MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO.: F-78-R-6 STUDY TITLE: SURVEY AND INVENTORY OF WARMWATER LAKES

JOB NO.: IV-C JOB TITLE: FORT PECK RESERVOIR STUDY

PROJECT PERIOD: JULY 1, 2013 THROUGH JUNE 30, 2014
REPORT PERIOD: MARCH 1, 2013 THROUGH FEBRUARY 29, 2014

ABSTRACT

Fort Peck Reservoir reached peak elevation on June 26th, 2013 at 2227.18 mean feet above sea level (MSL) from a minimum elevation on March 5th, 2013 at 2222.16 MSL, a spring rise of 5.02 feet. Spawning walleye and northern pike populations were sampled in the upper Big Dry Arm with modified fyke nets from April 17th to May 10th. Walleye eggs were collected. The fertilized eggs were sent to Fort Peck and Miles City fish hatcheries. Trap netting captured 2,176 walleye for a catch rate of 4.5 per net night in 2013 which was up from the previous year of 2.2 per net night. Due to unfavorable spawning conditions, only 40 million eggs were collected in 2013. A total of 9.5 million fry and 2.8 million fingerlings were stocked in various locations throughout Fort Peck Reservoir. One hundred gill nets were set in standard locations throughout the reservoir from July 23rd to August 15th. Walleye, northern pike, and common carp were the most abundant species captured overall, with catch rates of 4.8, 3.2, and 2.9 per net night, respectively. Gill net relative abundance of walleye in 2013 decreased to 4.8 per net night which is still above the long-term average of 3.7 per net for the period from 1984 to 2013. Gill-netted walleye averaged 15.2 inches and 1.5 pounds. In 2013, relative abundance increased slightly for substock-size walleye while catch rates of all other length groups decreased. Relative weights of walleye decreased for stock and quality length groups while preferred and memorable length groups increased. Northern pike relative abundance decreased in 2013 to 3.2 per net night which is still above the long term average of 1.7 per net night for the period of 1984 to 2013. Average size of gill-netted northern pike in 2013 was 24.6 inches and 3.9 pounds. Overall, relative abundance of shoreline forage decreased to 106 per haul in 2013 which was below the long-term average of 169 per haul from 1984 to 2013. The most notable decrease in shoreline forage occurred for yellow perch from 85 to 30 per seine haul. In June of 2013, 151,696 chinook salmon were stocked at Duck Creek, Marina, and Milk Coulee. Young-of-year cisco relative abundance increased to 191 per net night in 2013 which was above the long-term average of 76 per net night for the period of 1986 to 2013.

OBJECTIVES AND DEGREE OF ATTAINMENT

Activity 1 - Survey and Inventory

Objective: To survey and monitor the characteristics and trends of fish populations and to assess habitat conditions in Fort Peck Reservoir. This objective was met and is presented in the Results and Discussion section of this report.

Activity 2 - Fish Population Management

Objective: To implement fish stocking programs to maintain fish populations at levels consistent with habitat conditions and other limiting factors. This objective was met and results are presented in Results and Discussion of this report.

Activity 3 - Technical Guidance

Objective: To review projects by government agencies and private parties that have the potential to affect fisheries resources, provide technical advice or decisions to mitigate effects on these resources, and provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources. This objective was met by evaluating the impact of reservoir water levels on the fishery and was presented to North and South Dakota fisheries personnel during annual Missouri River mainstem reservoir meetings. This information was also presented to Corps of Engineers to make recommendations for Annual Operating Plan (AOP). Objectives of the Fort Peck Reservoir Fisheries Management Plan (FPRFMP) are presented in the Results and Discussion of this report. The FPRFMP will guide fisheries management activities on Fort Peck Reservoir for a ten-year period (2012-2022). Objective accomplished.

Activity 4 - Aquatic Education

Objective: To enhance the public's understanding, awareness and support of the state's fishery and aquatic resources and to assist young people to develop angling skills and to appreciate the aquatic environment. Eighty volunteers assisted with the annual walleye egg-taking operation at Nelson Creek. Reservoir staff assisted with the Home Run Pond kids fishing clinics. Staff also assisted the regional information and education officer with multiple press releases and as science fair judges. Staff attended Walleyes Unlimited meetings in Lewistown and Glasgow to present annual updates on the status the Fort Peck fishery. Objective accomplished.

STUDY AREA

Fort Peck Reservoir is a large earth-filled dam on the Missouri River located in northeastern Montana. Figure 1 depicts major roads around Fort Peck Reservoir, select locations and 5 sampling regions the reservoir is divided into: upper Big Dry Arm (UBD), lower Big Dry Arm (LBD), lower Missouri Arm (LMA), middle Missouri Arm (MMA), and upper Missouri Arm (UMA). The dam was closed in 1937 and is the largest water body in the state of Montana, with 240,000 surface acres at full multiple use pool. Full flood pool is reached at 2250 and multiple use pool is reached at 2246 mean feet above sea level (MSL). At full multiple use pool 1,500 miles of shoreline exists in 130 linear miles of the reservoir with a maximum depth of 220 feet. The bottom of the multiple use pool is 2234.19 MSL and the bottom of the multipurpose carryover zone is 2160 feet MSL. The reservoir reached peak elevation on June 26th, 2013 at 2227.18 mean feet above sea level (MSL) from a minimum elevation on March 5th, 2013 at 2222.16 MSL, a spring rise of 5.02 feet (Figure 2). Since July, reservoir elevation has decreased to 2222.45 MSL as of March 1st 2014. Reservoir elevations are predicted to rise approximately eight feet from March through June and fall beginning in August of 2014based on the March 2014 basic forecast (USACE 2013).

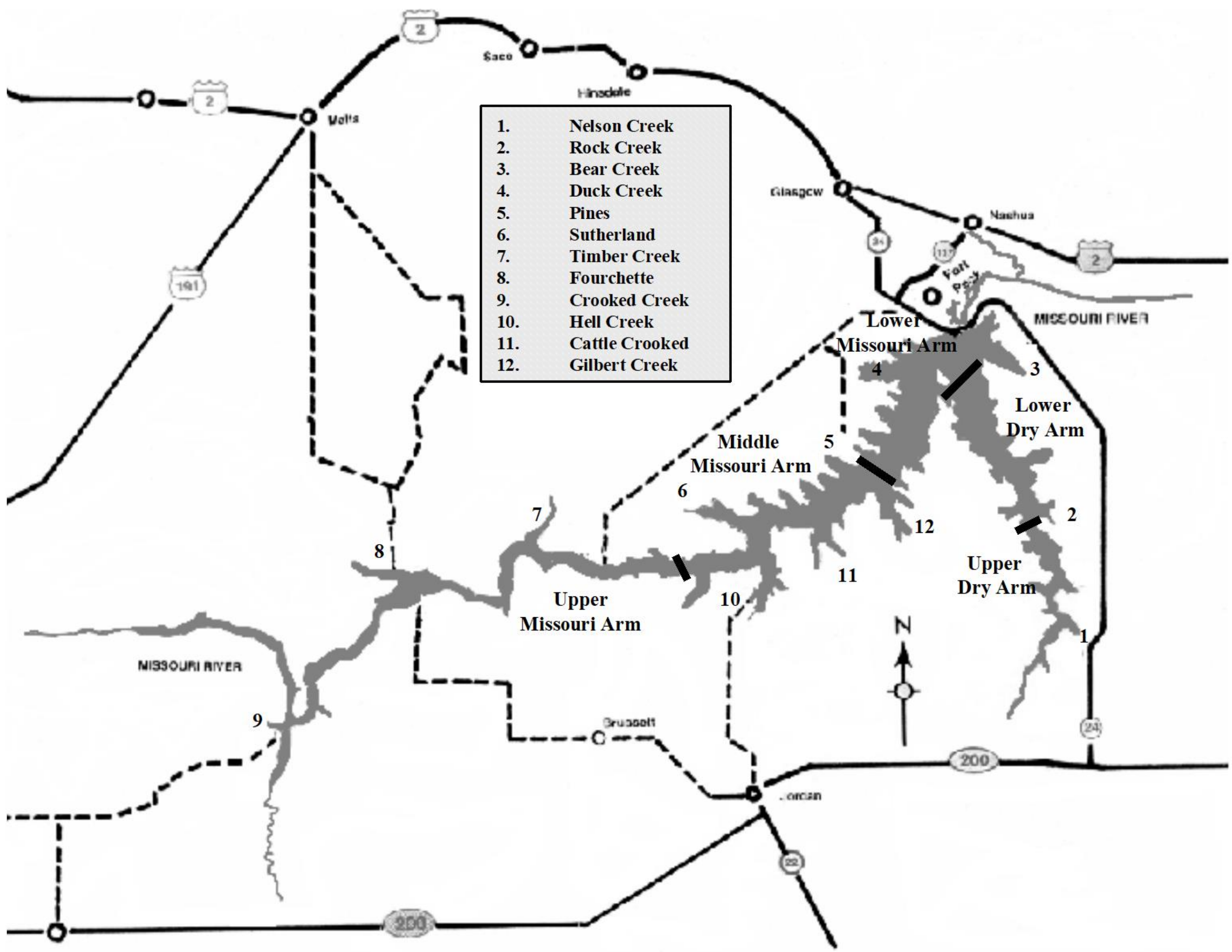

Figure 1. Fort Peck study area describing major sampling zones and select specific locations.

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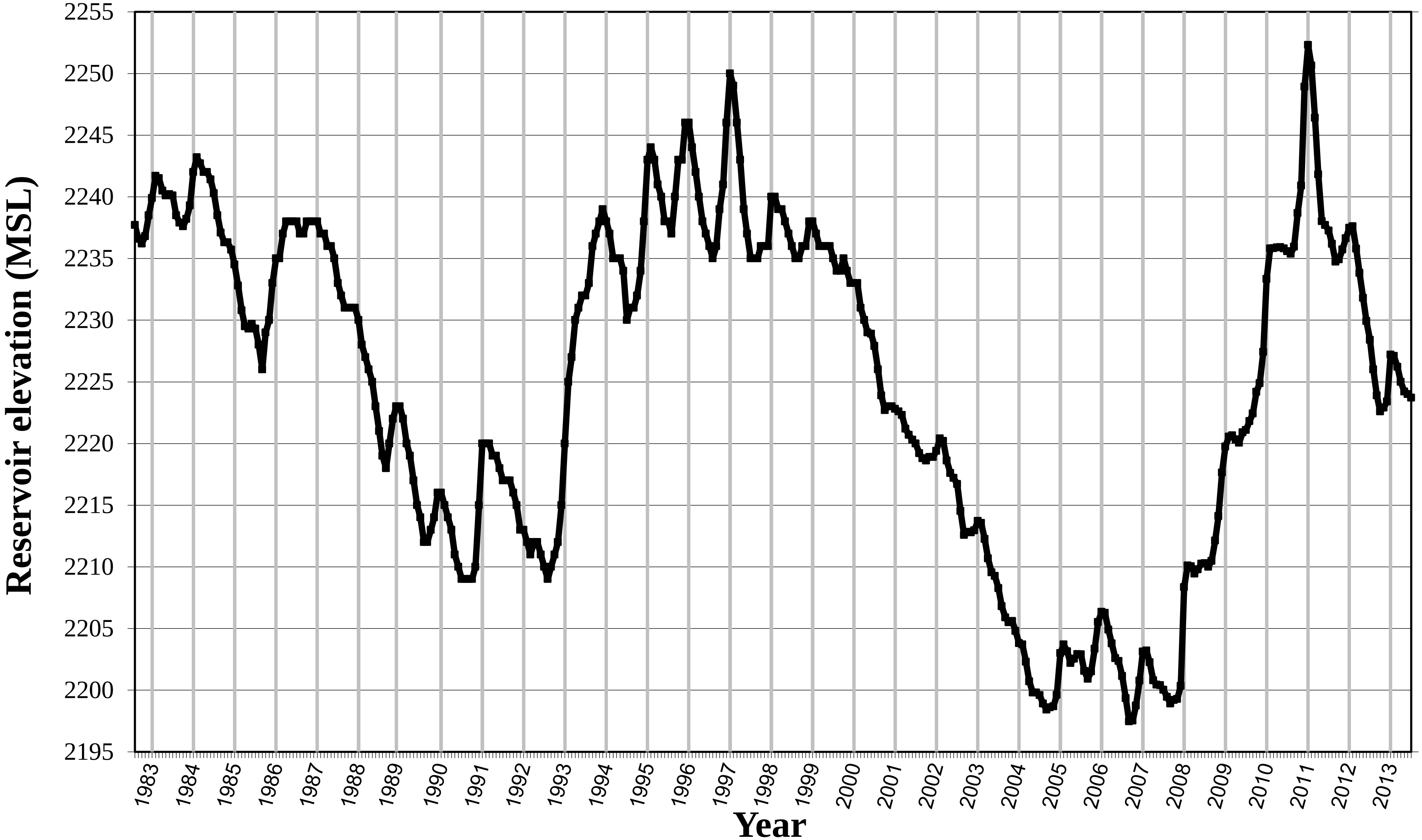


Figure 2. Peak monthly reservoir elevations on Fort Peck Reservoir from January 1983 to January 2013 (Data provided by the U.S. Army Corps of Engineers).

SAMPLING METHODS

Data Collection

- Spring sampling was conducted from April 17th to May 10th, 2013 in the Big Dry Arm with 4-ft x 6-ft modified fyke nets of 1-in square mesh rigged and 30 to 50-ft leads. This netting effort is targeted for collection of walleye and northern pike to provide an egg source to meet stocking requests for Fort Peck Reservoir and other sport fisheries in and out of the state. Not all fish are weighed and measured during the egg-taking effort due to time constraints, limited manpower, and rough conditions at times. Therefore, subsamples of fish are presented in the tables and length frequency distributions of this report. Vokoun et al. (2001) recommended using 300-400 individuals when constructing length frequency distributions with a given accuracy and precision.
- Limnological sampling was conducted at six sites (Bug Creek, Spring Creek, Haxby, Pines, Hell Creek, and Timber Creek) throughout the reservoir. Profile measurements were collected at 10-ft intervals using a Hydrolab equipped with a DS5 probe and Surveyor 4 data logger from May through September during the middle of each month. Profile measurements were recorded from the subsurface to the maximum depth at each site. Specific measurements included: temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L). A detailed table is located in Appendix 3 of the report.
- Zooplankton samples were collected using a 153 µ mesh net with a 12-in diameter opening and a 1:3 cone. Sampling was conducted at the same six sites listed above to address differences in general productivity and morphology of the reservoir. Fifty foot vertical tows were made monthly at each of the sampling stations from May through September. Two tows were conducted at each site and pooled into one sample. Zooplankton processing methods follow those described by Leathe and Graham (1982).
- One hundred sinking experimental multifilament gill nets 125-ft x 6-ft deep consisting of 25-ft panels of ¾, 1, 1 ¼, 1 ½, and 2-in square mesh were fished from 10 to 30-ft depths. Gill netting occurred from July 23rd to August 15th, 2013 to monitor distribution, species composition, relative abundance, and population parameters for game and native species throughout the reservoir. A list of sampling dates by region, water surface temperature and reservoir elevation during time of sampling are presented in Appendix 3.
- All walleye otoliths were collected at all sampling locations. Otoliths were mounted in epoxy and cut into thin sections on an Isomet saw and later mounted on glass slides. Walleye otoliths were used as an aging structure because of their higher precision when compared to scales and spines (Erickson 1983; Isermann et al. 2003). Growth was expressed as mean length-at-age at time of capture in July/August for walleye. No age and growth information are presented in this report due to the otolith microchemistry study.
- Beach seining was conducted from August 13th to September 3rd, 2013 using a 100-ft x 9-ft beach seine of 3/16-in square mesh at 100 locations throughout the reservoir, to determine relative abundance and reproductive success of game and forage fish.
- Twelve multifilament gill nets 100-ft x 6-ft with ½-in square mesh were fished vertically from the water's surface to sample young-of-year cisco from September 13th to September 25th, 2013. Only the lower Big Dry, lower Missouri, and middle Missouri Arms were sampled because they contained sufficient depths of 100 ft. In previous years when reservoir elevations were higher, other locations were sampled as shown in Table 15.
- Electrofishing was used during October 2nd to October 24th, 2013 to locate, sample, and collect chinook salmon as part of the annual egg-take effort.
- Chinook salmon otoliths were collected from all deceased fish used in the egg taking process. Otolith preparation followed methods outlined by Secor et al. (1992). Otoliths were mounted in epoxy and cut into thin sections on an Isomet saw and later mounted on glass slides.

Data Analysis

Relative abundance of fish species was expressed as mean catch per unit effort (CPUE) for modified fyke nets (No./net night), gill net (No./net night), and seine catches (No./haul).

Proportional stock density (PSD; Anderson and Weithman 1978) and relative stock density (RSD) values were calculated for channel catfish, northern pike, sauger, smallmouth bass, and walleye (Gablehouse 1984). Length categories used to calculate PSD and RSD values are listed in Table 1.

Table 1. Minimum lengths (in) 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	11	16	24	28	36
Northern pike	14	21	28	34	44
Sauger	8	12	15	20	25
Smallmouth bass	7	11	14	17	20
Walleye	10	15	20	25	30

Relative weights (*Wr*; Anderson 1980) were calculated using the standard weight (*Ws*) equations developed for channel catfish (Brown et al. 1995), northern pike (Willis 1989), and walleye (Murphy et al. 1990). Calculated values for channel catfish and northern pike are presented in Appendix 4, while values for walleye are presented in the results and discussion section of this report. Proportional stock density, RSD, and *Wr* values were calculated using EXCEL.

RESULTS AND DISCUSSION

Spring Trap Netting

Spawning walleye and northern pike populations were sampled in the Nelson Creek area of the upper Big Dry Arm from April 17th to May 10th, 2013. A total of 484-trap days were committed to walleye spawning efforts in 2013. Netting effort was slightly higher compared to previous years on Fort Peck Reservoir due to (Table 2). Ice cover has typically receded by the first week in April and the walleye spawning operation has concluded in three to four weeks. Water surface temperatures were 38°F when trap netting efforts commenced and didn't approach 50°F until the first week in May. Becker (1983) reported that walleye spawning activity peaks when water temperatures are 43°F to 50°F in the north-central United States.

Walleye were spawned and the fertilized eggs were sent to the Fort Peck and Miles City Fish Hatcheries. Because of late ice cover and cooler water temperatures, fewer ripe female walleye were collected in 2013. Fluctuations and declines in water temperatures have been shown to prolong spawning or result in females retaining their eggs (Derback 1947). This resulted in only 40 million eggs which was far less than the egg-take goal of 80 million. A total of 17.8 million fry and 2.6 million fingerlings were stocked in various locations throughout Fort Peck Reservoir (Appendix 2). Kerr (2011) recommended walleye release sites should be increased as size and basin complexity of the waterbody increases to distribute them over as wide an area as possible. The goal of 3 million fingerlings for Fort Peck Reservoir was not met (FPRFMP 2012). This was due to below average fingerling production at the Miles City and Fort Peck hatcheries.

Walleye

Relative abundance of walleye increased from 2.2 per trap in 2012 to 4.5 per trap in 2013 which is below the long-term average of 7.2 per trap (1982-2013; Table 2). The increase in relative abundance in 2013 can be attributed to greater numbers of smaller fish recruiting into the population. Average length and weight decreased from 19.7 inches and 3.9 pounds in 2012 to 17.6 inches and 2.5 pounds in 2013. Furthermore, length frequency distributions showed greater numbers of fish less than 20 inches in 2013 when compared to previous years (74%; Figure 3).

Northern Pike

Relative abundance of northern pike increased greatly from 2.1 per net in 2012 to a record 10.5 per net in 2013 (Table 2). The large increase in relative abundance can be attributed to smaller fish recruiting to the population and cooler water temperatures that prolonged spawning activity. Typically, northern pike have spawned by the time the walleye egg-taking operation has commenced when water temperatures are below 43°F (Frost and Kipling 1967). Average length and weight decreased from 25.0 inches and 4.5 pounds in 2012 to 24.2 inches and 3.8 pounds in 2013. In larger part, this is due to smaller fish recruiting into the population. In addition, length frequency distributions showed greater numbers of fish less than 26 inches in 2013 when compared to previous years (73%; Figure 4).

Table 2. Summary of mean CPUE (No./net-night), mean length (in), and mean weight (lb)walleye and northern pike captured during spring trap netting in the upper Big Dry Arm of Fort Peck Reservoir, 1982-2013. *N* is the total number of walleye and northern pike collected.

Year	Date	Net-Nights	Walleye *N*	Walleye CPUE	Northern pike *N*	Northern pike CPUE
1982	(4/21-5/07)	89	655	7.4	221	2.5
1983	(4/06-5/09)	106	725	6.8	87	0.8
1984	(4/10-5/04)	96	579	6	21	0.2
1985	(4/08-4/26)	97	1,202	12.4	69	0.7
1986	(4/07-4/24)	102	1,448	14.2	174	1.7
1987	(4/07-4/24)	220	1,512	6.9	78	0.3
1988	(4/06-4/22)	214	1,610	7.5	163	0.8
1989	(4/25-5/06)	207	2,360	11.4	383	1.9
1990	(4/05-5/04)	292	1,863	6.4	513	1.8
1991	(4/09-5/10)	375	793	2.1	491	1.3
1992	(4/07-4/29)	278	1,585	5.7	684	2.5
1993	(4/15-4/30)	172	1,945	11.3	201	1.2
1994	(4/12-4/26)	168	1,882	11.2	160	1
1995	(4/11-4/28)	473	3,284	6.9	648	1.4
1996	(4/15-5/02)	391	3,231	8.3	2,307	5.9
1997	(4/15-4/29)	307	3,937	12.8	2,652	8.6
1998	(4/04-4/29)	477	2,806	5.9	1,354	2.8
1999	(3/27-4/26)	434	5,673	13.1	2,573	5.9
2000	(4/04-4/28)	392	2,126	5.4	603	1.5
2001	(4/06-4/27)	328	3,362	10.3	1,922	5.9
2002	(4/17-5/09)	349	2,377	6.8	1,713	4.9
2003	(4/11-5/01)	426	2,366	5.6	1,579	3.7
2004	(4/09-4/26)	324	2,323	7.2	2,174	6.7
2005	(4/06-4/27)	537	2,030	3.8	1,327	2.5
2006	(4/12-5/01)	579	2,345	4.1	503	0.9
2007	(4/03-5/01)	617	2,478	4	1,425	2.3
2008	(4/18-5/07)	383	1,151	3	629	1.6
2009	(4/18-4/28)	176	1,740	9.9	813	4.6
2010	(4/13-4/30)	289	1,470	5.1	525	1.8
2011	(4/18-5/06)	399	1,341	2.8	911	2.3
2012	(3/27-5/01)	730	1,576	2.2	1,499	2.1
2013	(4/17-5/10)	484	2,176	4.5	5,082	10.5

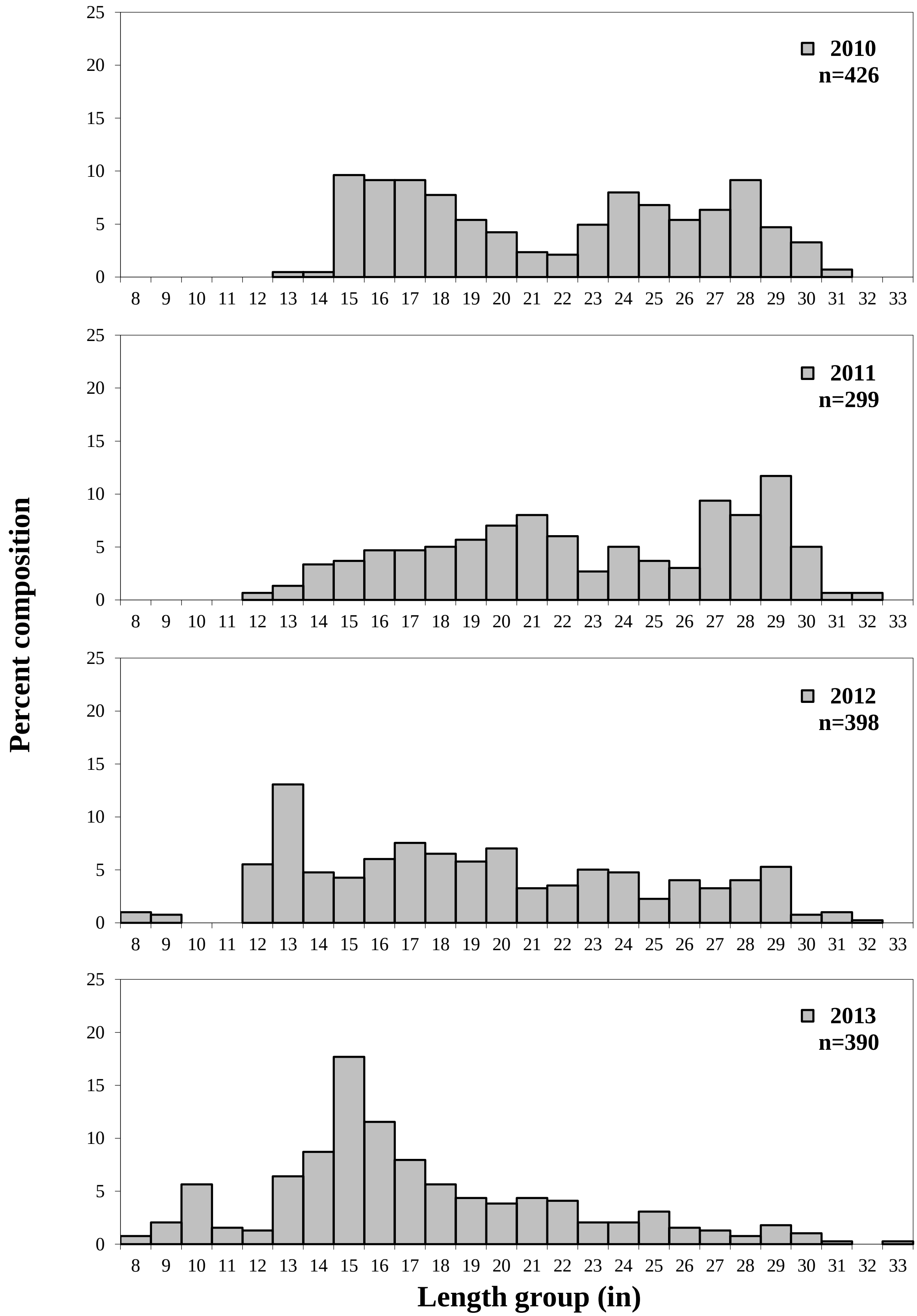


Figure 3. Length frequency of subsampled walleye collected during spring trap netting in the upper Big Dry Arm of Fort Peck Reservoir, 2010-2013.

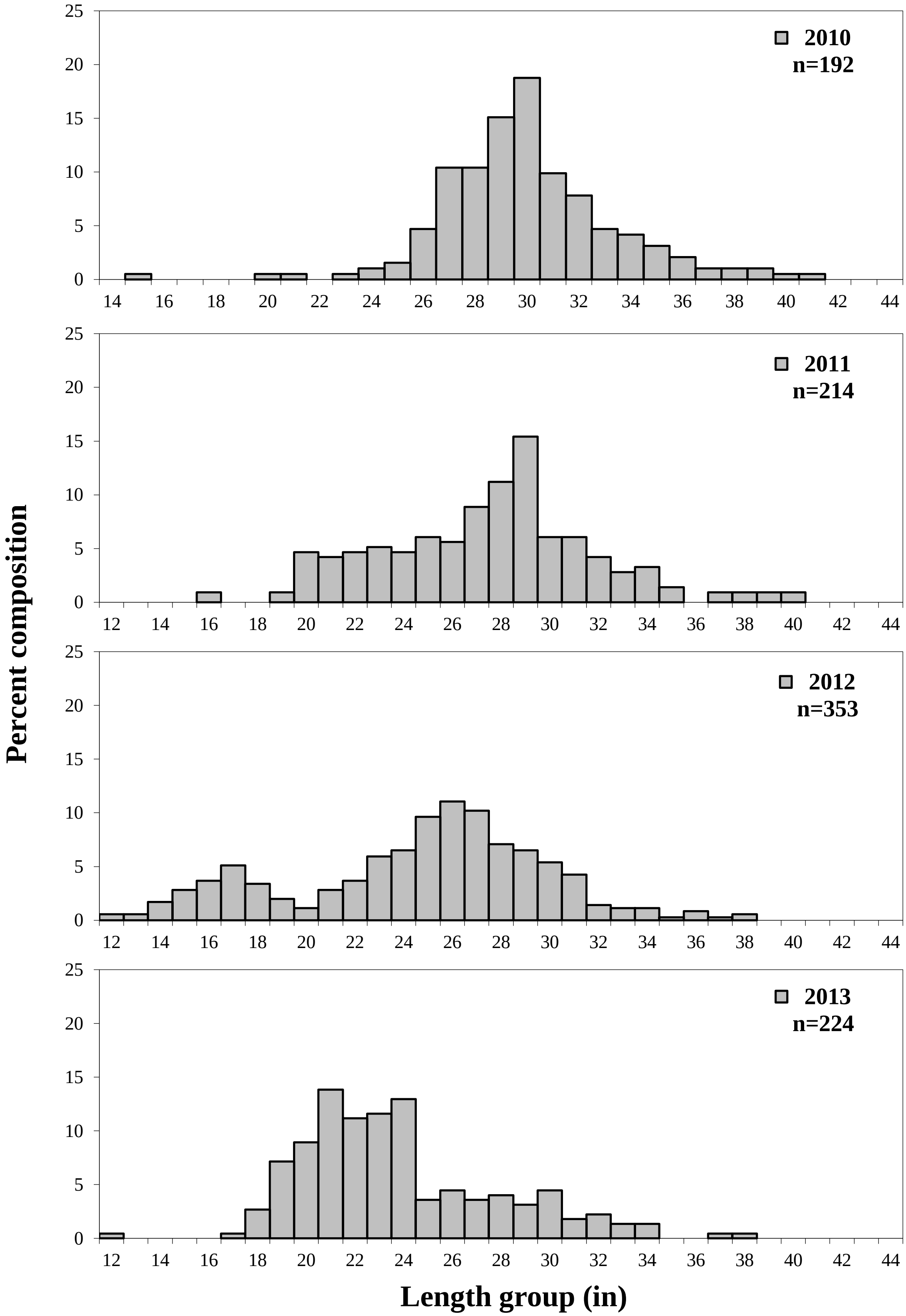


Figure 4. Length frequency of subsampled northern pike collected during spring trap netting in the upper Big Dry Arm of Fort Peck Reservoir, 2010-2013.

LIMNOLOGY AND ZOOPLANKTON MONITORING

Water temperature in Fort Peck Reservoir ranged from 23.6°C below the water surface to 4.7°C at the bottom (Appendix 3). Temperatures throughout the water column were coolest during May and warmest during August. Water temperatures below the surface were warmest at the uppermost sites (Timber Creek and Bug Creek) during the sampling period but gradually decreased at each site moving downstream towards the dam area.

Near isothermal conditions were observed during the month of May at each site. Thermal stratification of Fort Peck Reservoir was not observed until July and strong thermoclines were present in August (Appendix 3). Each site was thermally stratified during the month of August with the exception of Timber Creek. Thermocline depth varied by month and site. The most pronounced thermocline was located at the Haxby site during July (Figure 5).

Dissolved oxygen concentrations were highest (11.6 mg/L) during May when the reservoir was coolest. Uniform dissolved oxygen levels were also observed during this time when near isothermal conditions were present (Appendix 3). Dissolved oxygen concentrations decreased to their lowest levels during late summer/early fall. Dissolved oxygen levels fell below 5 mg/L at Hell Creek and Pines during September. Although no anoxic conditions were observed at any of the locations in 2013, dissolved oxygen levels of less than 5 mg/L may limit some deep-water salmonid habitat (e.g., lake trout; Sellers et al. 1998).

Zooplankton samples were collected monthly at six stations throughout Fort Peck Reservoir from May through September. The purpose of this sampling was to determine the difference in zooplankton populations in various portions of the reservoir, and to determine seasonal fluctuations in densities and composition of principal zooplankton at each station.

The maximum estimated zooplankton density was 98/L which occurred in June of 2013. Cyclopoids dominated the zooplankton community from May through September but reached peak density in May at 47/L. *Bosmina* and *Daphnia* were the two most abundant cladocerans sampled. *Bosmina* were more abundant in May while *Daphnia* where more abundant in July through September (Figure 6). Cladocerans, *Leptodora* and *Diaphanosoma*, were present in small numbers and were only collected periodically. These trends in seasonal abundance are similar to previous findings on Fort Peck Reservoir and other large mainstem Missouri River Reservoir systems (Wiedenheft 1985; Mullins 1991; Fielder 1992).

Comparison of total densities for all zooplankton from each station indicated that the mid to lower portions of Fort Peck Reservoir were more productive than other areas sampled (Figure 7). Wiedenheft (1985) noted a similar trend in zooplankton density. Mean density of zooplankton was higher in 2013at all locations. A possible explanation for the higher zooplankton density in 2013could be explained by stable reservoir elevations and increased flows into the reservoir. Declining reservoir elevations and low inflows, which were characteristic of Fort Peck Reservoir in 2012, have been shown to decrease standing crops of zooplankton and diversity of the zooplankton community (Martin et al. 1981).

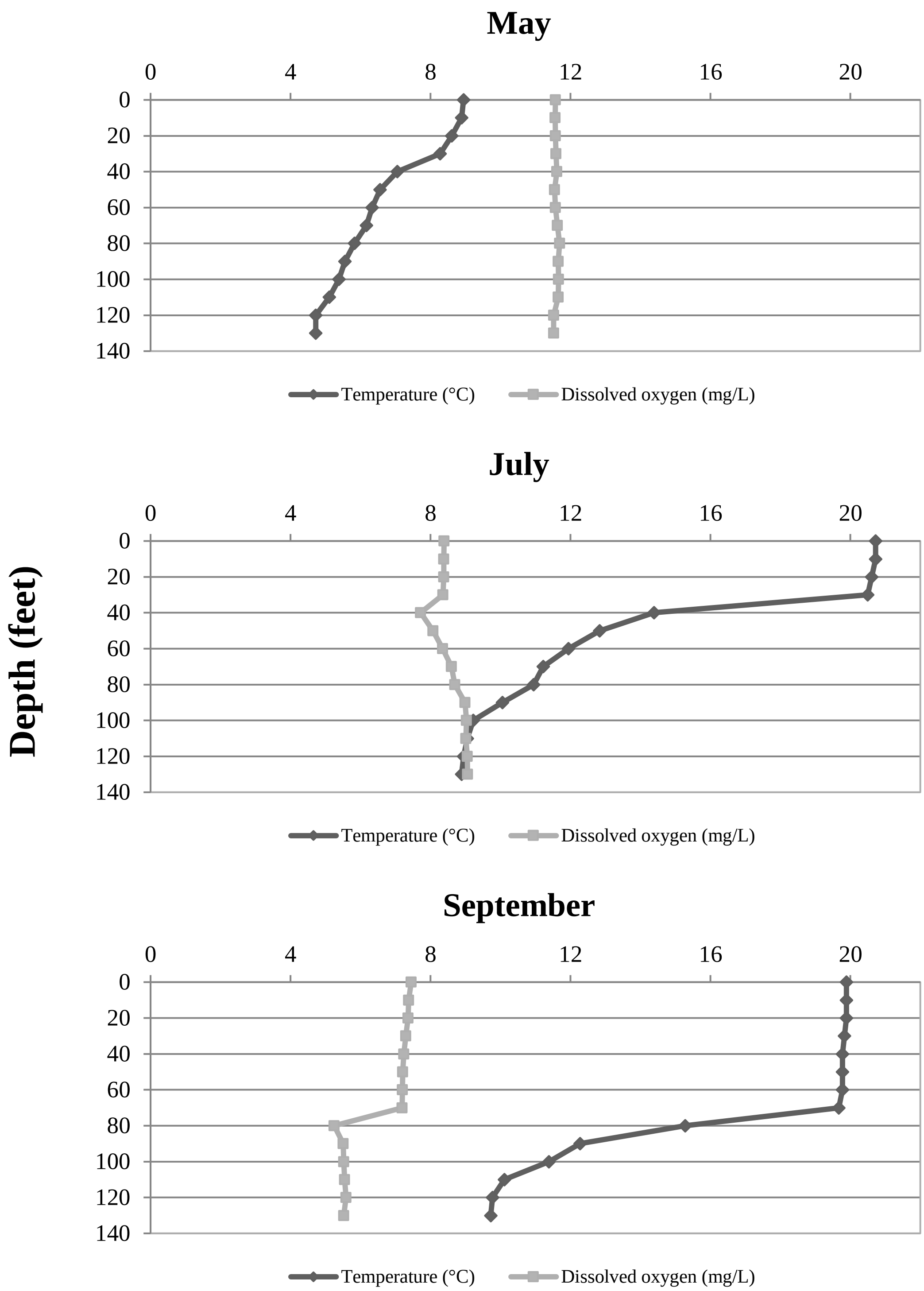


Figure 5. Depth profiles of temperature (°C) and oxygen (mg/L) located near Haxby Point on Fort Peck Reservoir, May-September 2013.

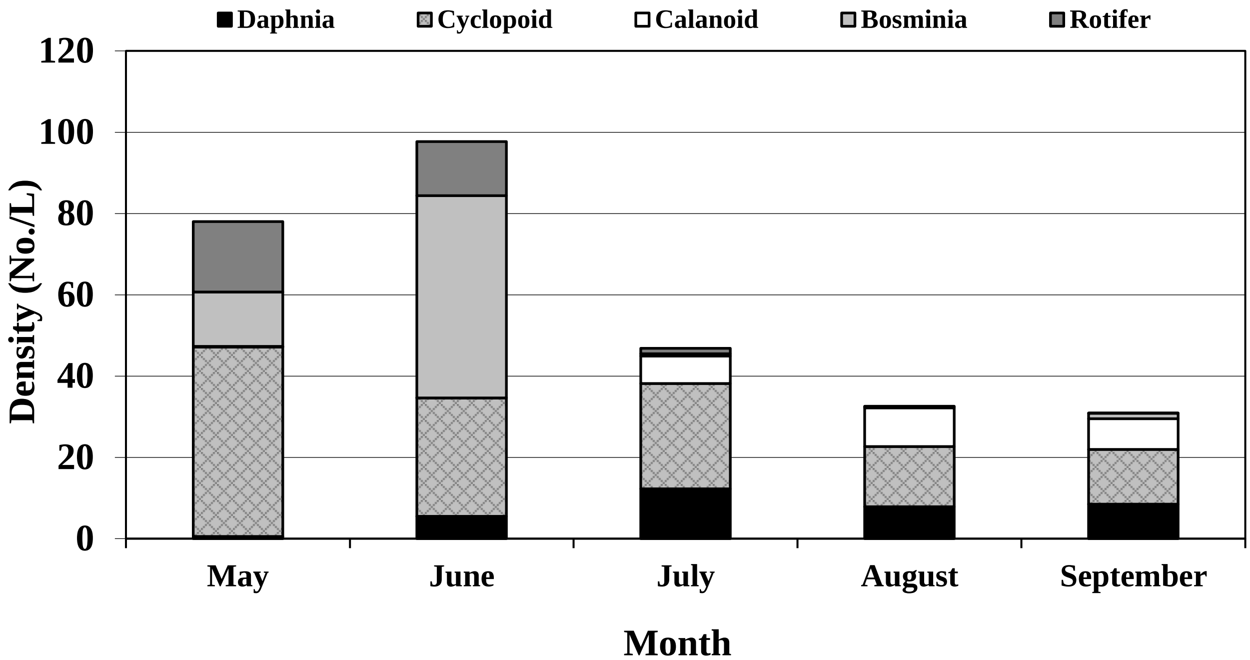


Figure 6. Mean zooplankton density (number of organisms/L) by taxonomic group and month for Fort Peck Reservoir, 2013.

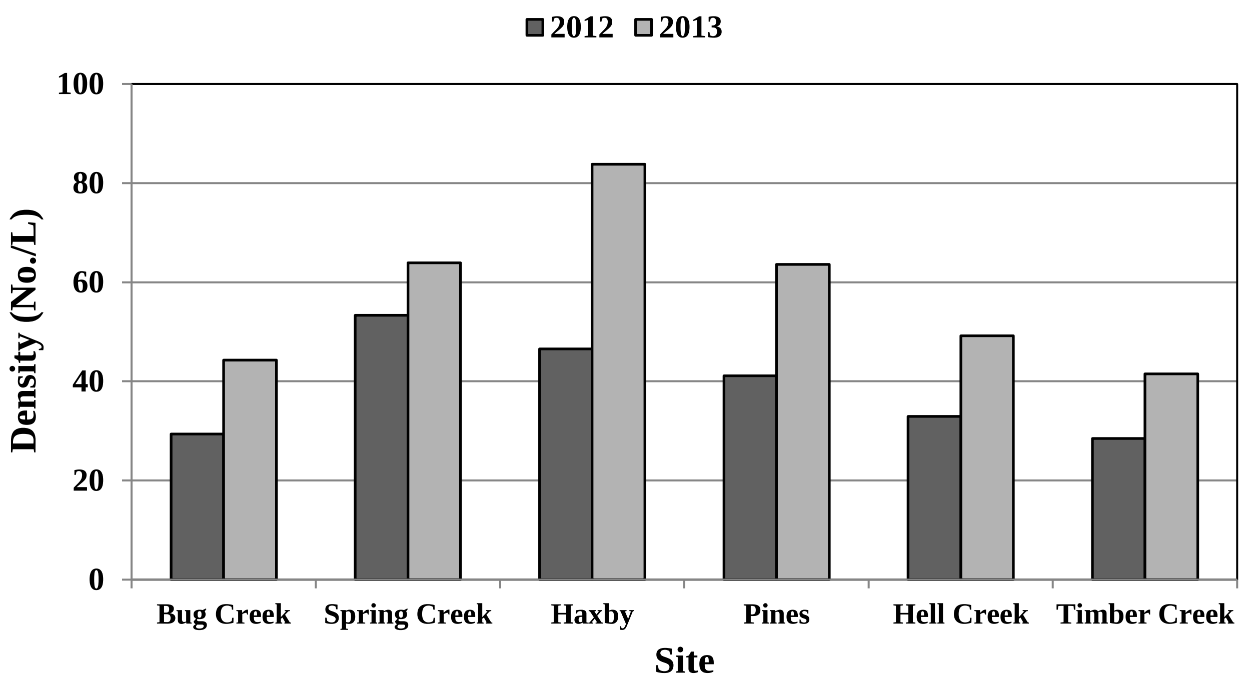


Figure 7. Mean zooplankton density (number of organisms/L) by site for Fort Peck Reservoir, 2012-2013.

RESERVOIR-WIDE GILL NETTING

Standard experimental gill nets were set in throughout the reservoir from July 23rd to August 15th, 2013 when water surface temperatures ranged from 64°F to 78°F. Gill netting provides information on species distribution; composition, relative abundance, population parameters, and stomach contents of game species. Twenty-one species were captured for a total of 2,495 fish (Table 2). Walleye, northern pike, and common carp were the most abundant species captured overall, with catch rates of 4.8, 3.2, and 2.9 per net night, respectively. Fish with catch rates equal to or greater than 1.0 per-net night include: channel catfish, goldeye, shorthead redhorse, river carpsucker, smallmouth bass, and smallmouth buffalo.

Walleye

Relative abundance of walleye decreased during the 2012 reservoir-wide gill netting surveys. Relative abundance increased from a record 6.8 walleye per net in 2012 to 4.8 per net in 2013 (Figure 8). This was above the long term average of 3.7 per net from 1984 to 2013. The three-year running average goal of 3.6 per net was met (4.8 per net in 2011-2013) as outlined in the FPRFMP. The large increase is attributed to more walleye in the stock and quality length groups recruiting to the fishery. Relative abundance of walleye was greatest in the upper Big Dry arm with a catch rate of 9.5 per net (Table 3). The lowest catch rate of 2.6 walleye per net was documented in the lower and upper Missouri arms.

Length frequency distributions of walleye in 2013 indicated a large year class present with a majority of fish in the 14 to 16 to inch range (Figure 9). This group represented 37% of all walleye gill netted in 2013. Length frequency distributions in 2012 indicated an extremely large year class was present as indicated by a group of fish in the 13 to 15 inch range. This size group represented 42% of all walleye sampled in 2012. In 2013, 49% of the walleye collected in experimental gill nets were less than 15 inches indicating continued recruitment to the fishery. It should also be noted that a strong group of 8 to 10-inch fish were observed during the 2013 gill netting survey which would indicate a strong year class of one or two-year old fish (Headley 2010).

Relative weights showed mixed results for walleye in 2013. Relative weights for stock and quality length groups decreased while preferred and memorable+ length groups increased (Figure 10). The continued decrease of relative weight for stock and quality length walleye in 2013 can be attributed to continued decrease in shoreline forage fish abundance. In contrast, young-of-year cisco relative abundance in 2013 indicated a large year class was produced. This would explain the increase in relative weights for preferred length and greater walleye. Cisco have been found to be an important prey item for walleye greater than 18 inches in Fort Peck Reservoir (Mullins 1991).

Proportional stock density (PSD) and relative stock density-preferred (RSD-P) are measures of balance for fish populations (Gabelhouse 1984). The measures are percents of fish captured at substock (<10”), and numbers of fish of each size and larger for stock (> 10”), quality (>15”), preferred (>20”), and memorable (>25”) size fish. Changes in value in each group can be from increases or decreases in recruitment and natural or fishing mortality. Anderson and Weithman (1978) models of walleye PSD’s suggest a range of 30-60 as favorable values for walleye populations. Since 1987, walleye PSD would have fallen into the favorable category, with the exception of 1995 and 1996. The favorable trend resumed in 1998 and continued into 2013 with a value of 59. RSD-P was 13 indicating a greater abundance of stock and quality size walleye. High values of RSD-P indicate an abundance of larger fish with a small stock size available (Table 6). A ratio between 10 and 20 is considered desirable as a RSD-P for a balanced population. The young to adult ratio (YAR) increased from 7 in 2012 to 16 in 2013. A ratio of 20 to 30 would be considered good for YAR.

Table 3. Mean CPUE (No./net-night), mean length (in), and mean weight (lb) of fish collected by experimental gill nets in Fort Peck Reservoir during July-August, 2013. *N* is total number collected for length and weight measurements.

			Average			
			Length		Weight	
Species	Number	CPUE	Inches	*N*	Pounds	*N*
Bigmouth buffalo	8	0.1	10.3	8	2.0	8
Black bullhead	36	0.4	7.6	36	0.2	36
Black crappie	17	0.2	8.8	17	0.4	17
Channel catfish	240	2.4	17.5	240	1.9	240
Cisco	9	0.1	9.9	9	0.4	9
Common carp	285	2.9	18.6	285	3.3	285
Freshwater drum	77	0.8	12.6	77	1.2	77
Goldeye	190	1.9	13.4	190	0.8	190
Northern pike	324	3.2	24.6	324	3.9	324
Paddlefish	2	0.0	52.3	2	62.3	2
River carpsucker	185	1.9	16.0	185	2.8	185
Sauger	29	0.3	14.8	29	0.9	29
Shorthead redhorse	121	1.2	12.6	120	1.1	120
Shovlenose sturgeon	6	0.1	20.0	6	0.9	6
Smallmouth bass	171	1.7	12.9	171	1.3	171
Smallmouth buffalo	173	1.7	19.0	173	5.6	173
Stonecat	2	0.0	7.7	2	0.2	2
Walleye	479	4.8	15.2	479	1.5	479
White crappie	9	0.1	9.1	9	0.4	9
White sucker	54	0.5	15.4	54	1.6	54
Yellow perch	78	0.8	6.7	77	0.1	77

Table 4. Number (*N*) and mean catch per unit effort (CPUE; No./net-night) of fish species collected by experimental gill nets in Fort Peck Reservoir during July-August, 2013.

	UBD[1]		LBD[2]		LMA[3]		MMA[4]		UMA[5]		Total	
Species	N	CPUE	N	CPUE	N	CPUE	N	CPUE	N	CPUE	N	CPUE
Bigmouth buffalo	5	0.3	2	0.1	1	0.1	0	--	0	--	8	0.1
Black bullhead	25	1.3	11	0.6	0	--	0	--	0	--	36	0.4
Black crappie	2	0.1	0	--	0	--	1	0.1	14	0.7	17	0.2
Channel catfish	32	1.6	5	0.3	7	0.4	41	2.1	155	7.8	240	2.4
Cisco	2	0.1	1	0.1	2	0.1	3	0.2	1	0.1	9	0.1
Common carp	67	3.4	59	3.0	72	3.6	70	3.5	17	0.9	285	2.9
Freshwater drum	10	0.5	5	0.3	8	0.4	16	0.8	38	1.9	77	0.8
Goldeye	30	1.5	13	0.7	58	2.9	23	1.2	66	3.3	190	1.9
Northern pike	105	5.3	75	3.8	45	2.3	36	1.8	63	3.2	324	3.2
Paddlefish	0	--	0	--	0	--	0	--	2	0.1	2	0.0
River carpsucker	117	5.9	20	1.0	3	0.2	13	0.7	32	1.6	185	1.9
Sauger	2	0.1	4	0.2	3	0.2	6	0.3	14	0.7	29	0.3
Shorthead redhorse	10	0.5	8	0.4	0	0.0	8	0.4	95	4.8	121	1.2
Shovelnose sturgeon	0	--	0	--	0	--	0	--	6	0.3	6	0.1
Smallmouth bass	51	2.6	22	1.1	25	1.3	53	2.7	20	1.0	171	1.7
Smallmouth buffalo	85	4.3	20	1.0	20	1.0	25	1.3	23	1.2	173	1.7
Stonecat	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1	2	0.0
Walleye	190	9.5	123	6.2	52	2.6	62	3.1	52	2.6	479	4.8
White crappie	0	--	0	--	0	--	0	--	9	0.5	9	0.1
White sucker	13	0.7	22	1.1	13	0.7	4	0.2	2	0.1	54	0.5
Yellow perch	2	0.1	7	0.4	27	1.4	21	1.1	21	1.1	78	0.8
Total	748	37.4	397	19.9	336	16.8	382	19.1	632	31.6	2,495	25.0

[1]Upper Big Dry (UBD): Nelson Creek., Lone Tree Creek, McGuire Creek, Bug Creek, Lost Creek
[2]Lower Big Dry (LBD): Box Creek, South Fork Rock Creek, North Fork Rock Creek, Box Elder Creek, Sand Arroyo, Spring Creek
[3]Lower Missouri Arm (LMA): Spillway Bay, Bear Creek, North Fork Duck Creek, South Fork Duck Creek, Main Duck Creek
[4]Middle Missouri Arm (MMA): Pines Bay, Gilbert Creek, Cattle/Crooked Creek, Hell Creek, Sutherland Creek, Snow Creek
[5]Upper Missouri Arm (UMA): Cabin Coulee, Wagon Coulee, Bone Trail, Timber Creek, Seven Blackfoot, Fourchette Bay, Devils Creek

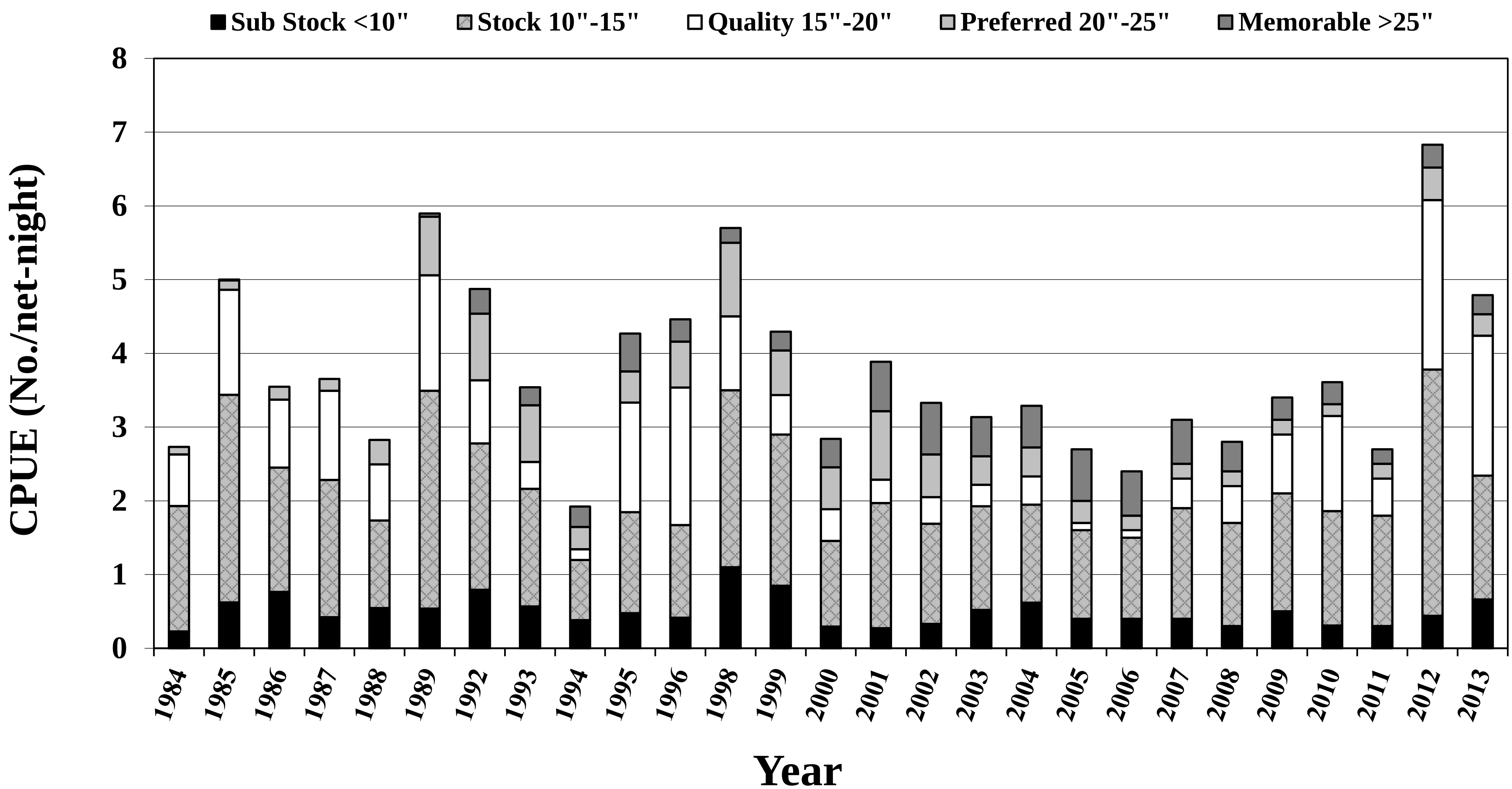


Figure 8. Length structure, in terms of catch per unit effort (CPUE), of walleye collected by experimental gill nets in Fort Peck Reservoir during July-August, 1983-2013 (no data for 1990-1991 and 1997).

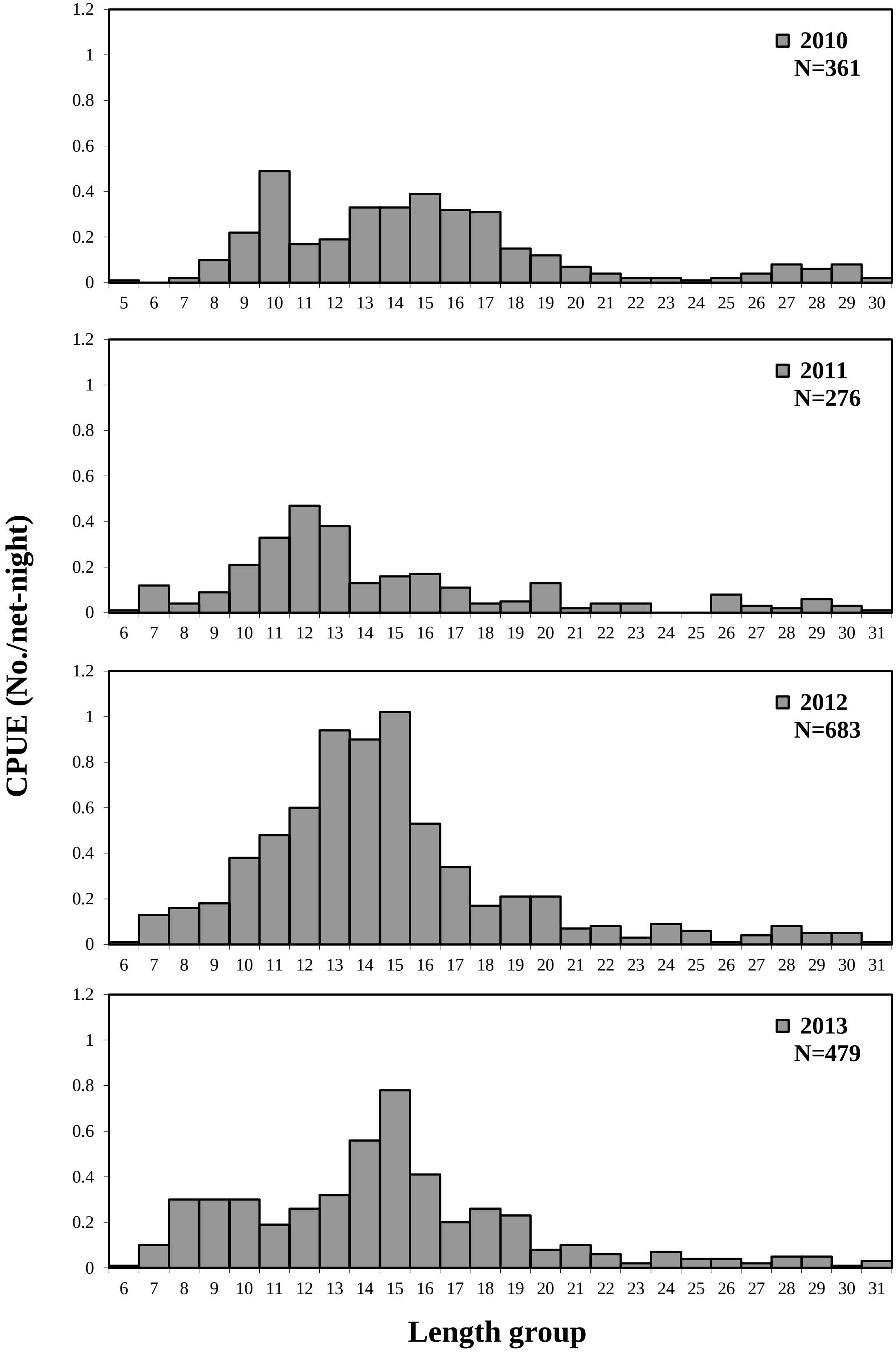
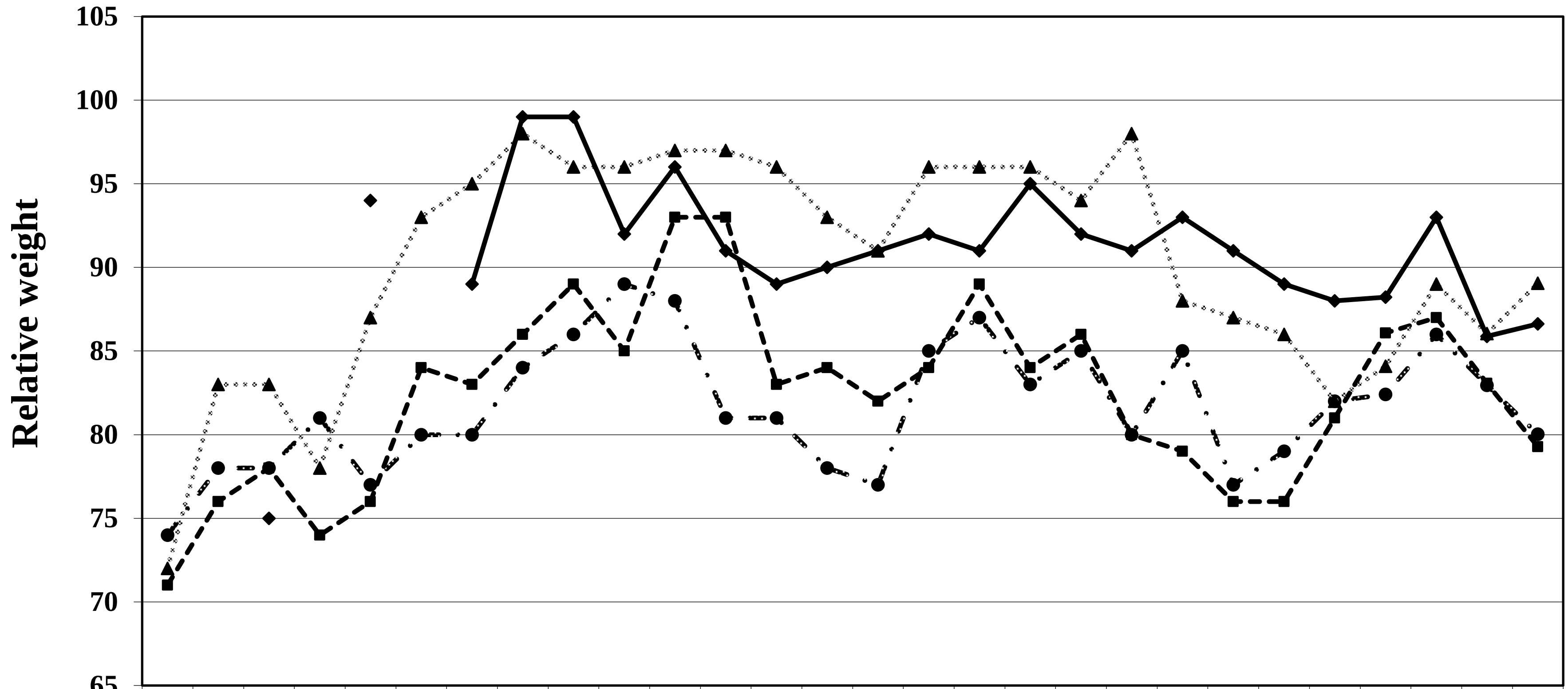


Figure 9. Length frequency, as catch per unit effort, of walleye collected by experimental gill nets in Fort Peck Reservoir during July-August, 2010-2013.



	1983	1984	1985	1986	1987	1988	1989	1992	1993	1994	1995	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stock 10"-15"	74	78	78	81	77	80	80	84	86	89	88	81	81	78	77	85	87	83	85	80	85	77	79	82	82	86	83	80
Quality 15"-20"	71	76	78	74	76	84	83	86	89	85	93	93	83	84	82	84	89	84	86	80	79	76	76	81	86	87	83	79
Preferred 20"-25"	72	83	83	78	87	93	95	98	96	96	97	97	96	93	91	96	96	96	94	98	88	87	86	82	84	89	86	89
Memorable >25"			75		94		89	99	99	92	96	91	89	90	91	92	91	95	92	91	93	91	89	88	88	93	86	87

Figure 10. Relative weights for stock, quality, preferred, and memorable length groups of walleye collected by experimental gill nets in Fort Peck Reservoir, 1983-2013 (no data for 1990-1991 and 1997).

Northern Pike

Relative abundance decreased from a record 5.0 per net in 2012 to 3.2per net in 2013 following declining reservoir elevations (Figure 11). Despite the decrease, the three-year running average goal of 2.0 northern pike per net was met (3.7 per net in 2013) as outlined in the FPRFMP. Average length and weight of northern pike in 2013 was 24.6 inches and 3.9, respectively, which was lower when compared to the drought years (2000-2006; Table 6). This was a result of smaller individuals recruiting into the population as a result of natural reproduction following several favorable water years where reservoir water levels were increasing and flooding suitable habitat. Furthermore, 62% of the northern pike captured in 2013 were less than 25 inches (Figure 12). This was an improvement compared to 2005-2006 when 20% of the northern pike captured in gill nets were less than 25 inches (Headley 2007).

In 2013, northern pike PSD was 75 and RSD-P was 24 indicating improved recruitment. During the drought years, PSD ranged from 93 to 98 and RSD-P ranged from 55-71 indicating a population comprised of larger fish. With increasing water levels from 2008 to 2011, terrestrial vegetation has become submerged throughout the reservoir creating ideal spawning and rearing habitat. As a result, relative abundance of substock, stock, and quality sized northern pike has continued to increase. Overall, relative weight of northern pike was 93 in 2013 which was similar to 99 in 2012.

Channel Catfish

Relative abundance of channel catfish captured by gill netting decreased to 2.4 per net in 2013. This was a slight decrease from 2.7 per net in 2012 but still above the 26-year average of 1.9 per net (Figure 13). The higher relative abundance could be explained by downstream movement due to increased flows over the last few years. North Dakota fisheries personnel have observed similar trends in Lake Sakakawea (Dave Fryda, personal communication). In 2012, mean length and weight was 17.5 inches and 1.9 pounds, respectively. This was slightly higher than the long term average of 16.1 inches and 1.6 pounds (Table 7). Relative abundance continues to be highest in riverine portions of the reservoir with the Upper Missouri Arm containing 7.8 per net (Table 4). Relative weights of channel catfish decreased from 88 in 2012 to 86 in 2013. Catfish PSD and RSD-P was 64 and 4, respectively, indicating a population comprised of good numbers of larger fish.

Sauger

Sauger numbers have declined in Fort Peck Reservoir since 1985 and remained low since then (Figure 13). This decline has occurred in spite of restrictive angling regulations. Angling regulations during this time ranged from 10 walleye/sauger in any combination to a more restrictive bag limit of 5 walleye/sauger with only one being a sauger. This more restrictive regulation was implemented in 2002. Relative abundance in 2013 was 0.3 per net which was a slight increase from 0.8 per net in 2012. Average size of sauger in 2013 was 14.8 inches and 0.9 pounds with a relative weight of 72. This population relies on natural reproduction from the Missouri River where more suitable spawning habitat is available (Bellgraph et al. 2008). Relative abundance for sauger was highest in the upper Missouri arm with a catch rate of 0.7 per net (Table 4).

Table 5. Summary of mean catch per unit of effort (CPUE; No./net-night), standard error (SE), mean length (in), mean weight (lb), mean *Wr*, and stock density indices of walleye collected in experimental gill nets on Fort Peck Reservoir, 1988-2013 (no data for 1990-1991 and 1997).

Year	No. walleye	CPUE	SE	Length	Weight	*Wr*	Substock[1]	Stock[2]	Quality[3]	Preferred[4]	PSD[5]	RSD-P[6]	YAR[7]
1988	207	2.8	0.3	14.3	1.2	83	36	171	82	21	48	15	21
1989	404	5.9	0.5	14.8	1.3	83	36	367	166	58	45	16	10
1992	297	4.7	0.4	15.8	2	88	39	257	132	78	51	30	15
1993	258	3.5	0.4	15.3	2	91	38	219	101	75	46	34	17
1994	139	1.8	0.2	15.9	2.4	92	23	116	54	43	47	37	20
1995	330	4.2	0.3	16.6	2.4	91	34	295	189	73	64	25	12
1996	361	4.4	0.4	16.5	2.1	89	31	327	228	75	70	23	9
1998	418	5.6	0.4	14.8	1.6	86	79	339	159	89	47	26	23
1999	329	4.2	0.3	14.4	1.5	90	63	266	108	67	41	25	24
2000	250	2.8	0.2	16.6	2.3	83	26	224	122	84	54	38	12
2001	272	3.9	0.4	17.4	2.8	88	19	253	134	112	53	44	8
2002	324	3.3	0.2	17.4	2.8	90	32	291	159	124	55	43	11
2003	301	3.1	0.3	17.3	2.8	88	38	263	156	105	59	40	14
2004	250	3.3	0.3	15.9	2.3	88	47	203	102	73	50	36	23
2005	227	2.7	0.3	16.3	2.6	85	37	190	88	78	46	41	19
2006	207	2.4	0.2	16.2	2.6	87	38	168	78	66	46	39	23
2007	261	3.1	0.3	16.2	2.3	81	36	225	100	70	44	31	16
2008	234	2.8	0.3	15.5	1.9	81	21	212	89	45	42	21	10
2009	393	3.3	0.3	14.6	1.4	83	59	332	143	53	43	16	18
2010	361	3.6	0.3	15.4	1.7	84	31	330	175	46	53	13	9
2011	267	2.8	0.3	14.9	1.7	88	25	251	99	45	39	18	10
2012	683	6.8	0.4	15.1	1.4	83	44	639	305	75	47	12	7
2013	479	4.8	0.4	15.0	1.5	81	66	413	245	55	59	13	16

[1]Substock is the sum of all walleye less than 10inches, [2]Stock is the sum of all walleye greater than 10 inches, [3]Quality is the sum of all walleye greater than 15 inches, [4]Prefered is the sum of all walleye greater than 20 inches, [5]PSD is the proportional stock density (Quality/Stock), [6]RSD-P is the relative stock density, preferred (Preferred/Stock), [7]YAR is the ratio of young to adults (Substock/Stock).

Table 6. Summary of mean catch per unit of effort (CPUE; No./net-night), mean length (in), mean weight (lb), and mean *Wr* of northern pike collected in experimental gill nets on Fort Peck Reservoir during July-August, 1984-2013.

Year	*N*	CPUE	Length	Weight	*Wr*
1984	52	0.6	20.8	2.4	94
1985	36	0.4	24.1	3.5	97.8
1986	21	0.4	23.7	3.6	94.3
1987	60	0.7	19.7	2.3	106.7
1988	43	0.6	26.4	5.3	107
1989	47	0.7	24.4	4.5	110.2
1992	35	0.6	26.6	5.5	112.3
1993	47	0.6	28.3	6.4	113.9
1994	104	1.4	22.6	4.4	107.3
1995	295	3.8	20.1	2.5	114.6
1996	321	3.9	23.3	3.7	112.8
1998	231	3.1	24.7	4.3	104.6
1999	151	1.9	26.5	5.1	103.2
2000	134	1.5	28	6	106.5
2001	73	1	28.6	6.5	110.6
2002	144	1.5	29.5	7.2	102
2003	126	1.3	28.1	6.2	101.1
2004	75	1	29.1	6.7	100.1
2005	86	1	28.4	6.5	100.3
2006	108	1.3	26.1	5.2	98.9
2007	147	1.7	24.8	4.6	101
2008	137	1.6	26.6	5.2	100
2009	176	1.5	24.5	4.3	93.1
2010	191	1.9	23.4	3.9	100
2011	293	2.9	23.2	3.6	100
2012	503	5.0	23.6	3.6	99.3
2013	324	3.2	24.6	3.9	93.0

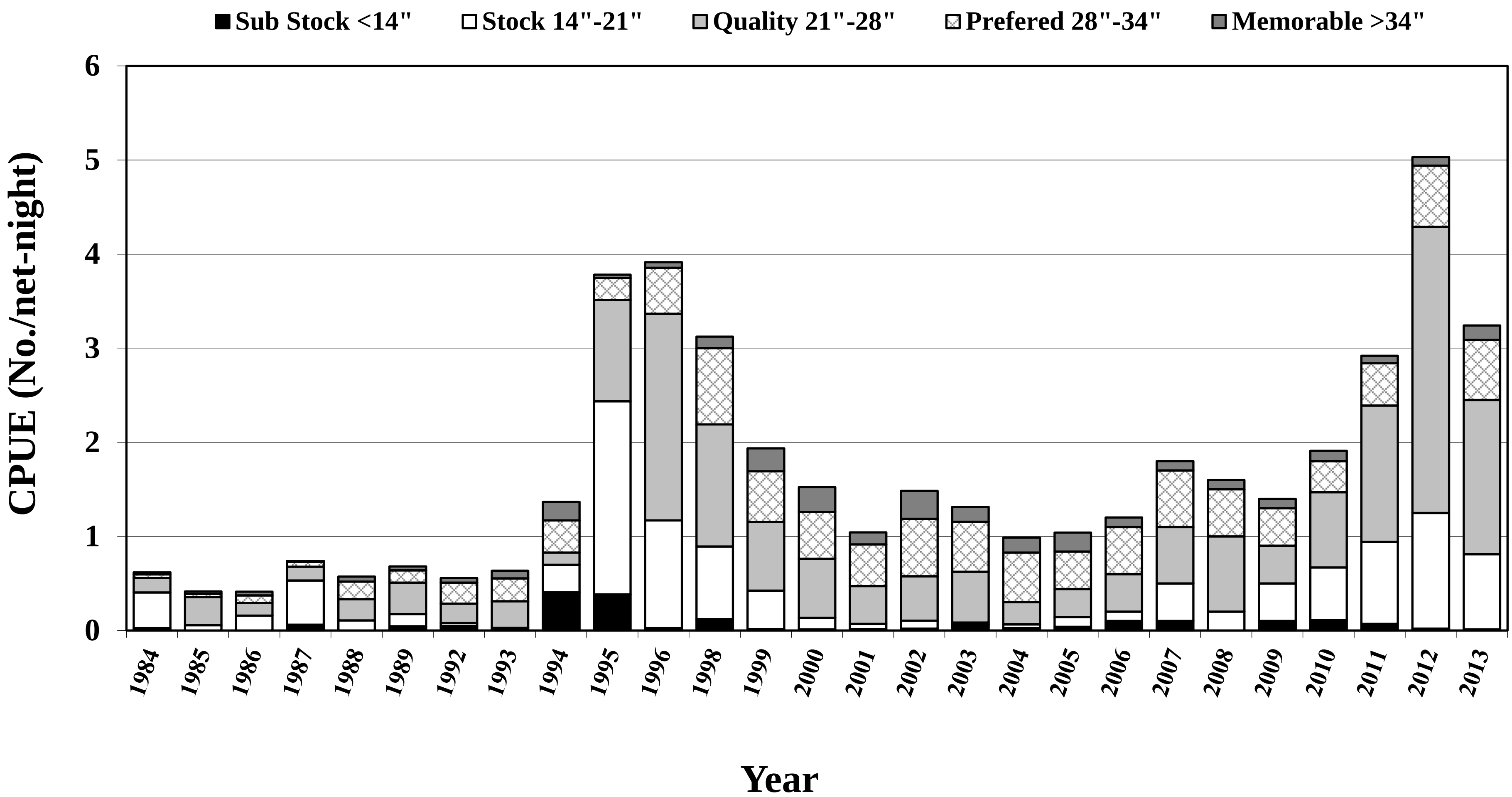


Figure 11. Length structure, in terms of catch per unit effort (CPUE), of northern pike collected by experimental gill nets in Fort Peck Reservoir during, July-August, 1984-2013, (no data for 1990-1991 and 1997).

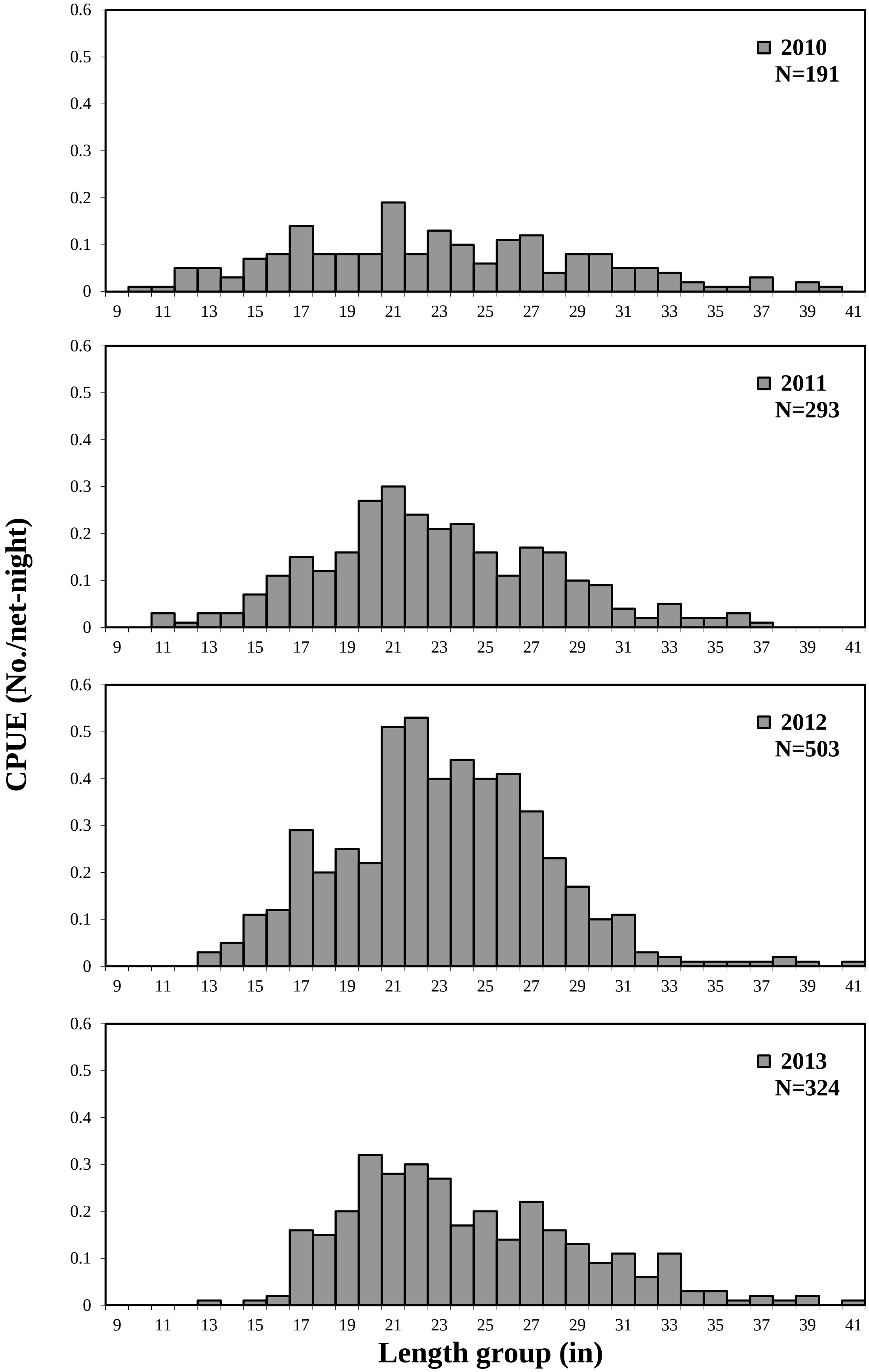
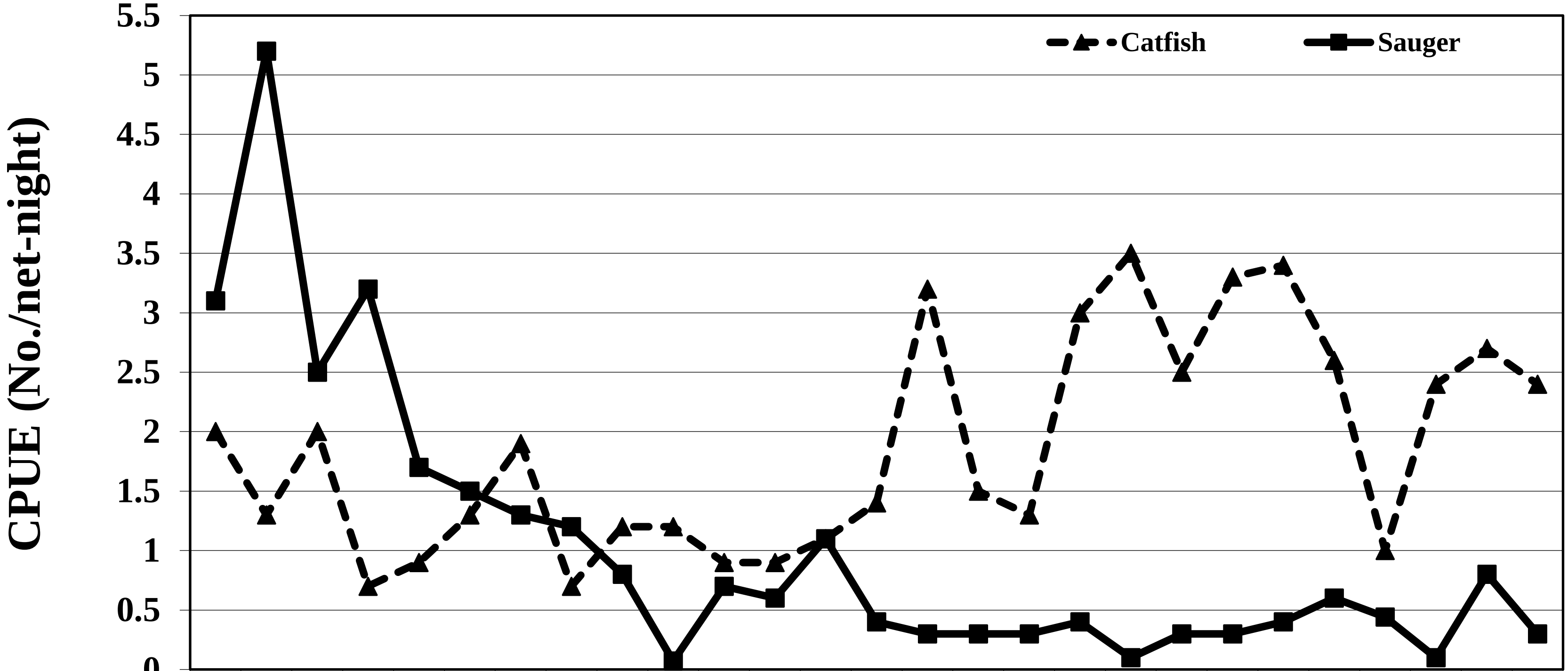


Figure 12. Length frequency, as catch per unit effort (CPUE), of northern pike collected by experimental gill nets in Fort Peck Reservoir during July-August, 2010-2013.



	1984	1985	1986	1987	1988	1989	1992	1993	1994	1995	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Catfish	2	1.3	2	0.7	0.9	1.3	1.9	0.7	1.2	1.2	0.9	0.9	1.1	1.4	3.2	1.5	1.3	3	3.5	2.5	3.3	3.4	2.6	1.0	2.4	2.7	2.4
Sauger	3.1	5.2	2.5	3.2	1.7	1.5	1.3	1.2	0.8	0.07	0.7	0.6	1.1	0.4	0.3	0.3	0.3	0.4	0.1	0.3	0.3	0.4	0.6	0.4	0.1	0.8	0.3

Year

Figure 13. Mean catch per unit of effort (CPUE; No./net-night) of channel catfish and sauger collected by experimental gill nets in Fort Peck Reservoir, 1984-2013 (no data for 1990-1991 and 1997).

Table 7. Summary of mean catch per unit of effort (CPUE; No./net-night), mean length (in) and mean weight (lb) of channel catfish collected in experimental gill nets on Fort Peck Reservoir, 1984-2013.

Year	*N*	CPUE	Length	Weight
1984	167	2.0	14.2	0.9
1985	115	1.3	14.5	1.1
1986	105	2.0	14.6	1.1
1987	53	0.7	15.3	1.2
1988	69	0.9	15.9	1.7
1989	99	1.4	16.5	1.5
1992	165	2.6	15	1.4
1993	68	0.9	14.9	1.4
1994	119	1.6	14.4	1.1
1995	123	1.6	16.3	1.6
1996	93	1.1	15.6	1.4
1998	91	1.2	18	2.3
1999	88	1.1	17.2	2.0
2000	122	1.4	17.5	2.0
2001	222	3.2	17.6	2.1
2002	145	1.5	18	2.1
2003	129	1.3	17.6	2.1
2004	227	3.0	15.7	1.8
2005	297	3.5	14.3	1.3
2006	215	2.5	15.1	1.4
2007	278	3.3	15.3	1.3
2008	289	3.4	14.2	1.1
2009	314	2.6	16.8	1.9
2010	104	1.0	18.4	2.4
2011	241	2.4	17.9	2.3
2012	272	2.7	17.4	1.8
2013	240	2.4	17.5	1.9

STOMACH CONTENTS OF GILL NETTED GAME FISH

Stomach contents of walleye, northern pike, sauger, and smallmouth bass captured in experimental gill nets from July 23rd to August 15th, 2013 were examined for the presence of forage items. Walleye had the most diverse diet followed closely by northern pike (Table 8). Invertebrates were the most commonly identified items found in walleye at 13.6% followed by yellow perch at 2.9%. Similarly, cisco were the most commonly identified fish found in northern pike and smallmouth bass at 9.8% and 6.7%, respectively. The high frequency of occurrence in these game fish species can be explained by the high abundance of young-of-year and adult cisco observed in 2013. Empty stomach contents comprised a large portion of the walleye, northern pike, sauger, and smallmouth bass stomachs, which is attributed to purging of the stomach during stress.

Table 8. Percent frequency of occurrence for various forage items found in stomach contents of northern pike, sauger, smallmouth bass, and walleye collected in experimental gill nets in Fort Peck Reservoir 2013. Sample size is given in parentheses.

Forage items	Northern pike (*N*=297)	Sauger (*N*=27)	Smallmouth bass (*N*=105)	Walleye (*N*=450)
Cisco	9.8%		6.7%	2.9%
Pomoxis spp.				0.7%
Crayfish	2.0%		4.8%	1.3%
Empty	78.8%	81.5%	38.1%	62.4%
Invertebrates	0.7%	7.4%	9.5%	13.6%
Smallmouth bass				0.2%
Spottail shiner			1.0%	
Unknown	8.4%	11.1%	38.1%	17.6%
Walleye	0.3%		1.9%	0.4%
Yellow perch				0.9%

BEACH SEINING

Shoreline beach seining was conducted to determine reproductive success of age-0 game and non-game fish from August 13th to September 3rd, 2013. Seine hauls at 100 locations throughout the reservoir captured 16 species of young-of-year and forage fish for a total of 13,192 fish (Table 11). Relative abundance of shoreline forage typically follows changes in reservoir elevations (Figure 14). In 2013, reservoir elevations decreased during the winter months due to evacuation of water to provide flood storage capacity (Figure 14). Reservoir elevations increased approximately four feet during June due to runoff from mountain snowpack. No terrestrial vegetation was inundated in 2013.

Eurasian watermilfoil (EWM) was first discovered in Fort Peck Reservoir by Montana Fish, Wildlife & Parks and the U.S. Army Corp of Engineers in 2010. Since then, it has become well established throughout the reservoir while conducting shoreline beach seining surveys. Seining surveys in 2012 indicated that it was present at 90% of the seining sites. This trend decreased sharply in 2013 to only 46% of the seining sites containing EWM. The large decrease in EWM can be attributed to a decrease in reservoir elevation from the summer of 2012 to the following year (loss of 15 feet). The loss of established EWM stands and no shoreline vegetation inundated in 2013 could explain the decrease in relative abundance of shoreline forage fish.

It is uncertain what impacts EWM will have to the fishery on Fort Peck Reservoir. Some studies have suggested slow growth and poor size structure for some fish species (Unmuth et al. 1999). However, EWM has proved beneficial to fisheries if it occurs in lakes that typically do not support much growth of native submersed species (Engel 1995). Similarly, Pratt and Smokorowski (2003) found more fish and invertebrates in areas with EWM than areas devoid of any submerged aquatic vegetation. Due to Fort Peck Reservoir's fluctuating reservoir elevation, lack of native submerged aquatic vegetation, and complex basin characteristics, it is possible that EWM may provide spawning and rearing habitat for some forage and/or game fish species.

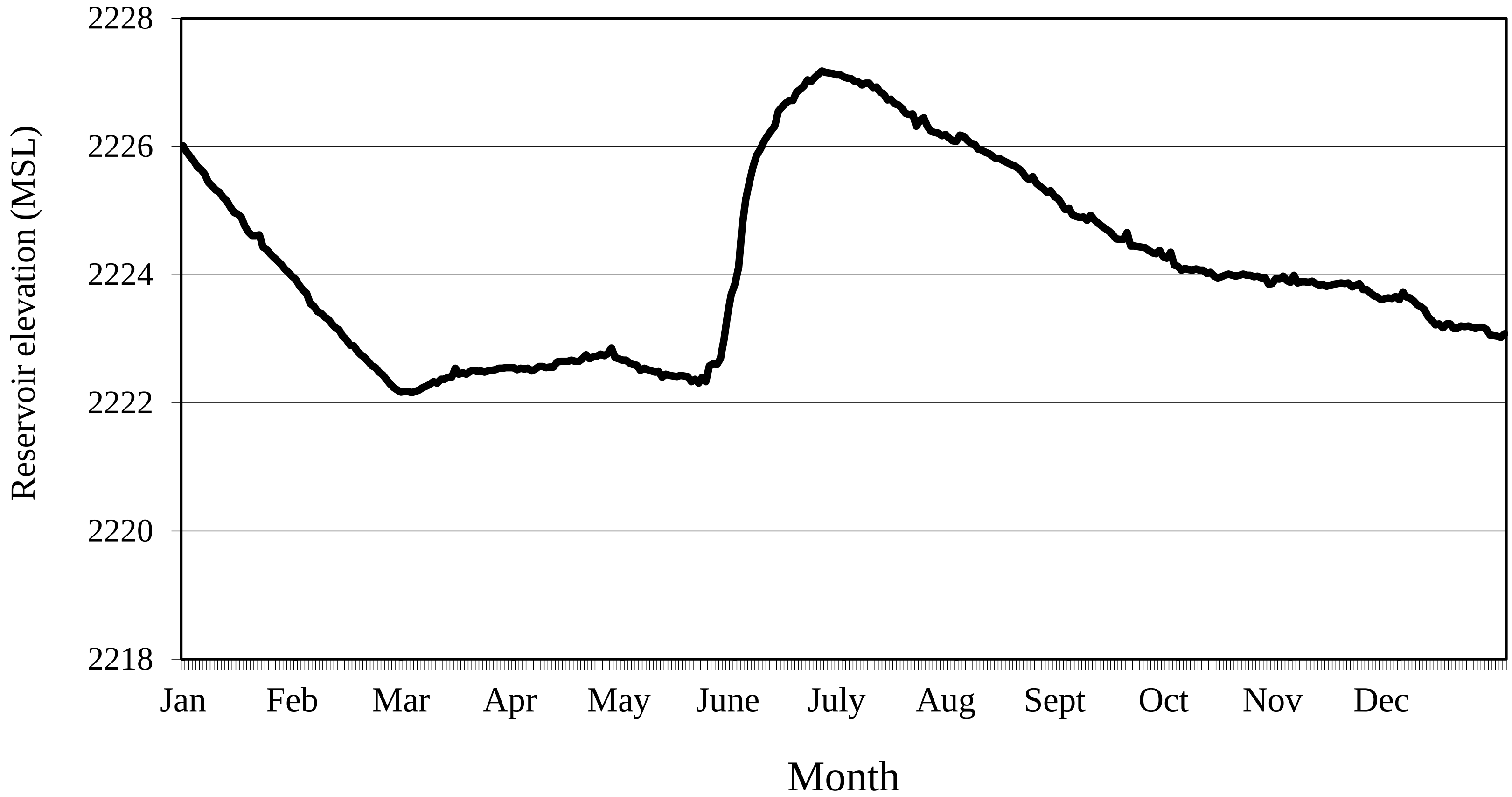


Figure 14. Average daily reservoir elevation for Fort Peck Reservoir from January 1, 2013 to December 31, 2013 (data provided by USACE).

Table 9. Number (*N*) and mean catch per unit effort (CPUE; No./haul) for fish species collected by seine hauls in Fort Peck Reservoir during August 2013. Catches are for young-of-year fishes except where noted.

	UBD[1]		LBD[2]		LMA[3]		MMA[4]		UMA[5]		Total	
Species	*N*	CPUE	*N*	CPUE	*N*	CPUE	*N*	CPUE	*N*	CPUE	*N*	CPUE
Bigmouth buffalo	6	0.3	0	--	1	<0.1	0	--	0	--	7	0.1
Black bullhead	1,056	52.8	0	--	0	--	0	--	0	--	1,056	10.6
Channel catfish	0	--	0	--	0	--	0	--	2	0.1	2	0.02
Common carp	4	0.2	4	0.2	1	<0.1	0	--	1	<0.1	10	0.1
*Pomoxis spp.**	886	44.3	366	18.3	77	3.9	548	27.4	864	43.2	2,741	27.4
Emerald shiner*	24	1.2	3	0.15	20	1	50	2.5	314	15.7	411	4.1
Fathead minnow	1	<0.1	0	0	0	--	0	--	0	--	1	0.01
Freshwater drum	31	1.6	3	0.15	6	0.3	34	1.7	144	7.2	218	2.2
Goldeye	0	--	0	--	0	--	0	--	31	1.6	31	0.3
*Hybognathus spp.**	4	0.2	0	--	0	--	0	--	472	23.6	476	4.8
Northern pike	2	0.1	0	--	0	--	0	--	1	<0.1	3	<0.1
River carpsucker	2	0.1	0	--	0	--	0	--	17	0.85	19	0.19
Sauger	0	--	0	--	0	--	0	--	8	0.4	8	0.1
Smallmouth bass	204	10.2	202	10.1	50	2.5	123	6.2	72	3.6	651	6.5
Smallmouth buffalo	67	3.35	3	0.2	6	0.3	1	<0.1	5	0.3	82	0.8
Spottail shiner*	758	37.9	457	22.9	392	19.6	516	25.8	2,346	117.3	4,469	44.7
Walleye	1	<0.1	2	0.1	4	0.2	5	0.3	8	0.4	20	0.2
White sucker	1	<0.1	9	0.5	15	0.8	1	<0.1	0	--	26	0.3
Yellow perch	861	43.1	721	36.1	482	24.1	781	39.1	116	5.8	2,961	29.6
Total	3,908	195.4	1,770	88.5	1,054	52.7	2,059	103.0	4,401	220.05	13,192	131.92

*Includes all ages.
[1]Upper Big Dry (UBD): Nelson Cr., Lone Tree Cr., McGuire Cr., Bug Cr., Lost Cr.
[2]Lower Big Dry (LBD): Box Cr., S. Fork Rock Cr., N. Fork Rock Cr., Box Elder Cr., Sandy Arroyo, Spring Cr.
[3]Lower Missouri Arm (LMA): Spillway Bay, Bear Cr., N.Fork Duck Cr., S. Fork Duck Cr., Main Duck
[4]Middle Missouri Arm (MMA): Pines, Gilbert Cr., Cattle Crooked Cr., Hell Cr., Sutherland Cr., Snow Cr.
[5]Upper Missouri Arm (UMA): Bone Trail, Timber Cr., Seven Blackfoot, Fourchette Bay, Devils Cr.

Walleye

Relative abundance of young-of-year walleye in 2013 increased slightly compared to the previous several years (Figure 15). A total of 20 walleye were caught for a catch rate of 0.2 per seine haul reservoir wide. In 2013, young-of-year walleye were captured in all sampling regions of the reservoir (Table 9). Similar to previous years, the upper Missouri arm contained the highest catch rates (Brunsing 1998). No hatchery-reared walleye fry or fingerlings are released in this area suggesting all fingerlings captured were a product of natural reproduction. Dispersal of young-of-year walleye has been shown to be limited 2 to 3 months after release (Paragamian and Kingery 1992). In addition, the Missouri River above Fort Peck Reservoir has been shown to support walleye spawning activity (Billington et al. 2005; Bellgraph et al. 2008). Pyloric caecums were counted to identify *Sander spp.* in question.

Sauger

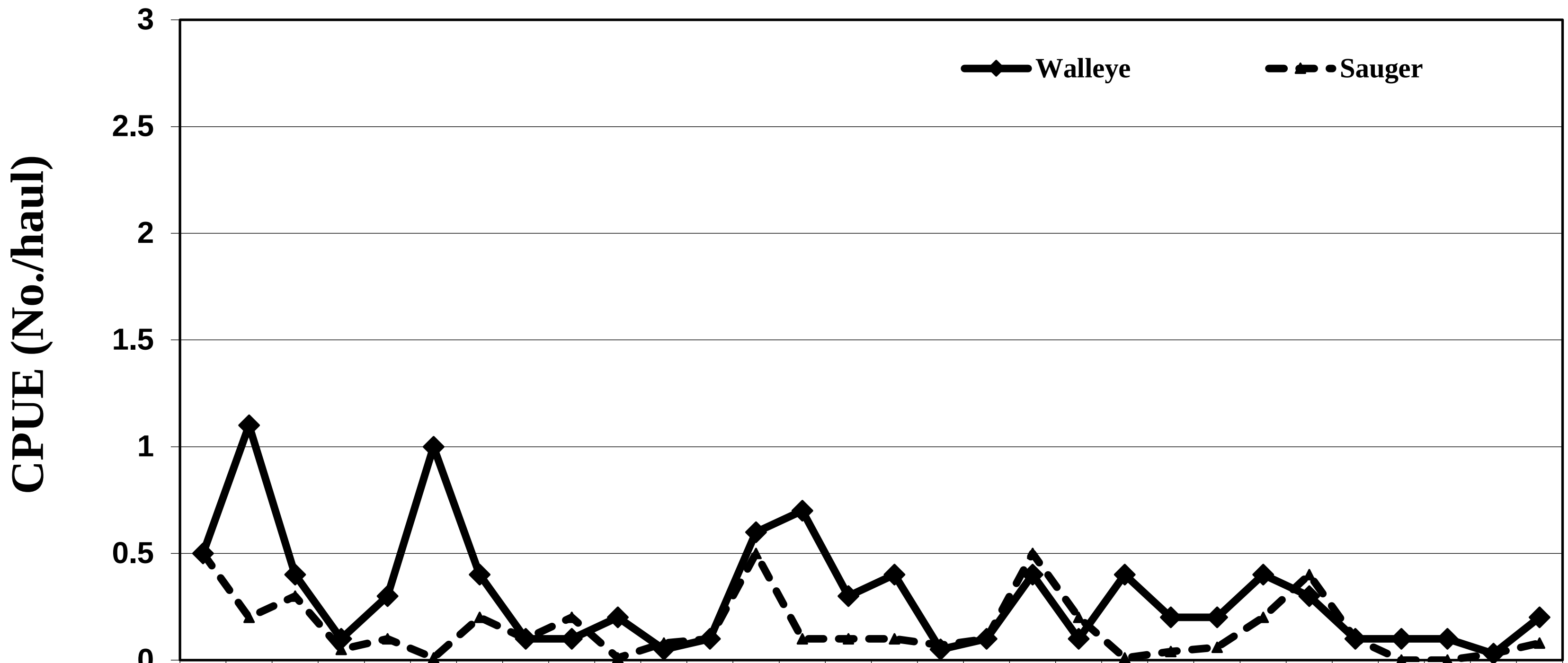
Relative abundance of young-of-year sauger in 2013 was similar to those observed during the years of 1987, 1989, 1993, and 2004 through 2006 (Figure 15). These years of low relative abundances coincide with severe drought conditions (i.e., declining reservoir elevations and low inflows) and have been suggested to be the reason for decline of sauger populations (McMahon and Gardner 2001). The Missouri and Musselshell Rivers above Fort Peck Reservoir have been identified as spawning areas for sauger (McMahon and Gardner 2001; Bellgraph et al. 2008). Once these fish hatch, it's likely these young fish drift downstream into the reservoir as they have been sampled during annual shoreline seining surveys and no sauger fingerlings are planted in Fort Peck Reservoir.

Northern Pike

Young-of-year northern pike relative abundance decreased slightly from 0.05 per seine haul in 2012 to 0.03 per seine haul in 2013. This was the lowest catch rate observed over the sampling period (Figure 16). The continued decrease in relative abundance of young-of-year northern pike can be attributed to declining reservoir elevations which prohibited inundation of shoreline vegetation in 2013. Typically, young-of-year northern pike are captured in all sampling regions of the reservoir. However, young-of-year northern pike were only captured in the upper Big Dry Arm and upper Missouri Arm in 2013 (Table 9).

Smallmouth Bass

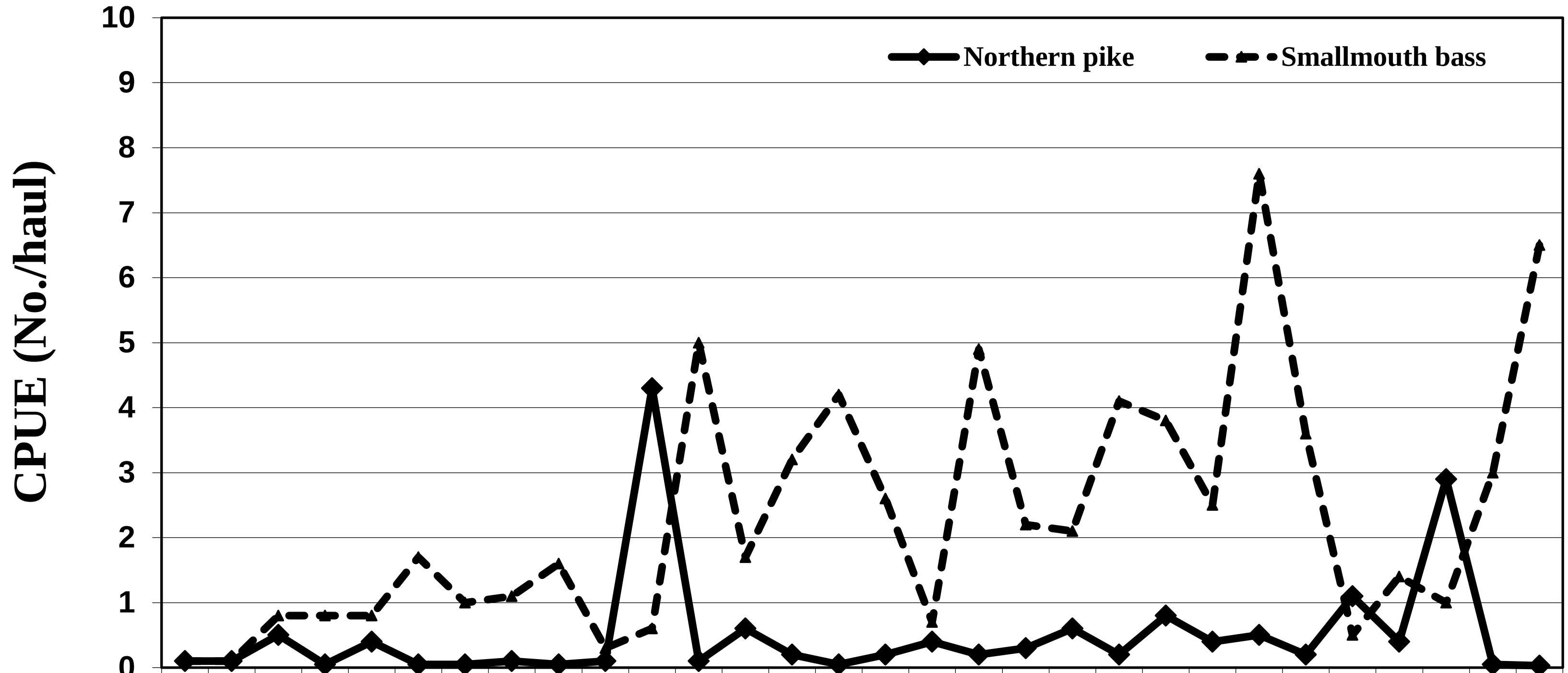
Smallmouth bass continue to be the most abundant game species captured during annual seining surveys. Relative abundance increased from 3.0 per seine haul in 2012 to 6.5 per seine haul in 2013. This was the second highest catch rate observed over the sampling period (Figure 16). Smallmouth bass were captured in all regions with the highest catch rate in the upper Big Dry Arm at 10.2 fish per haul (Table 9). As indicated by seining surveys, smallmouth bass have successfully spread to all areas of the reservoir.



	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Walleye	0.5	1.1	0.4	0.1	0.3	1	0.4	0.1	0.1	0.2	0.05	0.1	0.6	0.7	0.3	0.4	0.05	0.1	0.4	0.1	0.4	0.2	0.2	0.4	0.3	0.1	0.1	0.1	0.03	0.2
Sauger	0.5	0.2	0.3	0.05	0.1	0.01	0.2	0.1	0.2	0.01	0.08	0.1	0.5	0.1	0.1	0.1	0.07	0.1	0.5	0.2	0.01	0.04	0.06	0.2	0.4	0.1	0	0	0.03	0.08

Year

Figure 15. Mean catch per unit effort (CPUE; No./haul) of walleye and sauger young-of-year collected by seine hauls in Fort Peck Reservoir from 1984-2013.



	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Northern pike	0.1	0.1	0.5	0.05	0.4	0.05	0.05	0.1	0.05	0.1	4.3	0.1	0.6	0.2	0.05
Smallmouth bass	0.1	0.1	0.8	0.8	0.8	1.7	1	1.1	1.6	0.3	0.6	5	1.7	3.2	4.2

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Northern pike	0.2	0.4	0.2	0.3	0.6	0.2	0.8	0.4	0.5	0.2	1.1	0.4	2.9	0.05	0.03
Smallmouth bass	2.6	0.7	4.9	2.2	2.1	4.1	3.8	2.5	7.6	3.6	0.5	1.4	1	3	6.5

Year

Figure 16. Mean catch per unit effort (CPUE; No./haul) of northern pike and smallmouth bass young-of-year collected by seine hauls in Fort Peck Reservoir from 1984-2013.

Yellow Perch

Young-of-year yellow perch relative abundance in 2013 decreased greatly to 29.6 per seine haul from 84.5per seine haul in 2012. The continued decline in relative abundance can be explained by decreasing reservoir elevation beginning in 2011 (Figure 17). Decreasing reservoir elevations reduce the spawning and rearing habitat due to lack of inundated terrestrial vegetation. However, relative abundance of young-of-year yellow perch in 2013 was still higher than those levels observed during the drought years (i.e., 1998-2006). Yellow perch were most abundant in the upper Big Dry arm with a catch rate of 43.1 per seine haul in 2013(Table 9).

Crappie

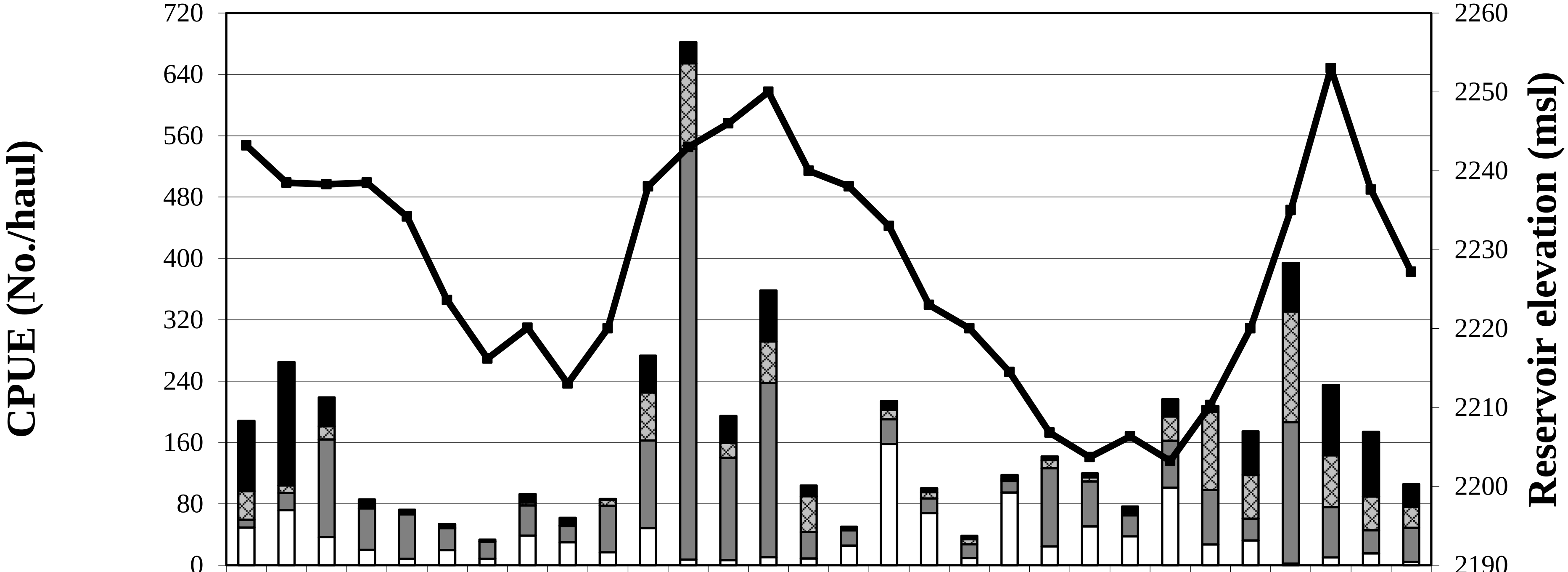
Young-of-year crappie relative abundance decreased from 43.7 per seine haul in 2012 to 27.4 per seine haul in 2013. Similar to young-of-year yellow perch, relative abundance of young-of-year crappie was still higher than during the drought years (Figure 17). In 2013, the largest percentage of young-of-year crappie were collected in the upper Big Dry arm and upper Missouri arm (Table 9). In the past, the upper Missouri arm contained +90% of the young-of-year crappie collected due to more suitable spawning and rearing habitat.

Emerald Shiner

Emerald shiner relative abundance in 2013 was 4.1 per seine haul, which was lower than 15.6 per seine haul in 2012. Relative abundance of emerald shiners has been relatively low over the last several years making them similar to the mid to late 1990's when reservoir elevations were increasing (Figure 17). A possible explanation for these decreases could be upstream movement into more riverine type habitat. In 2013, 76 % of emerald shiners were captured in the upper Missouri arm (Table 9).

Spottail Shiner

Relative abundance of spottail shiners increased from 30.2 per seine haul in 2012 to 44.7 per seine haul in 2013 but is still lower than long-term average of 76.6 per seine haul. Relative abundance was highest in the upper Missouri arm at 117.3 per seine haul (Table 9). Typically, relative abundance is highest in the main lake portions (lower Big Dry, lower Missouri arm, middle Missouri arm) of the reservoir. In 2012, 90% of spottail shiners were collected in the main lake portion of the reservoir. It is uncertain what forced this trend in 2013.



	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Perch	91.8	160.9	37.5	11.3	6	5.1	1.9	10.9	10	1.3	47.9	27.9	35.1	66.5	14.1
Crappie	37.4	9.7	17.1	0.2	0	0.1	0.7	4.1	0.4	7.6	62.6	111.6	19.3	54	46.7
Spottails	10.1	22.6	127.5	54.2	58	28.9	22	39.2	21.4	60.7	114.2	535.4	133.6	227.5	34.4
Emeralds	49.1	71.6	36.6	19.9	8.3	19.6	8.6	38.7	29.9	16.8	48.4	7.3	6.5	10.4	8.8
Elevation	2243	2239	2238	2239	2234	2224	2216	2220	2213	2220	2238	2243	2246	2250	2240

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Perch	4.4	11.4	5.3	4.3	5	4.9	5.2	8.4	22.6	8.01	57.2	63.3	91.8	84.5	29.6
Crappie	0.2	11.9	8.2	6.7	2.5	10.6	5.2	3.1	31.6	101.8	56.9	144.3	67.3	43.7	27.4
Spottails	20	32.6	19.1	17.7	15.2	101.7	58.8	27.4	61.1	70.8	28.2	184.4	65.7	30.2	44.7
Emeralds	25.5	157.9	67.9	9.6	94.8	24.6	50.5	37.6	101.1	27.11	32.4	2.2	10.3	15.6	4.1
Elevation	2238	2233	2223	2220	2215	2207	2204	2206	2203	2210	2220	2235	2253	2238	2227

Year

Figure 17. Maximum annual reservoir elevation compared to mean catch per unit effort (CPUE; No./haul) of emerald, spottail, young-of-year yellow perch, and young-of-year crappie collected by seine hauls in Fort Peck Reservoir from 1984-2013.

Chinook salmon

Chinook salmon were stocked in Fort Peck Reservoir in the spring of 2012 but the minimum objective of 200,000 fingerlings was not met as outlined in the FPRFMP. A total of 151,696 spring-stocked chinook salmon were released in June at 21and 32 per pound (Table 10). The spring-stocked fish were reared to a larger size in an attempt to create salmon large enough to avoid predation. Both North and South Dakota Game and Fish have used this strategy and been successful in developing a return run from larger spring-stocked chinook salmon (Lott et al. 1997). In the past, Montana has typically stocked fewer fingerlings and less total pounds than North and South Dakota. However, Montana has increased stocking numbers and/or size in efforts to create a more stable fishery and more fish for spawning beginning in 2000 (Figure 18 and 19).

Return of salmon to the release site has been variable over the years. In 2013, the number of females spawned and eggs collected decreased by 73% (Figure 20). It is uncertain what caused the large decline, but it’s possible the high discharge rates via the spillway entrained a large number of salmon in 2011. South Dakota fisheries personnel observed high numbers of salmon entrained through Lake Oahe from the record high discharge in 2011 (Bob Hanten, personal communication). The 2013 egg-take effort for Montana resulted in 155,000 green eggs which averaged approximately 3,780 eggs per female. North Dakota was able to supplement eggs needed to approach the stocking goal of 200,000+ fingerlings for 2014.

Fisheries personnel relied exclusively on electrofishing to obtain brood stock for the annual chinook salmon egg-take. This has proved to be a more cost effective and efficient manner due to limited time and manpower issues as opposed to the fish ladder. Electrofishing was conducted from October 2nd to October 24th in various embayments adjacent to the marina, spillway, off the face of the dam, Duck Creek, and Bear Creek. In addition, electrofishing was conducted near Rock Creek and the Pines bay to determine if salmon released at these sites in 2011would return. Salmon were released at these sites in hopes to reduce entrainment near the spillway area. No salmon were captured at Rock Creek or Pines Bay in 2013.

Biological data was collected from adult chinook salmon during spawning to provide more information on age, growth, and stocking-and-rearing history. In 2013, 68% of females spawned were 4-year olds and 28% were 3-year old females (Table 12). Similarly, the majority of females spawned in 2012 were 4-year olds (55%) and the remaining were 3-year old females (41%; Table 11). A greater return from the 2010 brood year (3-year old) in 2013 was anticipated due to increased stocking numbers compared to previous years (255,492;Table 10) and improved growing conditions (i.e., increases in reservoir elevations and cisco abundance). It should be noted that salmon released in 2011 averaged 62/pound compared which was smaller when compared to previous years (30-35/pound;Table 10).

Mean weight of pre-spawn female chinook salmon increased from 15.3 pounds in 2012 to16.5 pounds in 2013. When examining mean weight at each age, both male and female salmon collected in 2013 were higher than those collected in 2012 with the exception of 3-year old males (Table 11; Table 12). Three and four-year old males averaged 8.4 and 18.3 pounds, respectively in 2013 compared to 13.0 and 17.5 pounds in 2012. In 2013, three and four-year old females averaged 14.3 and 17.5 pounds, respectively compared to 12.4 and 17.2 pounds in 2012. The higher relative abundance of cisco from 2009 to 2011 has contributed to the increased weights observed in 2013. Cisco have been found to be the primary forage item of age 1+ chinook salmon in Fort Peck Reservoir (Brunsing 1998; Headley 2010).

Table 10. Chinook salmon stocked by number, size, and location in Fort Peck Reservoir, 2002-2013.

Date	Number	Pounds Stocked	No./lb	Mark	Location
3/13/2002	22,021	202	108.8	None	Pines Bay
4/25/2002	93,465	1144	81.7	None	Marina Bay
4/25/2002	66,000	303	218	None	Marina Bay
4/25/2002	14,400	75	192	None	Marina Bay
5/31/2002	71,744	2,424	29.6	None	Pines Bay
6/13/2002	107,331	4,128	26	None	Marina Bay
4/22/2003	232,618	3,366	69.1	None	Marina Bay
6/13/2003	70,522	2,457	28.7	Adipose Clip	Marina Bay
6/14/2004	70,537	2,574	27.4	None	Marina Bay
10/5/2004	13,622	1,603	8.5	Adipose Clip	Marina Bay
6/30/2005	97,008	1,647	58.9	None	Marina Bay
9/28/2005	11,534	923	12.5	Adipose Clip	Marina Bay
6/7/2006	65,558	509	128.92	None	Marina Bay
6/14/2006	60,283	502	120	None	Milk Coulee Bay
6/15/2006	49,376	457	108	None	Marina Bay
10/13/2006	4,988	529	9.43	Adipose Clip	Marina Bay
6/18/2007	36,418	331	110	None	Marina Bay
10/25/2007	15,559	841	18.5	Adipose Clip	Marina Bay
6/5/2008	60,482	1,960	30.86	None	Marina Bay
6/11/2008	35,100	716	49	None	Marina Bay
6/12/2008	30,900	1,000	30.9	None	Marina Bay
8/12/2008	12,913	683	18.9	None	Marina Bay
8/12/2008	15,291	823	18.58	None	Marina Bay
11/18/2008	4,402	823	5.35	Adipose Clip	Marina Bay
6/16/2009	188,906	5,145	36.71	None	Marina Bay
11/4/2009	56,513	7,859	7.19	Adipose Clip	Marina Bay
6/10/2010	143,966	4,223	34.09	None	Marina Bay
10/22/2010	23,801	3,365	7.1	Adipose Clip	Marina Bay
6/10/2011	108,760	1,729	62.9	None	Duck Creek
6/10/2011	108,706	1,828	59.4	None	Pines Bay
6/15/2011	38,026	561	67.8	None	Rock Creek
11/1/2011	38,605	6,893	5.6	Adipose Clip	Marina Bay
6/4/2012	55,366	1,700	32.6	None	Duck Creek
6/4/2012	50,203	1,512	33.2	None	Bear Creek
6/5/2012	75,750	2,320	32.6	None	Marina Bay
6/6/2013	11,247	530	21.2	Adipose Clip	Marina Bay
6/6/2013	15,915	750	21.2	Adipose Clip	Milk Coulee Bay
6/10/2013	33,772	1,018	34.0	None	Duck Creek
6/10/2013	59,870	1,878	33.4	None	Marina Bay
6/10/2013	30,892	987	32.1	None	Milk Coulee Bay

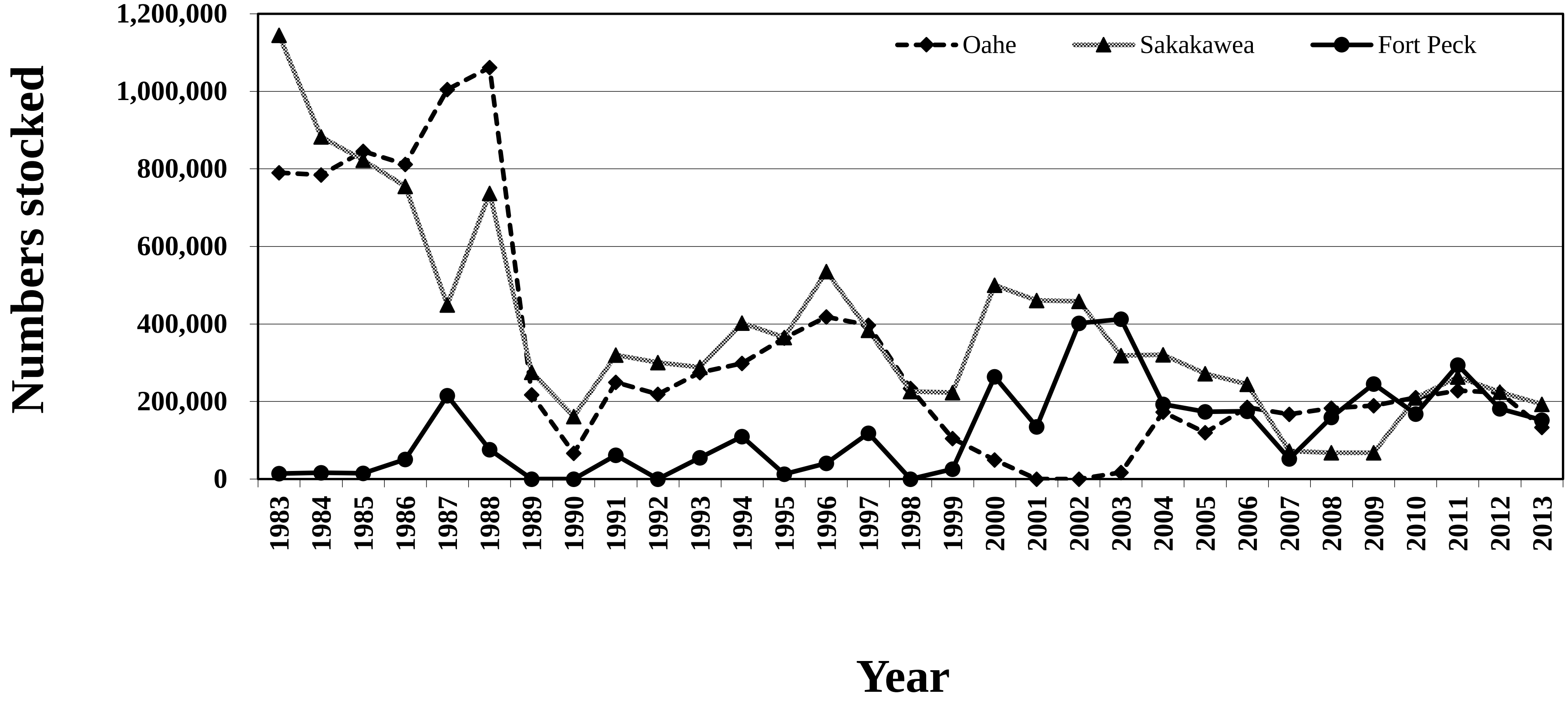


Figure 18. Annual comparison of total chinook salmon numbers stocked in Oahe, Sakakawea, and Fort Peck Reservoir, 1983-2013**.**

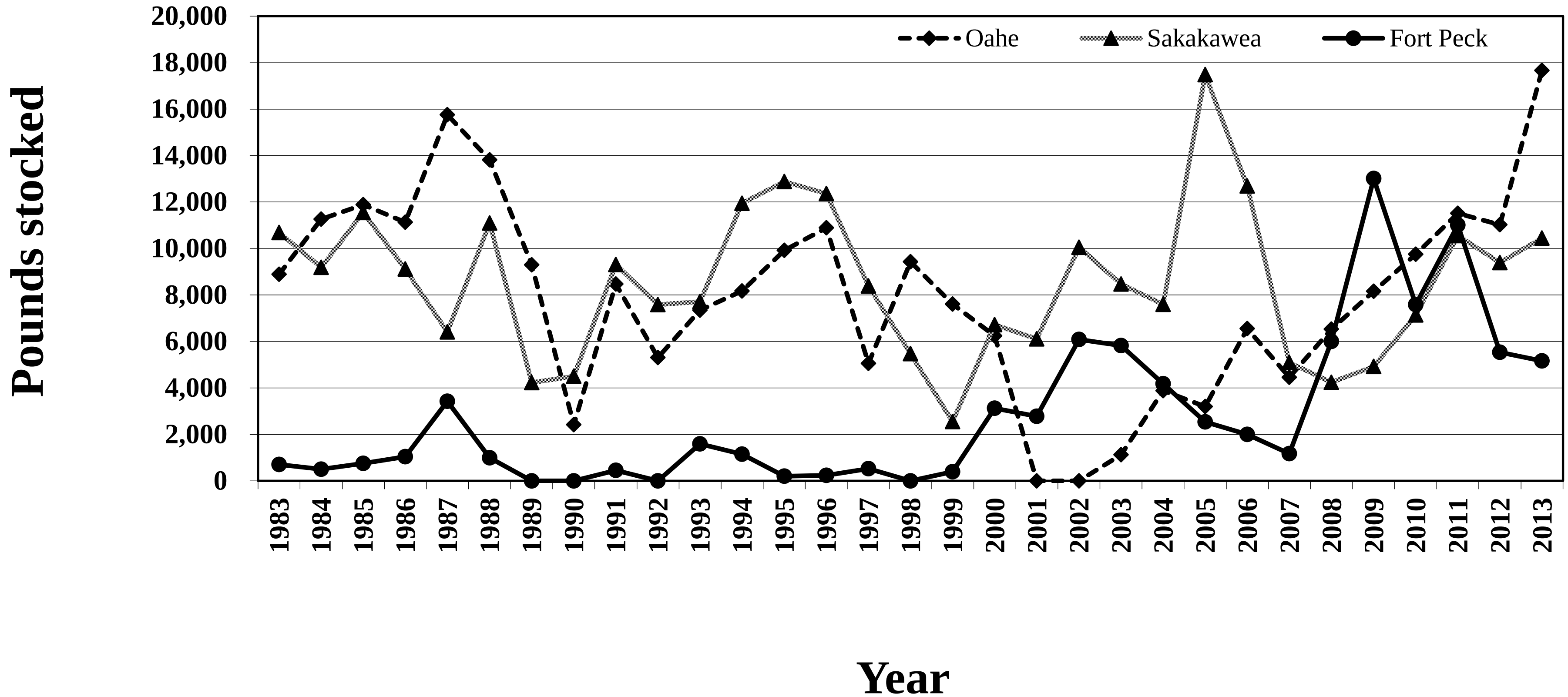


Figure 19. Annual comparison of total chinook salmon pounds stocked in Oahe, Sakakawea, and Fort Peck Reservoir, 1983-2013.

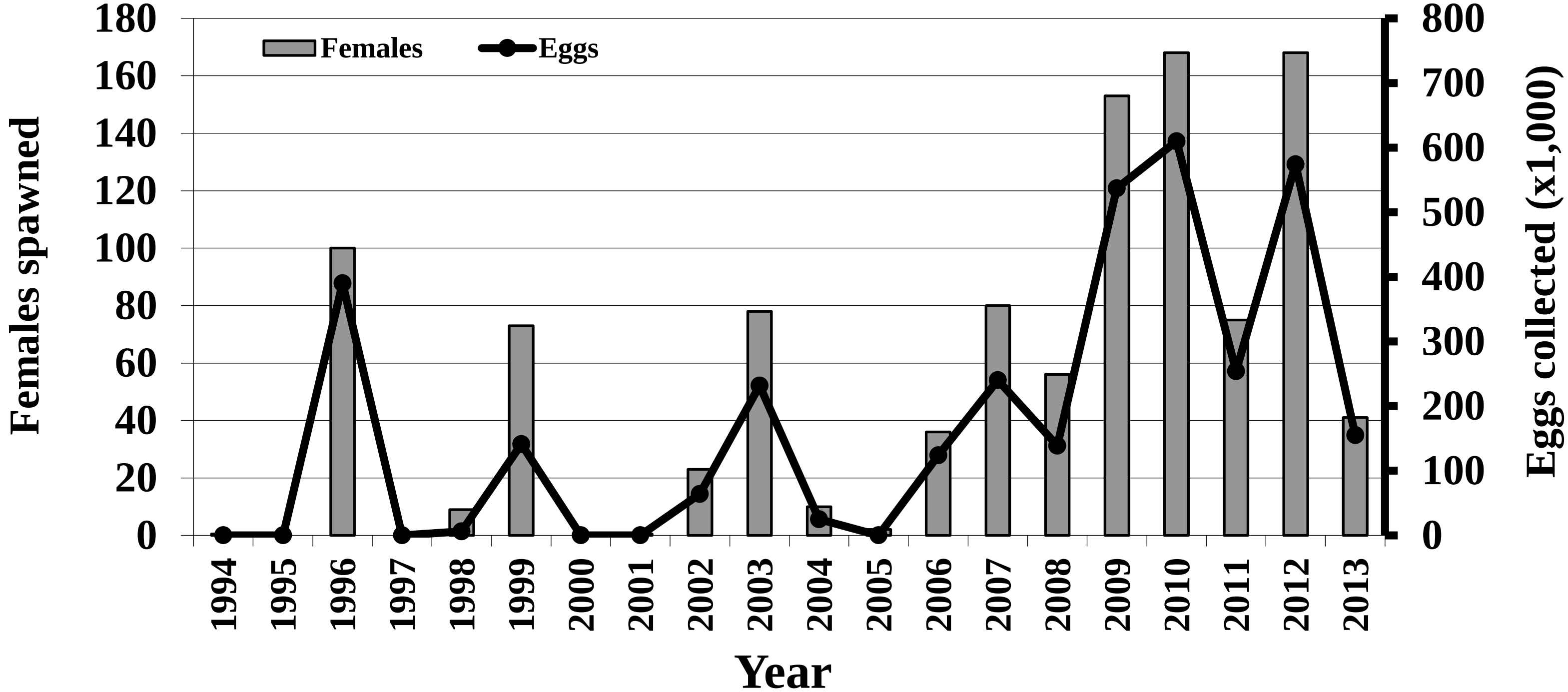


Figure 20. Annual comparison of female chinook salmon spawned and eggs collected from Fort Peck Reservoir, 1994-2013.

Table 11. Age composition, length and weight of 352 chinook salmon collected by electrofishing, fall 2012.

Age	Sex	Brood year	Number	Mean length (in)	Range	Mean weight (lb)	Range
1	Male	2011	0	--	--	--	--
	Female		0	--	--	--	--
2	Male	2010	55	21.3	17.6-24.9	4.3	2.0-6.6
	Female		0	--	--	--	--
3	Male	2009	96	30.9	26.1-35.1	13.0	7.8-19.5
	Female		75	29.5	24.8-32.9	12.4	6.3-18.8
4	Male	2008	17	34.1	30.1-37.7	17.5	14.1-21.7
	Female		105	33.0	28.9-36.9	17.2	11.9-26.7
5	Male	2007	1	29.4	--	13.0	--
	Female		3	35.9	34.8-36.8	20.8	18.8-22.0

Table 12. Age composition, length and weight of 183 chinook salmon collected by electrofishing, fall 2013.

Age	Sex	Brood year	Number	Mean length (in)	Range	Mean weight (lb)	Range
1	Male	2012	0	--	--	--	--
	Female		0	--	--	--	--
2	Male	2011	14	21.1	16.8-24.5	4.4	2.0-6.8
	Female		1	23.2	--	6.5	--
3	Male	2010	115	25.8	18.9-34.4	8.4	3.2-19.2
	Female		14	30.8	24.6-35.6	14.3	7.3-20.7
4	Male	2009	4	35.3	34.1-37.1	18.3	15.1-21.7
	Female		34	33.4	27.8-39.5	17.5	9.1-29.5
5	Male	2008	0	--	--	--	--
	Female		1	36.5	--	21.7	--

Cisco Vertical Gill Netting

Young-of-year cisco

Relative abundance of young-of-year cisco increased dramatically to 191 per net-night in 2013; up from less than one per net-night in 2012. This was well above the long term average of 76 per net-night from 1986 to 2013. Young-of-year cisco relative abundance on Fort Peck Reservoir has fluctuated over the years and similar trends have been observed in other reservoirs where cisco populations occur (Dave Yerk, personal communication; Table13). A total of 2,302 young-of-year cisco were captured in 2013.

Late ice cover appears to correlate with decreases in young-of-year cisco relative abundance on Fort Peck Reservoir. Duration of ice cover has been shown to reduce the wind and wave action, which decreases sedimentation over incubating eggs, and ultimately reduces mortality (Freeberg et al. 1990; Rook et al. 2013). For example, in 1987 and 1992 the reservoir did not freeze over and resulted in very few young-of-year cisco captured. In contrast, ice cover occurred on December 13^{th}, 1985 and December 21^{st}, 2000 resulting in two of the largest year classes ever produced. Ice cover occurred on January 13^{th}, 2013 but opened late on April 28^{th}, 2013 resulting in the fifth largest year class on record.

Decreases in reservoir elevation could also explain the significant reduction in young-of-year cisco on Fort Peck Reservoir. Decreases in reservoir elevation, which dewater incubating eggs, have been shown to reduce to young-of-year cisco abundance in other reservoir systems (Gaboury and Patalas 1984; Zollweg and Leathe 2006). For example, large decreases in reservoir elevation during 1989, 1996, 2003, and 2007 resulted in low relative abundance of young-of-year cisco (Figure 21). Although the decline in reservoir elevation in 2013 was greater than normal, it’s likely that lingering ice cover also influenced young-of-year cisco production. It should be noted when water levels were increasing over winter of 1993-1994 and again in 2008-2009, two of the best year classes of cisco were produced.

Table 13. Mean CPUE (No./net-night) of young-of-year cisco collected in vertical gill nets and netting location on Fort Peck Reservoir during September-October 2002-2013.

	Young-of-year cisco CPUE									
Location	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Lower Big Dry										
Bear Creek West	18	0	37	26	44	155	12	24	0	104
Spring Creek	13	16	--	--	--	--	--	--	--	--
Bobcat	2	3	100	13	16	221	11	11	0	11
Lower Missouri Arm										
Duck Creek	31	321	139	102	263	185	53	36	2	243
Fifth Coulee	--	--	200	42	281	201	152	51	0	179
Marina	2	26	256	5	17	7	39	31	0	3
Milk Coulee	--	121	--	117	174	366	60	77	0	201
Sage Creek	1	82	201	13	33	188	44	67	0	101
Shaft Houses	86	--	70	--	--	--	--	--	--	--
Bear Creek	213	261	58	58	225	897	120	249	2	451
Middle Missouri Arm										
Cattle/Crooked Creek	2	77	67	5	107	--	96	879	1	190
Pines Bay	14	55	225	12	76	239	122	102	1	591
Gilbert Creek	9	22	270	51	20	285	21	119	2	126
7th Point	8	32	--	--	--	--	--	--	--	--
8th Point	8	82	27	8	108	--	107	81	0	96
Mean CPUE	31	84	137	37	113	274	70	144	<1.0	191

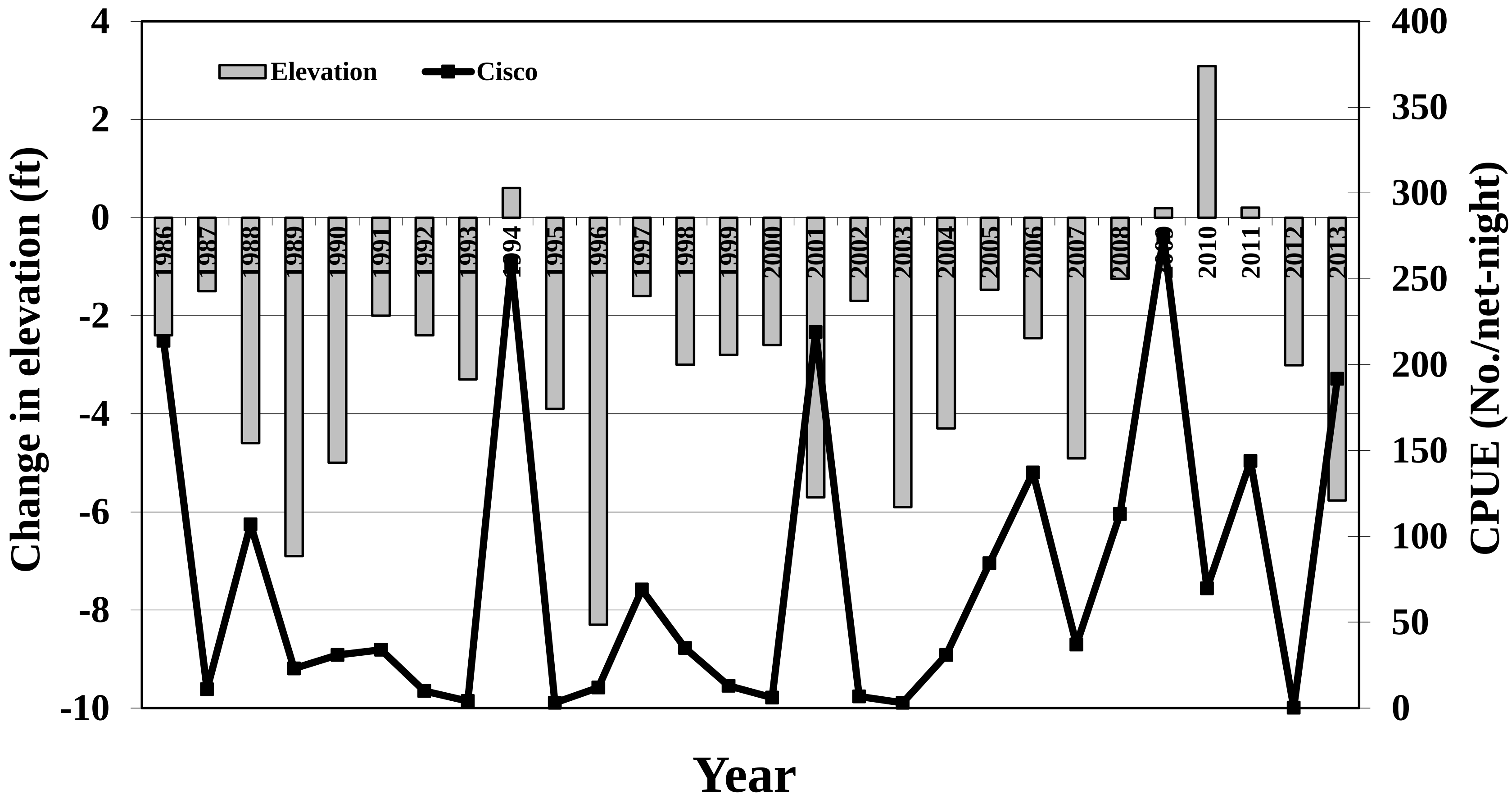


Figure 21. Change in reservoir elevation from December high to March low in contrast to mean CPUE (No./net-night) of young-of-year cisco collected in vertical gill nets on Fort Peck Reservoir, 1986-2013.

RECOMMENDATIONS

- Spring trapping of walleye and northern pike will continue to provide an egg source for sustaining Fort Peck Reservoir and sport fisheries in and out of state.

- Provide walleye eggs to Fort Peck Hatchery staff to develop methods to produce sterile walleye.

- Routine sampling with modified fyke nets, experimental gill nets, vertical gill nets and beach seines will continue to obtain information on game and forage fish distribution, abundance, production and condition.

- Evaluate native species (sauger, channel catfish, and burbot) more closely by continuing to collect additional length, weight, and age information during routine sampling.

- Reservoir water levels will be monitored to determine impacts to the overall fishery. Information will be utilized to make recommendations to Corps of Engineers for Annual Operating Plan in conjunction with the Missouri River Natural Resource Committee.

- Continue to secure funding for a lake wide creel survey every three years with the next creel survey scheduled for 2014.

- Continue working with South Dakota and North Dakota to develop a stronger tri-state chinook salmon fishery. This may require traveling out of-state to help collect and spawn salmon to receive additional eggs or collection of eggs from Fort Peck to support North and South Dakota needs.

- An evaluation of stocking strategies indicates the size of salmon released is more important than the timing of release. Efforts should be made to increase the numbers of total pounds stocked as opposed to total numbers of fish. In 2014, plans are in place to produce larger spring stocked fingerlings (21/lb.).

- Continue efforts to spawn Fort Peck salmon when numbers of adults permit. Adults should be captured with the aid of an electrofishing boat due to time and manpower constraints.

- Investigate using fisheries computer models to evaluate angler exploitation of the lake trout population. Continue to evaluate the use of spring and fall gill netting surveys to determine relative abundance and population dynamics of lake trout.

- Continue annual public informational meetings and press releases to disseminate information from the previous year’s work and to discuss stocking goals and work plans for the coming year.

- Continue transferring or entering historical data to create a full database of all documented work with Fort Peck’s fishery while ensuring data is proofed and error checked.

- Continue limnological sampling program for Fort Peck Reservoir and collect water samples for “baseline” information to use in conjunction with walleye otolith microchemistry.

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Prepared by: Heath Headley
Date: May 1st , 2014

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*
Brassy minnow	*Hybognathus hankinsoni*
Brook stickleback	*Culaea inconstans*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Channel catfish	*Ictalurus punctatus*
Chinook salmon	*Oncorhynchus tshawytscha*
Cisco	*Coregonus artedii*
Common carp	*Cyprinus carpio*
Creek chub	*Semotilus atromaculatus*
Emerald shiner	*Notropis atherionoides*
Fathead minnow	*Pimephales promelas*
Flathead chub	*Hybopsis gracilis*
Freshwater drum	*Aplodinotous grunniens*
Goldeye	*Hiodon alosoides*
Green sunfish	*Lepomis cyanellus*
Lake chub	*Couesius plumbeus*
Lake trout	*Salvelinus namaycush*
Largemouth bass	*Micropterus salmoides*
Northern pike	*Esox lucious*
Paddlefish	*Polyodon spathula*
Pallid sturgeon	*Scaphirhynchus albus*
Plains minnow	*Hybognathus placitus*
Rainbow trout	*Oncorhynchus mykiss*
River carpsucker	*Carpoides carpio*
Sauger	*Sander canadense*
Shorthead redhorse	*Moxostoma macrolepidotum*
Shovelnose sturgeon	*Scaphiryhynchus platorynchus*
Silvery minnow	*Hybognathus argyritis*
Smallmouth bass	*Micropterus dolemieu*
Smallmouth buffalo	*Ictiobus bubalus*
Spottail shiner	*Notropis hudsonius*
Walleye	*Sander vitreum*
White crappie	*Pomoxis annularis*
White sucker	*Catostomus commersoni*
Yellow perch	*Perca flavescens*

Appendix 2. Number of walleye stocked in Fort Peck Reservoir during 2013 by date, region, location, and size.

Date	Location	Region[1]	Fry	Fingerling	Advanced	Hatchery
5/16/2013	McGuire Creek	UBD	2,000,000			Miles City
5/17/2013	Little Bug	UBD	2,500,000			Fort Peck
5/22/2013	Nelson Creek	UBD	1,433,332			Fort Peck
6/18/2013	Nelson Creek	UBD		72,668		Miles City
6/18/2013	Nelson Creek	UBD		193,146		Miles City
6/14/2013	Rock Creek	LBD		232,914		Miles City
7/12/2013	Bobcat	LBD		22,052		Fort Peck
5/24/2013	Duck Creek	LMA	208,333			Fort Peck
6/26/2013	South Fork Duck Creek	LMA		90,856		Fort Peck
6/27/2013	Main Duck - Pre Gondola	LMA		84,105		Fort Peck
6/27/2013	Marina	LMA		10,977		Fort Peck
6/28/2013	North Fork Duck Creek	LMA		92,544		Fort Peck
7/1/2013	Youth Camp	LMA		19,149		Fort Peck
7/1/2013	Third Coulee	LMA		44,952		Fort Peck
7/1/2013	Sage Creek	LMA		41,413		Fort Peck
7/3/2013	Bay south of Sage Creek	LMA		39,412		Fort Peck
7/3/2013	Sturgeon Bay	LMA		19,124		Fort Peck
7/3/2013	Catfish Bay	LMA		19,124		Fort Peck
7/8/2013	Marina	LMA		12,490		Fort Peck
7/9/2013	Bear Creek	LMA		72,483		Fort Peck
7/9/2013	Marina	LMA		5,820		Fort Peck
7/11/2013	Skunk Coulee	LMA		29,033		Fort Peck
7/11/2013	Cut Coulee	LMA		29,033		Fort Peck
7/11/2013	Haxby	LMA		29,034		Fort Peck
7/11/2013	Flat Lake	LMA		7,584		Fort Peck
7/12/2013	Skunk Coulee	LMA		17,361		Fort Peck
7/12/2013	Spring Draw	LMA		22,052		Fort Peck
7/12/2013	Flat Lake	LMA		24,517		Fort Peck
7/15/2013	Flat Lake	LMA		30,580		Fort Peck
8/8/2013	Marina	LMA			4,931	Fort Peck
5/13/2013	Hell Creek	MMA	3,400,000			Miles City
6/10/2013	Hell Creek	MMA		182,544		Miles City
6/12/2013	Hell Creek	MMA		359,504		Miles City
6/20/2013	Sutherland	MMA		159,647		Miles City
6/20/2013	Duck Coulee	MMA		159,647		Miles City
6/21/2013	Upper 8th Coulee	MMA		113,249		Miles City
6/21/2013	Cattle/Crooked Creek	MMA		113,249		Miles City
6/24/2013	Hell Creek	MMA		36,672		Miles City
6/28/2013	7th Coulee	MMA		25,000		Fort Peck
7/2/2013	Upper 8th Coulee	MMA		1,797		Fort Peck
7/2/2013	Middle 8th Coulee	MMA		41,537		Fort Peck
7/3/2013	Gilbert Creek Bay	MMA		53,649		Fort Peck
7/8/2013	Lower 8th Coulee	MMA		62,124		Fort Peck
7/8/2013	7th Coulee	MMA		19,480		Fort Peck
7/10/2013	Sheep Creek Bay	MMA		25,049		Fort Peck
7/10/2013	Gilbert Creek Bay	MMA		25,049		Fort Peck
7/15/2013	Pines	MMA		119,828		Fort Peck
Total			9,541,665	2,760,448	4,931	

[1]Upper Big Dry (UBD), Lower Big Dry (LBD), Lower Missouri Arm (LMA), Middle Missouri Arm (MMA).

Appendix 3. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month at Bug Creek site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)		Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May							**June**			
0	12.5	9.99	8.5	NA	0.4837		0	15.9	9.46	8.78	3.6	0.4941
10	12.5	9.96	8.6	NA	0.4844		10	15.9	9.44	8.81	3.6	0.4945
20	12.4	10	8.56	NA	0.4837		20	15.3	9.51	8.82	3.7	0.4931
30	12.3	10.05	8.56	NA	0.4829		30	12.6	9.86	8.79	3.2	0.4854
40	11.7	10.2	8.63	NA	0.4814		40	10.9	10.05	8.77	3.7	0.481
50	10.8	10.1	8.53	NA	0.4791		50	10.8	10.04	8.77	4.2	0.4822
		July							**August**			
0	20.7	8.21	9.02	6.2	0.4947		0	22.7	8.29	9.28		0.5025
10	20.7	8.12	9.05	6.5	0.4945		10	22.6	8.46	9.29		0.5016
20	20.3	8.06	9.04	5.4	0.493		20	21.4	8.62	9.3	2.8	0.4949
30	16.9	7.57	8.92	5.7	0.4899		30	19.7	8.32	9.24	3.1	0.4808
40	13.1	7.62	8.76	6.5	0.4843		40	18.7	7.71	9.13	4.4	0.4852
50	12.9	7.64	8.74	6.6	0.4843		50	16.1	6.51	8.91	5.7	0.4884
		September										
0	20.5	7.39	8.49	1.6	0.4913							
10	20.3	7.36	8.54	1.4	0.4914							
20	20.1	7.38	8.55	1.6	0.4895							
30	18.1	6.59	8.38	1.8	0.4807							
40	14.7	4.98	8.08	4.7	0.4744							
50	12.9	5.09	8.04	4.6	0.4725							

Appendix 3 continued. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month at Spring Creek site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)	Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May						**June**			
0	11.0	10.9	8.56	NA	0.4697	0	14.1	10.16	8.78	2.5	0.4816
10	11.0	10.8	8.54	NA	0.4702	10	14.2	10.15	8.81	28	0.4821
20	10.8	10.94	8.62	NA	0.4704	20	13.9	10.14	8.84	2.8	0.4819
30	10.6	10.93	8.65	NA	0.4717	30	13.9	10.12	8.86	2.9	0.481
40	9.9	11.03	8.65	NA	0.4749	40	13.6	10.13	8.87	3.4	0.4798
50	9.4	11.08	8.65	NA	0.4767	50	13.0	10.11	8.86	5.3	0.4802
60	9.1	11.08	8.64	NA	0.4776	60	10.7	10.04	8.79	4.5	0.4799
70	8.4	11.07	8.63	NA	0.4771	70	10.6	10.06	8.79	4.8	0.4796
80	8.2	11.16	8.63	NA	0.4781	80	9.4	9.98	8.76	3.4	0.4796
		July						**August**			
0	19.3	8.28	8.99	2.4	0.4722	0	21.8	8.69	9.28	1.4	0.4805
10	19.3	8.23	9	2.8	0.4721	10	21.1	8.74	9.29	1.5	0.4786
20	19.1	8.23	9.02	3.1	0.472	20	20.7	8.82	9.3	1.7	0.4788
30	18.4	8.17	9	4.6	0.4717	30	20.7	8.74	9.29	2	0.4777
40	15.5	7.87	8.86	3.8	0.4797	40	19.8	7.92	9.2	4.5	0.4775
50	12.4	8.06	8.78	3.9	0.481	50	17.8	7.28	9.09	5.8	0.4806
60	12.0	8.06	8.77	3.6	0.4813	60	15.4	9.96	8.96	4.8	0.4798
70	11.7	8.14	8.76	3.9	0.4809	70	14.7	6.84	8.91	4.2	0.4826
80	11.3	8.19	8.75	4.3	0.4811	80	13.8	6.81	8.86	5.6	0.4824
90	10.9	8.23	8.74	4.6	0.4812						
		September									
0	20.8	7.46	8.57	1.2	0.4671						
10	20.7	7.48	8.6	1.3	0.4666						
20	20.3	7.47	8.6	1.5	0.4669						
30	19.5	6.78	8.51	2.1	0.4719						
40	18.8	6.43	8.44	2	0.4731						
50	18.1	6.32	8.4	2	0.4721						
60	17.6	6.19	8.37	2.2	0.4719						
70	16.1	5.7	8.26	4.3	0.4713						
80	14.6	5.35	8.16	5	0.4714						

Appendix 3 continued. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month at Haxby site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)		Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May							**June**			
0	8.9	11.6	8.5	NA	0.4724		0	12.8	10.2	8.8	2.9	0.457
10	8.9	11.6	8.6	NA	0.4727		10	12.7	10.2	8.8	3	0.4566
20	8.6	11.6	8.6	NA	0.4739		20	12.6	10.2	8.9	3.2	0.4551
30	8.3	11.6	8.7	NA	0.4739		30	12.5	10.1	8.9	3.6	0.4547
40	7.1	11.6	8.6	NA	0.475		40	12.5	10.1	8.9	3.7	0.4555
50	6.6	11.6	8.6	NA	0.4754		50	11.7	10.3	8.9	3.4	0.4708
60	6.3	11.6	8.6	NA	0.4738		60	10.5	10.3	8.9	2.8	0.4753
70	6.2	11.6	8.6	NA	0.4741		70	9.8	10.4	8.8	2.1	0.4753
80	5.8	11.7	8.6	NA	0.4758		80	9.2	10.4	8.8	2.5	0.4765
90	5.6	11.7	8.6	NA	0.4762		90	8.7	10.4	8.8	2.1	0.4738
100	5.4	11.7	8.6	NA	0.4767		100	7.6	10.5	8.8	1.9	0.4762
110	5.1	11.7	8.6	NA	0.4777		110	7.4	10.6	8.8	1.7	0.4759
120	4.7	11.5	8.6	NA	0.4789		120	7.2	10.5	8.8	1.8	0.4762
130	4.7	11.5	8.6	NA	0.479		130	6.9	10.5	8.7	1.8	0.4766
		July							**August**			
0	20.7	8.4	9.1	3.1	0.4689		0	22.6	8.6	9.3	2.3	0.466
10	20.7	8.4	9.1	3.1	0.469		10	20.9	8.7	9.3	2.5	0.4665
20	20.6	8.4	9.1	3.7	0.469		20	20.6	8.7	9.3	2.6	0.4663
30	20.5	8.4	9.1	3.9	0.4689		30	20.4	8.5	9.3	2.6	0.4659
40	14.4	7.7	8.8	3.3	0.4656		40	20.2	8.2	9.3	3.0	0.466
50	12.8	8.1	8.8	2.8	0.4677		50	19.8	8.1	9.2	3.0	0.4679
60	11.9	8.4	8.8	3.0	0.468		60	17.4	6.8	9.0	3.6	0.4681
70	11.2	8.6	8.8	3.0	0.4702		70	14.6	6.6	8.9	3.5	0.4713
80	10.9	8.7	8.8	3.0	0.4711		80	13.5	6.9	8.8	3.5	0.4734
90	10.1	9.0	8.8	2.7	0.4701		90	11.7	7.5	8.8	3.7	0.4758
100	9.2	9.0	8.8	2.7	0.4698		100	10.9	7.6	8.8	3.8	0.4741
110	9.1	9.0	8.8	2.8	0.4694		110	9.3	7.6	8.3	3.7	0.4774
120	8.9	9.1	8.8	2.7	0.4704		120	9.2	7.6	8.8	3.7	0.4772
130	8.9	9.1	8.8	2.8	0.4717		130	9.1	7.5	8.7	3.5	0.4774
		September										
0	19.9	7.5	8.6	1.2	0.465							
10	19.9	7.4	8.6	1.4	0.4651							
20	19.9	7.4	8.7	1.4	0.4654							
30	19.8	7.3	8.7	1.6	0.4644							
40	19.8	7.2	8.7	1.9	0.4653							
50	19.8	7.2	8.7	2.0	0.4649							
60	19.8	7.2	8.7	2.2	0.4649							
70	19.7	7.2	8.7	2.3	0.4646							
80	15.3	5.3	8.3	2.1	0.4655							
90	12.3	5.5	8.2	2.0	0.4646							
100	11.4	5.5	8.1	2.2	0.463							
110	10.1	5.6	8.1	2.0	0.4644							
120	9.8	5.6	8.1	1.9	0.4669							
130	9.7	5.5	8.1	1.8	0.467							

Appendix 3 continued. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month at Pines site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)	Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May						**June**			
0	11.9	11.31	8.55	NA	0.4418	0	14.3	10.2	8.68	4.1	0.4323
10	11.1	11.49	8.62	NA	0.4407	10	14.3	10.2	8.73	4.4	0.4339
20	9.9	11.76	8.92	NA	0.4385	20	13.4	10.13	8.77	4.7	0.4337
30	9.6	11.68	8.71	NA	0.4373	30	13.2	9.96	8.78	5.2	0.4336
40	9.1	11.66	8.7	NA	0.439	40	12.7	9.85	8.75	4.8	0.4323
50	7.1	11.72	8.66	NA	0.4587	50	11.7	9.86	8.72	4.7	0.4419
60	6.4	11.6	8.69	NA	0.461	60	10.1	9.93	8.68	3.9	0.4532
70	6.3	11.53	8.65	NA	0.4617	70	9.3	10.06	8.64	3.5	0.4559
80	5.9	11.46	8.63	NA	0.4641	80	8.5	10.2	8.66	3.1	0.4611
90	5.4	11.4	8.63	NA	0.468	90	7.9	10.29	8.65	2.9	0.4642
100						100	7.9	10.29	8.64	2.8	0.4632
		July						**August**			
0	22.2	8.39	9.02	1.6	0.4464	0	22.4	8.64	9.3	1.4	0.4667
10	21.8	8.49	9.04	1.8	0.445	10	22.1	8.75	9.32	1.7	0.4659
20	21.6	8.52	9.04	20	0.4453	20	21.5	8.59	9.31	2.3	0.4654
30	21.4	8.43	9.01	2.3	0.4456	30	21.1	8.1	9.27	2.2	0.4652
40	18.4	7.74	8.81	3.3	0.4514	40	20.5	6.94	9.14	2.8	0.4879
50	15.3	7.65	8.68	3.2	0.4578	50	18.2	5.57	8.88	3.1	0.4912
60	12.1	8.15	8.65	2.8	0.4556	60	13.9	6.1	8.77	2.9	0.4626
70	10.9	8.53	8.64	2.7	0.4609	70	11.9	6.79	8.76	3.1	0.4619
80	9.8	8.74	8.61	2.6	0.4646	80	10.8	7.16	8.75	3	0.4625
90	9.3	8.8	8.59	2.7	0.4666	90	10.4	7.55	8.78	2.4	0.4632
100	8.6	8.95	8.58	2.6	0.4716	100	9.9	7.26	8.72	2.8	0.4654
		September									
0	21.3	7.45	8.55	1.3	0.469						
10	21.3	7.47	8.55	1.4	0.4691						
20	21.3	7.45	8.56	1.4	0.4697						
30	21.1	7.44	8.57	1.1	0.4711						
40	21.0	7.29	8.55	1.4	0.4714						
50	20.8	7.07	8.52	1.4	0.4704						
60	19.6	5.98	8.35	1.1	0.4697						
70	16.7	4.93	8.09	1.1	0.4653						
80	15.4	4.87	8.02	1.6	0.464						
90	14.2	4.99	7.98	1.3	0.4624						
100	13.1	4.83	7.9	2.8	0.4592						

Appendix 3 continued. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month at Hell Creek site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)		Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May							**June**			
0	13.2	11.1	8.66	NA	0.3756		0	15.9	9.91	8.73	7.7	0.3816
10	13.1	11.1	8.74	NA	0.3748		10	15.8	9.84	8.73	7.9	0.3829
20	12.2	11.3	8.76	NA	0.3766		20	14.4	9.44	8.67	7.1	0.38
30	11.4	11.48	8.74	NA	0.3796		30	15.1	9.32	8.66	6.8	0.3797
40	9.8	10.85	8.58	NA	0.3752		40	13.0	9.23	8.63	6.7	0.3806
50	7.1	11.1	8.56	NA	0.4014		50	11.5	9.28	8.62	5.5	0.391
60	6.3	11.28	8.57	NA	0.4287		60	10.8	9.37	8.63	5	0.4007
70	5.9	11.32	8.55	NA	0.4358		70	9.8	9.45	8.95	4.5	0.4048
							80	8.9	9.49	8.56	4.5	0.4095
							90	8.8	9.52	8.56	4.4	0.4021
		July							**August**			
0	22.7	8.16	8.99	6.1	0.4808		0	22.9	8.32	9.21		0.4909
10	22.6	8.18	9	6.6	0.4806		10	21.4	8.19	9.2	5.5	0.506
20	22.3	8.19	9	6.9	0.4765		20	21.4	7.76	9.16	5.8	0.5143
30	22.1	8.15	9	7	0.4753		30	21.3	7.8	9.17	5.8	0.5115
40	19.2	7.11	8.75	8.6	0.4658		40	21.3	7.54	9.13	6.3	0.5221
50	13.8	7.2	8.57	8.4	0.4382		50	21.3	7.1	9.08	7.3	0.5373
60	13.1	7.27	8.54	8.4	0.4362		60	21.0	6.95	9.08	7.7	0.5229
70	11.9	7.54	8.54	8.8	0.4345		70	12.4	5.48	8.58	10.4	0.4654
80	11.7	7.74	8.56	9.4	0.436		80	11.3	5.74	8.56	10.4	0.4563
90	10.4	8.02	8.54	10	0.4418		90	10.3	5.73	8.54	22	0.4548
		September										
0	22.1	7.66	8.6	1.5	0.5058							
10	22.0	7.64	8.62	1.6	0.5054							
20	21.6	7.44	8.6	2	0.5055							
30	22.1	7.1	8.58	2.1	0.5089							
40	21.4	6.92	8.55	2.3	0.5127							
50	21.3	6.76	8.54	2.6	0.5133							
60	18.9	4.15	8.02	6.4	0.5053							
70	13.9	3.41	7.76	5.5	0.4691							
80	12.2	3.43	7.71	7.3	0.4573							
90	11.3	3.49	7.69	12.6	0.4529							

Appendix 3 continued. Temperature (°C), dissolved oxygen (mg/L), pH (standard units), turbidity (NTU), and total dissolved solids (g/L), profiles by month atTimber Creek site, Fort Peck Reservoir, 2013.

Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)		Depth (feet)	Temperature (C)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)	TDS (g/L)
		May							**June**			
0	15.6	9.84	8.57	NA	0.367		0	16.8	9.49	8.63	12.9	0.4643
10	11.8	9.67	8.4	NA	0.367		10	16.8	8.67	8.67	13.7	0.464
20	9.5	9.85	8.35	NA	0.367		20	16.6	8.85	8.62	15.3	0.4849
30	8.1	10.15	8.3	NA	0.367		30	15.8	8.34	8.56	17.1	0.4796
40	7.9	10.24	8.34	NA	0.3676		40	14.5	7.72	8.46	19.8	0.4613
50	7.6	10.26	8.33	NA	0.3686		50	13.9	7.4	8.4	23.6	0.4664
		July							**August**			
0	22.8	7.29	8.86	30.7	0.6468		0	23.6	8.4	9.19	5.4	0.5664
10	22.6	7.29	8.87	40.3	0.6471		10	23.4	8.45	9.17	5	0.5783
20	22.4	7.13	8.85	40.2	0.6455		20	22.7	8.27	9.17	5.4	0.5723
30	22.3	7.01	8.82	36	0.6425		30	22.6	7.66	9.08	7.1	0.6027
40	21.3	6.44	8.62	20.6	0.633		40	22.2	7.28	9.02	8.7	0.6063
50	14.9	5.06	8.31	13.5	0.5369		50	22.1	6.94	8.96	11.6	0.6151
		September										
0	22.4	7.29	8.46	3.6	0.5553							
10	22.3	7.27	8.49	4	0.5548							
20	22.1	7.24	8.51	3.7	0.5557							
30	22.0	7.12	8.5	4.8	0.5558							
40	21.8	6.88	8.45	5.1	0.5528							
50	21.7	6.73	8.44	4	0.5534							

Appendix 4. Gill netting dates by region, water surface temperature range (°F), and reservoir elevation (MSL) during standard experimental gill net surveys on Fort Peck Reservoir. Mean water surface temperatures are given in parentheses.

	Region[1]					Water surface	Reservoir
Year	UBD	LBD	LMA	MMA	UMA	Temperature (°F)	Elevation (MSL)
1988	7/26 to 7/29	8/2 to 8/6	8/9 to 8/16	7/26 to 8/4	7/27 to 8/18	70 to 78 (74.5)	2229.7 to 2228.0
1989	7/25 to 7/26	7/27 to 8/1	8/2 to 8/4	8/4 to 8/11	8/15 to 8/16	70 to 78 (72.6)	2222.9 to 2221.6
1992	7/27 to 7/28	7/22 to 7/30	7/21 to 8/5	8/6 to 8/20	8/18 to 8/19	66 to 75 (69.3)	2212.9 to 2211.9
1993	7/27 to 8/3	8/10 to 8/20	8/25 to 8/27	8/10 to 8/20	8/5 to 8/6	64 to 72 (67.9)	2219.6 to 2224.7
1994	7/19 to 7/27	7/26 to 7/29	8/2 to 8/3	8/4 to 8/16	8/16 to 8/18	68 to 76 (72.6)	2238.1 to 2236.7
1995	7/18 to 7/21	7/25 to 7/28	8/8 to 8/24	8/1 to 8/15	8/15 to 8/17	68 to 76 (71.0)	2242.6 to 2244.1
1996	7/16 to 7/18	7/23 to 7/25	7/30 to 8/1	8/6 to 8/13	8/13 to 8/15	66 to 74 (69.4)	2246.5 to 2244.2
1998	7/17 to 7/28	7/15 to 7/21	7/14 to 7/30	8/5 to 8/11	8/11 to 8/13	NA	2239.7 to 2239.9
1999	7/13 to 7/20	7/15 to 7/22	7/23 to 7/28	7/29 to to 8/9	8/10 to 8/11	67 to 76 (71.6)	2238.0 to 2236.9
2000	7/26 to 9/8	7/19 to 7/27	7/11 to 7/14	8/8 to 8/11	8/23 to 8/24	NA	2232.6 to 2231.0
2001	7/31 to 8/2	8/7 to 8/16	8/16 to 8/17	8/21 to 8/28	7/23 to 8/28	NA	2222.5 to 2221.8
2002	7/17 to 9/6	7/18 to 9/6	7/23 to 8/1	7/25 to 9/4	8/6 to 8/14	68 to 81 (74.3)	2220.2 to 2219.3
2003	7/10 to 8/20	7/10 to 8/5	7/8 to 8/13	7/15 to 8/12	7/22 to 7/24	NA	2213.0 to 2211.6
2004	7/14 to 7/15	7/13 to 7/15	7/20 to 7/22	7/21 to 7/27	7/27 to 7/29	69 to 77 (73.6)	2203.2 to 2201.6
2005	7/19 to 7/21	7/21 to 7/27	7/28 to 8/2	8/2 to 8/17	8/16 to 8/17	68 to 78 (72.1)	2203.4 to 2202.7
2006	7/11 to 7/13	7/18 to 7/20	7/20 to 7/26	7/26 to 8/3	8/3 to 8/16	69 to 80 (74.3)	2205.6 to 2204.2
2007	7/17 to 7/24	7/24 to 7/27	7/27 to 8/1	8/1 to 8/7	8/14 to 8/15	70.3 to 84.9 (78.2)	2202.9 to 2201.6
2008	7/15 to 7/17	7/17 to 7/23	7/24 to 7/30	7/30 to 8/4	8/4 to 8/6	67.1 to 80.2 (74.3)	2209.9 to 2210.0
2009	7/16 to 7/21	7/21 to 7/23	7/24 to 7/28	7/29 to 8/3	8/3 to 8/5	66.7 to 76.3 (71.1)	2220.5 to 2220.4
2010	7/13 to 7/20	7/20 to 7/22	7/22 to 7/28	7/28 to 8/5	8/3 to 8/5	67.3 to 77.9 (73.3)	2235.2 to 2235.7
2011	7/26 to 7/28	7/28 to 7/29	8/2 to 8/3	8/3 to 8/5	8/9 to 8/11	70.5 to 79.8 (75.2)	2249.3 to 2244.7
2012	7/17 to 7/19	7/19 to 7/20	7/24 to 7/25	7/25 to 8/1	7/30 to 8/1	67.2 to 83.5 (75.5)	2236.6 to 2235.8
2013	7/23 to 7/25	7/25 to 8/1	8/1 to 8/7	8/8 to 8/9	8/13 to 8/15	63.5 to 77.9 (72.3)	2236.3 to 2234.9

[1]Upper Big Dry (UBD), Lower Big Dry (LBD), Lower Missouri Arm (LMA), Middle Missouri Arm (MMA), and upper Missouri Arm (UMA).

Appendix 5. Northern pike and channel catfish proportional stock density (PSD) relative stock density of preferred-length (RSD-P) fish and mean relative weight values (*Wr*), for 2002-2013, for fish collected in the standard July-August gill net survey, on Fort Peck Reservoir.

Northern pike				
Year	PSD	RSD-P	*Wr*	Sample size
2002	94	62	102.0	144
2003	98	55	101.1	126
2004	96	71	100.1	75
2005	93	59	100.3	86
2006	89	60	98.9	108
2007	75	41	101.0	147
2008	89	39	100.0	137
2009	73	39	93.1	176
2010	68	24	100.0	191
2011	69	18	100.5	293
2012	75	15	99.0	503
2013	75	24	93.1	324

Channel catfish				
Year	PSD	RSD-P	*Wr*	Sample size
2002	74	3	89.9	145
2003	71	5	89.4	129
2004	57	11	98.1	227
2005	35	6	91.3	297
2006	46	10	95.1	215
2007	38	4	85.3	278
2008	35	2	88.2	289
2009	57	5	91.6	314
2010	74	11	88.2	104
2011	72	8	90.5	241
2012	65	3	87.9	272
2013	64	4	85.7	240