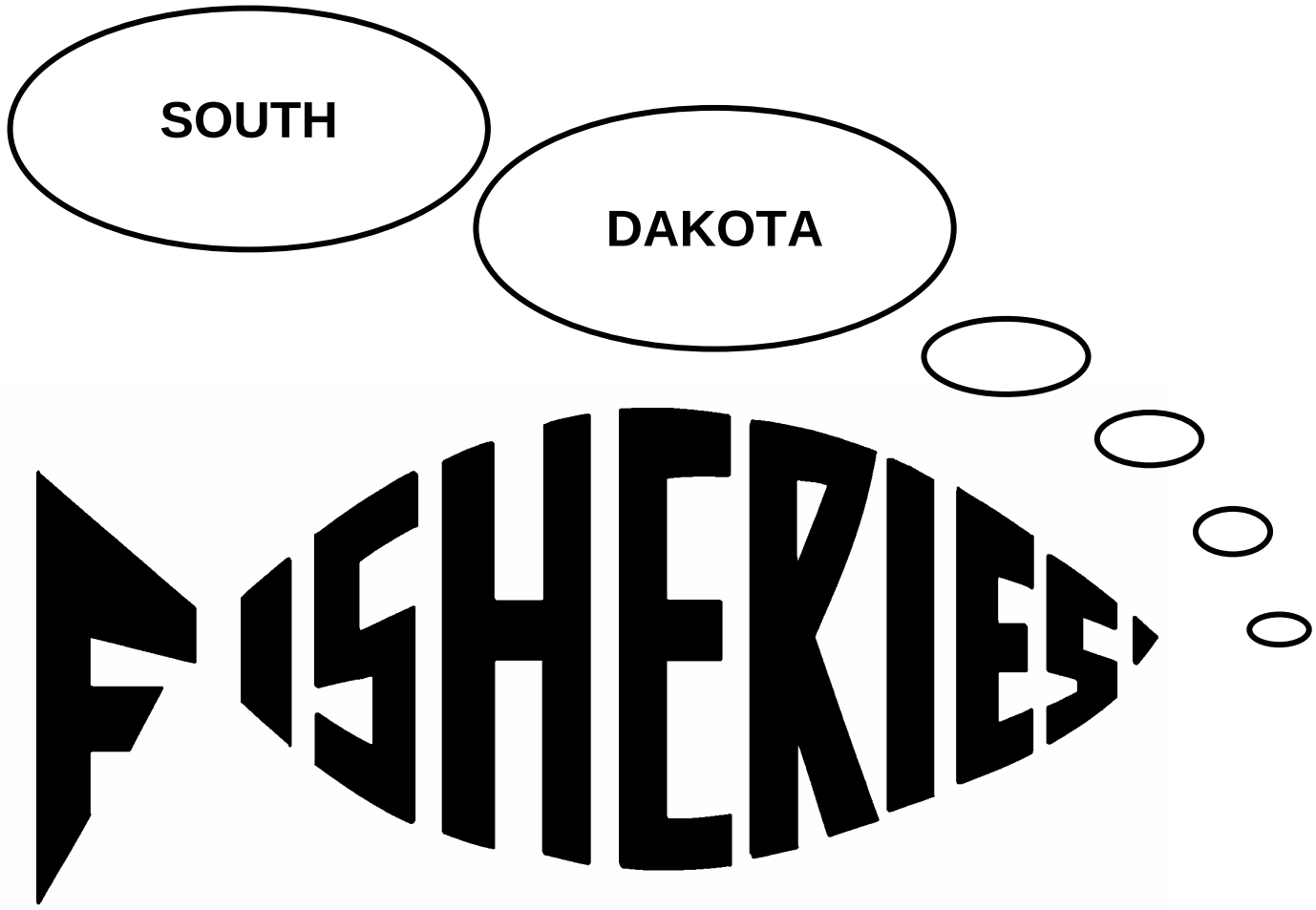

ANNUAL FISH POPULATION AND ANGLER USE, HARVEST, AND PREFERENCE SURVEYS ON LAKE OAHE, SOUTH DAKOTA, 2010

South Dakota
Department of
Game, Fish and Parks
Wildlife Division
Joe Foss Building
Pierre, South Dakota 57501-3182

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AND
ANGLER USE, HARVEST AND PREFERENCE SURVEYS
ON
LAKE OAHE, SOUTH DAKOTA, 2010

By

Chris Longhenry, Kris Edwards, Robert Hanten, and Kyle Potter
Missouri River Fisheries Center
South Dakota Dept. of Game, Fish, and Parks

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Missouri River Program Administrator
James Riis

Fisheries Program Administrator
Geno Adams

Grants Coordinator
Tanna Zabel

Department Secretary
Jeff Vonk

Wildlife Division Director
Tony Leif

Aquatics Section Chief
John Lott

PREFACE

Information collected during 2010 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.

The authors would like to thank the following individuals from the South Dakota Department of Game, Fish and Parks who helped with data collection, data entry, manuscript preparation, and report editing: John Aberle, Brian Beel, Bryan Boocock, Chris Dekker, Doug Jones, Dan Jost, Jason Jungwirth, Amanda Murphy, Darla Kusser, Mallory Petersen, Gene Perkins, Nathan Pool, Keith Swartz, Jim Riis, Caitlin Wagner.

The collection and analysis of data for these surveys was funded, in part, by Federal Aid in Sport Fish Restoration, (D-J) project F-21-R-43, Statewide Fish Management Surveys. Some of these data have been presented previously in segments F-21-23 through 42.

EXECUTIVE SUMMARY

This report includes results of angler use and harvest and fish population surveys conducted during 2010 on Lake Oahe, South Dakota and references information collected during previous years. Discussion focuses on species that may be important from a sport perspective or as prey.

Yellow perch were the most abundant species captured during the August seining survey, with a mean CPUE of 44 fish/haul. White bass were the second most abundant species in the seine survey with a catch rate of 38 fish/haul. Gizzard shad, typically abundant during the seine survey, were not collected during this survey in 2010.

Yellow perch, channel catfish and walleye comprised 32%, 29% and 24% of the fish caught in the 2010 coolwater gill net survey, respectively. Channel catfish CPUE, for the 2006-2010 period ranged from 14 to 28. Walleye gill net CPUE for Lake Oahe in 2010 was 18, the highest recorded value in the last five years.

One of the Lake Oahe Strategic Plan (LOSP) objectives for walleye is to maintain a proportional size distribution of preferred-length fish (PSD-P) 10 or higher. This goal was met the previous two years and again in 2010. Condition of fish has generally been improving since 2003, and in 2010 *Wr* values were similar to the five year average. Mean length at capture for age-1 through age-5 walleye in 2010 was similar to previous years.

Sixteen age classes of walleye were sampled during 2010 with approximately 58% originating from the 2009 year class. Walleye production in 2010 was down, based on an age-0 catch of 1 fish during the entire netting survey (Table 18). Mean CPUE for age-1 fish (2009 year class) in the total Lake Oahe sample was 6.35 fish/net-night, indicating excellent recruitment from 2009.

Estimated fishing pressure for the South Dakota portion of Lake Oahe in 2010 was 1,126,597 h. This estimate was the highest recorded since 1998. Fishing pressure peaked in June at 426,200 total hours, 47% of the total fishing pressure for April through October. As with fishing pressure, catch and harvest was highest during June. The total catch estimate for June and July 2010 was 663,441 fish, 67% of the 989,299 total fish caught during the April-October period.

Anglers harvested an estimated 271,164 walleyes from Lake Oahe during the April-October 2010 period. Walleye harvest during June and July comprised 69% (186,161) of the total walleye harvest during the April-October period in 2010. The mean hourly catch rate for walleye in 2010 was at 0.37 fish/angler-h; the lowest catch rate since 2003 (0.42 fish/angler-h).

Use of the Chinook salmon fishery on the face of the dam in 2010 (16,384 angler-h) on Lake Oahe was below the 2007 to 2009 seasons. Mean catch rate of Chinook salmon by anglers specifically fishing for salmon in 2010 was 0.10 fish/angler-h. In 2010, 8 % of the interviewed angler parties indicated they were specifically fishing for Chinook Salmon.

Approximately 65% of angling parties interviewed during 2010 expressed some level of satisfaction with their fishing trip, below the Lake Oahe plan objective of 70%.

For the April-October 2010 daytime period, the Lake Oahe fishery had a direct economic impact of 17.7 million dollars based on 224,870 trips at value of $79 per trip (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007).

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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 161,000 trips annually over the last ten years (Lott et al. 2007). The Lake Oahe fishery had an estimated direct economic impact of over $25 million for the April-October 1998 daylight period, calculated based on information provided by the United States Census Bureau (1998). Approximately 215,190 trips occurred during the April-October 2010 daylight period on Lake Oahe, for an estimated economic input of ~$17 million (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007). Due to the importance of Lake Oahe fisheries to the State of South Dakota, these resources must be effectively managed to produce optimal recreational benefits. A prerequisite to the development of effective management strategies is the annual acquisition and analysis of data describing fish community and population parameters, angler use and harvest of these populations, and angler preference and satisfaction data. These surveys provide essential information used in the evaluation of accomplishments towards objectives of the South Dakota Department of Game, Fish and Parks (SDGF&P) Missouri River Program Strategic Plan (SDGF&P 1994) and more specifically, the Lake Oahe Strategic Plan (LOSP). This report also evaluates fisheries management activities (regulations and stocking) and effects of environmental variables (water levels, weather, etc.) on Lake Oahe fisheries.

OBJECTIVES

The objectives of the annual fish population and associated surveys (Federal Aid Code 2102) are to provide information on:

1. species composition and relative abundance
2. population size structure
3. individual fish condition
4. age, growth, and recruitment
5. survival and mortality rates
6. fish reproduction
7. effects of regulations
8. success of stocking and other management activities
9. effects of sport fish harvest on fish population status

Emphasis is given to selected species that may be important from a sport or prey perspective. Common and scientific names of fishes collected or observed during these surveys are listed in Appendix 1.

The objectives of the angler use, harvest, and preference surveys (Federal Aid Code 2109) are to:

1. estimate recreational angling pressure
2. estimate fish harvest, by species
3. estimate fish harvest rates and catch rates, by species
4. provide statistics on mean angler party size, mean length of angler day, and angler residency
5. provide estimates of the annual direct economic impact of Lake Oahe's fishery
6. document effects of walleye regulations on the sport fishery and the walleye population
7. document angler attitudes, preferences, and level of satisfaction

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. Historical, biological, chemical, and physical parameters have been discussed in South Dakota Game, Fish and Parks reports (Warnick 1987). Table 1 presents selected physical characteristics and a fisheries management classification for Lake Oahe in South Dakota (Michaletz et al. 1986). Sampling locations for the various surveys discussed in this report appear in Figure 1 and average elevation of Lake Oahe during August, the month the standard gill net and seining surveys are conducted, is provided in Figure 2.

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.

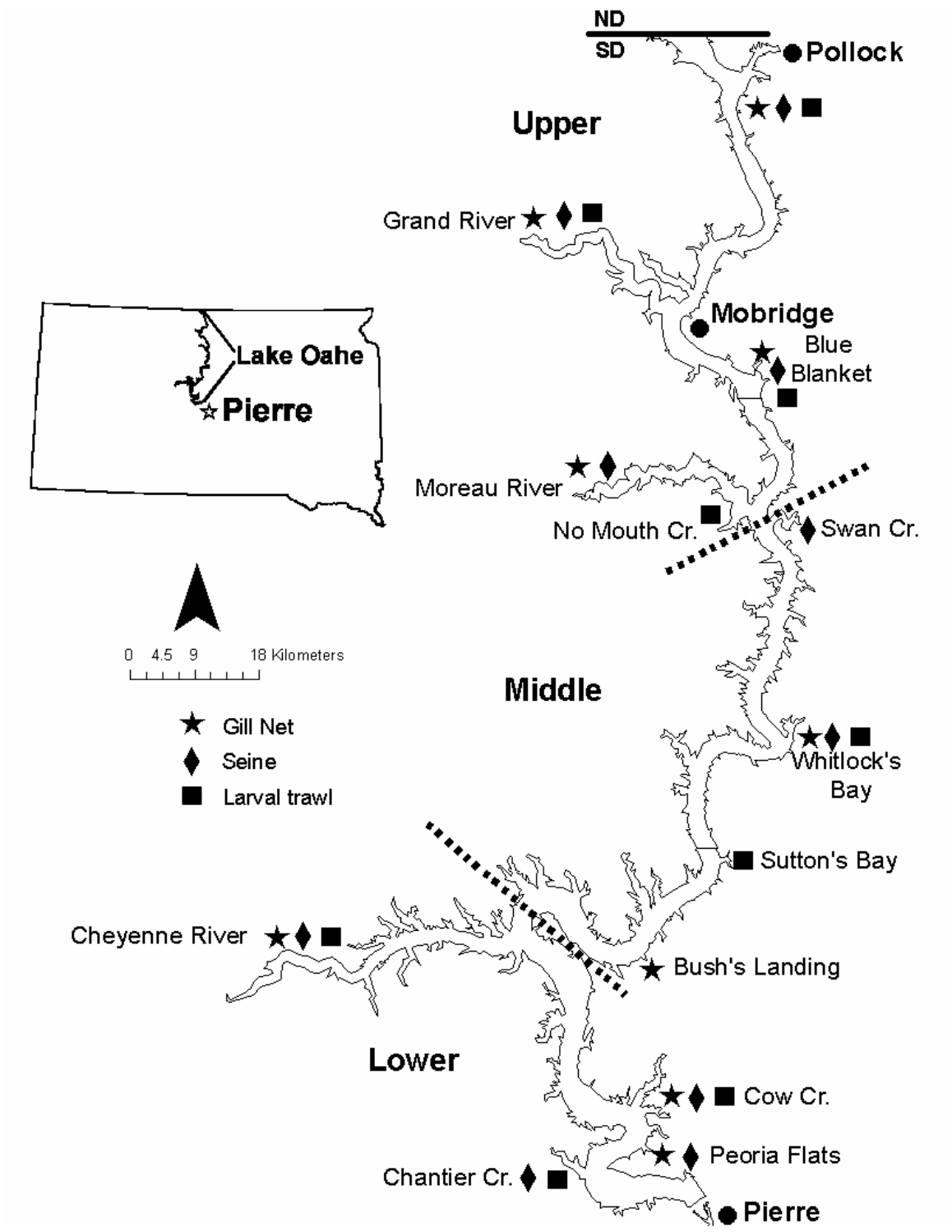

Figure 1. Reservoir zones for population surveys on Lake Oahe, South Dakota, for 2010. Specific fish population sampling stations are also listed.

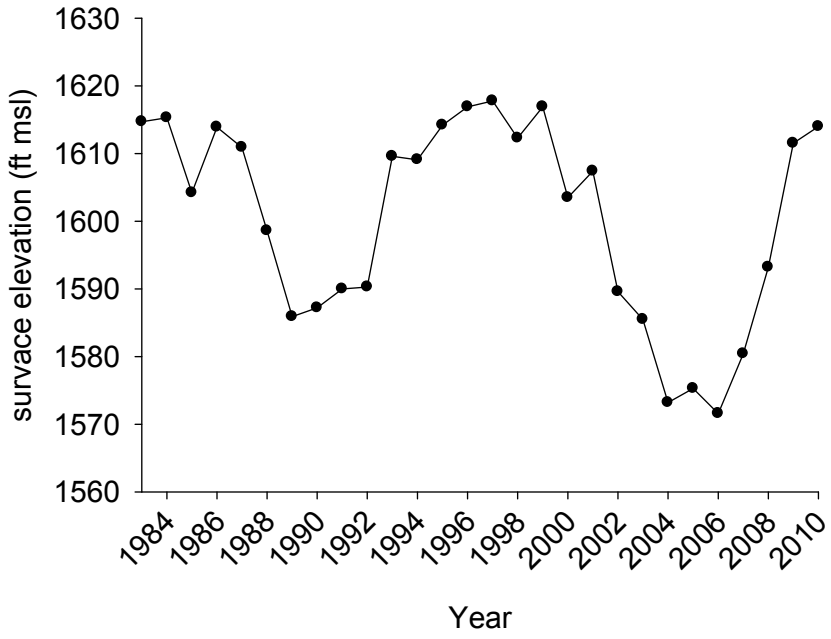

Figure 2. Average August elevation of Lake Oahe for the 1983-2010 period, as determined by the U.S. Army Corps of Engineers.

REGULATION HISTORY

Fish population and angler use and harvest survey data is essential when evaluating management regulations. Walleye harvest regulations for Lake Oahe have differed from standard statewide regulations since 1990, when an April through June 14-inch minimum length limit was placed in effect on Lakes Oahe, Sharpe, and Francis Case and the daily limit was reduced from six to four fish (Table 2). A stipulation that, at most, one fish in the daily limit could be 18 inches or longer was also added to the walleye regulation package in 1999, and the April-June 14-inch minimum length limit was removed. The objectives of regulation changes for 1999 were to concentrate harvest on abundant walleye less than 381-mm (15 inches) in length and to reduce harvest of larger walleye in the population in order to maintain the quality of the fishery. The daily walleye limit was increased from four fish to 14 fish in 2001, with the objective of maximizing harvest to reduce walleye abundance and precipitate an increase in rainbow smelt abundance by reducing predatory pressure on rainbow smelt.

Table 2. History of harvest regulations for walleye on Lake Oahe, South Dakota, 1968 through 2010.

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 14 inch minimum length
	1999-2000	4	8	• At most one equal to or longer than 18 inches
	2001	14	42	• At most four equal to or longer than 15 inches • At most one equal to or longer than 18 inches
	2002-2003	10	30	• At most four equal to or longer than 15 inches • At most one equal to or longer than 18 inches
	2004-2005	6	18	• At most four equal to or longer than 15 inches • At most one equal to or longer than 20 inches
	2006	4	12	• At most one equal to or longer than 20 inches
	2007-2010	4	8	• At most one equal to or longer than 20 inches

The stipulation that, at most, four fish could be 381-mm (15 inches) or longer in the daily limit of 14 was aimed at concentrating harvest on walleye less than 381-mm, which were in high abundance (Lott et al. 2002). The daily limit was reduced to 10 fish for 2002 and 2003 and six fish for 2004 and 2005 due to decreases in the walleye abundance index (catch per gill-net night) and in angler satisfaction. A decrease in percentage of anglers satisfied with their trip was associated with anglers not being able to realistically attain high daily limits, as hourly catch rates declined (Lott et al. 2002, 2003, 2004). The daily limit was reduced to the statewide daily limit of four fish beginning January 1, 2006, while the possession limit of 12 fish was reduced to align with the statewide possession limit of 8 fish on January 1, 2007.

SAMPLING METHODS

FISH POPULATION SURVEYS

Data Collection

Gill nets, seines and larval trawls were used to sample fish populations in Lake Oahe in 2010. Dates and depths of fish population surveys are presented in Table 3

Table 3. Sampling times, depths, and gears for annual fish population surveys on Lake Oahe, South Dakota.

Survey	Time	Survey gear	Sampling specifics
Gill nets	August	Standard gill net *Deepwater gill nets	Three shallow (0-9 m) three middles (9-18 m), and three deeps (18-27 m) at standardized locations
Shoreline seining	August	30.5-m by 2.4-m bag seine, 6.4-mm mesh	Four quarter-arc pulls at each station
Larval trawling	May-June	1-m x 2-m limnetic trawls, 0.5-mm mesh	Two paired trawl hauls/week for four consecutive weeks, of 5-minutes duration, at each station

* Number of deep water gill net sites varies with water levels.

The standard coolwater fish population survey consists of setting three standard gill nets, overnight (approximately 20 h) on the bottom in each depth zone (where possible), for a total of six or nine nets at each station (depending on water levels) (Table 3, Figure 1). A standard gill net of multifilament nylon was 91.4-m (300-ft) long x 1.8-m (6-ft) deep, with 15.2-m (50-ft) panels of the following bar mesh sizes: 12.7 mm (1/2 in), 19.1 mm (3/4 in), 25.4 mm (1 in), 31.8 mm (1 1/4 in), 38.1 mm (1 1/2 in), and 50.8 mm (2 in).

All walleye collected during the standard coolwater gill net survey were measured for total length (TL; mm) and weighed (g). Attempts were made to remove sagittal otoliths from all walleye, sauger, and hybrids captured at each sampling station (Figure 1). 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 nylon, 6.4-mm (1/4-in) mesh bag seine, measuring 30.5-m (100-ft) long x 2.4-m (8-ft) deep with a 1.8-m (6-ft) x 1.8-m (6-ft) bag, was used to collect age-0 fishes and small littoral species. A quarter-arc seine haul was accomplished using methods described in Martin et al. (1981). Four seine hauls were made at each sampling station (Figure 1). All fish collected with seines were identified, counted, and classified as age-0 or other.

Due to safety concerns and in an attempt to increase sampling locations and improve efficiency many changes were made to the larval trawling survey in 2009. Previous larval sampling was

conducted at night with paired 1 x 2 m rectangular icthyoplankton nets that were extremely bulky and difficult to handle. In 2009 a switch was made to daylight sampling, utilizing a single 1-m conical icthyoplankton surface trawl equipped with a flow meter. Approximately 20 locations (up from six sites in previous years) throughout Lake Oahe were sampled weekly during late May and early June of 2009. Each trawl transect lasted approximately five minutes. All samples were preserved in 75% ethanol and later identified and enumerated.

Data Analysis

Relative abundance of fish species is expressed as mean catch per unit effort (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.

Age and growth analyses were conducted for all walleye. Otoliths from walleye and sauger less than 300-mm were viewed and aged whole while 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 interpretation to make annuli easier to distinguish. Growth was expressed as mean length at age at time of capture in August. Incremental growth rates were estimated by subtracting the mean length of fish from a year class at the time of capture in August from the mean length at capture of the same year class the previous year. Age distributions for gill-net catches were developed by assigning ages to all walleye captured during the survey, based on length-at-capture information. Mean age-0 walleye gill net CPUE was correlated with mean age-1 walleye CPUE to determine if age-0 CPUE was an adequate early indicator of recruitment.

Proportional size distribution (PSD; Anderson and Weithman 1978; Willis et al 1991) values were calculated for channel catfish, smallmouth bass, white bass, walleye and yellow perch (Gabelhouse 1984). Length categories used to calculate PSD values are listed in Table 4.

Table 4. Minimum lengths (mm) of length-class designations used when calculating proportional stock density and relative stock density values for fish population survey samples

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

Relative weight values (*Wr;* Anderson 1980) were 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). Calculated values for yellow perch and white bass are presented in Appendix 2, while values for walleye and channel catfish are presented in the results and discussion section of this report. Proportional size distribution, PSD, and *Wr* values were calculated using the WinFin software package developed by Francis (2000).

Acoustic surveys have been conducted over several years with a variety of equipment and processing techniques. Equipment specification used during the 2003 -2005 surveys can be found in Nelson-Stastny 2001. Processing methods were not recorded for the 2003 -2005 surveys. The 2007 data was collected by staff from the SDGF&P and data analysis was contracted with Hydroacoustics Technology Inc. Seattle, Washington. Detailed results and

processing methods from the 2007 survey can be found in Nealson et al. 2008 (HTI project report 2444). Data collected from 2008-2010 was collected with Biosonics equipment and processing methods for 2008-2010 are below:

Acoustic data was processed using EchoView™ Ver. 4.9 (Myriax Software Pty Ltd.). Analysis was conducted independently for each year and for above and below the thermocline. Based on a 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. All files for each year-thermocline combination were analyzed using the same technique.

Table 5. Analysis techniques used for hydroacoustics data processing.

Year	Location	Analysis technique
2008	Above thermocline	Trace counting
	Below thermocline	Trace counting
2009	Above thermocline	Echo integration
	Below thermocline	Trace counting
2010	Above thermocline	Trace counting
	Below thermocline	Echo integration

Separation of age classes was based on size ranges determined from fish collected in the mid-water trawl survey. Fish lengths were converted to expected target strength using the empirical formula from Love (1977).

Table 6. Rainbow smelt age 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

The bottom line and thermocline depth line were identified for each file. Bottom lines were adjusted as needed to account for submerged trees and other structure along the bottom. Thermocline depths were estimated by comparing the available temperature profiles and the vertical distribution of fish targets in the echogram. 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.

For echo integration, the expected mean target strength below the thermocline was -44.4 dB; this value was the mean target strength of the 2009 fish traces. 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: $TS = 10Log(\sigma_{bs})$

Where:

TS= Target Strength (dB) and (σ_{bs}) = Back scattering cross section.
Target strength to length was calculated from Love's equation:
TS = 19.1 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 (# 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.
For trace counting, the single target detection parameters used are provided in Table 7.

Table 7. Single target detection parameters used in the trace counting analysis.

Single target detection parameter	Value used
Target strength threshold	-60 dB
Pulse length determination level	6 dB
Minimum normalized pulse length	0.80
Maximum normalized pulse length	1.5
Beam compensation model	BioSonics
Maximum beam compensation	4.0 dB
Max. standard deviation of major axis	0.600
Max. standard deviation of minor axis	0.600

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 boat and shore angler counts 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.

Sampling was conducted from April 1, 2010 through October 31, 2010, for the sunrise to sunset period. Creel zones are similar as the fish population survey zones identified in Figure 1. Aerial pressure counts were made during all months. For a more detailed description of aerial count, angler interview, and data expansion techniques see Stone et al. (1994).

Angler satisfaction and attitude questions were included in angler interviews in 2010. In addition to asking anglers how satisfied they were with their fishing trip, considering all factors, anglers were asked two questions about spear fishing. They were asked if they participated in the activity of spear fishing the previous year and how many days in an average year they spend spearfishing on the Missouri River. Boat anglers were also asked the last location their boat was launched and how many days previous that was. A complete list of satisfaction, attitude and preference questions asked in conjunction with the 2010 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 (CAS) package (Soupir and Brown 2002) and 80% confidence intervals were calculated for estimates of fishing pressure and harvest.

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 (Hubert 1996). However, changes in fish behavior can also affect CPUE of gill nets (Hubert 1996). Because Lake Oahe is a storage reservoir, the elevation of the reservoir surface, and therefore the surface area and volume of the reservoir, change over time and 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 FT MSL in 2000 to 1571.6 FT MSL in 2006 and increased to 1613 in 2009. Therefore, caution should be used when inferring density or abundance of fish species captured in the standard gill net survey from CPUE.

Yellow perch, channel catfish and walleye comprised 32%, 29%, and 24% of the fish caught in the 2010 coolwater gill net survey, respectively (Table 8). Twenty-four species were captured in the coolwater gill net survey samples in 2010. Mean CPUE for all species collected in 2010 were near ranges previously observed (Michaletz et al. 1986; Riis et al. 1988; Stone et al. 1989; Johnson et al. 1990; Wickstrom et al. 1991; Johnson et al. 1992; Wickstrom et al. 1993; Lott et al. 1994; Johnson et al. 1995, 1997, 1999; Lott et al. 2000, 2002, 2004, 2007; Adams et al. 2009).

Table 8. Relative species composition, by percent of total catch, of fish species collected during August standard gill net survey on Lake Oahe, South Dakota, during 2006 through 2010.

Species	Year				
	2006	2007	2008	2009	2010
Channel catfish	31	36	41	29	29
Walleye	28	30	27	21	24
Gizzard shad	7	6	4	0	0
Freshwater drum	5	4	4	3	3
River carpsucker	1	1	2	2	1
Yellow perch	7	7	6	26	32
Common carp	4	2	3	5	4
Goldeye	7	3	2	0	1
White bass	2	2	2	1	1
Other	7	9	8	13	14

Table 9. Mean catch per unit effort (CPUE; No./net-night) and standard error values (SE) for selected fish species collected with standard coolwater gill net sets in Lake Oahe, South Dakota, 2005-2010. Trace (T) indicates values less than 0.05.

Species	Year									
	2006		2007		2008		2009		2010	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0.1	0.1	0.2	0.1	0.4	0.1	T	--	0.2	0.1
Burbot	0.0	---	0.0	---	0.0	---	0.0	0.0	0.0	0.0
Black bullhead	T	---	0.0	---	0.0	---	T	--	0.0	0.0
Bluegill	0.0	---	0.1	---	0.1	0.0	0.5	0.3	0.2	0.1
Channel catfish	16.9	2.4	18.8	1.5	28.0	2.3	16.2	1.7	14.7	1.3
Chinook salmon	0.0	---	0.0	---	T	---	T	--	0.0	0.0
Common carp	2.4	0.4	1.1	0.2	2.0	0.3	3.0	0.4	2.7	0.3
Freshwater drum	2.9	0.5	1.8	0.2	2.0	0.5	1.5	0.3	2.3	0.3
Gizzard shad	3.8	1.5	3.3	1.3	2.0	0.7	0.2	0.1	0.1	0.0
Goldeye	3.9	0.8	1.3	0.3	1.2	0.3	0.1	0.1	0.5	0.2
Lake herring	0.0	---	0.0	---	0.0	---	T	--	T	--
Northern pike	0.1	T	0.1	T	0.1	0.0	0.5	0.1	1.5	0.3
Paddlefish	0.0	---	T	T	T	---	0.0	0.0	0.0	0.0
Rainbow smelt	0.0	---	0.0	---	0.4	0.2	0.3	0.1	T	--
River carpsucker	0.6	0.1	0.7	0.2	1.0	0.2	1.0	0.3	1.1	0.3
Sauger	1.4	0.4	1.4	0.3	1.0	0.2	0.9	0.2	0.6	0.2
Shorthead redhorse	0.3	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.6	0.2
Shortnose gar	T	T	0.0	---	0.2	0.1	0.1	0.1	T	--
Shovelnose sturgeon	0.0	---	0.0	---	0.0	---	0.0	0.0	0.0	0.0
Smallmouth bass	1.0	0.5	1.9	0.8	1.0	0.5	2.3	0.5	4.2	0.7
Smallmouth buffalo	T	T	0.1	T	0.2	0.1	0.3	0.1	0.2	0.1
Spottail shiner	0.5	0.2	0.3	0.1	0.1	0.0	0.2	0.1	0.0	0.0
Walleye	15.3	1.9	15.6	2.2	14.0	2.0	12.1	1.9	18.4	1.9
White bass	1.1	0.3	1.1	0.3	1.0	0.4	0.6	0.2	1.1	0.2
White crappie	0.3	0.1	0.3	0.3	0.2	0.1	1.6	0.7	1.4	0.3
White sucker	T	T	T	T	0.1	0.1	0.4	0.1	0.6	0.2
Yellow perch	3.6	0.9	3.5	0.7	3.0	1.0	14.6	3.5	24.0	4.5

Yellow perch were the most abundant species captured during the August seining survey, with a mean CPUE of 44.8 fish/haul (Table 10). Age-0 gizzard shad, first collected in the annual seining survey in 2001, have been the most abundant species in seining survey catches since 2003; however, catches of shad have been declining since 2006. Other species commonly sampled during the 2010 seining survey included smallmouth bass, black and white crappie, white bass and emerald shiners.

Table 10. Mean catch per unit effort (CPUE; No./haul) and standard error (SE) values for fish species collected during the standard August seining survey on Lake Oahe, South Dakota, 2006-2010. Catches are for age-0 fishes except where noted. Trace (T) indicates values less than 0.05.

Species	Year									
	2006		2007		2008		2009		2010	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0.1	T	0.0	--	0.0	--	0.0	--	0.1	0.1
Black crappie	T	--	0.0	--	T	--	9.1	9.1	3.9	2.4
Bluntnose minnow	0.4	0.4	0.0	--	0.0	--	0.7	0.7	0.0	--
Brassy minnow*	0.1	T	0.3	0.2	T	--	0.1	0.1	0.7	0.4
Channel catfish	0.1	0.1	4.1	2.8	2.0	1.8	0.0	--	0.0	0.0
Common carp	0.3	0.2	0.4	0.3	1.0	0.5	0.6	0.4	0.2	0.1
Emerald shiner*	26.1	6.4	21.4	8.3	12.0	8.1	14.6	6.1	7.9	3.6
Fathead minnow*	0.0	--	0.0	--	0.0	--	0.1	0.1	20.9	14.2
Flathead chub	6.8	3.9	0.0	--	0.0	--	0.0	--	0.0	--
Freshwater drum	3.8	1.1	2.0	0.6	0.3	0.1	0.0	--	0.1	0.1
Gizzard shad	191.0	41.8	118	56.1	76.0	31.0	22.0	13.7	0.0	--
Golden shiner	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Goldeye	0.0	--	0.6	0.4	0.5	0.2	0.0	--	0.0	--
Johnny darter*	0.1	T	0.1	0.1	T	--	0.4	0.2	1.1	0.4
Lake herring	0.0	--	0.0	--	0.2	0.2	0.1	--	0.0	0.0
Largemouth bass	0.0	--	0.0	--	0.5	0.3	0.0	--	0.3	0.2
Northern pike	0.0	--	0.0	--	0.1	0.1	0.4	0.2	0.0	--
River carpsucker	4.8	3.5	1.1	0.4	1.0	0.5	2.3	1.7	0.8	0.5
Red shiner*	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Shorthead redhorse	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Silvery minnow	0.0	--	0.0	--	0.0	--	0.0	--	0.1	0.1
Smallmouth bass	3.5	0.9	4.1	1.1	37.0	14.0	8.3	2.3	7.9	2.0
Smallmouth buffalo	0.0	--	0.0	--	0.0	--	4.8	1.9	T	--
Spottail shiner*	10.4	3.2	5.1	1.6	2.0	0.5	6.3	3.4	12.7	5.3
Suckermouth minnow*	0.0	--	0.0	--	0.0	--	0.0	--	0.0	--
Walleye	0.3	0.1	0.1	T	0.2	0.1	1.3	0.7	0.2	0.1
White bass	21.6	5.3	15.2	4.1	20.0	4.7	135.0	56.9	38.9	17.5
White crappie	0.1	0.1	3.3	1.5	15	5.1	13.5	6.3	28.9	27.0
White sucker	0.1	0.1	0.1	T	1.0	0.4	2.4	2.3	0.3	0.2
Yellow perch	11.4	6.8	5.0	2.1	35	17.0	393.0	217.0	44.8	27.1

- Includes all ages.

Table 11. 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 on Lake Oahe, South Dakota, 2006-2010. Trace (T) indicates values less than 0.1.

Species	Year									
	2006		2007		2008		2009		2010	
	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Bigmouth buffalo	0	0	0	0	0.1	0.1	0	0	0	0
Burbot	0	0	0.1	0.1	0	0	0	0	0	0
Channel catfish	9.7	3.5	8.5	1.5	14.7	3.7	3.9	1.0	9.8	3.0
Chinook salmon	0	0	0.3	0.2	1.3	0.5	0.3	0.1	0.7	0.3
Common carp	0	0	0.4	0.2	0.2	0.1	0.1	0.1	0.7	0.4
Freshwater drum	0	0	0.1	0.1	0	0	0	0	0	0
Gizzard shad	0	0	0	0	0.1	0.1	0	0	0	0
Goldeye	0	0	0.2	0.2	0	0	0	0	0.5	0.4
Lake herring	18.3	4.2	10.7	2.8	10.8	2.5	6.8	1.9	7.9	2.2
Northern pike	0	0	0	0	0	0	T	T	0	0
Paddlefish	0	0	0	0	0	0	0	0	0	0
Rainbow smelt	0.6	0.3	1.1	0.4	1.3	0.6	10	3	8.7	2.9
River carpsucker	0	0	0.1	0.1	0	0	0	0	0	0
Sauger	0	0	0.2	0.1	0.2	0.1	0.1	0.1	0	0
Smallmouth bass	0	0	0	0	0	0	0	0	0.3	0.2
Smallmouth buffalo	0	0	0	0	0	0	0	0	0	0
Walleye	0	0	4.6	1.5	8	2.6	2.2	0.7	5.4	1.5
White bass	0.1	0.1	0.3	0.3	0	0	0	0	0.1	0.1
White crappie	0	0	0	0	0	0	0	0	0	0
White sucker	0	0	0	0	0	0	0.2	0.1	1	0.3
Yellow perch	0	0	0.8	0.3	1.7	0.9	0.5	0.3	9.5	2.7

Population Parameters for Walleye

Walleye CPUE in the standard gill net survey was similar in the lower and middle zones of Lake Oahe (Figure 3). The CPUE in the upper zone, which typically supports high gill net catches for walleye during the August gill net survey, was higher than the previous four years. With high catches of WAE in each zone, the lake wide walleye CPUE increased as well.

The increased water elevation of Lake Oahe in 2009 likely influenced the walleye abundance index (CPUE) estimates for the various reservoir zones. Water levels rose at rates faster than ever recorded during 2009 and the lake is now at normal operating levels. Changes in surface area, volume, and flow may also influence catch rates of other species in the standard fish population surveys so caution should be used when interpreting results. In 2010, water levels once again increased and Lake Oahe nearly reached maximum pool cresting at 1617 msl.

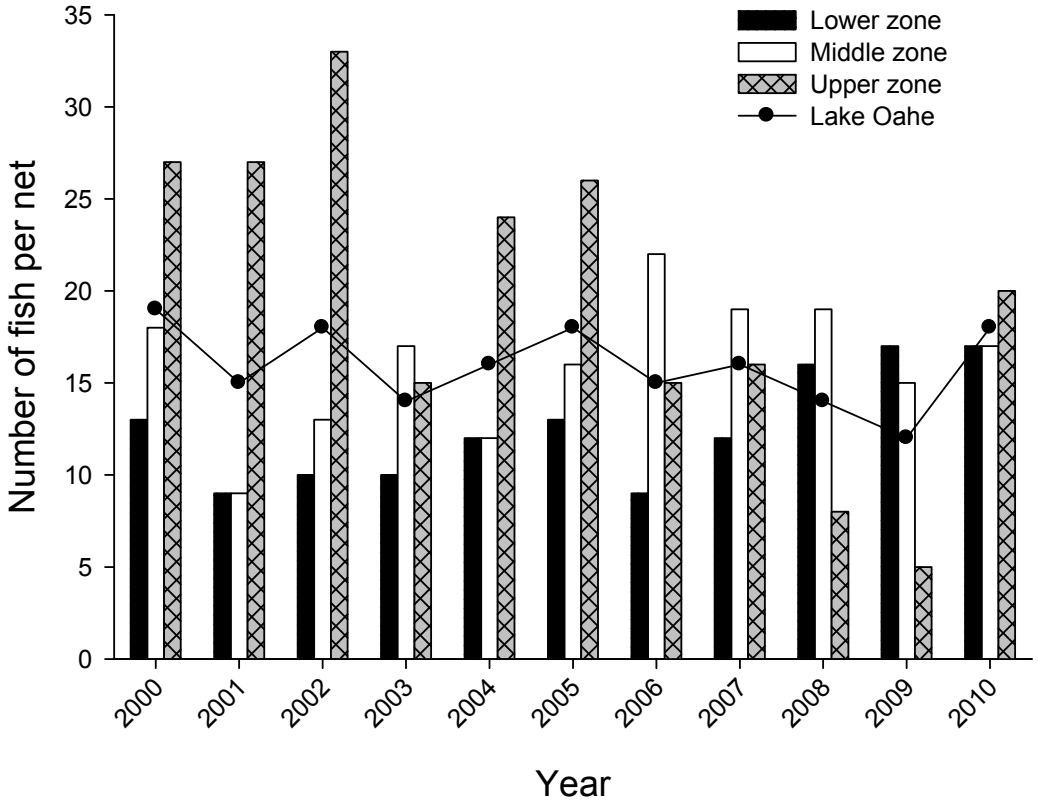

Figure 3. Mean walleye catch per unit effort (No./net-night) in the coolwater gill net survey for lower, middle, and upper zones of Lake Oahe, South Dakota, 2000-2010.

In 2010, walleye gill net CPUE for the entire reservoir increased from the previous four years but was similar to the 10 year average (Table 12). Variations in CPUE by length group exist annually due to variability in year class strength.

Stock density indices for the 2005 through 2010 period are presented in Table 13. In 2010, most stock density index values remained similar to the previous 5 years. Walleye PSD for the total Lake Oahe sample in 2010 was 39. This is within the desired range of 30 to 60, which represents a balanced population (Anderson and Weithman 1978). The PSD-P objective of 10 from the LOSP for the total Lake Oahe sample has been met since 2006.

Table 12. Mean walleye catch per unit effort (No./net-night) in the standard coolwater gill net survey, by year and length group, for 2005-2010, for Lake Oahe, South Dakota.

Year	Length group				
	Substock	Stock-quality	Quality-preferred	Preferred-memorable	Total
2005	1	5	11	1	18
2006	2	5	6	2	15
2007	2	4	7	2	16
2008	1	7	5	2	14
2009	2	10	8	2	12
2010	6	8	3	2	18

Table 13. Walleye proportional size distributions (PSD, PSD-P,PSD-M), by reservoir zone, for fish collected during the standard coolwater gill net survey on Lake Oahe, South Dakota, 2005-2010.

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
2006	92	32	0	34	4	0	56	5	0	60	13	1
2007	77	27	2	35	5	0	70	4	0	62	11	1
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

Although *Wr* values have generally been increasing since 2006, they are slightly lower in 2010 than 2009, but are similar to the previous five years (Table 10). The objective range for mean *Wr* values for Lake Oahe walleye is 90-100 (LOSP 1994) and this year the objective range was not met (Table 14).

Table 14. Mean walleye relative weight (*Wr*) values, by length group, for Lake Oahe, South Dakota, 2006-2010. N is number of stock-length fish in a sample.

Year	Length group							
	Stock-quality		Quality-preferred		Preferred		Total sample	
	Wr	N	*Wr*	N	*Wr*	N	*Wr*	N
2006	85	276	88	325	87	93	86	694
2007	87	255	86	343	87	70	87	673
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

Mean walleye lengths-at-capture for 2006-2010 are presented in Table 15. Walleye growth varied among zones (Table 16). Mean length at time of capture is generally higher in the lower zone of Lake Oahe. Growth increments of walleye have remained similar throughout the previous five year period within zones (Table 16).

Table 15. Mean length-at age time of capture (mm) for walleye collected in the standard August coolwater gill net survey, 2006-2010, on Lake Oahe, South Dakota.

Year		Length at age at capture (mm)											
		1	2	3	4	5	6	7	8	9	10	11	12
2006	**Mean**	256	355	427	461	479	484	524	528	550	549	540	544
	N	203	123	102	102	146	20	28	10	7	5	17	8
	SE	2	2	3	3	3	12	8	17	20	27	20	22
2007	**Mean**	242	367	420	459	477	488	516	526	516	526	617	527
	N	137	265	57	59	29	91	13	16	5	5	3	6
	SE	2.5	1.6	4.0	4.2	6.3	4.8	13.5	17.1	26	15.0	53	14.2
2008	**Mean**	251	349	431	478	512	517	532	555	561	544	564	600
	N	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
	N	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
	N	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	---	---
Mean of means		249	355	428	475	499	505	543	547	551	559	552	560

Table 16. Mean length (TL; mm) at time of capture, by reservoir zone, for walleye collected in the coolwater gill net survey from 2008 through 2010, in Lake Oahe, South Dakota. N is sample size and SE is standard error.

Zone	Age	2008			2009			2010		
		Length	N	SE	Length	N	SE	Length	N	SE
Lower	**1**	285	7	2.7	290	17	6	295	137	2
	2	362	106	3.2	384	20	5	391	21	8
	3	443	87	2.8	435	125	2	450	20	8
	4	478	7	10.8	489	64	4	495	50	4
	5	525	9	12.5	--	--	--	526	30	6
	6	537	18	10.5	539	4	15	530	2	24
	7	541	23	9.3	553	9	23	589	1	--
	8	560	8	19.3	541	23	9	638	2	31
	9	583	7	18.5	592	2	45	547	3	20
	10	563	2	39	616	7	23	603	1	--
	11	564	4	28.4	524	2	22	514	1	--
	12	618	5	37.6	558	3	6	570	1	--
Middle	**1**	243	52	3.3	236	52	4	239	158	3
	2	338	157	2.1	355	86	3	345	69	4
	3	421	50	3.7	420	69	3	428	29	4
	4	473	5	19.1	468	12	9	493	18	8
	5	505	8	14.4	546	1	--	523	9	14
	6	497	14	7.1	546	3	10	--	--	--
	7	527	15	10	519	1	--	615	1	--
	8	512	2	10.5	496	6	22	556	2	26
	9	482	1	--	566	4	14	608	1	--
	10	508	1	--	622	2	16	491	1	--
	11	665	2	--	--	--	--	--	--	--
	12	--	--	--	--	--	--	--	--	--
Upper	**1**	261	20	5.9	241	14	7	215	149	3
	2	357	44	4.7	378	18	5	325	79	4
	3	428	34	6.1	441	14	8	434	27	7
	4	482	4	9.5	493	10	10	480	17	7
	5	503	7	15.5	480	1	--	495	10	35
	6	435	1	--	--	--	--	458	2	5
	7	519	10	5.0	--	--	--	--	--	--
	8	535	2	31.5	--	--	--	--	--	--
	9	501	1	--	--	--	--	527	1	--
	10	571	1	--	--	--	--	--	--	--
	11	--	--	--	--	--	--	--	--	--
	12	--	--	--	--	--	--	--	--	--

Table 17. Mean annual growth (length) increment estimates for walleye collected in the coolwater gill net survey on Lake Oahe, South Dakota, for the 2005-2006, 2006-2007, 2007-2008, 2008-2009, and 2009-2010 periods.

Year	Growth increment added during period (mm)								
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2005 -2006	121	79	58	55	43	32	44	58	35
2006 -2007	111	65	32	16	9	32	2	--	--
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

Age distribution is represented in Table 18. Sixteen year classes were represented in 2010. The 2009 year class represented the largest year class in the gill net sample with 58% of the sample comprised of age-1 fish. In 2010, 84% of the walleye sample were age-3 or younger.

Table 18. Age distribution of walleye collected from Lake Oahe, South Dakota in 2005 through 2010, with standard coolwater gill net sets, as determined by aging otoliths.

	Age												
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2005	17	91	185	115	399	48	43	23	5	12	25	3	1
2006	25	267	125	105	56	148	20	28	10	7	5	17	9
2007	49	173	289	61	68	33	101	14	18	5	5	3	19
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

Currently 10-15 inch walleye make up the highest percentage of the population sampled (Figure 4). Age-0 fish numbers were down considerably in 2010 indicating recruitment to age-1 of the 2010 age class will likely be very limited. Numbers of fish above 20 inches are currently higher than the 2000 to 2001 period, but remains below those recorded in the late 1990's.

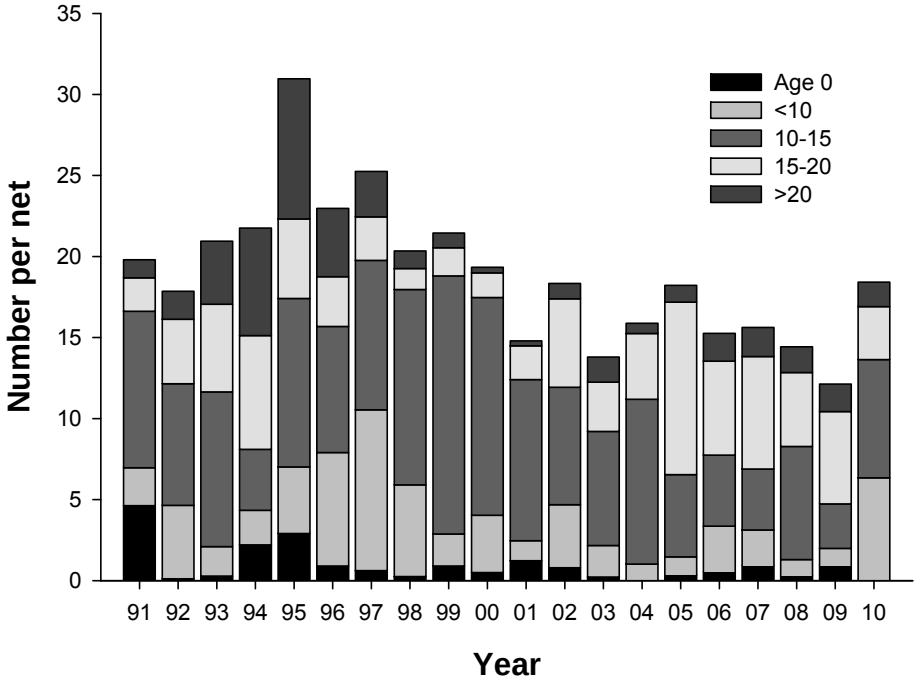

Figure 4. Length structure, in terms of catch per unit effort (CPUE), of Lake Oahe walleye sampled in the standard coolwater gill net survey, 1991-2010.

Length frequency distributions for gill net catches in 2010 illustrate the current status of the Lake Oahe walleye population (Figure 5). Sampling in the lower zone continues to produce more walleye above preferred length (508 mm) when compared with the middle and upper zones. Numbers of fish below 254 mm were again lower in the lower part of Lake Oahe indicating recruitment on the southern part of the reservoir continues to be an issue. During the previous years, walleye production in the lower zone of Lake Oahe has been extremely low while growth is generally faster than the other two zones of the reservoir (Lott et al. 2006).

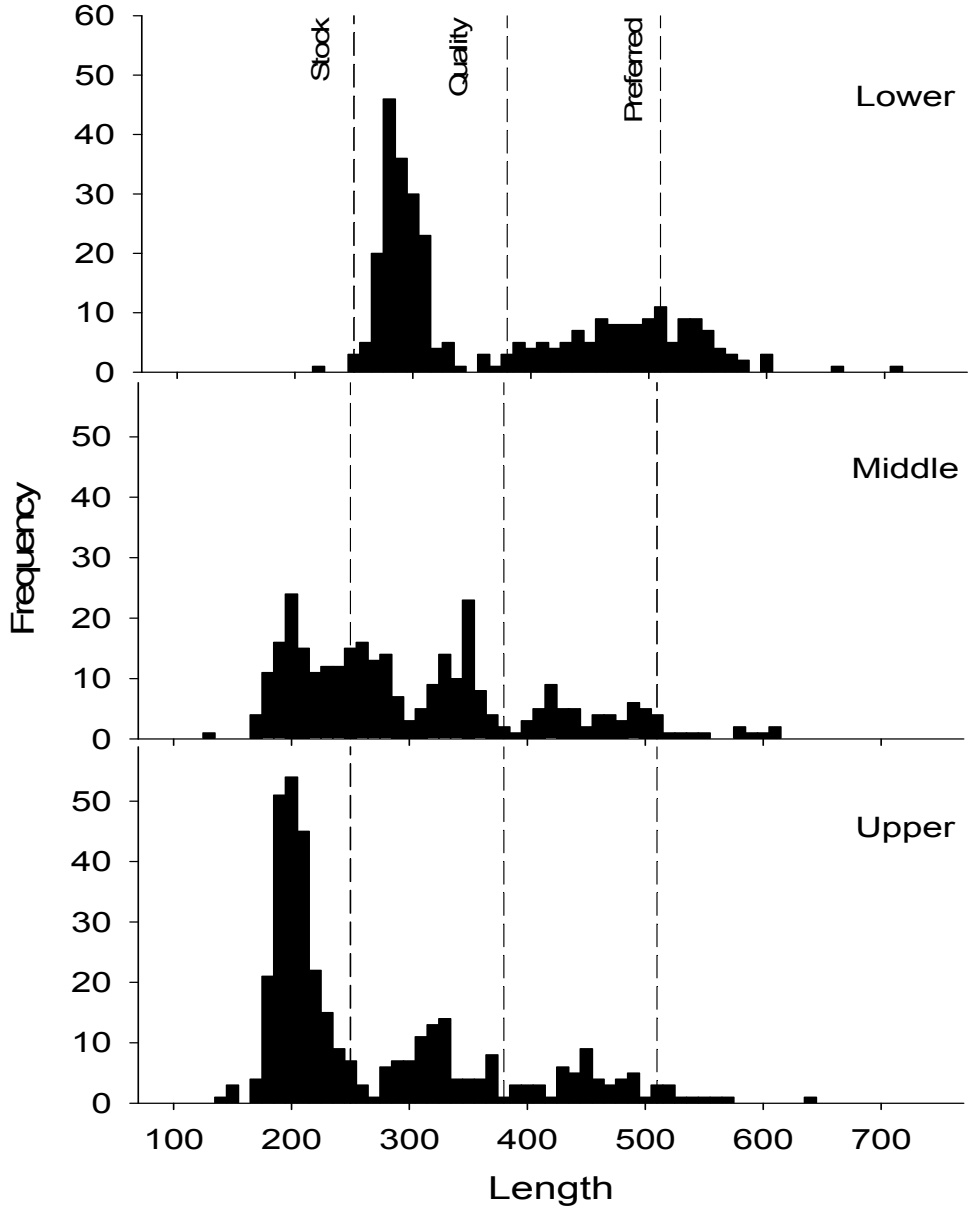

Figure 5. Length frequencies of walleye collected by zone, for fish collected during the standard coolwater gill net survey in 2010.

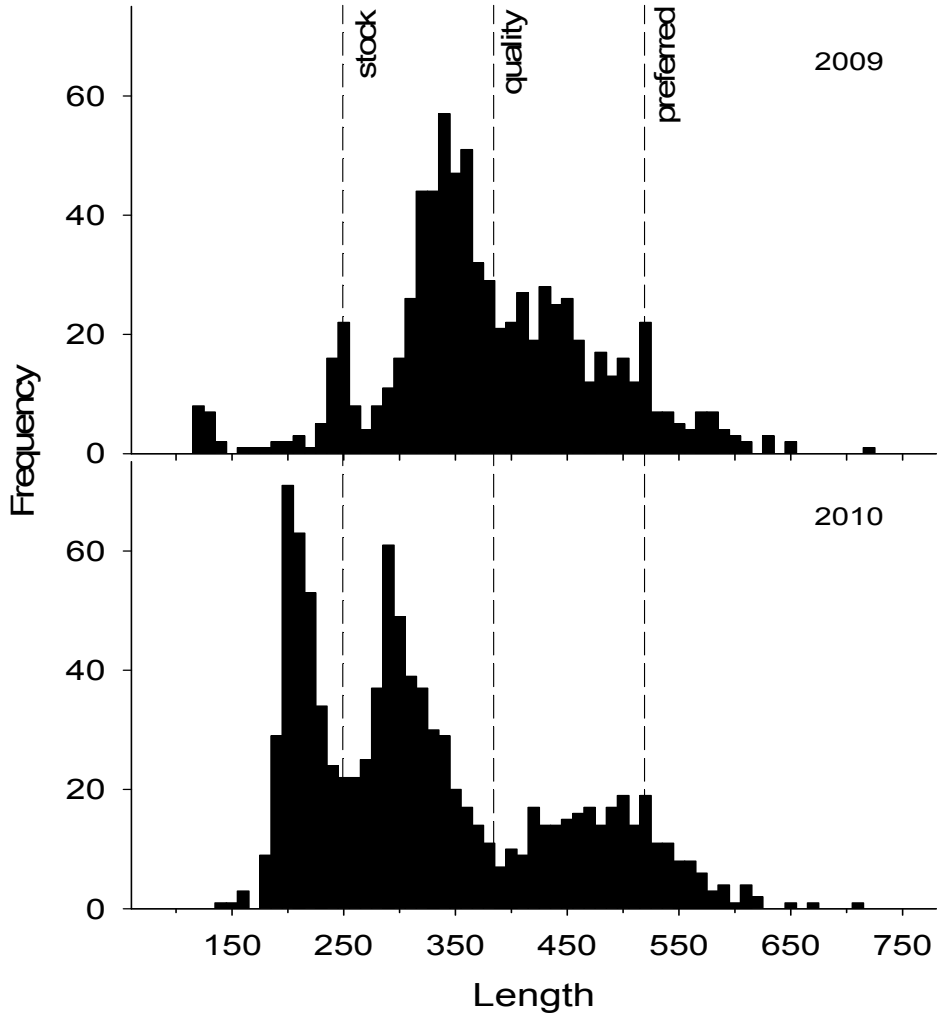

Figure 6. Overall Length frequency of walleye collected in standard gill-net sets in Lake Oahe, South Dakota, during August 2009 and 2010.

Population Parameters for Channel Catfish

Proportional size distribution for the overall Lake Oahe 2009 gill net sample of channel catfish, at 63, was higher than the past six years (Table 19). Relative weight for channel catfish has remained relatively stable ranging between 79 and 91 over the previous 6-year period (Table 19). Structural and condition indices for the Lake Oahe channel catfish population have generally varied little among years due to slow growth, consistent recruitment, and low exploitation. Channel catfish growth rates have slowed considerably since the impoundment of Lake Oahe (Starostka and Nelson 1974; Lott et al. 2003). Quality length for channel catfish is 410 mm, or approximately 16 inches. Many of the channel catfish sampled in the standard gill net survey in 2009 were longer than 16 inches (Figure 7) but angler use and harvest of this species remains low. Mean CPUE of channel catfish in the 2010 standard gill net survey, at 14.7, was similar to other channel catfish CPUE during the 2005-2010 period (Table 9).

Length frequency information presented in Figure 7 reveals a balanced channel catfish population. Consistent recruitment of channel catfish is evidenced by the presence of multiple strong year classes in length frequency figures.

Table 19. Channel catfish proportional size distributions (PSD, PSD-P, and PSD-M), and mean relative weight (*Wr*) values for 2005-2010 for Lake Oahe, South Dakota. Mean Wr values for 2004-2009 are for stock-length fish only.

Year	PSD	PSD-P	PSD-M	*Wr*	Sample size
2005	43	1	0	80	481
2006	44	0	0	79	461
2007	50	1	0	79	620
2008	50	1	0	82	490
2009	54	3	0	91	792
2010	63	5	1	83	563

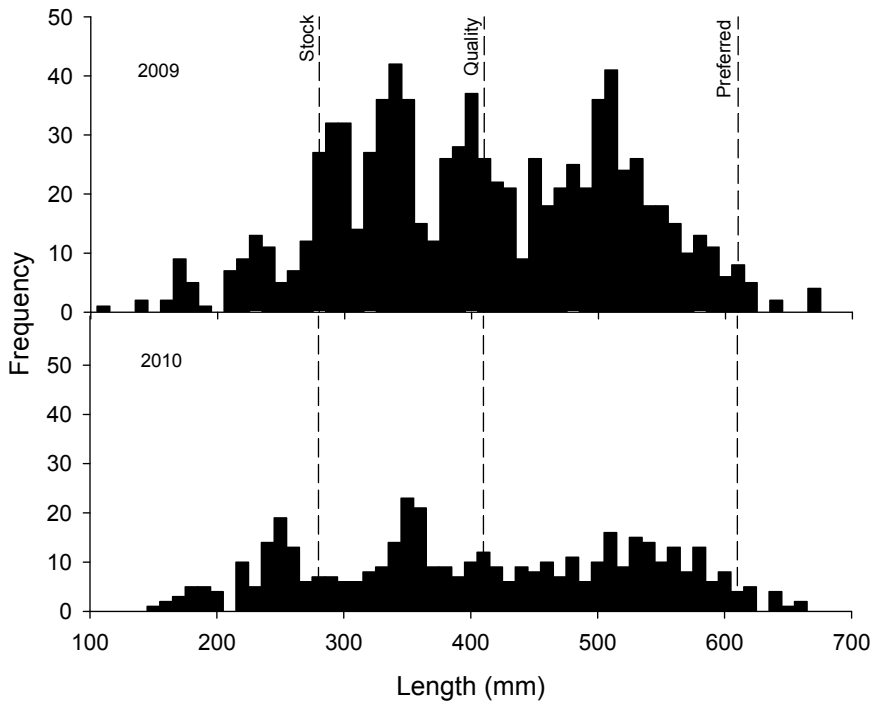

Figure 7. Length frequency of channel catfish collected during the standard coolwater gill net survey in 2009 and 2010.

Population Parameters for Rainbow Smelt

The number of rainbow smelt has varied greatly over the course of the hydroacoustic survey on Lake Oahe. The lowest abundance of smelt was reported in 2001 at approximately 300,000 (Nelson-Stastny 2001). The following year smelt numbers increased dramatically as they were at an estimated 73 million in 2002. The increasing trends only lasted a few years and since they last peaked in 2006, smelt numbers have declined (Table 20). In 2009, smelt numbers were at the second lowest level ever estimated on Lake Oahe at approximately 9 million during the hydroacoutics survey (Table 20); however, we recommend viewing the 2009 data with caution as we speculate that smelt numbers were actually much higher than recorded during this survey. Lake Oahe received record in flows from its three major western tributaries which increased overall lake elevation by more than ten feet in a short period of time. This event followed an extreme drought period that, in 2006, resulted in the lowest water elevation recorded since the reservoir filled after dam enclosure. As a result of the prolonged drought, dense shoreline vegetation established on over hundreds of miles of shoreline proving shelter and hiding areas for many species of fish. In 2010, smelt numbers increased from the previous two years but are still much lower than the ten year average of 154 million.

Table 20. Summary of 2003-2010 Lake Oahe annual hydracoustic estimates of rainbow smelt.

Year	Zone	Age-0 smelt	≥ Age-1 smelt	Warmwater prey fish
2003	1	97,729,928	49,944,953	95,805,322
	2	76,687,030	41252147	76,811,349
	3	0	0	72,590,701
	Total	**174,416,958**	**91,197,100**	**254,207,372**
2004	1	18,176,115	75,830,260	105,383,296
	2	4,851,526	37,801,886	97,649,770
	3	0	0	381,727,895
	Total	**23,027,641**	**113,632,146**	**584,760,961**
2005	1	107,642,452	28,295,289	92,659,837
	2	22,545,136	16,452,986	131,607,192
	3	0	0	133,602,672
	Total	**130,187,588**	**44,748,275**	**357,869,701**
*2006	1	42,515,230	77,589,686	58,100,747
	2	16,361,068	39,359,059	118,117,674
	3	0	0	78,747,607
	Total	**58,876,298**	**116,948,745**	**254,966,028**
*2007	1	26,129,654	46,947,821	26,216,371
	2	5,212,669	18,162,333	34,113,949
	3	13,133,275	0	83,055,368
	Total	**44,475,598**	**65,110,154**	**143,385,687**
**2008	1	7,819,675	7,096,619	13,492,433
	2	8,889,415	10,095,070	3,033,355
	3	372,391	5,121,394	21,720,510
	Total	**17,081,481**	**22,313,083**	**38,246,299**
**2009	**1**	2,501,156	2,210,713	2,069,918
	2	2,693,472	1,515,366	2,538,911
	3	13,653	40,235	1,374,144
	Total	**5,208,281**	**3,766,315**	**5,982,974**
**2010	**1**	16,745,937	20,157,322	779,849
	2	8,961,293	11,232,022	361,554
	3	562,504	5,143,243	249,354
	Total	**26,269,734**	**36,532,586**	**1,390,758**

* indicates year with HTI equipment and Erickson processing methods.
** Indicates year with Biosonics equipment and Echoview Software

Table 21. Mean peak larval densities (No./100 m3) of rainbow smelt, by reservoir zone, in Lake Oahe, South Dakota, during late May and early June, 2009 and 2010.

Year	**Zone**			
	Lower	**Middle**	**Upper**	**Total**
2009	0.56 (0.14)	8.74 (4.7)	0.74 (0.39)	3.35
2010	0.44 (0.21)	1.38 (0.94)	0.98 (0.98)	0.93

ANGLER USE, SPORTFISH HARVEST, AND PREFERENCE SURVEYS

Angler Use

A total of 3,101 parties were interviewed during the April-October 2010 angler use and harvest survey. Estimated fishing pressure for the South Dakota portion of Lake Oahe for 2010 was 1,150,910 h; the highest estimated since 1998 and approximately 9% higher than 2009 (Table 22). The highest estimated fishing pressure for the April-October period occurred in 1996 at 1,968,525 hours and 338,880 angler trips. In 2010, estimated pressure was 58% of the 1996 level and estimated trips were 64% of the 1996 level.

Table 22. Angler use and harvest estimates for surveys conducted on Lake Oahe, South Dakota, 1995-2010. 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	This report

Estimated fishing pressure peaked in June during 2010, at 426,200 hours, or 38% of the fishing pressure for the months of April through October (Table 23). Approximately 70% of the fishing pressure in the April through October period occurred during the months of May, June, and July, which is lower than 81% in the same period in 2009 (Longhenry et al. 2010). When compared to 2009, estimated fishing pressure in 2010 was lower in April, May, and October but higher in June during the April through October survey period. Angling pressure was the highest in the middle zone of Lake Oahe at 40% of the total estimated pressure, followed by the upper and lower zones at 35% and 25%, respectively. The percentage of the total estimated fishing pressure taking place in the lower zone decreased from 30% to 25% (Longhenry et al 2010). The percentage of the total estimated fishing pressure taking place in the upper zone increased from 29% in 2009 to 35% in 2010.

Table 23. Estimated fishing pressure (angler hours), by month and zone, with 80% confidence intervals (CI), for the April-October 2010 daylight period on Lake Oahe, South Dakota.

Zone	Month							
	April	May	June	July	August	Sept.	Oct.	Total
Lower	11,645	16,500	63,869	101,902	47,253	33,073	9,035	283,274
80% CI	4,329	7,796	29,286	32,618	14,541	16,438	2,195	49,876
Middle	3,019	13,957	176,501	121,275	62,852	53,799	13,278	444,681
80% CI	1,326	7,261	86,756	92,275	30,578	25,994	5,643	133,185
Upper	4,383	57,814	185,830	51,216	39,438	36,444	23,515	398,639
80% CI	2,474	26,794	48,162	34,820	10,001	19,821	6,508	69,219
Total	19,047	88,271	426,200	274,393	149,542	123,316	45,828	1,126,597
80% CI	5,160	28,834	103,459	103,880	35,306	36,589	8,889	158,168

Estimated fishing pressure, calculated using full pool surface area, was 10.2 h per hectare for the April-October period in 2010 (Table 24). Estimates for angler hours per hectare for the 2006 through 2010 period ranged from 5.6 h/ha to 10.2 h/ha. The majority of the pressure on Lake Oahe is by boat, with 96% of estimated angler hours for the April-October 2010 period being attributed to boat anglers (Table 24). Estimated fishing pressure was highest in the middle zone of Lake Oahe in 2010, at an average of 13.1 h/ha, followed by the upper and lower zones at 11.3 and 6.8 h/ha, respectively (Table 25).

Table 24. 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, on Lake Oahe, South Dakota, from 2006 through 2010.

Type of fishing	Year				
	2006	2007	2008	2009	2010
Boat (h)	600,294	617,134	855,753	1,009,924	1,083,102
80% CI	82,555	89,990	102,263	143,611	158,790
h/ha	5.4	5.6	7.7	9.1	9.8
Shore (h)	19,978	35,693	41,680	36,640	43,495
80% CI	3,649	6,201	6,368	5,761	5,784
h/ha	0.2	0.3	0.4	0.3	0.4
Combined (h)	620,272	652,828	897,434	1,046,564	1,126,597
80% CI	82,712	89,789	102,968	143,899	158,168
h/ha	5.6	5.9	8.1	9.5	10.2

Table 25. 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, on Lake Oahe, South Dakota, from 1995 through 2010.

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
Zone size (ha)	41,598		33,890		35,172		110,660	

Catch, Harvest and Release Estimates

Of the estimated 356,573 fish harvested from Lake Oahe during the April-October 2010 daytime period, 271,164 (76%) were walleye. Channel catfish (25,551; 7%) and white bass (18,306; 5%) had the second and third highest harvest estimates for the 2010 survey period. The walleye harvest during June and July made up 69% of the total walleye harvest during the April-October period in 2010 (Table 26).

Table 26. Estimated number of fish harvested, by species and month, with 80% confidence intervals (CI), for the April-October 2010 daylight period, on Lake Oahe, South Dakota.

Species	Month							
	April	May	June	July	Aug.	Sept.	Oct.	Total
Walleye	18	10,878	103,903	82,258	48,544	18,199	7,363	271,164
80% CI	0.0	5,847	48,041	39,437	15,217	7,913	2,172	51,666
Channel catfish	1,042	4,803	5,555	3,262	1,857	865	922	18,306
80% CI	0.0	967	2,297	1,683	653	146	287	3,094
White bass	232	3,431	3,415	740	89	806	296	9,009
80% CI	151	948	922	30	0	920	45	1,619
Smallmouth bass	35	1,140	7,350	6,178	4,636	3,700	2,512	25,551
80% CI	--	669	1,303	3,243	2,015	1,554	1,205	4,537
Yellow perch	56	934	4,769	2,510	218	473	648	9,608
80% CI	--	630	1,917	1,277	109	390	463	2,466
Northern pike	955	388	1,657	1,615	725	1,047	843	7,229
80% CI	468	181	427	1,168	382	473	289	1,501
Chinook salmon	426	74	497	2,888	3,075	1,217	253	8,429
80% CI	163	11	156	3,489	892	1,106	67	3,774
Other*	373	377	4,709	650	678	246	243	14,552
Total	3,137	22,025	131,855	100,101	59,822	26,553	13,080	356,573
80% CI	1,310	6,829	33,074	44,238	17,142	9,858	3,272	59,170

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

An estimated 989,299 fish were caught in Lake Oahe during the 2010 standard survey period (Table 26). Smallmouth bass (188,427), yellow perch (175,153), and channel catfish (59,044) followed walleye in terms of total estimated catch in 2010. An estimated 419,471 walleye (42% of all fish) were caught with 65% harvested (Table 29). An estimated 632,726 fish were released back into Lake Oahe (Table 27). As with fishing pressure, catch and harvest was highest in the months of June and July. The total catch estimate for June and July 2010 was 663,441 fish, 67% of the total for the April-October period.

Table 27. Estimated number of fish released, by species and month, for the April-October 2010 daylight period, on Lake Oahe, South Dakota.

Species	Month							
	April	May	June	July	Aug.	Sept.	Oct.	Total
Walleye	0	4,420	48,041	39,847	30,604	14,397	10,998	148,307
80% CI	0	2,548	13,700	19,347	8,227	6,322	3,153	26,193
Channel catfish	247	1,075	5,962	24,773	6,236	1,075	1,371	40,738
80% CI	201	470	2,909	11,309	2,137	471	333	11,896
White bass	72	2,232	8,499	1,461	981	2,649	1,014	16,909
80% CI	0	1,033	1,233	659	176	3,043	300	3,522
Smallmouth bass	13	2,533	27,792	63,932	36,863	22,595	9,147	162,876
80% CI	--	1,098	6,601	30,435	9,586	9,048	3,569	34,023
Northern pike	685	2,779	19,697	11,796	3,159	3,950	2,402	44,468
80% CI	385	712	4,859	6,304	872	1,270	696	8,177
Yellow perch	56	3,454	82,687	57,258	7,738	12,296	2,054	165,545
80% CI	--	1,395	26,128	30,504	4,206	6,130	634	40,875
Chinook salmon	0	0	95	825	177	5	310	1,412
80% CI	0	0	28	997	196	9	0	1,016
Other*	403	2,179	18,925	19,895	8,535	2,348	189	52,474
Total	1,476	18,672	211,698	219,787	94,293	59,315	27,485	632,726
80% CI	779	5,915	56,316	93,595	23,530	20,108	6,386	113,868

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

Estimated walleye harvest in 2010 was highest in the middle zone of Lake Oahe, at 122,983 fish, followed by the upper and lower zones at 110,680 and 37,510 fish, respectively (Table 28). This is a reversal of harvest compared to 2009 at 90,640 and 66,697 fish, respectively (Longhenry et al. 2010). However, this a return to a long term pattern such as 2008 when 36,663 and 122,679 walleye were harvested in the lower and upper zones, respectively (Adams et. al 2009). The highest harvest of channel catfish (59% of total) occurred in the upper zone of the reservoir in 2010 (Table 28). The highest harvest of smallmouth bass (48% and 39% of total) occurred in the lower and middle zone of the reservoir in 2010, 12,214 and 10,018 fish, respectively (Table 28). The lower zone (89% of total) followed by the middle zone (11% of total) had the highest harvest for Chinook salmon.

Table 28. Estimated number of fish harvested, for selected species, by zone, with 80% confidence intervals (CI), for the April-October 2010 daylight period, on Lake Oahe, South Dakota.

Species	Zone			
	Lower	Middle	Upper	Total
Walleye	37,501	122,983	110,680	271,164
80% CI	11,749	44,363	23,732	51,666
Channel catfish	3,030	4,488	10,787	18,306
80% CI	1,110	1,497	2,470	3,094
White bass	1,305	563	7,141	9,009
80% CI	376	50	1,574	1,619
Smallmouth bass	12,214	10,018	3,319	25,551
80% CI	2,944	3,364	780	4,537
Yellow perch	2,048	4,271	3,290	9,608
80% CI	651	2,121	1,075	2,466
Northern pike	3,335	1,163	2,732	7,229
80% CI	1,201	445	781	1,501
Chinook salmon	7,505	924	0	8,429
80% CI	3,613	1,093	--	3,774
Other	1,053	1,091	5,132	7,276
Total	67,991	145,501	143,081	356,573
80% CI	16,457	50,167	26,711	59,170

Estimated walleye catch and the percentage of walleye caught that were harvested have varied greatly among years (Table 29). The percentage of fish caught that were harvested ranged from 23% to 41% during the 1997-2000 period due to the walleye population being dominated by fish less than 380 mm in length and high angler catch rates of walleye, allowing anglers to be very selective in the fish they kept (Lott et al. 2002). The high increase in percentage of fish caught that were kept in 2001 was the result of liberal limits implemented that year. The percentage of walleye caught that were harvested decreased from 81% in 2001 to 65% in 2010. Reasons for the reduction in percentage caught that were harvested from 2001 to 2009 include reductions in the daily limit from 14 fish to 4 fish during this time period (Table 2), and changes in sizes of walleye caught and hourly catch rates of walleye. Estimated walleye catch was highest in 1998,

at over 2 million walleyes caught, but the percentage harvested was lowest, at 23%. In 2010, with 419,471 walleyes caught, estimated catch was only 20% of the 1998 estimated catch, but harvest was 56% of the 1998 estimate (Table 29).

Table 29. Estimated number of walleye caught, harvested, and released during the April-October daylight period, by year, for Lake Oahe, South Dakota, 1994 through 2010.

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%

Length frequency histograms of walleye harvested by anglers for all of Lake Oahe (Figure 8) show that anglers generally begin harvesting walleyes at approximately 300 mm in length but prefer to harvest fish longer than 350 mm. Walleye < 300 mm were well represented in the population in all portions of Lake Oahe (Figure 5) but were not harvested by anglers. During 2010, walleye between 300 and 350 mm were harvested throughout Lake Oahe and contributed to the harvest during most months (Figure 8). The mean length of walleye harvested during the April-October 2009 period, of 434 mm (17 inches) illustrates the increase in quality of the Lake Oahe fishery since the early 2000's. In 2010, like many previous years, average size generally increased from upper Lake Oahe to lower Lake Oahe, with the average size of harvested walleye increasing from 434 mm for upper Lake Oahe to 450 mm in lower Lake Oahe (Figure 9 to Figure 11). The average size of walleye harvested were similar in middle and upper Lake Oahe, respectively (431 mm and 434 mm; Figure 10 & 11).

Smallmouth bass are typically an incidental catch by anglers and harvested by generalist anglers. The length frequency of harvested smallmouth bass showed a range of harvested sizes for 2009, and the mean length of bass harvested increased to 357 mm

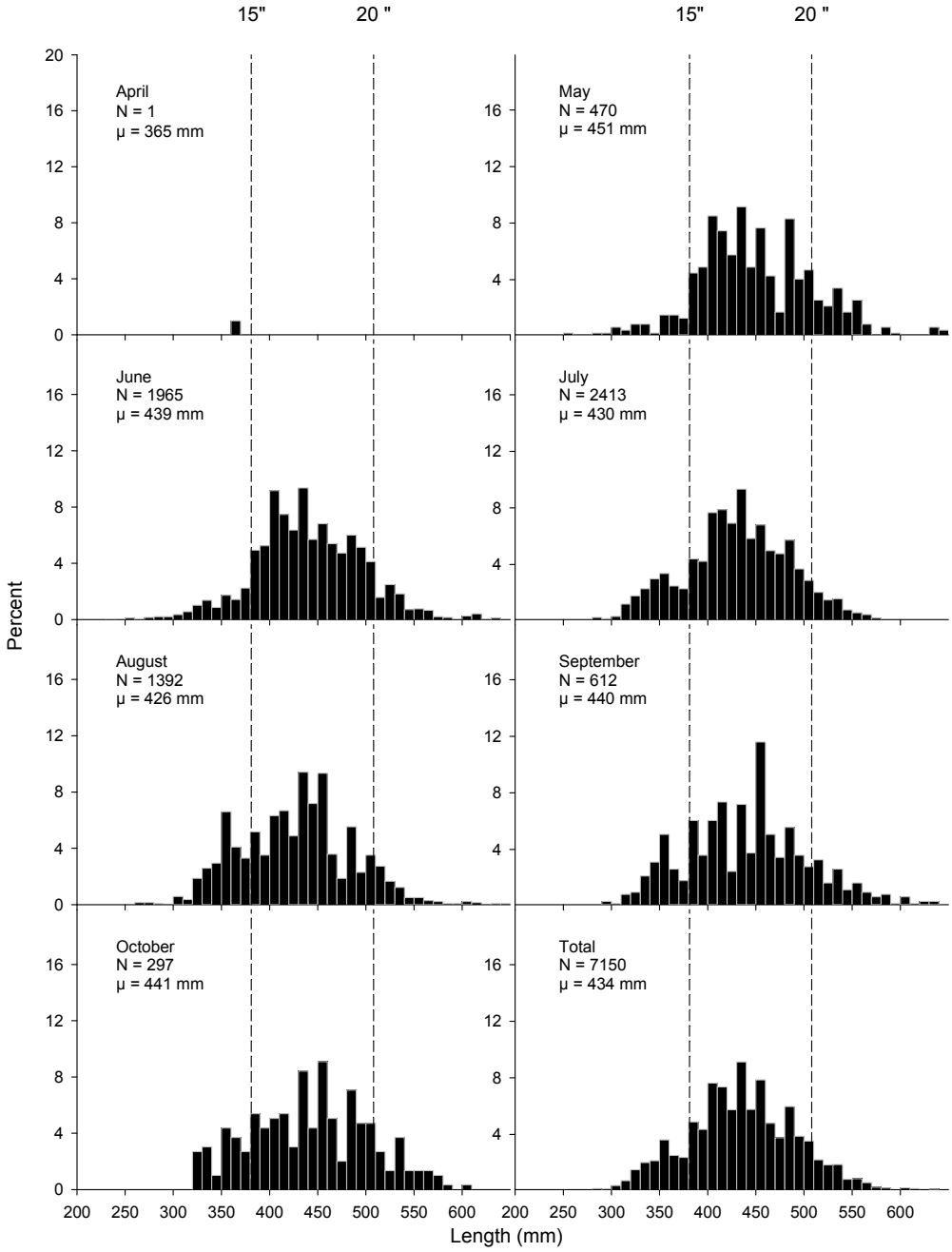

Figure 8. Length frequency distribution of walleye harvested by anglers fishing Lake Oahe, South Dakota, during the April-October 2010 daylight period. N= sample size, μ = mean length.

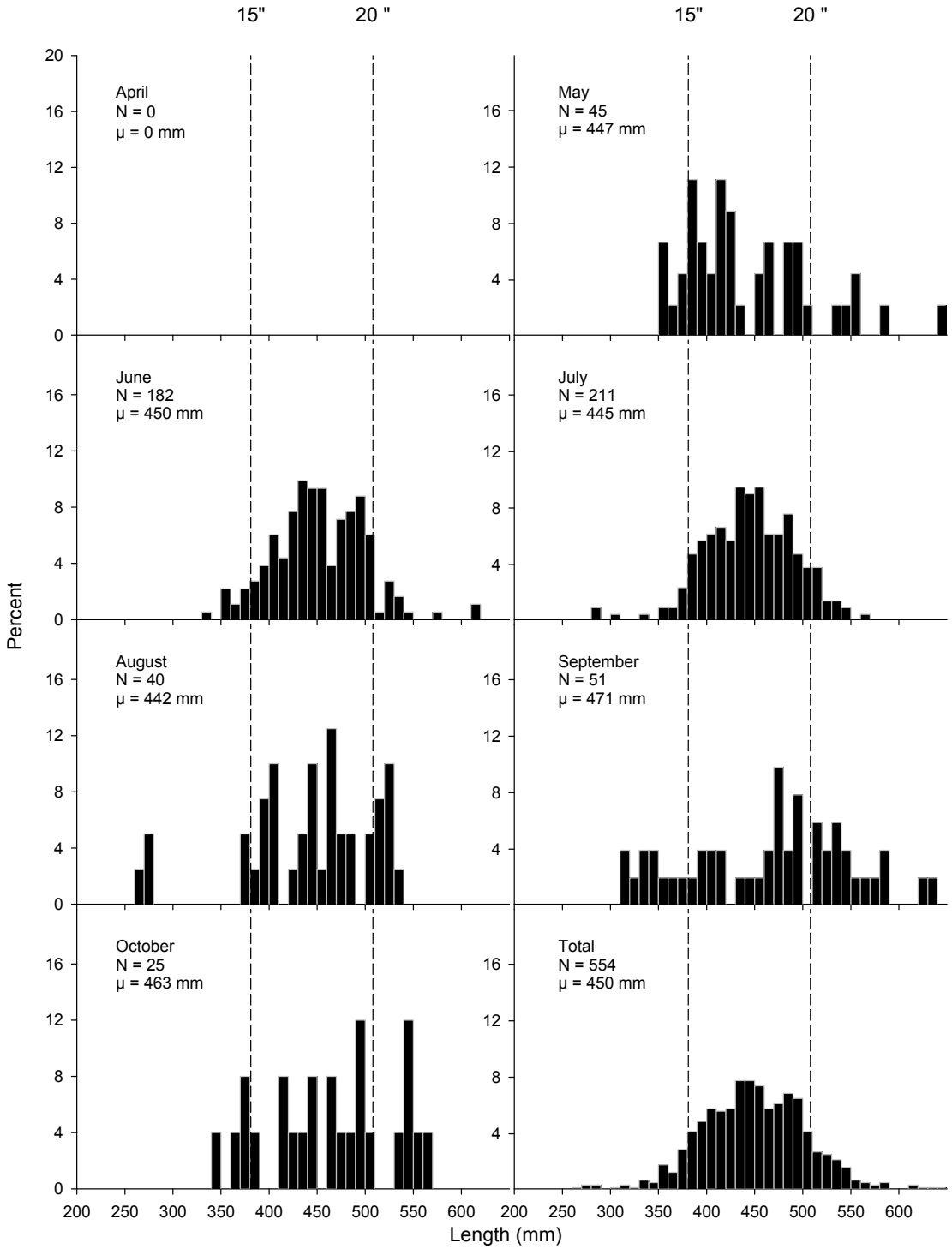

Figure 9. Length frequency distribution of walleye harvested by anglers fishing lower Lake Oahe, South Dakota, during the April-October 2010 daylight period. N= sample size, μ = mean length.

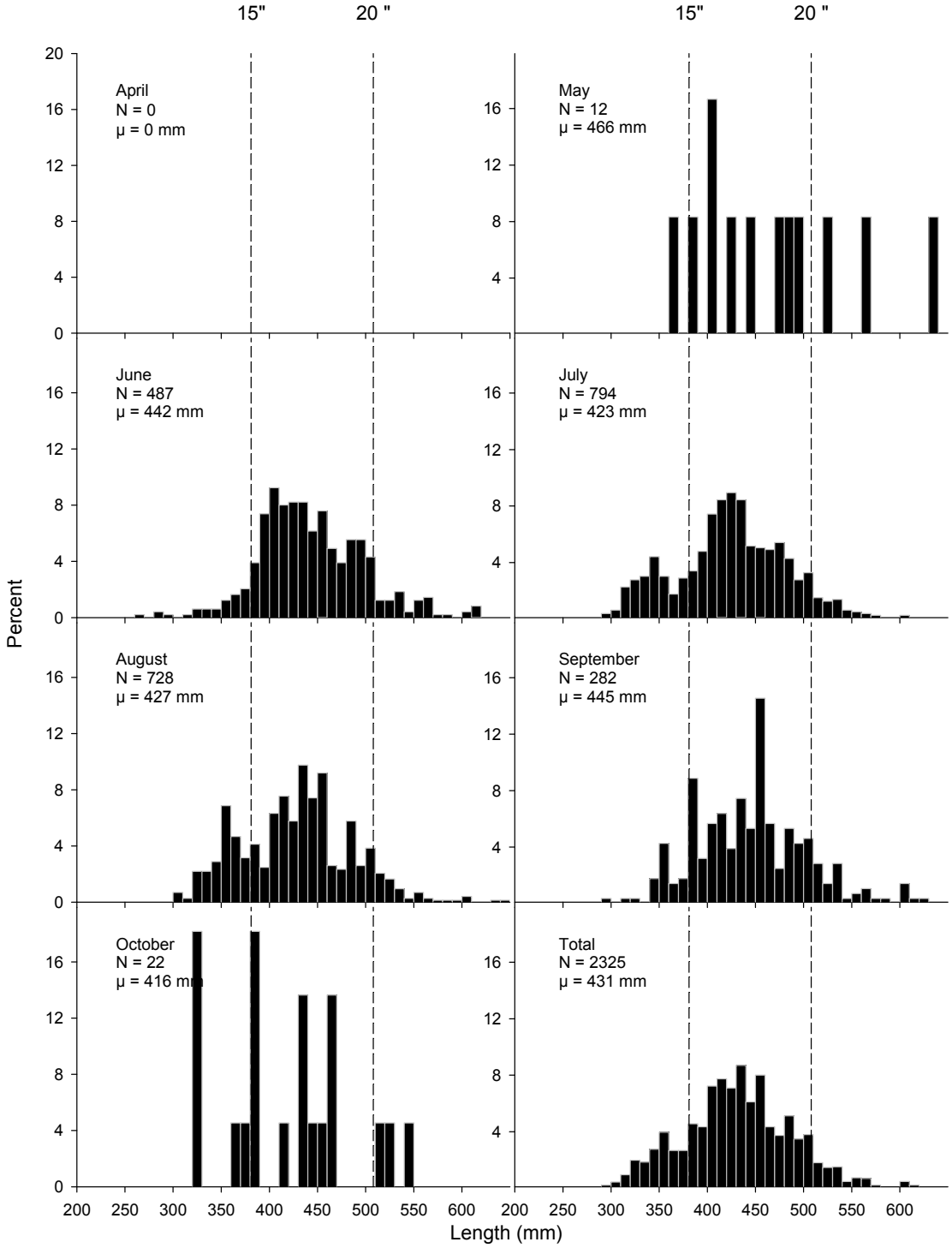

Figure 10. Length frequency distribution of walleye harvested by anglers fishing middle Lake Oahe, South Dakota, during the April-October 2010 daylight period. N= sample size, μ = mean length.

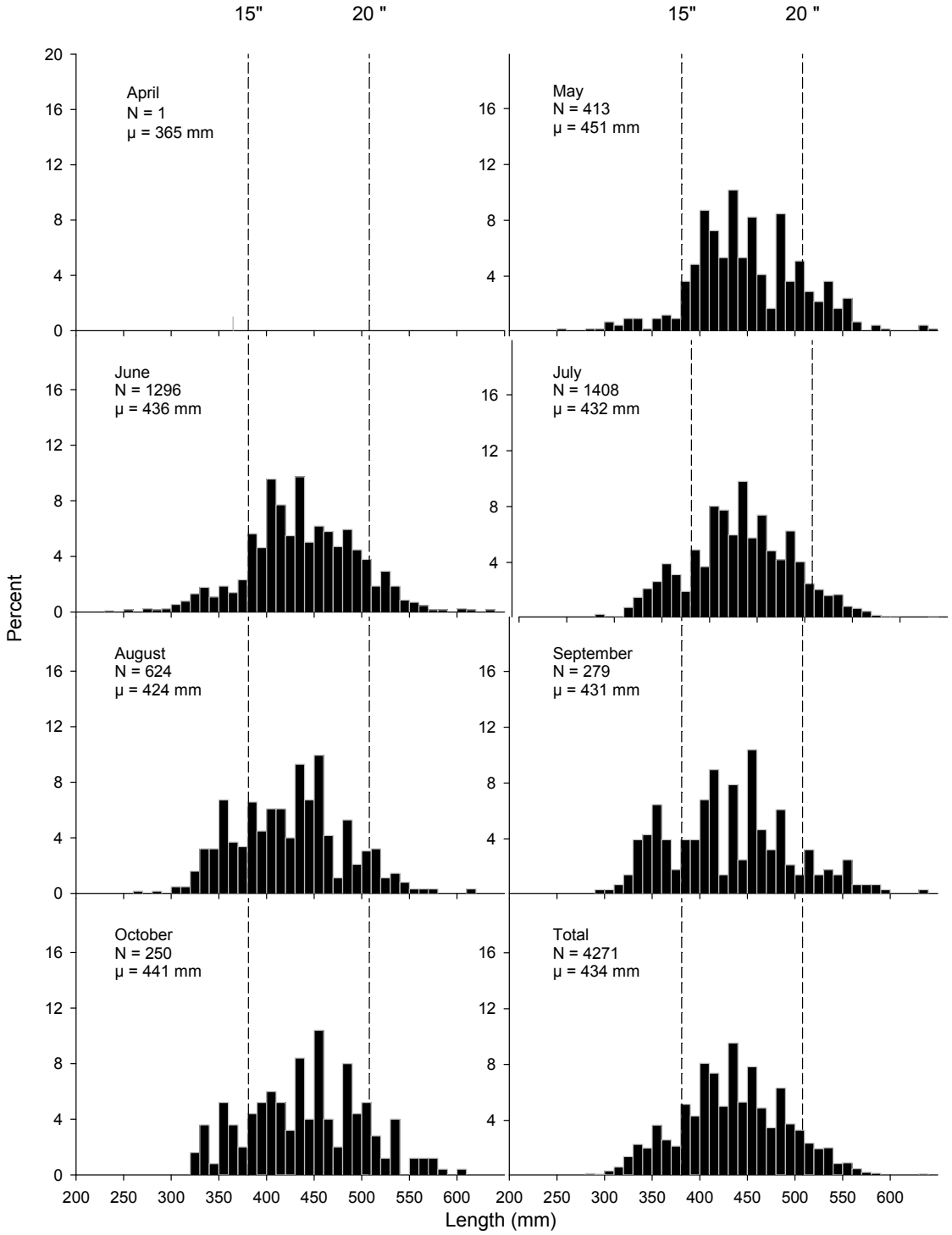

Figure 11. Length frequency distribution of walleye harvested by anglers fishing upper Lake Oahe, South Dakota, during the April-October 2010 daylight period. N= sample size, μ = mean length.

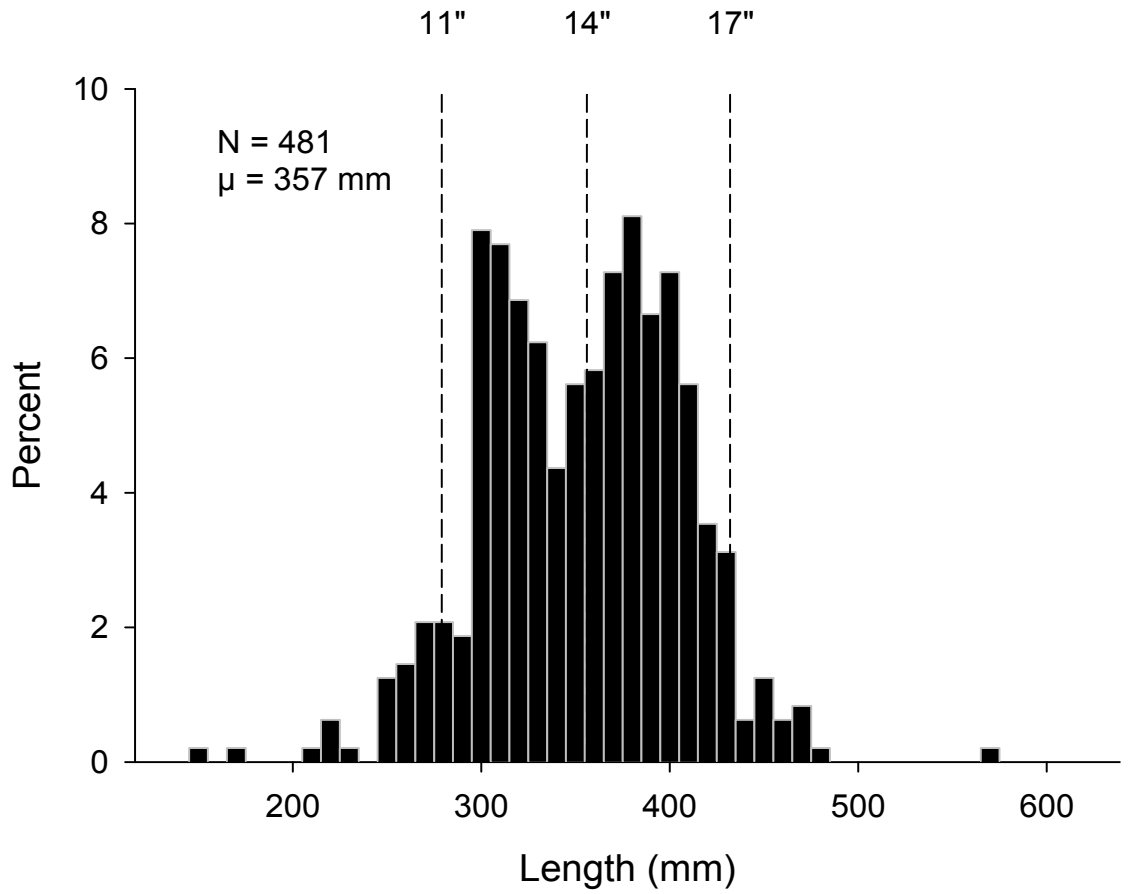

Figure 12. Length frequency distribution of smallmouth bass harvested by anglers fishing Lake Oahe, South Dakota, during the April-October 2010 daylight period. N= sample size, μ = mean length.

Hourly Catch, Harvest, and Release Rates

Mean angler catch rates for walleye on Lake Oahe have exceeded 0.3 fish/angler-h since annual surveys were initiated in 1991 (Stone et al. 1994, Table 32). Walleye catch rates exceeding 0.3 fish/angler-h are generally considered excellent (Colby et al. 1979). Anglers actively fishing for smallmouth bass had a catch rate of 5.68 fish/angler-h down slightly from 7.26 in 2009. Anglers targeting channel catfish in 2009 caught an estimated 1.74 fish/angler-h, while all anglers combined caught 0.05 fish/angler-h. A lake wide mean catch rate of 0.18 fish/angler-h for Chinook salmon by anglers targeting salmon during 2010 was below catch rates (0.20-0.34 fish/angler-h) estimated during the 2005 through 2009 period (Adams et al 2009, Lott et al. 2007, Lott et al. 2007b, Table 31).

Table 30. Estimated hourly catch, harvest, and release rates, by species, for all anglers interviewed on Lake Oahe, South Dakota, during the April-October 2010 daylight survey period. Confidence intervals (CI) are indicated in parenthesis and trace (T) indicates <0.01.

Species	Catch rate (fish/angler-h)	Harvest rate (fish/angler-h)	Release rate (fish/angler-h)
Walleye	0.37 (0.10)	0.24 (0.07)	0.13 (0.03)
Channel catfish	0.05 (0.01)	0.02 (0.0)	0.04 (0.01)
White bass	0.02 (0.01)	0.01 (0.0)	0.02 (0.0)
Smallmouth bass	0.17 (0.04)	0.02 (0.1)	0.14 (0.04)
Northern pike	0.05 (0.01)	0.01 (0.0)	0.04 (0.01)
Yellow perch	0.16 (0.05)	0.01 (0.0)	0.15 (0.04)
Chinook salmon	0.01 (0.0)	0.01 (0.0)	T (0.0)
Total	0.88 (0.21)	0.32 (0.08)	0.56 (0.14)

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

Table 31. Estimated hourly catch, harvest, and release rates, by species, for anglers specifically fishing for the species listed, on Lake Oahe, South Dakota during for the April-October 2010 daylight period. Confidence intervals (CI) are indicated in parenthesis.

Species	Catch rate (fish/angler-h)	Harvest rate (fish/angler-h)	Release rate (fish/angler-h)
Walleye	0.89 (0.11)	0.55 (0.07)	0.35 (0.08)
Smallmouth bass	5.68 (0.12)	0.70 (0.08)	4.98 (0.12)
Channel catfish	1.74 (0.17)	1.27 (0.16)	0.47 (0.06)
White bass	2.45	2.45	
Chinook salmon	0.18 (0.06)	0.13 (0.07)	0.05 (0.01)
Northern pike	0.07 (0.06)	0.05 (0.06)	0.02 (0.03)

Catch rates for walleye, smallmouth bass, white bass, and channel catfish vary greatly among years (Table 32). Walleye catch rates were highest from 1997 through 2001 with peak catch rates of 1.18 walleye per hour occurring during 1998. White bass catch rates were 0.12 fish/angler-h or higher during all years in the 1998-2005 period. However, a die-off of white bass (Lott et al. 2007) occurred during July of 2005 that may be responsible for the decrease in mean white bass catch per angler-h for 2006 to 2010 (Table 32). Catch rates, for all species combined in 2010, peaked during the months of July and August (Table 33); however, June and July had the highest fishing pressure (Table 33). Walleye catch rates also peaked in July and August 2010, with harvest rates being the greatest in August at 0.32 fish/angler-h (Table 33).

Catch rates, for all species combined in 2010, peaked during the months of July and August (Table 33). Walleye catch rates also peaked in July and August 2010, with harvest rates being the greatest in June (0.4 walleye per hour) (Table 33).

The percentage of anglers harvesting four walleye decreased from 16% in 2009 to 11% in 2010 (Table 34). The percentage of angling parties catching zero walleye per trip increased from the upper to lower zones of the reservoir in 2010, which is in contrast to 2009 where the percentage of anglers catching zero fish was highest in the upper and lower zones. The percentage of angling parties catching zero walleye per trip increased in the lower zone from 42% in 2009 to 61% in 2010. In 2009, 24% and 49% of fishing parties caught zero walleye in the middle and upper zones, respectively, compared to 27% and 20% in 2010(Table 34).

Table 32. 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 on Lake Oahe, South Dakota, 1995 through 2010.

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

Table 33. Estimated hourly catch, harvest, and release rates (fish/angler-h), for walleye and all species combined, with 80% confidence intervals (CI), by month, for the April-October 2010 daylight survey period, on Lake Oahe, South Dakota. Trace (T) indicates values >0.0 but <0.01.

Month	Walleye			All fish combined		
	Catch rate	Harvest rate	Release rate	Catch rate	Harvest rate	Release rate
April	T (0.0)	T (0.0)	0.0 (0.0)	0.24 (0.13)	0.16 (0.09)	0.08 (0.05)
May	0.17 (0.17)	0.12 (0.12)	0.05 (0.05)	0.46 (0.30)	0.25 (0.16)	0.21 (0.15)
June	0.36 (0.15)	0.24 (0.10)	0.11 (0.05)	0.81 (0.33)	0.31 (0.13)	0.50 (0.20)
July	0.45 (0.27)	0.30 (0.19)	0.15 (0.09)	1.17 (0.65)	0.36 (0.22)	0.80 (0.44)
August	0.53 (0.28)	0.32 (0.18)	0.20 (0.10)	1.03 (0.49)	0.40 (0.22)	0.63 (0.27)
September	0.26 (0.21)	0.15 (0.14)	0.12 (0.08)	0.70 (0.50)	0.22 (0.17)	0.48 (0.34)
October	0.40 (0.17)	0.16 (0.07)	0.24 (0.10)	0.89 (0.36)	0.29 (0.11)	0.60 (0.25)
Total	0.37 (0.10)	0.24 (0.65)	0.13 (0.03)	0.88 (0.21)	0.32 (0.08)	0.56 (0.14)

Table 34. Percentage of angling parties catching and harvesting the specified number of walleye and sauger per person per party, by reservoir zone, for Lake Oahe, South Dakota, during the April-October 2009 and 2010 daylight survey periods.

Number /trip	Catch per trip							
	2009				2010			
	Lower	Middle	Upper	Total	Lower	Middle	Upper	Total
0	42	24	49	37	61	27	20	33
0.1-0.9	10	10	11	10	13	16	14	14
1.0-1.9	13	14	11	13	11	16	17	15
2.0-2.9	9	10	11	9	5	10	10	9
3.0-3.9	5	9	7	7	3	9	8	7
4.0-4.9	10	9	4	8	3	9	9	8
5.0-5.9	5	6	3	5	1	4	7	5
6.0-6.9	4	6	2	4	1	3	5	3
7.0-7.9	1	4	0	2	--	2	3	2
8.0-8.9	1	2	1	1	0	1	1	1
9.0-9.9	1	2	0	1	0	1	1	1
≥10	1	5	1	3	1	2	4	2

Number /trip	Harvest per trip							
	2009				2010			
	Lower	Middle	Upper	Total	Lower	Middle	Upper	Total
0	47	29	53	42	65	33	28	39
0.1-0.9	9	10	10	10	12	15	14	14
1.0-1.9	13	17	11	14	10	17	22	17
2.0-2.9	9	13	12	11	5	11	13	10
3.0-3.9	7	10	6	8	3	10	9	8
4.0	16	20	7	16	4	14	13	11

Angler Demographics and Economic Impacts

Average party size was 2.2 anglers/party and average trip length was 5.0 h, during the April-October 2010 period. In 2010, resident anglers represented 76% of the parties interviewed on Lake Oahe (Table 35). Non-resident anglers made up 25% of the interviews in both the middle and upper zones, and 21% in the lower zone in 2010. From 2005 to 2010, the percentage of non-resident angler contacts within each zone has remained similar.

For the April-October 2010 daytime period, the Lake Oahe fishery had a direct economic impact of 17.7 million dollars based on 224,870 trips at a value of $79 per trip (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007). This is an increase from the 16.5 million dollars based on 209,347 trips in 2009.

Four states, Nebraska (27%), Minnesota (21%), Iowa (18%) and North Dakota (11%) made up 77% of the non-resident anglers that visited Lake Oahe (Table 36).

Table 35. Percentage of total angler contacts for resident and non-resident (states combined) anglers fishing Lake Oahe during the April-October daylight period, 2007-2010. N is the number of parties interviewed.

Zone		Year			
		2007	2008	2009	2010
Lower	**N**	883	612	797	760
	Residents (%)	79	76	78	79
	Non-residents (%)	21	24	22	21
Middle	**N**	859	1,050	659	1,161
	Residents (%)	69	70	74	75
	Non-residents (%)	31	30	26	25
Upper	**N**	444	566	377	1,179
	Residents (%)	83	81	80	75
	Non-residents (%)	17	19	20	25
Total	**N**	2,186	2,228	1,833	3100
	Residents (%)	76	74	77	76
	Non-residents (%)	24	26	23	24

Table 36. Percentage of total non-resident angler contacts for the states listed, for anglers fishing Lake Oahe, South Dakota, during the April-October daylight survey period, 2006-2010.

State	Percent by Year				
	2006	2007	2008	2009	2010
Iowa	15	21	19	14	18
Nebraska	32	33	29	33	27
North Dakota	7	9	12	14	11
Colorado	7	7	6	7	3
Minnesota	18	13	17	18	21
Wisconsin	6	2	2	2	3
Wyoming	2	2	3	4	3
Other*	16	13	12	8	13

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

County of residence data for South Dakota resident anglers that fished Lake Oahe in 2009 are depicted in Figure 13 through Figure 16. A large percentage (48%) of resident angler contacts for lower Lake Oahe in 2010 were from Hughes and Stanley counties (Figure 13). Twenty percent of resident anglers fishing middle Lake Oahe were from Potter, Sully, and Hughes counties (Figure 14). Anglers from Walworth County comprised 29% of resident angler contacts in upper Lake Oahe with Brown County residents accounting for 31% of the resident angler contacts in this zone (Figure 15). For the overall Lake Oahe sample in 2010, the highest percentages of resident angler contacts for a county were Hughes (15%), Brown (12%) Walworth (11%), Minnehaha (7%), and Pennington (6%) (Figure 16). Visiting resident anglers fishing Lake Oahe have a tendency to fish the zone closest to their county of residency. For upper Lake Oahe, many anglers are from the northern tier of counties or along US Highway 12. 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. These three highways cross South Dakota in an east-west pattern.

Not surprisingly, the counties with the highest percentage of resident angler contacts are also areas either close to Lake Oahe or supporting major population centers (Table 37). High percentages of total resident angler contacts for Hughes and Walworth Counties are due to the close proximity of Pierre and Mobridge to Lake Oahe, while the percentage of Minnehaha and Pennington County residents in the sample of total resident angler contacts is due to the large populations in Sioux Falls and Rapid City. Approximately 42% of angling parties contacted during the standard April-October angler survey traveled in excess of 200 miles, one way, to fish Lake Oahe (Table 38) a value similar to other years in the 2004-2009 period.

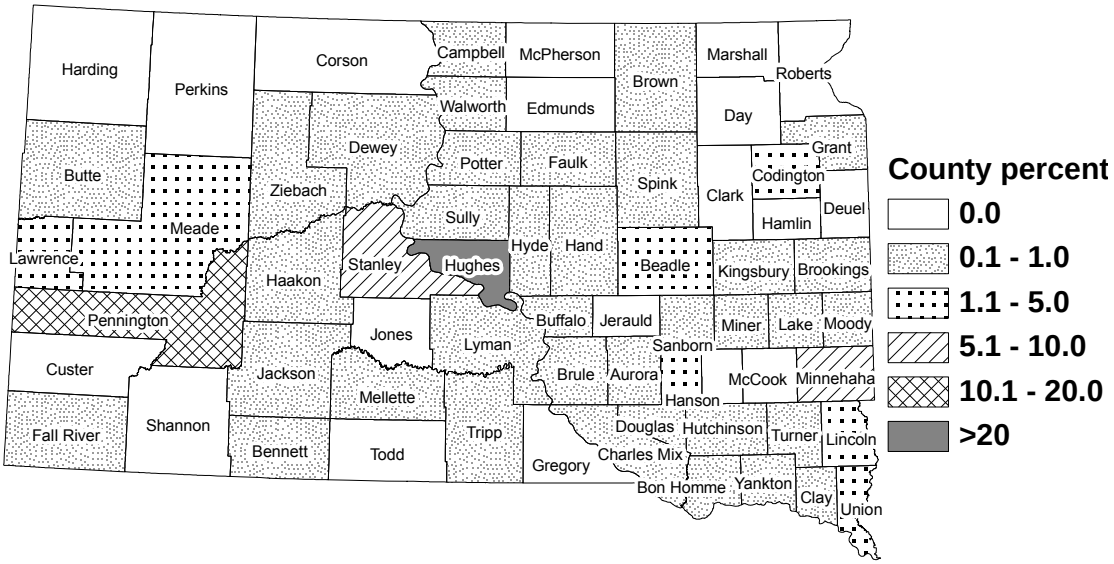

Figure 13. County of residency for South Dakota residents fishing lower Lake Oahe during the April-October 2010 daylight survey period.

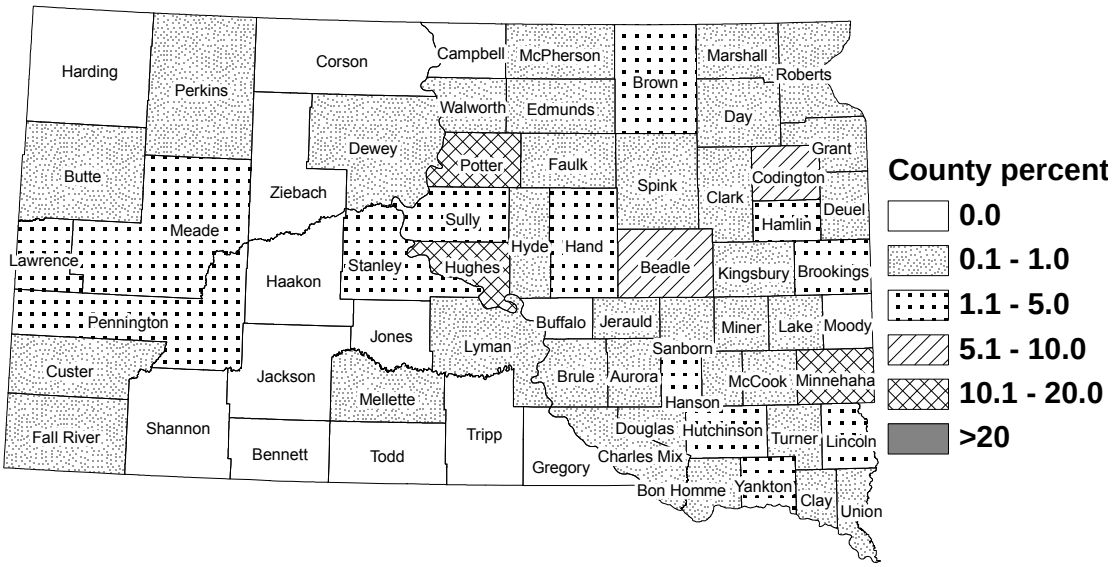

Figure 14. County of residency for South Dakota residents fishing middle Lake Oahe during the April-October 2010 daylight survey period.

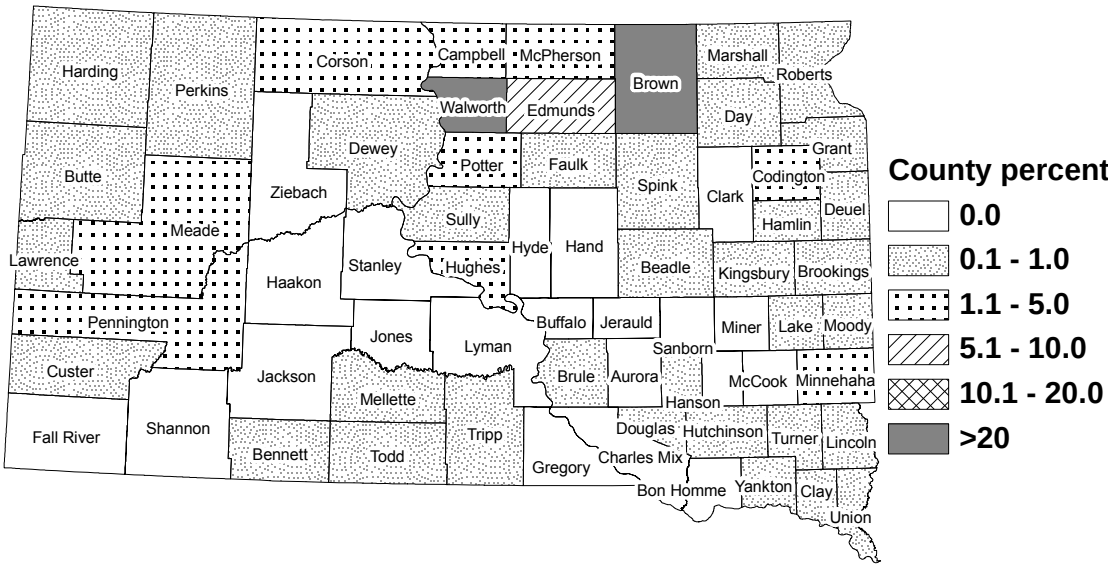

Figure 15. County of residency for South Dakota residents fishing upper Lake Oahe during the April-October 2010 daylight survey period.

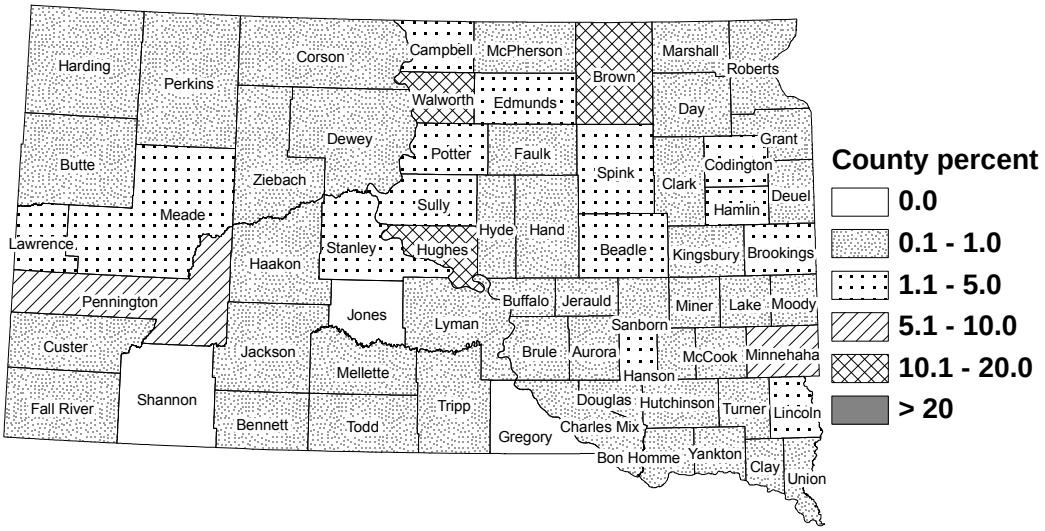

Figure 16. County of residency for South Dakota residents fishing Lake Oahe during the April-October 2010 daylight survey period.

Table 37. Percentage of total angler contacts on Lake Oahe by residents of the counties listed, for anglers fishing Lake Oahe, South Dakota, during the April-October daylight survey period, 2006-2009.

County	Major city	Percent by Year			
		2007	2008	2009	2010
Beadle	Huron	3	4	4	3
Brown	Aberdeen	8	9	9	12
Campbell	Pollock	2	2	3	2
Codington	Watertown	2	2	3	4
Davison	Mitchell	3	2	2	1
Hughes	Pierre	23	20	22	15
Minnehaha	Sioux Falls	10	10	8	7
Pennington	Rapid City	7	7	8	6
Potter	Gettysburg	3	5	4	5
Stanley	Fort Pierre	6	4	4	3
Sully	Onida	1	2	<0.5	1
Walworth	Mobridge	10	11	7	11
Other		22	22	26	30

Table 38. Percentage of anglers driving the specified distances, one way, to fish Lake Oahe, South Dakota, during the April-October daylight survey period, 2005-2010.

Distance (miles)	Percent by Year					
	2005	2006	2007	2008	2009	2010
<25	22	23	21	21	22	18
25-49	10	11	11	9	8	9
50-99	4	9	5	5	4	6
100-199	22	22	20	20	22	25
≥200	42	35	43	45	44	42

The majority (80%) of anglers fishing Lake Oahe were targeting walleye during the April-October period in 2010, while 8% of parties were not fishing for a particular species (Table 39). The percentage of angler parties interviewed that were specifically fishing for Chinook salmon was 8% in 2010, down from 10% in 2009 (Table 39).

Table 39. Target species of anglers fishing Lake Oahe, South Dakota, during the April-October daylight survey period, expressed as percent of total, 2006 - 2010. T (trace) indicates values > 0.0 but < 0.5.

Target species	Percent by Year				
	2006	2007	2008	2009	2010
Walleye	75	79	83	75	80
Anything	9	7	7	10	8
Chinook salmon	13	11	7	10	8
Northern pike	2	2	2	2	3
White bass	0	0	T	0	T
Channel catfish	1	T	T	T	1
Smallmouth bass	T	T	1	1	1

Angler Satisfaction and Attitudes

Anglers' attitudes about fishing, their preferences concerning management issues and their level of satisfaction are important components of the total fishery survey. Historically, fisheries managers have primarily focused on understanding biological aspects of fish populations and monitoring sport fish harvest and use. Recently, biologists have realized the necessity and value of understanding angler attitudes, levels of satisfaction, and preferences. Consequently, more attitude, preference and satisfaction data have been collected during recent years. The following results build on angler preference and attitude survey data collected previously for the Lake Oahe fishery. Angler assessment of the fishing experience is important to the success of a fishery. Angler responses help evaluate if 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 2010 was at 65%, not including neutral or no opinion (Table 40), which is slightly below the Lake Oahe plan objective of 70%. Trip satisfaction was rated the highest during the month of June. Trip satisfaction generally increases with the percentage of daily limits attained by anglers. Median satisfaction rating for angling parties that harvested 2.0 to 3.9 walleye per person was "moderately satisfied", while for parties harvesting a daily limit of four walleyes per person, median rating was "highly satisfied" (Table 41).

Table 40. Responses of Lake Oahe anglers who were asked the following question during the April-October 2010 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	43	56	40	16	10	4	3	172	2
May	50	83	81	34	30	34	26	338	3
June	224	234	195	65	96	102	72	988	2
July	169	133	159	48	77	74	26	686	3
August	110	92	91	21	43	41	10	408	3
September	68	46	58	17	42	66	49	346	4
October	29	25	34	9	29	22	16	164	3
Total	693	669	658	210	327	343	202	3102	
Percent		65		7		28			

Table 41. Responses of Lake Oahe anglers who were asked the following question during the April-October 2010 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	118	142	126	57	63	94	83	683	3
0-0.9	26	30	57	15	34	48	21	231	4
1.0-1.9	27	50	73	28	55	34	11	278	3
2.0-2.9	38	52	46	12	18	8	1	175	2
3.0-3.9	35	43	29	5	7	2	0	121	2
4.0 (limit)	107	51	23	3	4	2	1	191	1
Percent		64		7		29			

In addition to the angler satisfaction question, anglers were asked a series of spearing/bowfishing questions (Appendix 3). The first question was, "In 2009, did you use a spear gun or bow and arrow to harvest fish in the Missouri River?" Approximately 95% of the anglers indicated they had not participated in this activity, with approximately 5% indicating they had speared or bowfished in 2009 (Table 43). Anglers that reported spear or bowfishing were then asked, "On average how many days a year do you spear or bowfish on the Missouri River?" Approximately half (48.4%) of the spear and bowfisherman spent 1 or more days spearing or bowfishing on Lake Oahe. Approximately 26.6% of the respondents spent 1-9 days spearing or bowfishing. The remaining portion (25%) reported they spent 10 or more days spearing or bowfishing on the Missouri River.

Table 42. Size distribution of walleye harvested by anglers, by length category, during April-October, 2010 daylight period on Lake Oahe, South Dakota. <15 inches is fish less than 379 mm, 15-20 inches is fish between 380 to 509 mm, and >20 inches is fish greater or equal to than 510 mm.

Walleye kept by size	<15 inches		15-20 inches		>20 inches	
	%	N	%	N	%	N
April	100	1	0	0	0	0
May	8	37	76	356	77	16
June	10	203	81	1,581	9	181
July	17	415	75	1,811	8	187
August	23	316	69	965	8	111
September	17	104	68	419	15	89
October	17	52	69	204	14	41
Total	16	1,128	74	5,336	10	686

Table 43. Percentage of responses to the following question in 2010, "In 2009, did you use a spear gun or bow and arrow to harvest fish on the Missouri River?" N is the number of respondents.

Response			
Yes		No	
%	N	%	N
5	64	95	1,351

Table 44. Percentage of responses to the following question in 2010, "On average, how many days a year do you spear or bow fish on the Missouri River?" N is the number of respondents.

Days	%	N
1-9	48.4	31
10-19	26.6	17
20-29	9.4	6
≥30	15.6	10
Total		64

OAHE DAM SALMON SURVEY

Angler Use, Catch and Harvest Rates, and Fish Condition

The Oahe Dam (i.e. West Shore) salmon survey was conducted from 2006 to 2010 during June-August daylight periods. The 2006 data only includes the month of July. The average weight of salmon harvested during 2010 was 3,718 g, which was the heaviest recorded since the salmon creel started in 1993, and above the 1993 to 2010 average of 2,535 g (Table 45). The harvest rate of 0.09 salmon was below the long term average of 0.11 fish/h. In 2010, salmon anglers harvested 90% of the fish they caught (Table 45).

Table 45. Results of the 3-month salmon angler use and harvest survey near the face of the Oahe dam, July of 2006, 2007-2010.

Statistic	[a]2006	2007	2008	2009	2010
Fishing Pres. (h)	9,510	24,585	20,179	22,339	16,384
Harvest	1,070	4,114	1,918	1,878	1,415
[b]**Ave. weight(g)**	2,858	2,594	2,814	3,007	3,718
Catch rate(fish/h)	0.13	0.22	0.10	0.09	0.10
[c]**Harvest rate (fish/h)**	0.11	0.17	0.10	0.08	0.09

[a]2006 is July data only, numbers rerun with CAS ver. 2.2 update.
[b]Mean harvest weight 1993-2010 excluding 2001-2005= 2,535g.
[c]Mean harvest rate 1993-2010 excluding 2001-2005 = 0.11 fish per hour.

Table 46. Salmon proportional size distributions (PSD) of, stock-quality-length (S-Q), quality to preferred-length (Q-P), preferred to memorable-length (P-M), and memorable to trophy-length (M-T) classifications for fish measured during the Oahe Dam creel survey, South Dakota, 2006-2010. 2006 only includes July data.

Year	S-Q	Q-P	P-M	M-T	PSD
2006	6	27	55	12	94
2007	13	38	45	4	87
2008	1	11	86	1	99
2009	10	22	57	12	90
2010	6	26	49	19	94

Table 47. Estimated number of salmon caught, harvested, and released during the June through August daylight period, with 80% confidence intervals (CI), for Lake Oahe, South Dakota, 2006-2010.

Year	Caught	Harvested	Released	Percent Harvested
2006	1,228	1,070	158	87
80% CI	348	315	78	
2007	5,304	4,114	1,190	78
80% CI	829	661	233	
2008	1,984	1,918	66	97
80% CI	446	439	31	
2009	2,106	1,878	228	90
80% CI	433	382	69	
2010	1,576	1,415	161	90
80% CI	410	377	69	

2006 is July data only.

Table 48. Salmon angler use and harvest by month on Oahe Dam face June through August 2009 and 2010.

	2009			2010		
	June	**July**	**August**	**June**	**July**	**August**
Angler trips	2,410	1,884	582	894	1,158	1,437
Fishing pressure (h)	11,426	8,612	2,299	4,184	5,317	6,883
Harvest	1,126	622	107	336	340	739
Ave. weight(g)	3,031	3,063	3,282	3,007	3,394	4,191
Harvest rate (fish/h)	0.10	0.07	0.05	0.08	0.06	0.11
Catch rate (fish/hr)	0.11	0.08	0.05	0.09	0.08	0.11

2010 August salmon catch rates on the face of the dam were higher than June and July (Table 48). This trend is in contrast to the 2009 harvest rates where anglers experienced the highest fishing pressure and catch rates in June and lowest pressure and catch rates in August (Figure 17). Harvest rates in 2010 were 0.09 fish/h which is below the ten year average of 0.11 fish/h for this fishery (Table 45). Mean weight of harvested fish was 711 g higher in 2010 than in 2009 (Table 44).

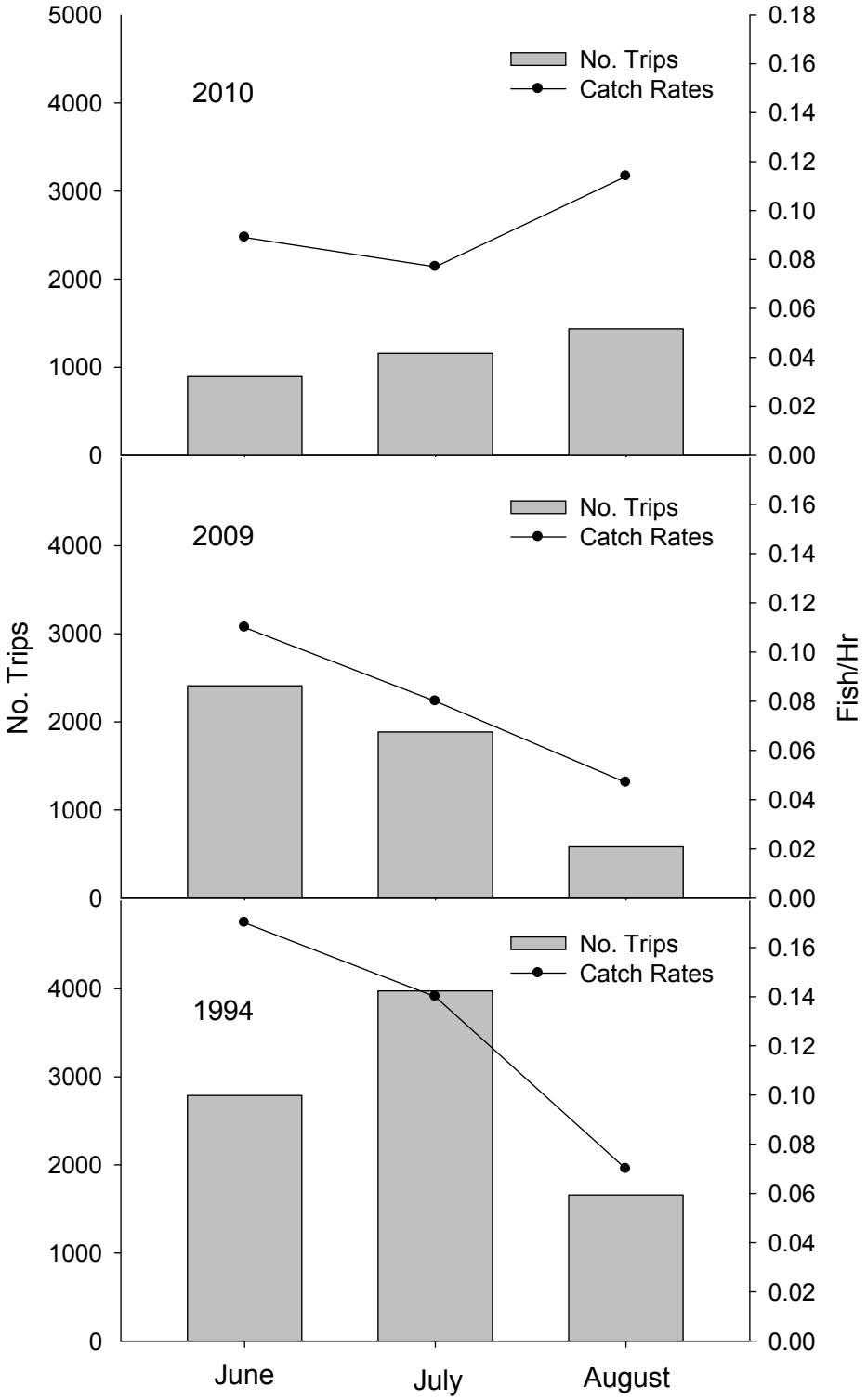

Figure 17. Angling trips and catch rates (fish/h) for Chinook salmon during the Oahe Dam creel survey June-August 1994, 2009, and 2010

Biological data from 14 coded-wire tagged (CWT) Chinook salmon were collected from anglers throughout 2010 to provide information on age, growth, hatchery rearing techniques, and stocking and rearing evaluations. The absence of age-4 tagged Chinook salmon was due to no salmon tagged from the 2006 brood year (i.e., stocked in 2007). This decreased the number of tagged fish collected because a portion of the tagged fish harvested would have been 4 year old fish. Of the 2 and 3 year old fish collected 64% of the CWT salmon were age-3 with a mean weight of 4,249 g (Table 49).

Table 49. Age composition, length and weight of coded-wire-tagged Chinook salmon caught by anglers and measured and weighed during the June-August creel survey in 2010.

Age	Brood year	Number	Mean length (mm)	Range	Mean weight (g)	Range
1	**2009**	0	---	---	---	---
2	**2008**	5	495	430-540	1360	920-1960
3	**2007**	9	698	582-772	4249	2300-6340
4	**2006***	0*	---	---	---	---
5	**2005**	0	---	---	---	**---**

*No Chinook salmon were coded-wire tagged from the 2006 brood year class (stocked in 2007).

Angler Satisfaction, Preferences and Demographics

During the June through August creel, the overall median angler trip rating was “moderately satisfied” (median=2; Table 50). A median trip rating of moderately satisfied was good with a below average catch rate for salmon and the largest average size of salmon harvested documented since the start of creel in 1993 (3,718 g; Table 45).

During 2010, 33% of the salmon angling trips were by nonresidents (Table 51). For all anglers interviewed, approximately 34% of the anglers traveled less than 25 miles, one way. Sixty-five percent of the anglers traveled in excess of 100 miles, one way, and 50% of the anglers traveled in excess of 200 miles, one way (Table 52) to fish for salmon. The percentage of anglers that traveled 25 miles and the percentage of anglers traveling in excess of 200 were similar to 2009 (Longhenry et. al. 2010).

Table 50. Responses of Lake Oahe salmon anglers who were asked the following question during the June through August 2010 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, 5 = slightly dissatisfied, 6 = moderately dissatisfied, 7 = very dissatisfied, and 8 = no opinion (N.O.). N is sample size and does not include "no opinion" responses.

Month	Satisfaction rating								N	Median
	Satisfied			Neutral	Dissatisfied			N.O.		
	1	2	3	4	5	6	7	8		
June	23	21	20	5	4	13	5	0	91	3
July	27	21	26	12	6	8	16	0	116	3
August	44	33	17	10	6	3	4	0	117	2
Total	94	75	63	27	16	24	25	0	324	2
Percent		74		8		18				

Table 51. Number of anglers interviewed and percentage of resident and nonresident salmon anglers fishing Lake Oahe, South Dakota, during the daylight period June -August survey period, 2010.

Residency	Percent	Number
Residents	67	217
Nonresidents	33	107
Total	100	324

Table 52. Percentage of anglers driving the specified distances, one way, to fish salmon on Lake Oahe, South Dakota, during the June through August daylight survey period, 2010.

Distance (miles)	Percent	Number
<25	34	110
25-49	T	2
50-99	1	4
100-199	15	47
≥200	50	161
Total	100	324

FISHERY STATUS AND 2010 OUTLOOK

The Lake Oahe walleye population continues to improve after diminished prey abundance from 1997 through 2001. Walleye condition, as indexed by *Wr* (relative weight), has remained stable throughout the previous five year period with values between 86 and 91. Walleye abundance in 2010 has increased compared to the previous five year period but it is still lower than the mid-1990s. Abundance continues to vary by zone. Walleye recruitment occurred in 2008, 2009 and likely 2010 in all zones including the lower zone which led to lower PSD and PSD-P values in all zones in 2010. Walleye PSD of 39 for Lake Oahe is within the desired range of 30-60, while PSD-P was above the objective of 10 again in 2010.

Yellow perch made up the highest percentage of the seine catch in 2010; however, the catches were considerably lower than the record perch catches of 2009. No gizzard shad were sampled in 2010. Gizzard shad abundance is at the lowest level since the establishment of shad in 2002. Since reproduction of gizzard shad was first documented in Lake Oahe in 2001, the species had become an important part of the prey fish community. Gizzard shad are still present in Lake Oahe; however, currently they do not exist at levels that significantly contribute to the prey base. 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 2010, estimated fishing pressure and number of angler trips was the highest it has been since 2001, but remained lower than the late 1990s (Table 22). Even with changes in the Lake Oahe fishery over the past decade, the direct economic impact of Lake Oahe remains immense at 17.7 million dollars based on 224,870 trips at value of $79 per trip (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 2007). Anglers spent an estimated 1,126,597 hours fishing on Lake Oahe in 2010 and harvested 271,164 walleyes for an hourly catch rate of 0.37 fish per hour.

Harvest rates for Chinook salmon in 2010 fell below 0.10 fish/hour for the second time in three years. However, the average summer weight of Chinook salmon harvested was the largest ever recorded since the salmon creel was started in 1993. The Chinook salmon program on Lake Oahe has become a major contributor to the overall fishery in recent years. With continued salmon spawning efforts and maintenance of high catch and harvest rates, the Chinook salmon program will likely gain additional angler support in the future.

MANAGEMENT RECOMMENDATIONS

1. Develop a new Lake Oahe Strategic Plan which includes:
    - Reviewing adequacy of current management plan and objectives
    - Developing management objectives for channel catfish.
    - Removing rainbow trout from the list of management species in Lake Oahe
2. Expand efforts to document characteristics of gizzard shad population structure and dynamics and role in the Lake Oahe predator-prey system
3. Investigate possible reasons for low walleye recruitment in lower Lake Oahe and investigate possible stocking options to supplement natural reproduction.
4. Continue to conduct annual creel and angler harvest surveys.
5. Continue to conduct annual fish population surveys.
6. Work to develop age structure and growth estimates for the rainbow smelt population.
7. Continue to stock Chinook salmon and evaluate the contribution of stocked salmon to the fishery.
8. Continue the Oahe Dam salmon creel to evaluate stocking strategies and attainment of management objectives for the salmon fishery.
9. Evaluate walleye predation on stocked Chinook salmon.

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APPENDICES

Appendix 1. Common and scientific names of fishes mentioned in this report.

Common name	Scientific name
Bigmouth buffalo	*Ictiobus cyprinellus*
Black bullhead	*Ictalurus 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 canadense*
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. White bass and yellow perch proportional size distribution (PSD), proportional size distribution of preferred-length (PSD-P) and memorable-length (PSD-M) fish, and mean relative weight (*Wr*) values, for 1998-2009, for fish collected in the standard August gill net survey, on Lake Oahe, South Dakota. Mean *Wr* values for 2002-2009 are for stock-length fish only.

White bass

Year	PSD	PSD-P	PSD-M	*Wr*	Sample size
1998	95	62	2	89	188
1999	100	82	2	89	170
2000	99	86	1	85	121
2001	100	91	3	92	149
2002	68	65	5	88	140
2003	100	38	1	93	127
2004	90	67	2	93	88
2005	100	67	33	100	11
2006	100	78	17	99	18
2007	100	94	30	99	51
2008	100	89	32	103	38
2009	100	100	76	98	33
2010	88	82	68	98	34

Yellow perch

Year	PSD	PSD-P	PSD-M	*Wr*	Sample size
1998	58	1	0	83	103
1999	57	6	0	89	63
2000	44	5	0	86	63
2001	55	6	0	90	65
2002	40	14	0	80	35
2003	26	3	0	84	63
2004	30	5	0	82	43
2005	13	1	0	87	49
2006	10	0	0	81	63
2007	21	4	0	82	177
2008	30	2	0	87	128
2009	12	0	0	103	788
2010	20	2	0	93	940

Appendix 3. Angler satisfaction, preference, and attitude questions asked as part of the April-October 2010 angler use and harvest survey on Lake Oahe, South Dakota.

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

Spearing Questions:

1. In 2009, did you use a spear gun or bow and arrow to harvest fish on the Missouri River?

2. On average, how many days a year do you spear or bow fish on the Missouri River?

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?