capture (TL; mm), by reservoir zone, for walleye collected in the coolwater gill net survey from 2010-2012. No. is sample size and SE is standard error.

Zone	Age	2010			2011			2012		
		Length	No.	SE	Length	No.	SE	Length	No.	SE
Lower	**1**	295	137	2	170	5	44	230	15	5
	2	391	21	8	351	246	3	257	7	6
	3	450	20	8	436	29	6	358	156	4
	4	495	50	4	499	22	4	468	8	12
	5	526	30	6	508	36	8	490	4	36
	6	530	2	24	543	18	10	511	12	44
	7	589	1	--	534	1	--	553	2	45
	8	638	2	31	558	2	26	--	--	--
	9	547	3	20	566	3	35	557	2	24
	10	603	1	--	--	--	--	--	--	--
	11	514	1	--	571	1	--	674	1	--
	12	570	1	--	--	--	--	--	--	--
Middle	**1**	239	158	3	211	5	7	212	28	6
	2	345	69	4	303	400	3	238	15	5
	3	428	29	4	399	41	8	338	120	4
	4	493	18	8	466	15	9	473	6	14
	5	523	9	14	534	8	13	588	2	13
	6	--	--	--	565	8	18	559	5	12
	7	615	1	--	--	--	--	554	3	31
	8	556	2	26	577	1	--	--	--	--
	9	608	1	--	--	--	--	631	1	--
	10	491	1	--	562	1	--	--	--	--
	11	--	--	--	--	--	--	--	--	--
	12	--	--	--	560	1	--	--	--	--
Upper	**1**	215	149	3	198	31	3	209	26	3
	2	325	79	4	270	363	3	269	30	3
	3	434	27	7	379	47	7	317	150	3
	4	480	17	7	450	8	20	392	7	14
	5	495	10	35	519	6	17	551	1	--
	6	458	2	5	521	4	18	523	4	54
	7	--	--	--	--	--	--	506	2	67
	8	--	--	--	--	--	--	550	1	--
	9	527	1	--	536	1	--	--	--	--
	10	--	--	--	647	2	13	--	--	--
	11	--	--	--	620	1	--	600	1	--
	12	--	--	--	602	1	--	--	--	--

Table 13. Mean annual growth (length/y) increment estimates for walleye collected in the coolwater gill net, for the 2007-2008, 2008-2009, 2009-2010, 2010-2011, and 2011-2012 periods.

Year	Growth increment added during period (mm/y)								
	1-2	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**7-8**	**8-9**	**9-10**
2007-2008	107	64	58	53	40	44	39	35	28
2008 -2009	112	82	56	35	30	26	0	19	56
2009 -2010	91	70	57	29	-19	60	53	23	-17
2010 -2011	55	61	45	26	31	40	-38	-37	64
2011-2012	62	35	44	48	11	-7	16	18	-2

Table 14. Age distribution of walleye from 2008-2012, with standard coolwater gill net sets, as determined using saggital otoliths for age-estimation.

	Age												
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2008	12	68	317	176	16	22	35	48	10	10	3	5	5
2009	50	86	133	214	87	2	7	12	31	6	9	2	3
2010	1	575	184	77	86	50	4	2	4	5	2	1	1
2011	12	36	647	102	41	47	29	1	3	4	3	2	2
2012	14	76	84	852	23	8	26	7	2	4	0	2	0

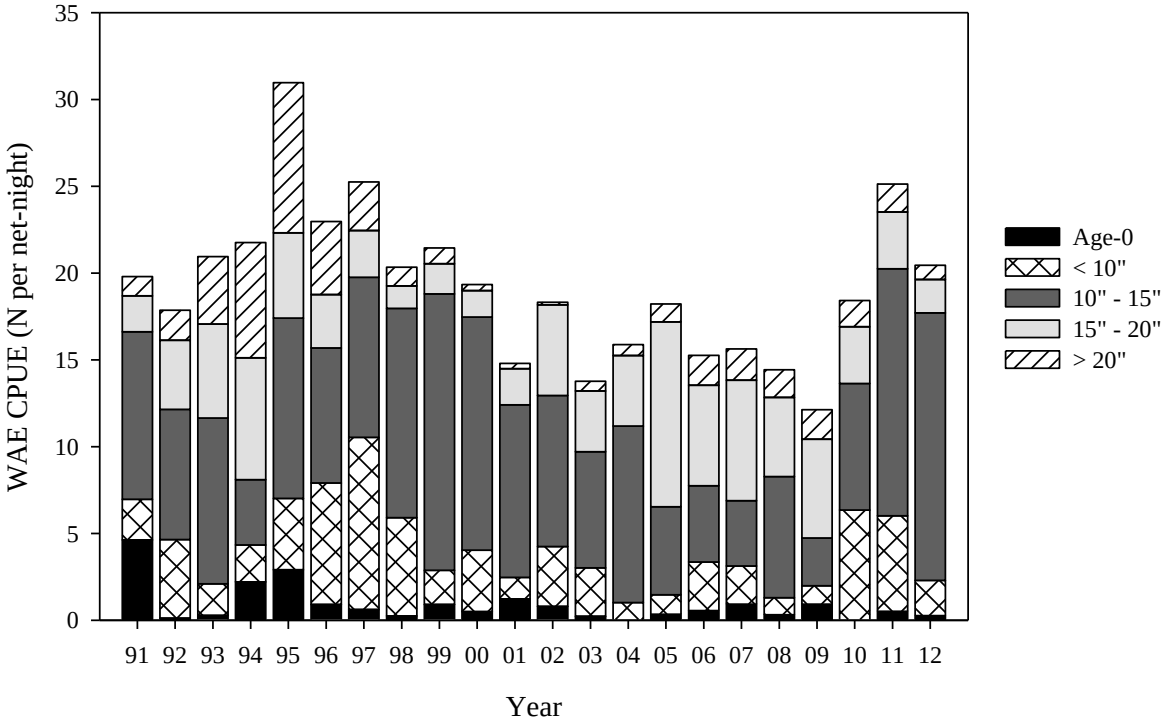

Figure 4. Incremental PSD for walleye by year as sampled by the standard coolwater gill net survey from 1991-2012.

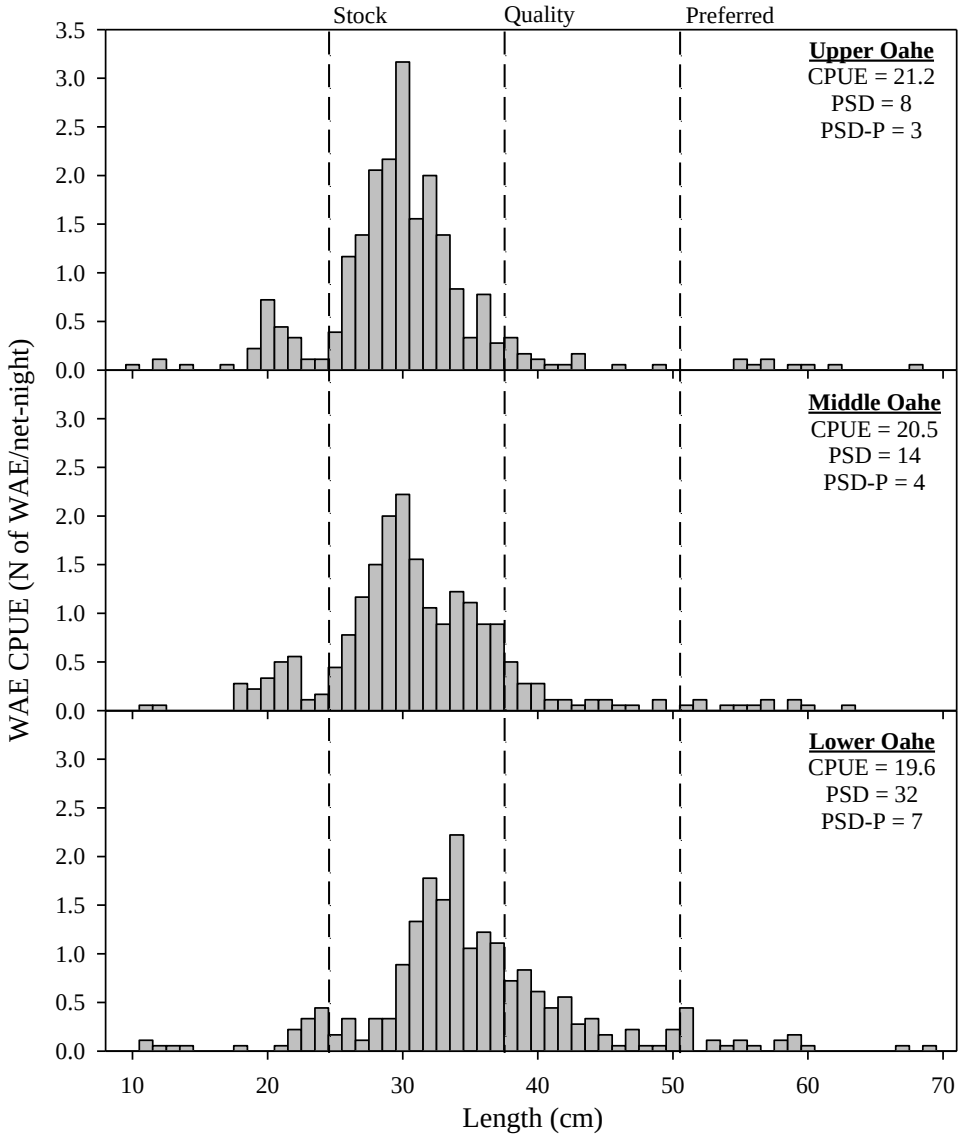

Figure 5. Length-frequency distribution of walleye, by zone collected during the standard coolwater gill net survey in 2012.

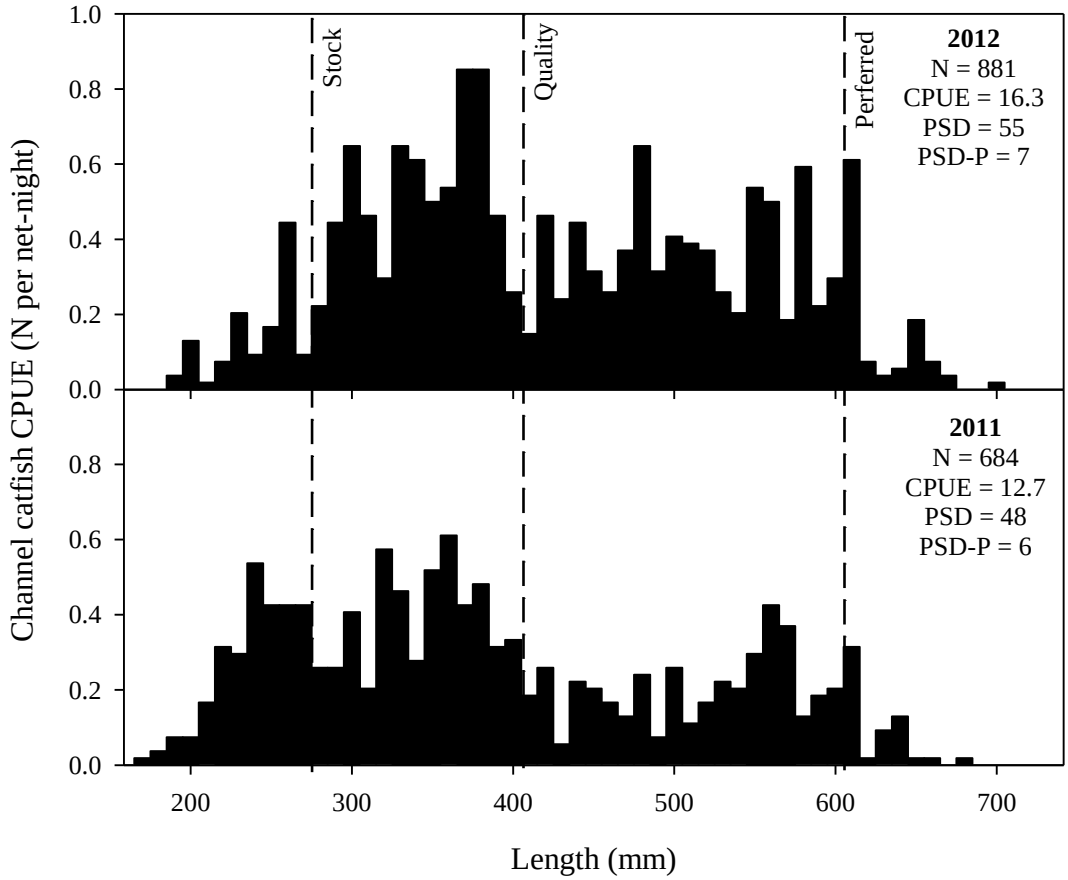

Figure 6. Length-frequency distribution of channel catfish, collected during the standard coolwater gill net survey in 2011 and 2012. N is number of channel catfish sampled.

Table 15. Channel catfish proportional size distribution (PSD), preferred- and memorable-length (PSD-P and PSD-M) fish, and mean relative weight (*Wr*) values for 2008-2012 for Lake Oahe, South Dakota. Mean *Wr* values are for stock-length fish only.

Year	PSD	PSD-P	PSD-M	*Wr*	Sample size
2008	50	1	0	83	481
2009	55	3	0	91	498
2010	63	5	1	84	175
2011	48	6	0	87	406
2012	55	7	0	81	335

Hydro-acoustic Surveys

Population Characteristics of for Rainbow Smelt

The 2012 annual hydroacoustics survey estimated the third lowest number of age-0 (10,608,563) and age-1+ (6,377,569) rainbow smelt since 2000 (Table 16). As in most years, a relatively high proportion of adults to juveniles was observed in the lower and upper zones and may suggest poor recruitment in those zones. Warm water prey fish abundance in 2012 (i.e., the number of fish above thermocline) was the lowest estimated (1,216,823) since 2000. This decline in warm water prey fish is likely a function of the absence of gizzard shad in Lake Oahe following the winters of 2008 and 2009.

Table 16. Summary of annual hydro-acoustic estimates of age-0 rainbow smelt and age-1+ rainbow smelt and warm-water prey fish from 2000-2012 in Lake Oahe.

Year	Age-0 Rainbow Smelt	≥ Age-1 Rainbow Smelt	Warmwater Prey Fish
2000	9,124,186	22,355,394	61,137,676
2001	0	301,649	46,481,942
2002	17,915,654	55,697,926	17,915,654
2003	174,416,958	91,197,100	254,207,372
2004	23,027,641	113,632,146	584,760,943
2005	130,187,588	44,748,275	357,869,701
2006	58,876,298	116,948,745	254,966,028
2007	44,475,598	65,110,154	143,385,687
2008	14,081,481	22,313,083	38,246,299
2009	5,208,281	3,766,315	5,982,974
2010	26,269,734	36,562,586	1,390,758
2011	128,129,398	31,371,182	3,381,415
2012	10,608,563	6,377,569	1,216,823

Angler Use, Sportfish Harvest and Preference Surveys

Angler Use

Estimated fishing pressure for the South Dakota portion of Lake Oahe for 2012 was 1,320,814 h, the second highest estimated since 1998 (Table 17). The highest estimated fishing pressure for the April-October period occurred in 1996 at 1,968,525 h and 338,880 angler trips. In 2012, estimated fishing pressure and number of trips were 61% and 76% of the 1996 levels, respectively. Estimated fishing pressure peaked in June during the 2012 season, at 393,094 h or 33% of the total fishing pressure throughout the months of April to October (Table 18). Approximately 79% of the total fishing pressure in the April through October period occurred during the months of May, June, and July, which is greater than the 70% we observed in the same period in 2010 (Longhenry et al. 2010).

Estimated boat fishing pressure decreased slightly in 2012 to 1,135,862 h (Table 19). Conversely, shore fishing pressure increased substantially and almost doubled the previous four year average at 73,229 h. Estimated fishing pressure, calculated using full pool surface area, was 10.9 h per hectare for the April-October period in 2012 (Table 20). Fishing pressure by hectare decreased from downstream to upstream. The lower zone had the highest pressure (12.5 angler-h/ha), middle zones had intermediate pressure (10.7 angler-h/ha) and the upper zone had the least pressure (9.2 angler-h/ha). Fishing pressure by hectare in the lower zone in 2012 was nearly double the rates observed since 2000 (Table 20).

Catch, Harvest and Release Estimates

Of the estimated 736,755 fish harvested from Lake Oahe during the April-October 2012 daytime period, 636,054 (86%) were walleye (Table 21). Smallmouth bass (6% of total harvest), northern pike (3%) and channel catfish (2%) were the next most common species harvested. Unlike previous years, the majority of the harvest (47%) took place on the lower zone (Table 22). The number of fish caught in 2012 peaked in June at 841,035 fish (Table 23), and May, June and July made up 88% of the total catch for the April-October 2012 daytime period. Walleye made up the majority of fish caught at 1,553,950 fish (76%), followed by smallmouth bass (211,562; 10%), northern pike (162,650; 8%) and channel catfish (48,972; 3%).

Estimated walleye catch and the percentage of walleye caught that were harvested have varied greatly among years (Table 24). The percent of fish caught that were harvested ranged from 23% to 41% during the 1997-2000 period because the walleye population was dominated by fish less than 380 mm in length. High angler catch rates of walleye allowed anglers to be selective in the fish they kept (Lott et al. 2002). The increase in percent of fish caught that were kept in 2001 was the result of liberal limits implemented that year. The percent of walleye caught that were harvested decreased from 81% in 2001 to 65% in 2010. In 2011, catch rates were high and likely increased the release rates on Lake Oahe; percent harvest was 31%, the lowest since 1998. This trend continued in 2012 with the percent harvest dropping to 29%. Despite the decrease in the percent of walleye harvested, 2012 saw the highest estimated walleye harvest to date.

Anglers generally begin harvesting walleyes at approximately 300-mm in length, but prefer to harvest fish longer than 350-mm (Figure 7). Walleye < 300-mm were well

represented in the population survey in all portions of Lake Oahe but were not harvested by anglers, hence the high release rate on Lake Oahe in 2012. As seen in previous years, anglers in the lower zone harvested larger fish than anglers in the middle and upper zones (Figure 8; Figure 9; Figure 10).

Hourly Catch, Harvest, and Release Rates

Walleye catch rates exceeding 0.3 fish/angler-h are generally considered excellent (Colby et al. 1979), and mean angler catch rates for walleye on Lake Oahe have exceeded this number (1.81 fish/angler-h in 2012) since the annual surveys were initiated in 1991 (Table 25; Stone et al. 1994). In 2011 and 2012, walleye catch rates were the highest recorded since the initiation of the creel survey in the mid 1980's (Stone et al. 1994). Additionally, anglers actively fishing for walleye witnessed a 3.79 fish/angler-h catch rate in 2012, higher than all previous years (Longhenry et al. 2011; Table 26). Catch rates for all fish species were substantially higher in May, June and July compared to April, August, September and October (Table 27).

The percentage of anglers catching zero walleye decreased from 15% in 2011 to 8% in 2012 (Table 28). The reduction in anglers catching zero walleye was greatest in the lower zone, which decreased from 21% in 2011 to 10% in 2012. The percent of anglers harvesting four walleye increased from 31% in 2011 to 34% in 2012 (Longhenry et al. 2011). Like catch, anglers harvesting zero walleye declined in the lower zone from 29% in 2011 to 18% in 2012.

Angler Demographics and Economic Input

In 2012, resident anglers represented 76% of the parties interviewed on Lake Oahe and were approximately equal across zones (Table 29). However, Lake Oahe has long been recognized as a destination walleye fishery and 2012 was no exception, with 64% of the anglers traveling ≥ 100 miles, one-way, to fish on Lake Oahe (Table 30). Non-resident anglers represent a large component of Lake Oahe creel and non-resident anglers in 2012 were predominantly from Nebraska (24%), Minnesota (23%) and Iowa (17%; (Table 31).Of the anglers fishing Lake Oahe, 88% targeted walleye, the highest observed in the last five years (Table 32).

Visiting resident anglers fishing Lake Oahe have a tendency to fish the zone closest to their county of residence. On upper Lake Oahe, many anglers were from the northern counties bordering Lake Oahe or along US Highway 12 (Figure 11). Anglers fishing middle Lake Oahe tend to reside near US Highway 212 and anglers fishing lower Lake Oahe tend to live near US Highway 14 (Figure 12; Figure 13). A large percent (15%) of resident angler contacts for Lake Oahe in 2012 were from Walworth County, an increase from previous years (Table 33). Overall for Lake Oahe in 2012, the highest percentages of resident angler contacts for a county were Walworth (15%), Brown (12%), and Hughes Counties (11%). Most resident anglers fishing lower Lake Oahe were from Hughes County (Figure 13). In middle Lake Oahe, most resident anglers were from Hughes, Potter and Minnehaha counties (Figure 12). Most resident anglers fishing in upper Lake Oahe were from Walworth and Brown counties (Figure 11).

Lake Oahe is one of the largest and most economically important fisheries in the State of South Dakota, with anglers averaging 176,000 trips annually over the last ten years. Anglers often travel more than 200 miles, one way, to take advantage of the fishing

opportunities in Lake Oahe. Approximately 257,254 trips occurred during the April-October 2012 daylight period on Lake Oahe, for an estimated economic input of ~$20.3 million (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007). This is down slightly from 2011 which had an estimated impact of $20.9 million, but up from 2010 which had an estimated impact of $17.7 million and 2009 with an impact of $16.5 million (Longhenry et al. 2011).

Angler Satisfaction and Attitudes

Angler attitudes about fishing, their preferences concerning management issues and their level of satisfaction are important components in managing South Dakota fisheries. Historically, fisheries managers have primarily focused on understanding biological aspects of fish populations and monitoring sport fish harvest and use. However, biologists now realize the necessity and value of understanding angler attitudes, levels of satisfaction, and preferences. Consequently, more attitude, preference and satisfaction data have been collected in recent years (Longhenry et al 2011). Assessment of angler satisfaction is important to the success of a fishery. Angler responses help evaluate whether current management practices and regulations are providing a fishery that meets angler needs and expectations.

Overall satisfaction on Lake Oahe during the April-October period of 2012 was at 89%, not including neutral or no opinion, which is above the Lake Oahe Strategic Plan objective of 70% (Table 34). Trip satisfaction generally increased with the percent of daily limits attained by anglers. Median satisfaction rating for angling parties that harvested 0 to 0.9 walleye per person was “satisfied”, and satisfaction continued to increase as the percent of daily limits increased (Table 35). Satisfaction of fishing conditions alone, as determined by the question “Considering numbers, sizes and species caught, how satisfied are you with your fishing experience today?”, was similar to overall satisfaction metrics in 2012 (Table 36).

In 2012, anglers were asked a suite of questions regarding proposed spearfishing regulation changes. Most resident anglers were in favor of allowing northern pike spearing statewide through the ice (79%, not counting no-opinion responses); however, fewer non-residents were in favor of the proposed regulation change (56%; Table 37).

Table 17. Angler use and harvest estimates for surveys conducted from 1995-2012. All surveys were conducted during the April-October daylight period, except where noted.

Year	Fishing pressure (h)	Angler trips	Estimated fish harvest	Estimated walleye harvest	Reference
1995	1,695,945	292,404	464,735	367,693	Johnson et al. (1996)
1996	1,968,525	338,880	533,062	438,355	Johnson et al. (1997)
1997	1,617,024	287,011	538,596	475,638	Johnson et al. (1998)
1998	1,781,032	309,744	563,009	484,234	Johnson et al. (1999)
1999	847,359	158,904	328,184	280,305	Lott et al. (2000)
2000	539,188	109,665	267,642	225,041	Lott et al. (2001)
2001	1,014,591	206,638	694,200	627,435	Lott et al. (2002)
2002	856,059	174,706	465,422	381,390	Lott et al. (2003)
2003	651,557	123,168	233,114	179,002	Lott et al.(2004)
2004	660,973	136,565	277,717	221,405	Lott et al. (2006)
2005	460,334	94,760	204,257	162,780	Lott et al. (2007)
2006	620,272	128,044	233,680	204,335	Lott et al. (2007b)
2007	652,828	132,624	246,430	211,111	Adams et al. (2008)
2008	897,434	192,345	371,089	328,558	Adams et al. (2009)
2009	1,046,564	209,347	335,384	291,885	Longhenry et al. (2010)
2010	1,126,597	224,870	356,573	271,164	Longhenry et al. (2011)
*2011	1,320,814	264,668	694,060	582,461	Fincel et al. (2012)
2012	1,209,091	257,254	736,755	636,054	This Report

*2011 survey period was May-Oct.

Table 18. Estimated fishing pressure (angler hours), by month and zone, with 80% confidence intervals (CI), for the April-October 2012 daylight period.

Zone	Month							
	April	May	June	July	August	Sept.	Oct.	Total
Lower	21,230	60,750	146,523	182,499	76,745	23,286	9,797	520,830
80% CI	6,674	32,604	76,405	44,065	14,786	9,764	7,674	96,228
Middle	11,062	80,345	126,004	95,470	28,094	16,493	6,035	363,501
80% CI	3,530	50,917	51,619	29,885	8,817	6,581	3,475	79,345
Upper	19,156	101,159	120,567	37,391	18,262	15,571	12,654	324,760
80% CI	8,532	37,890	10,933	8,272	6,724	5,047	9,037	42,997
Total	51,447	242,254	393,094	315,360	123,101	55,350	28,486	1,209,091
80% CI	11,392	71,353	92,853	53,882	18,482	12,810	12,355	131,925

Table 19. Estimated fishing pressure, expressed as angler-hours (h) and hours per hectare (h/ha), by type of fishing, with 80% confidence intervals (CI), for the standard April-October daylight survey period from 2008- 2012.

Type of fishing	Year				
	2008	2009	2010	2011*	2012
Boat (h)	855,753	1,009,924	1,083,102	1,279,595	1,135,862
80% CI	102,263	143,611	158,790	198,748	128,618
h/ha	7.7	9.1	9.8	11.6	10.3
Shore (h)	41,680	36,640	43,495	41,219	73,229
80% CI	6,368	5,761	5,784	6,259	11,725
h/ha	0.4	0.3	0.4	0.4	0.7
Combined (h)	897,434	1,046,564	1,126,597	1,320,814	1,209,091
80% CI	102,968	143,899	158,168	200,515	131,925
h/ha	8.1	9.5	10.2	11.9	10.9

*2011 survey period was May-Oct.

Table 20. Estimated fishing pressure, expressed as angler-hours (h) and hour per hectare (h/ha), by reservoir zone, for standard creel surveys conducted during the April-October daylight period from 1995-2012, except where noted.

Year	Zone							
	Lower		Middle		Upper		Total	
	H	h/ha	h	h/ha	h	h/ha	H	h/ha
1995	520,102	16.7	509,497	20.5	666,346	22.2	1,695,495	19.7
1996	688,936	22.0	579,200	23.4	700,389	23.3	1,968,525	22.9
1997	508,565	12.6	548,942	14.3	559,517	21.4	1,617,024	15.4
1998	760,797	18.8	522,740	13.6	497,495	19.0	1,781,032	17.0
1999	455,434	11.3	196,425	5.1	195,500	7.5	847,359	8.1
2000	233,013	5.8	170,320	4.4	135,855	5.2	539,188	5.1
2001	396,097	9.5	350,503	10.3	267,991	7.6	1,014,591	9.2
2002	216,608	5.2	320,535	9.5	318,915	9.1	856,059	7.7
2003	164,804	4.0	280,712	8.3	206,041	5.9	651,557	5.9
2004	161,693	3.9	296,194	8.7	203,086	5.8	660,973	5.9
2005	107,385	2.6	238,202	7.0	114,747	3.3	460,334	4.2
2006	146,218	3.5	307,479	9.1	166,575	4.7	620,272	5.6
2007	177,447	4.3	338,569	10.0	136,810	3.9	652,828	5.9
2008	195,497	4.7	397,962	11.7	303,974	8.6	897,434	8.1
2009	318,711	7.7	427,974	12.6	299,879	8.5	1,046,564	9.5
2010	283,277	6.8	444,681	13.1	398,640	11.3	1,126,597	10.2
***2011**	327,688	7.9	594,380	17.5	398,745	11.3	1,320,814	11.9
2012	520,830	12.5	363,501	10.7	324,760	9.2	1,209,093	10.9
Zone size (ha)	41,598		33,890		35,172		110,660	

*2011 survey period was May-Oct.

Table 21. Estimated number of fish harvested, by species and month, with 80% confidence intervals (CI), for the May-October 2012 daylight period.

Species	Month							
	April	May	June	July	Aug.	Sept.	Oct.	Total
Walleye	24,355	134,687	228,835	174,340	44,203	19,544	10,089	636,054
80% CI	7,460	42,140	57,984	33,111	8,022	4,902	5,622	80,062
Channel catfish	962	1,930	2,418	3,085	3,364	808	369	12,936
80% CI	385	769	577	1,124	1,314	266	256	2,049
White bass	223	1,235	1,483	1,657	1,078	574	748	6,997
80% CI	142	693	576	1,441	719	246	722	2,001
Smallmouth bass	1,574	12,413	8,361	5,028	8,640	4,171	522	40,709
80% CI	398	5,010	3,408	1,626	4,239	1,371	177	7,707
Yellow perch	13	420	563	446	362	186	64	2,054
80% CI	0	441	270	242	187	64	53	607
Northern pike	3,760	8,078	7,688	2,778	1,294	526	407	24,531
80% CI	1,252	2,261	2,601	851	322	157	274	3,791
Chinook salmon	0	544	530	552	0	74	80	1,778
80% CI		431	--	601		100	82	750
Other*	288	2,067	4,910	517	2,710	902	300	11,696
Total	31,175	161,374	254,788	188,403	61,651	26,785	12,579	736,755
80% CI	9,218	48,861	63,917	35,.011	11,069	6,383	6,733	89,399

*Other includes black crappie, freshwater drum, goldeye, sauger, and white crappie.

Table 22. Estimated number of fish harvested, for selected species, by zone, with 80% confidence intervals (CI), for the May-October 2012 daylight period.

Species	Zone			
	Lower	Middle	Upper	Total
Walleye	275,654	205,730	154,670	636,054
80% CI	57,715	50,888	22,119	80,062
Channel catfish	3,809	2,988	6,139	12,936
80% CI	1,454	812	1,194	2,049
White bass	4,002	736	2,259	6,997
80% CI	1,816	237	806	2,001
Smallmouth bass	17,826	15,250	7,632	40,709
80% CI	5,531	5,157	1,489	7,707
Yellow perch	213	781	1,060	2,054
80% CI	116	501	322	607
Northern pike	10,147	6,882	7,502	24,531
80% CI	3,002	1,641	1,633	3,791
Chinook salmon	1,604	74	101	1,778
80% CI	746	82	--	750
Other*	3,325	1,065	7,306	11,696
Total	316,580	233,506	186,669	736,755
80% CI	64,555	56,457	25,246	89,399

*Other includes black crappie, freshwater drum, goldeye, sauger, and white crappie.

Table 23. Estimated number of fish released, by species and month, with 80% confidence intervals (CI), for the May-October 2012 daylight period.

Species	Month							
	April	May	June	July	Aug.	Sept.	Oct.	Total
Walleye	22,013	300,982	702,320	432,686	59,147	23,192	13,610	1,553,950
80% CI	7,265	116,681	163,236	91,195	12,495	5,720	8,711	221,121
Channel catfish	718	2,826	2,647	17,679	18,991	5,283	828	48,972
80% CI	578	1,225	1,259	5,824	8,045	1,732	504	10,262
White bass	639	3,031	7,577	3,830	2,460	2,686	1,636	21,857
80% CI	337	1,314	2,452	1,109	538	1,156	1,118	3,458
Smallmouth bass	3,582	44,515	57,592	64,754	26,958	10,743	3,417	211,562
80% CI	1,119	21,214	18,799	15,609	4,435	3,164	1,137	32,853
Northern pike	12,213	40,434	59,605	32,673	8,616	7,585	1,523	162,650
80% CI	3,845	12,499	15,415	7,126	1,295	2,166	607	21,590
Yellow perch	81	1,194	2,524	3,623	1,506	819	37	9,783
80% CI	47	709	662	1,075	354	89	25	1,494
Chinook salmon	111	119	377	552	180	0	0	1,339
80% CI	27	161	--	473	243	--	--	557
Other*	653	2,920	8,393	11,140	6,120	1,456	86	30,767
Total	40,010	396,021	841,035	566,937	123,978	51,764	21,137	2,040,880
80% CI	11,887	144,792	197,147	116,788	19,265	12,117	11,173	272,498

*Other includes black bullhead, black crappie, common carp, freshwater drum, goldeye, sauger, smallmouth buffalo, white crappie, and white sucker.

Table 24. Estimated number of walleye caught, harvested, or released during the April-October daylight period, by year from 1994-2012, except where noted.

Year	Caught	Harvested	Released	Percent harvested
1994	423,527	288,182	135,345	68%
1995	583,671	367,693	215,978	63%
1996	675,269	438,355	236,914	65%
1997	1,152,050	475,638	676,412	41%
1998	2,103,666	484,234	1,619,432	23%
1999	816,394	280,305	536,089	34%
2000	602,288	225,041	377,247	37%
2001	777,640	627,435	150,205	81%
2002	499,881	381,390	118,491	76%
2003	272,461	179,002	93,459	66%
2004	351,255	221,405	129,849	63%
2005	213,334	162,780	50,554	76%
2006	311,931	204,334	107,594	66%
2007	415,398	211,111	204,287	51%
2008	586,890	328,557	258,333	56%
2009	438,631	291,885	146,746	67%
2010	419,471	271,164	148,307	65%
***2011**	1,869,788	595,511	1,274,276	31%
2012	2,190,003	636,054	1,553,950	29%

*2011 survey period was May-Oct

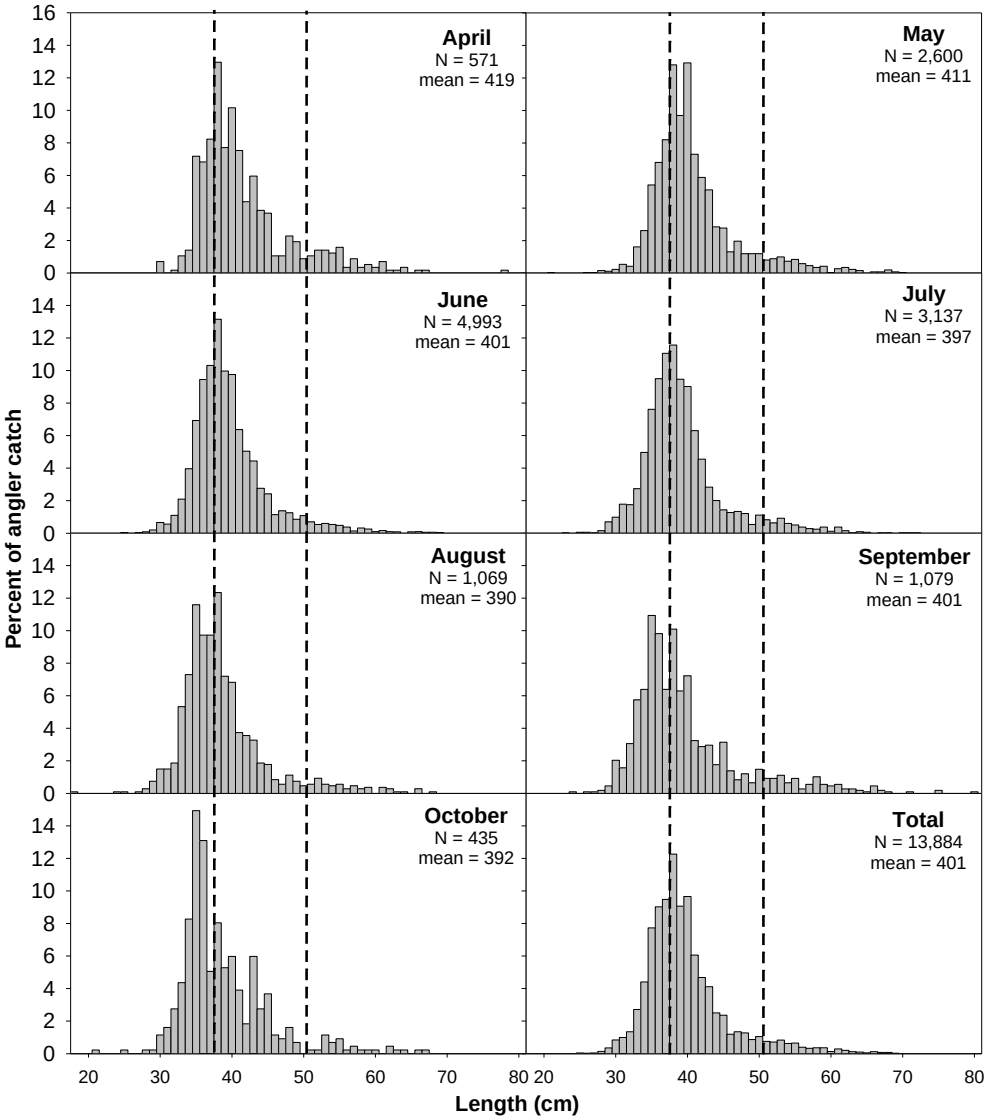

Figure 7. Length-frequency distribution of walleye harvested by anglers during the April-October 2012 daylight period on Lake Oahe, South Dakota. Vertical lines represent 15 and 20 inches. N= sample size.

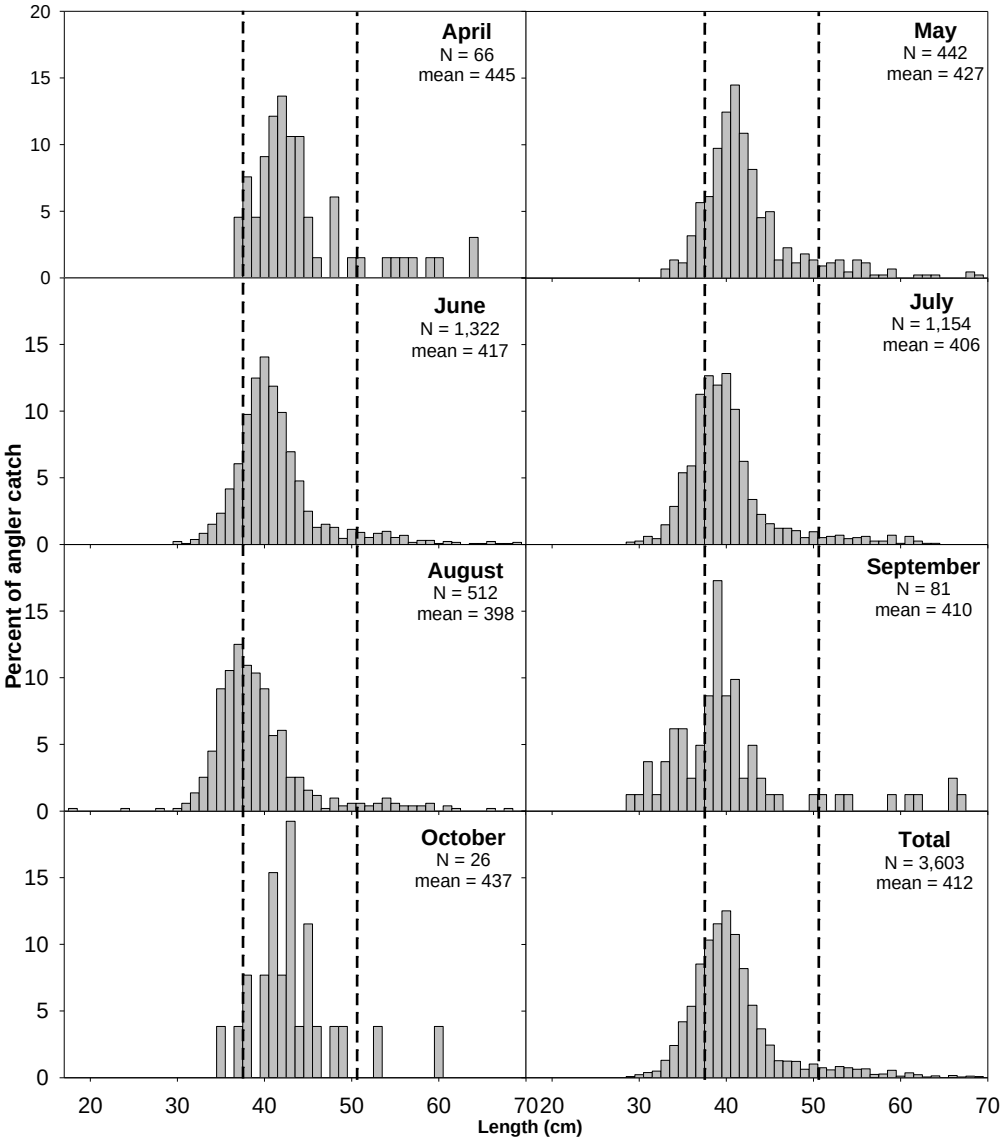

Figure 8. Length-frequency distribution of walleye harvested by anglers fishing lower Lake Oahe, South Dakota, during the April-October 2012 daylight period. Vertical lines represent 15 and 20 inches. N= sample size.

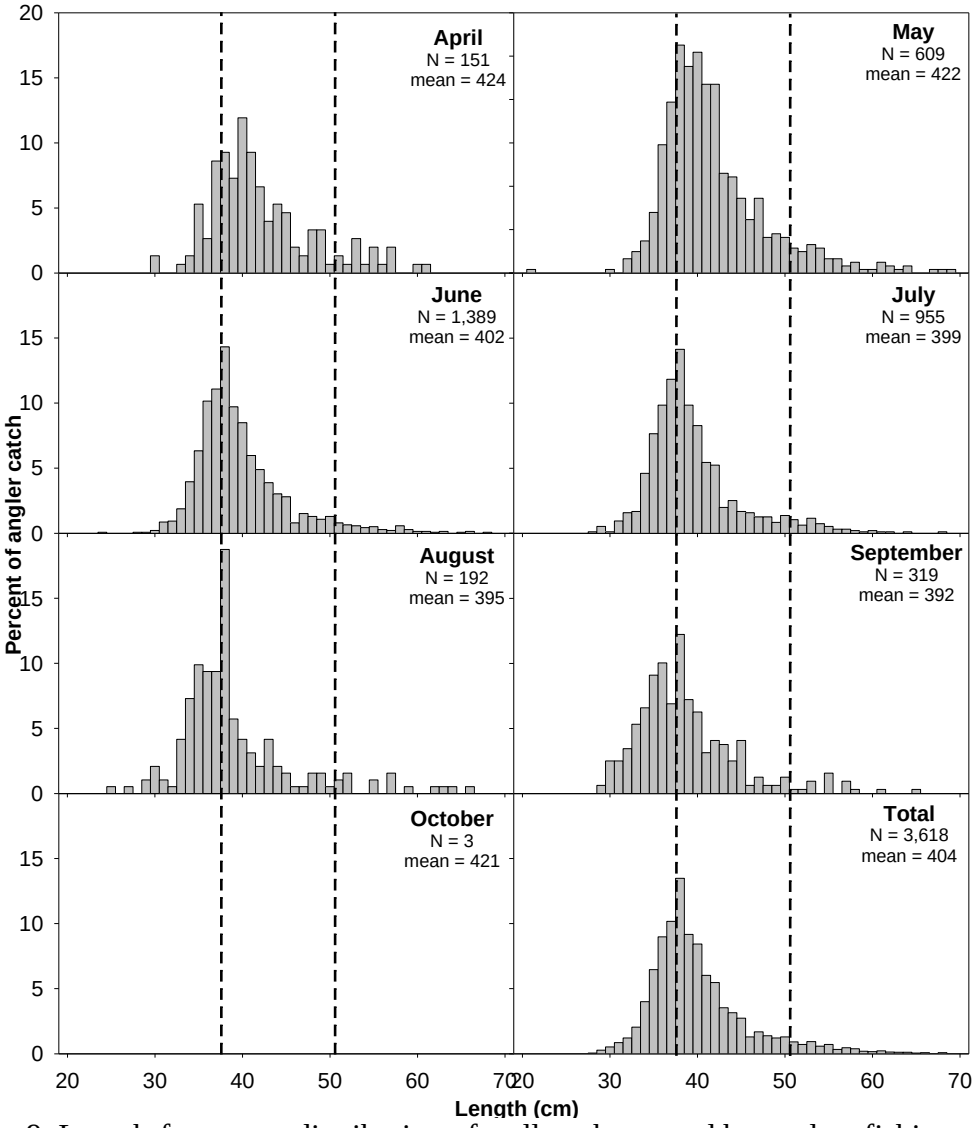

Figure 9. Length-frequency distribution of walleye harvested by anglers fishing middle Lake Oahe, South Dakota, during the April-October 2012 daylight period. Vertical lines represent 15 and 20 inches. N= sample size.

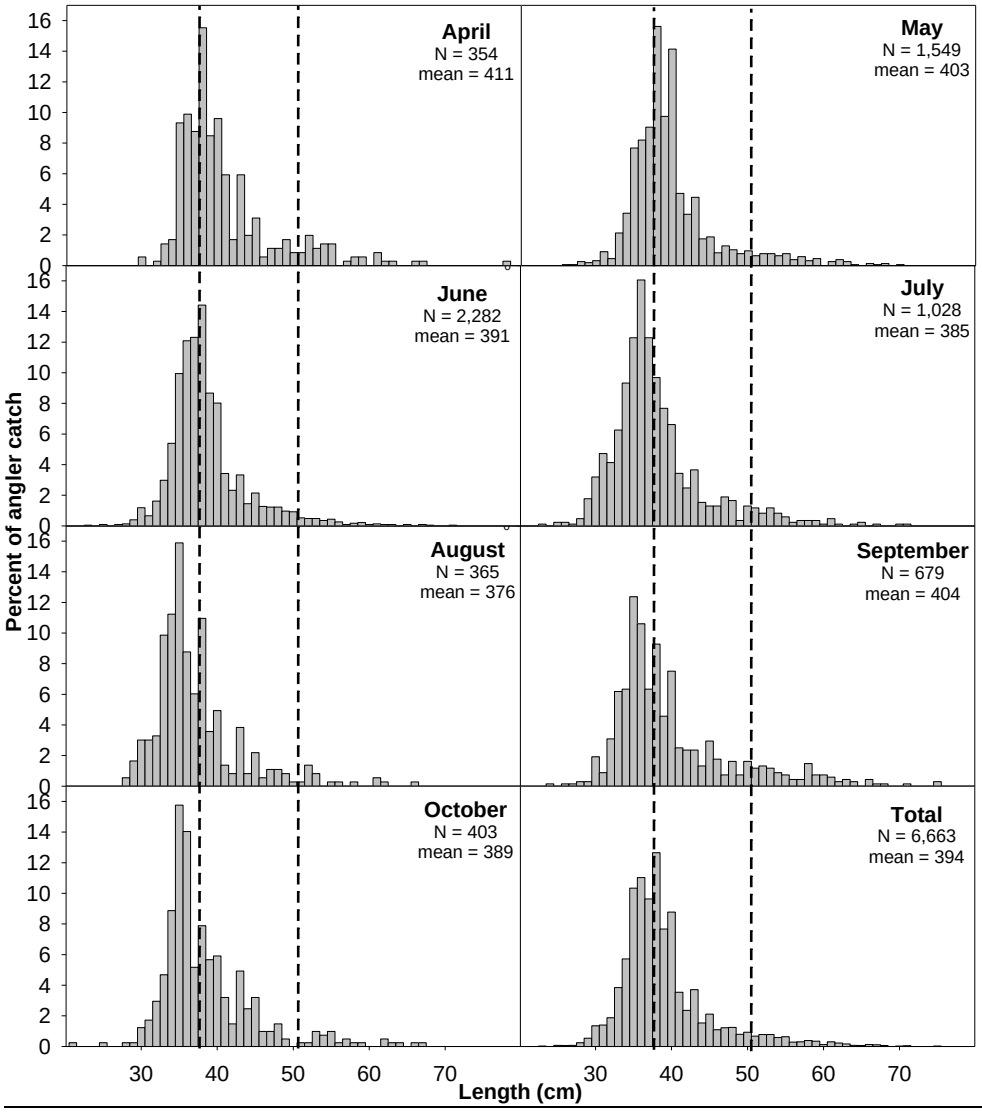

Figure 10. Length-frequency distribution of walleye harvested by anglers fishing upper Lake Oahe, South Dakota, during the April-October 2012 daylight period. Vertical lines represent 15 and 20 inches. N= sample size.

Table 25. Estimated hourly catch rates for walleye, smallmouth bass, white bass, channel catfish, and all fish combined, by year, for all anglers, for the April-October daylight survey period from 1995-2012, except where noted.

Year	Catch rate (fish/angler-h)				
	Walleye	Smallmouth bass	White bass	Channel catfish	All fish
1995	0.34	0.01	0.04	0.01	0.57
1996	0.34	0.02	0.03	0.01	0.50
1997	0.71	0.04	0.05	0.02	0.92
1998	1.18	0.06	0.13	0.02	1.45
1999	0.96	0.04	0.13	0.03	1.22
2000	1.11	0.05	0.20	0.03	1.00
2001	0.77	0.02	0.12	0.06	1.00
2002	0.58	0.03	0.27	0.09	1.02
2003	0.42	0.02	0.19	0.07	0.74
2004	0.53	0.02	0.18	0.06	0.85
2005	0.46	0.02	0.14	0.06	0.73
2006	0.50	0.03	0.03	0.08	0.73
2007	0.64	0.09	0.05	0.05	0.88
2008	0.65	0.08	0.02	0.05	0.85
2009	0.42	0.07	0.03	0.05	0.64
2010	0.37	0.17	0.02	0.05	0.88
2011*	1.42	0.15	0.03	0.06	1.90
2012	1.81	0.21	0.02	0.05	2.30

*2011 survey period was May-Oct

Table 26. Estimated hourly catch, harvest, and release rates, by species, for species-specific anglers during for the May-October 2012 daylight period. Confidence intervals (80%) are indicated in parenthesis. Trace (T) indicates values >0.0 but <0.01.

Species	Catch rate (fish/angler-h)	Harvest rate (fish/angler-h)	Release rate (fish/angler-h)
Walleye	3.79 (0.26)	1.22 (0.09)	2.57 (0.21)
Smallmouth bass	6.08 (1.42)	0.65 (0.23)	5.43 (1.44)
Channel catfish	5.20 (--)	4.99 (--)	0.21 (--)
White bass	2.16 (--)	2.16 (--)	0.00 (--)
Chinook salmon	0.12 (0.12)	0.11 (0.12)	0.01 (T)
Northern pike	1.06 (0.03)	0.49 (0.02)	0.57 (0.05)

Table 27. Estimated hourly catch, harvest, and release rates (fish/angler-h), for walleye and all species combined, by month, for the May-October 2012 daylight survey period. Confidence intervals (80%) are indicated in parenthesis.

Month	Walleye			All fish combined		
	Catch rate	Harvest rate	Release rate	Catch rate	Harvest rate	Release rate
April	0.90 (0.40)	0.47 (0.22)	0.43 (0.19)	1.39 (0.67)	0.61 (0.32)	0.78 (0.36)
May	1.80 (0.93)	0.56 (0.37)	1.24 (0.81)	2.30 (1.17)	0.67 (0.43)	1.63 (1.03)
June	2.37 (0.79)	0.58 (0.27)	1.79 (0.65)	2.79 (0.93)	0.65 (0.29)	2.14 (0.72)
July	1.92 (0.78)	0.55 (0.25)	1.37 (0.53)	2.40 (0.74)	0.60 (0.26)	1.80 (0.73)
August	0.84 (0.25)	0.36 (0.11)	0.48 (0.15)	1.51 (0.41)	0.50 (0.15)	1.01 (0.26)
September	0.77 (0.44)	0.35 (0.22)	0.42 (0.23)	1.42 (0.92)	0.48 (0.26)	0.94 (0.66)
October	0.83 (0.62)	0.35 (0.25)	0.48 (0.37)	1.18 (0.81)	0.44 (0.31)	0.74 (0.51)
Total	1.81 (0.36)	0.53 (0.13)	1.28 (0.28)	2.30 (0.42)	0.61 (0.14)	1.69 (0.35)

Table 28. Percentage of angling parties catching (top panel) or harvesting (bottom panel) specified number of walleye or sauger per angler in each reservoir zone during the May – October 2011 and April-October 2012 daylight survey periods.

Number/ person	Catch per trip							
	2011				2012			
	Lower	Middle	Upper	Total	Lower	Middle	Upper	Total
≥ 1	64	84	81	76	85	89	86	87
≥ 2	57	79	72	69	79	81	76	79
≥ 3	51	73	64	63	73	75	68	72
≥ 4	46	69	57	57	68	69	61	66
≥ 5	36	63	50	50	59	65	54	59
≥ 6	31	59	42	44	52	60	48	53
≥ 7	26	54	35	38	45	54	43	47
≥ 8	22	50	28	33	39	48	37	41
≥ 9	20	46	23	30	34	44	34	31
≥10	18	40	19	26	29	39	30	33

Number/ person	Harvest per trip							
	2011				2012			
	Lower	Middle	Upper	Total	Lower	Middle	Upper	Total
≥ 1	64	74	70	70	78	78	72	76
≥ 2	54	62	54	57	67	64	54	62
≥ 3	42	49	39	43	55	52	39	49
4	32	35	25	31	41	40	26	38

Table 29. Percent of total angler contacts for resident and non-resident anglers fishing Lake Oahe during the April-October daylight period from 2009-2012, except where noted. N is the number of parties interviewed.

Zone		Year			
		2009	**2010**	**2011***	**2012**
Lower	**N**	797	760	933	836
	Residents (%)	78	79	78	76
	Non-residents (%)	22	21	22	24
Middle	**N**	659	1,161	982	918
	Residents (%)	74	75	75	77
	Non-residents (%)	26	25	25	23
Upper	**N**	377	1,179	1,081	1,309
	Residents (%)	80	75	72	75
	Non-residents (%)	20	25	28	25
Total	**N**	1,833	3,100	2,996	3,063
	Residents (%)	77	76	75	76
	Non-residents (%)	23	24	25	24

*2011 survey period was May-Oct

Table 30. Percent of anglers that drove a specific distance, one way, to fish during the April-October daylight survey period, 2006-2012, except where noted.

Distance (miles)	Percent by Year				
	2008	**2009**	**2010**	**2011***	**2012**
<25	21	22	18	20	23
25-49	9	8	9	9	6
50-99	5	4	6	10	7
100-199	20	22	25	18	23
≥200	45	44	42	40	41

*2011 survey period was May-Oct

Table 31. Percent of anglers targeting a specific species on Lake Oahe during the May-October daylight survey period (except where noted) from 2008-2012. Trace (T) indicates values > 0.0 but < 0.5.

Target species	Percent by Year				
	2008	2009	2010	2011*	2012
Walleye	83	75	80	87	88
Anything	7	10	8	9	8
Chinook salmon	7	10	8	2	1
Northern pike	2	2	3	T	1
White bass	T	0	T	0	T
Channel catfish	T	T	1	T	T
Smallmouth bass	1	1	1	1	1

*2011 survey period was May-Oct

Table 32. Percent of non-resident angler contacts by state during the April-October daylight survey period (except where noted) from 2008-2012.

State	Percent by Year				
	2008	2009	2010	2011*	2012
Iowa	19	14	18	17	17
Nebraska	29	33	27	27	24
North Dakota	12	14	11	14	11
Colorado	6	7	3	4	4
Minnesota	17	18	21	18	23
Wisconsin	2	2	3	4	5
Wyoming	3	4	3	5	3
Other**	12	8	13	11	13

*2011 survey period was May-Oct

**Other includes Alabama, Alaska, Arkansas, Arizona, California, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Kansas, Michigan, Mississippi, Missouri, Montana, Nevada, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Ohio, Ontario Canada, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Washington, and non-USA residents.

Table 33. Percent of resident angler contacts on Lake Oahe by e county of residence during the April-October daylight survey period (except where noted) from 2008-2012.

County	Major city	Percent by Year				
		2008	2009	2010	2011*	2012
Beadle	Huron	4	4	3	3	4
Brown	Aberdeen	9	9	12	11	12
Campbell	Pollock	2	3	2	2	3
Codington	Watertown	2	3	4	3	3
Davison	Mitchell	2	2	1	2	2
Hughes	Pierre	20	22	15	18	11
Minnehaha	Sioux Falls	10	8	7	8	6
Pennington	Rapid City	7	8	6	7	7
Potter	Gettysburg	5	4	5	4	4
Stanley	Fort Pierre	4	4	3	3	3
Sully	Oneida	2	<0.5	1	2	2
Walworth	Mobridge	11	7	11	10	15
Other		22	26	30	27	28

*2011 survey period was May-Oct

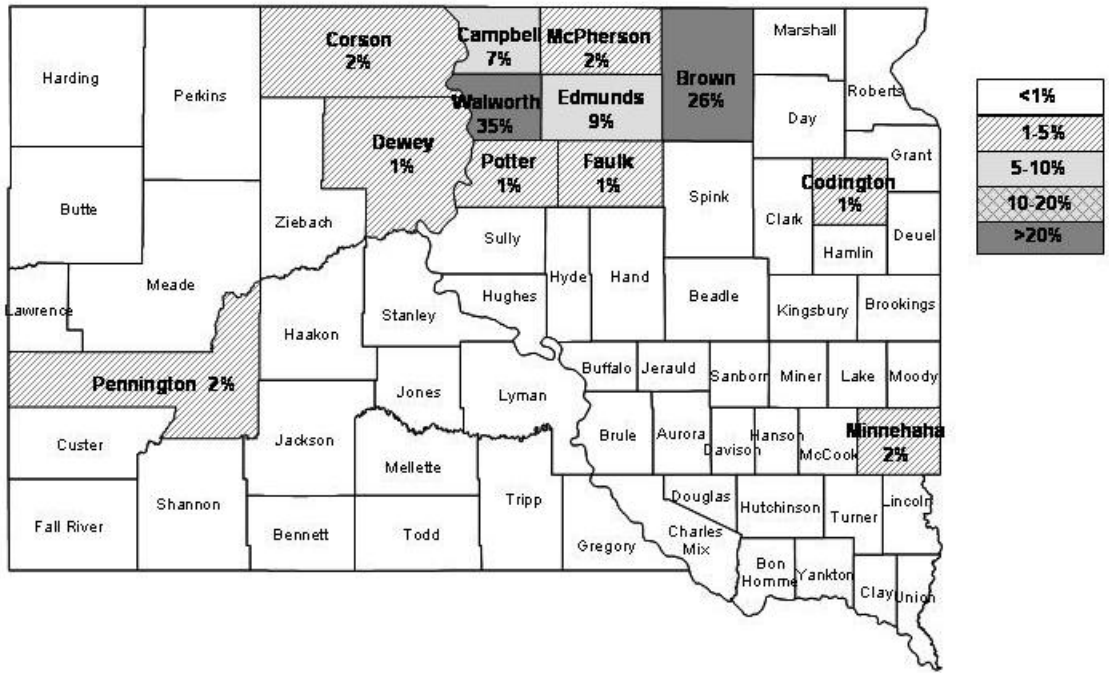

Figure 11. County of residence for South Dakota residents fishing upper Lake Oahe during the April-October 2012 daylight survey period.

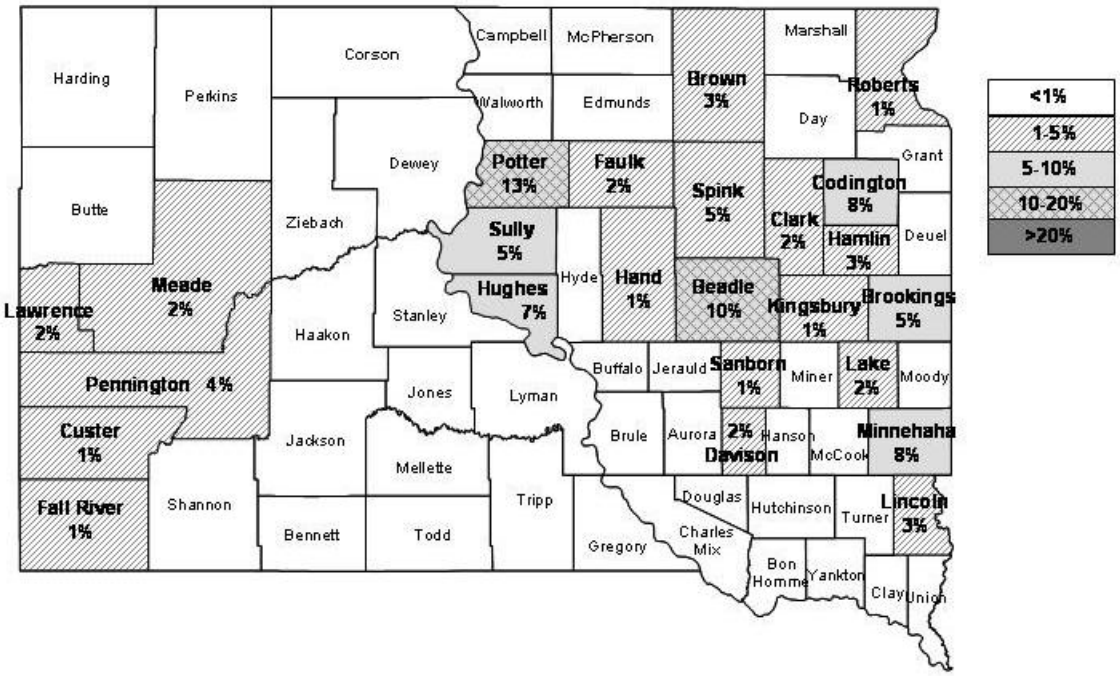

Figure 12. County of residence for South Dakota residents fishing middle Lake Oahe during the April-October 2012 daylight survey period.

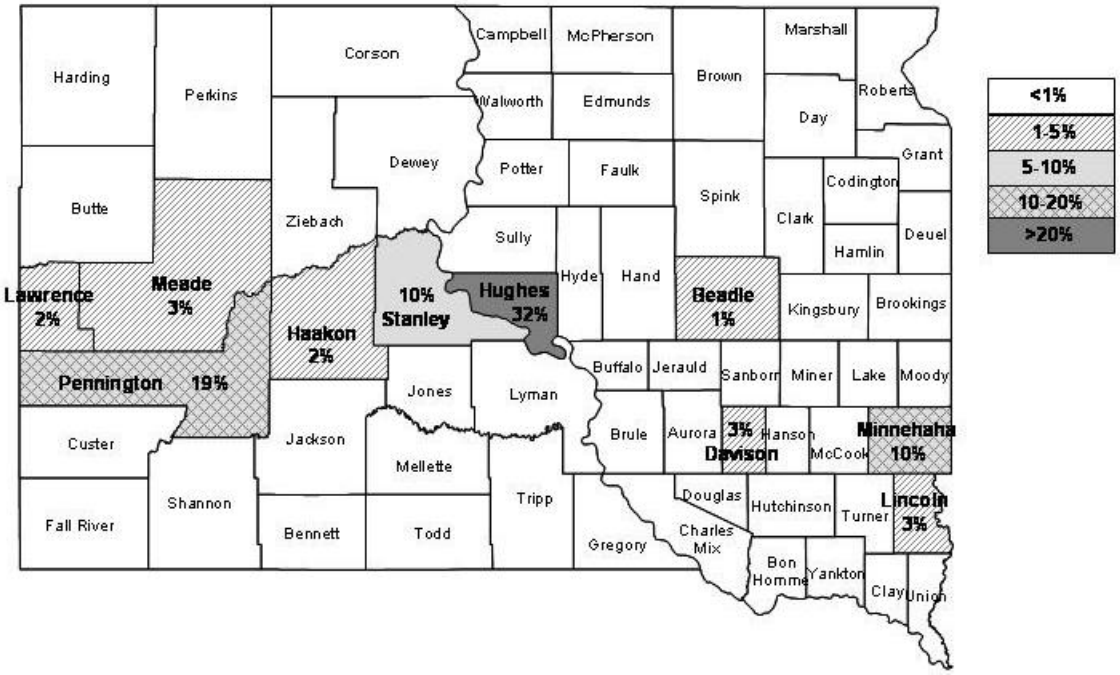

Figure 13. County of residence for South Dakota residents fishing lower Lake Oahe during the April-October 2012 daylight survey period.

Table 34. Responses of anglers who were asked the following question during the April-October 2012 daylight survey period: "Considering all factors, how satisfied are you with your fishing trip today?" 1 = very satisfied, 2 = moderately satisfied, 3 = slightly satisfied, 4 = neutral/no opinion (N.O.), 5 = slightly dissatisfied, 6 = moderately dissatisfied, and 7 = very dissatisfied. N is sample size and does include "neutral/no opinion" responses.

Month	Satisfaction rating							N	Median
	Satisfied			Neutral/N.O.	Dissatisfied				
	1	2	3	4	5	6	7		
April	55	33	20	6	2	1	0	117	2
May	168	54	32	7	4	2	4	271	1
June	253	133	56	11	9	3	1	466	1
July	188	80	40	11	20	6	7	352	1
August	72	54	44	5	13	7	7	202	2
September	69	29	33	4	20	3	10	168	2
October	27	10	16	2	12	4	5	76	2
Total	832	393	241	46	80	26	34	1,652	1
Percent	89%			3%	8%				

Table 35. Responses of anglers who were asked the following question during the April-October 2012 daylight survey period: "Considering all factors, how satisfied are you with your fishing trip today?" compared to the number of walleye harvested per person per trip. 1 = very satisfied, 2 = moderately satisfied, 3 = slightly satisfied, 4 = neutral/no opinion (N.O.), 5 = slightly dissatisfied, 6 = moderately dissatisfied and 7 = very dissatisfied. N is sample size.

Walleye/ angler	Satisfaction rating							N	Median
	Satisfied			Neutral/N.O.	Dissatisfied				
	1	2	3	4	5	6	7		
0	78	60	75	14	36	16	21	300	3
0-0.9	23	29	21	6	15	2	3	99	2
1.0-1.9	84	69	55	9	19	5	4	245	2
2.0-2.9	105	72	39	5	6	2	3	232	2
3.0-3.9	130	51	20	7	1	1	0	210	1
4.0 (limit)	406	111	31	4	3	0	3	558	1
Percent	89%			3%	8%			1,644	

Table 36. Responses of anglers who were asked the following question during the April-October 2012 daylight survey period: "Considering numbers, sizes, and species caught, how satisfied are you with your fishing experience today?" 1 = very satisfied, 2 = moderately satisfied, 3 = slightly satisfied, 4 = neutral/no opinion (N.O.), 5 = slightly dissatisfied, 6 = moderately dissatisfied, and 7 = very dissatisfied. N is sample size and does include "neutral/no opinion" responses.

Month	Satisfaction rating							N	Median
	Satisfied			Neutral/N.O.	Dissatisfied				
	1	2	3	4	5	6	7		
April	40	14	16	8	1	1	1	81	1.5
May	128	50	28	3	8	3	1	221	1
June	216	135	45	13	15	4	1	429	1
July	137	85	45	16	15	6	6	310	2
August	45	45	38	9	9	13	5	164	2
September	51	28	32	1	11	3	10	136	2
October	25	15	10	1	7	1	4	63	2
Total	642	372	214	51	66	31	28	1,404	2
Percent	87%			4%	9%				

Table 37. Percent of anglers either in favor of or against a northern pike spearing season when asked the following question during the April-September 2012 daylight period: "Are you in favor or against allowing northern pike spearing statewide through the ice?" N is the sample size.

	In favor	N	Against	N	No opinion	N
Resident	79%	821	3%	33	18%	182
Non-Resident	56%	204	7%	24	37%	134
Total	73%	1,025	4%	57	23%	316

FISHERY STATUS AND 2012 OUTLOOK

It appears the Missouri River flood of 2011 produced conditions that lead to a reduction in rainbow smelt abundance by downstream entrainment through Oahe Dam. Although not novel, this occurrence is particularly problematic as rainbow smelt are the primary food resource for walleye. Hence, Lake Oahe has experienced a decline in walleye condition since the high entrainment in 2011. Rainbow smelt exhibit boom-bust cycles in Lake Oahe and numbers will likely begin to recover in the coming years.

It appears that conditions favoring high yellow perch recruitment have diminished, as evidenced by reduced seine catches since the peak in 2009. Black crappie was the most abundant species captured during the August seining survey with whitebass and emerald shiners also being relatively abundant. Additionally, ancillary data suggest a strong lake herring spawn in 2012 with reports of lake herring in walleye diets and informal collections made throughout the summer. This species is particularly hard to monitor, so formal determinations on changes in relative abundance are unknown.

Following an intensive stocking program, gizzard shad were once again caught in 2012 albeit at the lowest level witnessed since their establishment in 2002. In the mid-2000's, gizzard shad became an important part of the prey fish community and stocking initiatives will continue through 2013 in an attempt to bolster weak prey abundances currently witnessed. Lake Oahe is located near the northern boundary of the gizzard shad range, so permanence of this prey fish species in Lake Oahe is unknown.

In 2012, estimated fishing pressure and number of angler trips was slightly lower than 2011 but considerably higher than levels seen since 1998. Even with changes in the Lake Oahe fishery over the past decade, the direct economic impact of Lake Oahe remains immense at $20.3 million. Anglers spent an estimated 1,209,091 hours fishing on Lake Oahe in 2012 and harvested a record 636,054 walleyes. With abundant year classes from 2009, and to a lesser extent 2010 and 2011, it is likely walleye catch rates will remain good through 2013, although the catch will be dominated by smaller walleye.

MANAGEMENT RECOMMENDATIONS

1. Develop a new Lake Oahe Strategic Plan which includes:
   - Review adequacy of current management plan and objectives
   - Examine methods to buffer prey fish crashes
2. Expand efforts to understand / improve prey fish dynamics in Lake Oahe
   - Expand efforts to document characteristics of gizzard shad population structure and dynamics
   - Implement and evaluate gizzard shad stocking programs in Lake Oahe
   - Implement and evaluate deep water gillnets targeting cold water prey fish
   - Continue to refine hydro-acoustics estimates of rainbow smelt
3. Expand efforts to understand the coldwater fishery in Lake Oahe
   - Work to develop age structure and growth estimates for the rainbow smelt and lake herring populations
   - Continue to stock Chinook salmon and evaluate the relative contribution of various stocking locations / stocking sizes to the fishery
   - Evaluate effects of predation on stocked Chinook salmon
   - Evaluate kokanee salmon as a potential sport fishery
4. Continue to monitor Lake Oahe sport fish and prey fish in particular examining:
   - Northern pike growth, mortality and recruitment
   - Yellow perch growth, mortality and recruitment
   - Lake herring growth, mortality and recruitment

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APPENDICES

Appendix 1. Common and scientific names of common fishes of South Dakota.

Common name	Scientific name
Bigmouth buffalo	*Ictiobus cyprinellus*
Black bullhead	*Ameiurus melas*
Black crappie	*Pomoxis nigromaculatus*
Bluntnose minnow	*Pimephales notatus*
Brassy minnow	*Hybognathus hankinsoni*
Burbot	*Lota lota*
Channel catfish	*Ictalurus punctatus*
Chinook salmon	*Oncorhynchus tshawytscha*
Common carp	*Cyprinus carpio*
Emerald shiner	*Notropis atherinoides*
Fathead minnow	*Pimephales promelas*
Flathead chub	*Platygobio gracilis*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Goldeye	*Hiodon alosoides*
Golden shiner	*Notemigonus crysoleucas*
Johnny darter	*Etheostoma nigrum*
Lake herring	*Coregonus artedi*
Largemouth bass	*Micropterus salmoides*
Northern pike	*Esox lucius*
Paddlefish	*Polyodon spathula*
Rainbow smelt	*Osmerus mordax*
Rainbow trout	*Oncorhynchus mykiss*
River carpsucker	*Carpiodes carpio*
Red shiner	*Cyprinella lutrensis*
Sauger	*Sander canadensis*
Shorthead redhorse	*Moxostoma macrolepidotum*
Shortnose gar	*Lepisosteus platostomus*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Silvery minnow	*Hybognathus nuchalis*
Smallmouth bass	*Micropterus dolomieu*
Smallmouth buffalo	*Ictiobus bubalus*
Spottail shiner	*Notropis hudsonius*
Suckermouth minnow	*Phenacobius mirabilis*
Walleye	*Sander vitreus*
White bass	*Morone chrysops*
White crappie	*Pomoxis annularis*
White sucker	*Catostomus commersonii*
Yellow perch	*Perca flavescens*

Appendix 2. Minimum lengths (mm) of length-class designations used when calculating proportional size distribution values for fish population survey samples (Gabelhouse 1984).

Species	**Length class**				
	Stock	**Quality**	**Preferred**	**Memorable**	**Trophy**
Channel catfish	280	410	610	710	910
Walleye	250	380	510	630	760
White bass	150	230	300	380	460
Yellow perch	130	200	250	300	380

Appendix 3. Angler satisfaction, preference and attitude questions asked as part of the April-October 2012 angler use and harvest survey on Lake Oahe, South Dakota. Question series A and B were asked in an alternating order as part of the survey.

Question Series A

Trip Satisfaction:

Considering all factors, how satisfied are you with your fishing trip today?

1 = Very satisfied
2 = Moderately satisfied
3 = Slightly satisfied
4 = Neutral/ No opinion *(neither satisfied or dissatisfied)*
5 = Slightly dissatisfied
6 = Moderately dissatisfied
7 = Very dissatisfied

Risk of anglers spreading aquatic nuisance species:

1. Other than Lake Oahe, where was the last place you launched your boat?

2. Approximately how many days ago did you launch your boat in that waterbody?

Question Series B

Catch Satisfaction:

1. Considering numbers, sizes, and species caught, how satisfied are you with your fishing experience today?

1 = Very satisfied
2 = Moderately satisfied
3 = Slightly satisfied
4 = Neutral/ No opinion *(neither satisfied or dissatisfied)*
5 = Slightly dissatisfied
6 = Moderately dissatisfied
7 = Very dissatisfied

2. Are you in favor or against allowing northern pike spearing statewide through the ice?