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, 2012 THROUGH JUNE 30, 2013
REPORT PERIOD: MARCH 1, 2012 THROUGH FEBRUARY 29, 2013

ABSTRACT

Fort Peck Reservoir reached peak elevation on June 26th, 2012 at 2237.48 mean feet above sea level (MSL) from a minimum elevation on February 21st, 2012 at 2234.19 MSL, a spring rise of 3.29 feet. Spawning walleye and northern pike populations were sampled in the upper Big Dry Arm with modified fyke nets from March 27th to May 1st. Walleye and northern pike eggs were collected. The fertilized eggs were sent to Fort Peck and Miles City fish hatcheries. Trap netting captured 1,576 walleye for a catch rate of 2.2 per net night in 2012 which was down from the previous year of 2.8 per net night. Due to lower catch rates of walleye and unfavorable spawning conditions, only 48 million eggs were collected in 2012. A total of 17.8 million fry and 2.6 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 17th to August 1st. Walleye, northern pike, and yellow perch were the most abundant species captured overall, with catch rates of 6.8, 5.0, and 3.1 per net night, respectively. Gill net relative abundance of walleye in 2012 increased to 6.8 per net night which is above the long term average of 3.6 per-net for the period from 1984 to 2012. Gill-netted walleye averaged 15.1 inches and 1.4 pounds. In 2012, relative abundance of stock and quality size walleye increased while catch rates of all other length groups remained similar to previous years. Relative weights of walleye decreased for all length groups. Northern pike relative abundance increased in 2012 to 5.0 per net night which is above the long term average of 1.6 per net night for the period of 1984 to 2012. Average size of gill-netted northern pike in 2012 was 23.6 inches and 3.6 pounds. Overall, relative abundance of shoreline forage decreased to 174 per haul in 2012 but was still similar to the long term average of 169 per haul from 1984 to 2012. The most notable decrease in shoreline forage occurred for spottail shiners from 66 to 30 per seine haul. In June of 2012, 181,239 chinook salmon were stocked at Duck Creek, Bear Creek, and the Marina. Young-of-year cisco relative abundance fell to less than 1 per net night in 2012 which is below the long term average of 72 per net night for the period of 1986 to 2012.

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. Ninety-three volunteers assisted with the annual walleye and northern pike 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 and Pike Master's meetings in Billings, Glasgow, and Malta 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, 2012 at 2237.48 MSL from a minimum elevation on February 21st, 2012 at 2234 MSL, a spring rise of 3.29 feet (Figure 2). Since July, reservoir elevation has decreased to 2222.00 MSL as of March 1st 2013. Reservoir elevations are predicted to rise approximately 5 feet from March through June and fall beginning in August of 2013 based on the March 2013 basic forecast (USACE 2012).

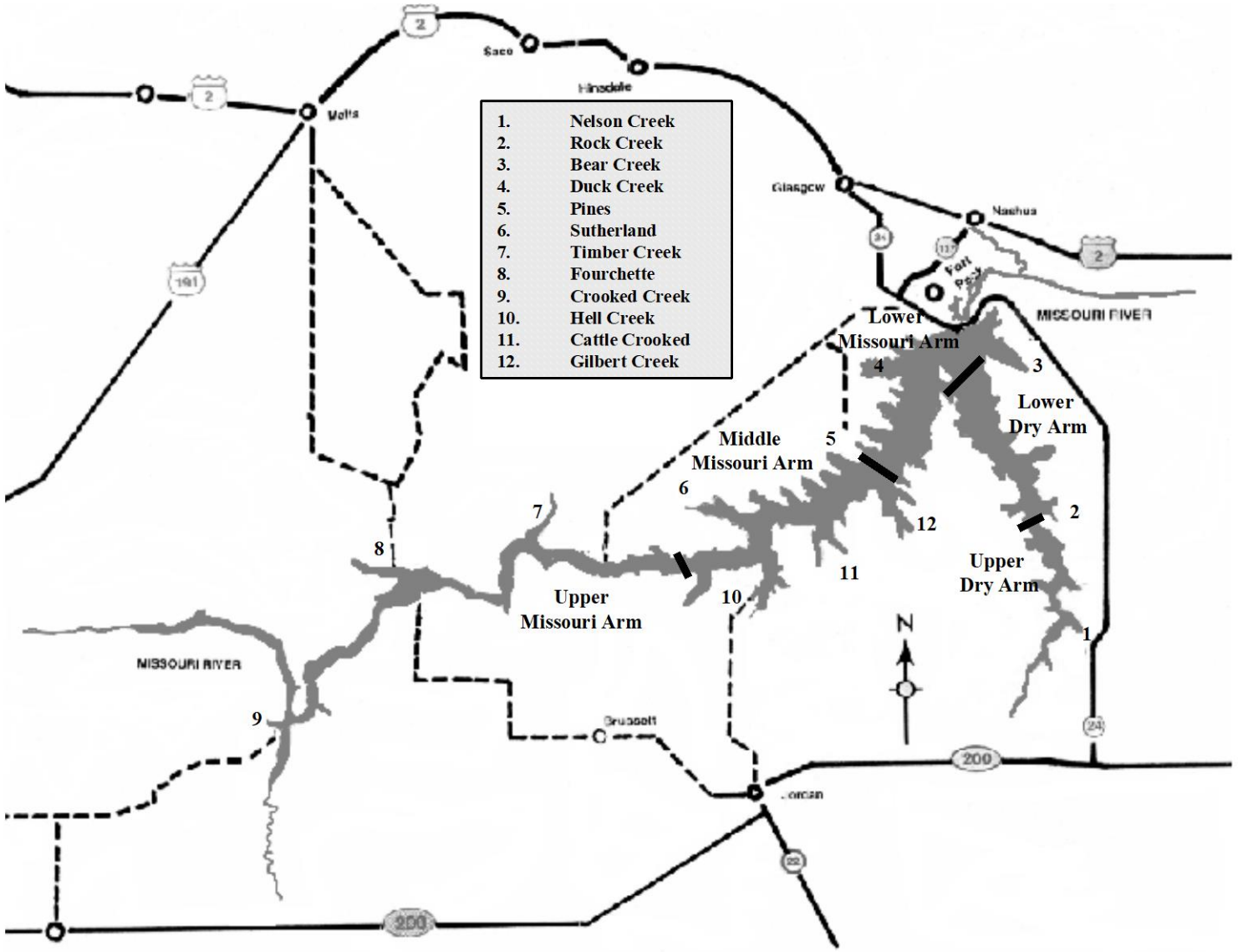


Figure 1. Fort Peck study area describing major sampling zones and select specific locations.

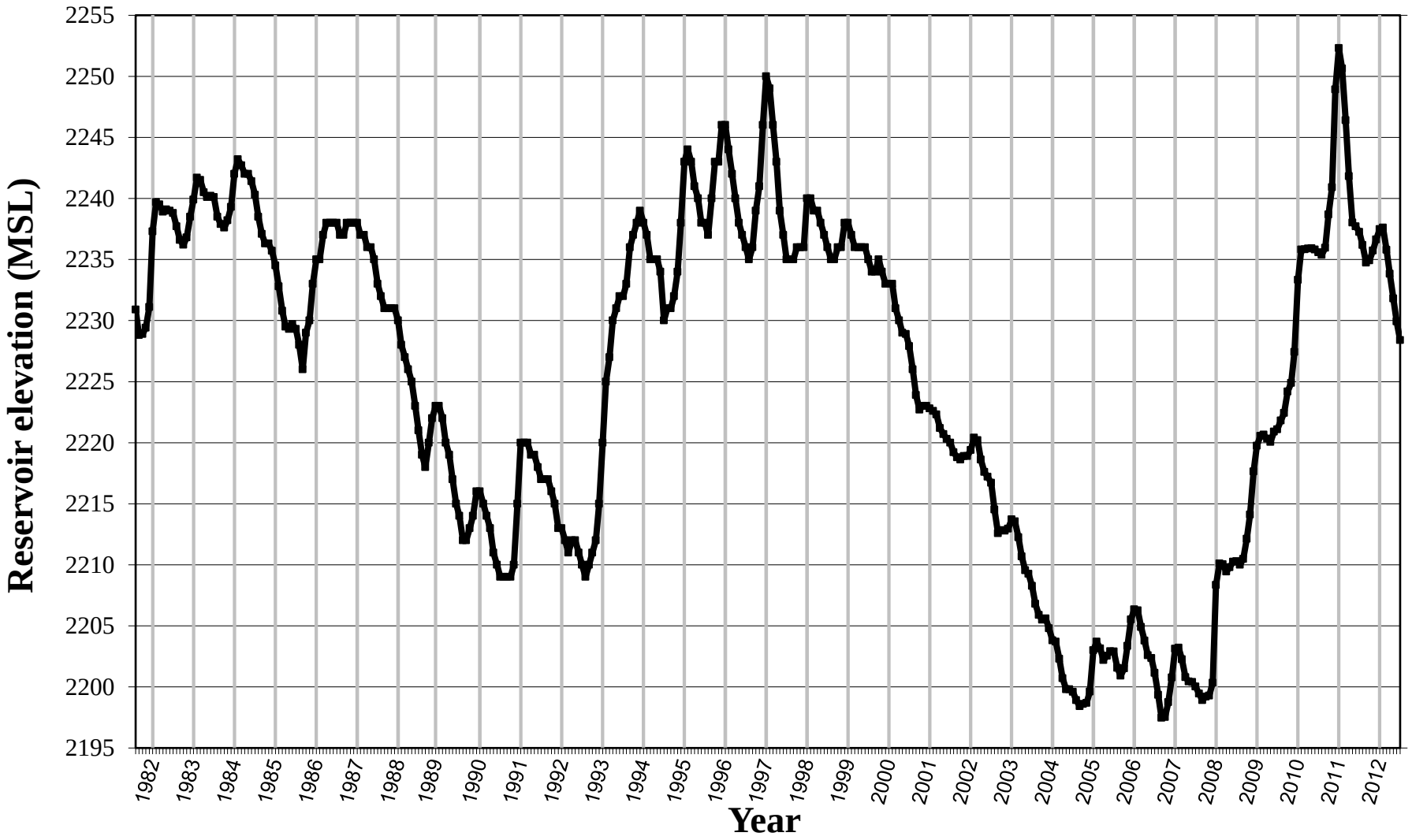


Figure 2. Peak monthly reservoir elevations on Fort Peck Reservoir from January 1982 to January 2012 (Data provided by the U.S. Army Corps of Engineers).

SAMPLING METHODS

Data Collection

- Spring sampling was conducted from March 27th to May 1st, 2012 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 the 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.
- 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 17th to August 1st, 2012 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.
- Beach seining was conducted from August 1st to September 10th, 2012 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 19th to September 27rd, 2012. 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 3rd to October 25th, 2012 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), lake trout (Piccolo et al. 1993), 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 March 27th to May 1st, 2012. Eighteen species were captured with walleye being the second most abundant with an average catch-rate of 2.2 fish per trap (Table 2). A total of 730-trap days were committed to walleye spawning efforts in 2012. This was the highest netting effort on record due to early ice-out and inability to meet the egg-take goal. 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 began approaching 50°F in early April, but declined to 45°F in mid April. Fluctuations and declines in water temperatures have been shown to prolong spawning or result in females retaining their eggs (Derback 1947).

Walleye were spawned and the fertilized eggs were sent to the Fort Peck and Miles City Fish Hatcheries. Northern pike were also spawned in 2012 and the fertilized eggs were sent to the Fort Peck Hatchery. A total of 2 million eggs were collected to meet the egg request. Because of the fluctuations and declines in water temperatures, fewer ripe female walleyes were collected. This resulted in only 48 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). 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 decreased from 2.8 per trap in 2011 to 2.2 per trap in 2012. This was well below the average of 7.6 per trap and the second lowest on record (1982-2012; Table 3). Lower relative abundance is attributed to fluctuations and declines in water temperatures. Average length and weight for spawning walleye was 19.7 inches and 3.9 pounds. Females averaged 25.0 inches and 7.2 pounds while males averaged 17.5 inches and 2.4 pounds (Table 2). In 2012, length frequency distributions showed greater numbers of fish less than 20 inches when compared to 2011 (Figure 3). Length frequency distribution indicated 55% of the walleye were less than 20 inches in 2012 compared to 29% in 2011.

Northern Pike

Relative abundance of northern pike decreased slightly from 2.3 per net in 2011 to 2.1 per net in 2012 (Table 3). The lower relative abundance in 2012 is attributed to early ice-out causing earlier 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 with fish averaging 25.0 inches and weighing 4.5 pounds. In larger part, this is due to smaller fish recruiting into the population. Females averaged 31.7 inches and 8.6 pounds, while males averaged 28.6 inches and 6.6 pounds (Table 2). In 2012, length frequency distributions showed greater numbers of fish less than 26 inches when compared to previous years (Figure 4).

Table 2. Mean catch per unit effort (CPUE;No./net-night), mean length (in), and mean weight (lb) of fish captured by trap nets in the upper Big Dry Arm of Fort Peck from March 27th to May 1st, 2012. *N* is total number collected and n is number subsampled for length and weight measurements.

Species	*N*	CPUE	Length	n	Weight	n
Bigmouth buffalo	42	0.1	--	--	--	--
Black bullhead	577	0.8	9.9	1	0.6	1
Black crappie	250	0.3	7.0	28	0.3	28
Channel catfish	142	0.2	19.4	22	3.8	22
Cisco	81	0.1	12.8	5	0.7	5
Common carp	590	0.8	15.5	26	2.3	26
Freshwater drum	1	<0.1	--	--	--	--
Goldeye	74	0.1	13.4	15	0.9	15
Longnose sucker	1	<0.1	--	--	--	--
Northern pike	1,499	2.1	25.0	353	4.5	353
Female	604	0.8	28.6	125	6.6	125
Male	587	0.8	25.4	154	4.2	154
Nonproductive	308	0.4	18.2	74	1.7	74
River carpsucker	571	0.8	21.7	9	5.6	9
Smallmouth buffalo	883	1.2	13.4	31	1.8	31
Sauger	6	<0.1	17.7	3	2.1	3
Shorthead redhorse	121	0.2	18.4	4	2.8	4
Smallmouth bass	8	<0.1	19.1	1	4.2	1
Walleye	1,576	2.2	19.7	398	3.9	398
Female	584	0.8	25.0	134	7.2	134
Male	848	1.2	17.5	218	2.4	218
Nonproductive	144	0.2	14.9	46	1.8	46
White sucker	151	0.2	15.7	9	2.0	9
Yellow perch	11,724	16.1	8.0	12	0.3	12

Table 3. 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, 1982-2012. *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	l.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

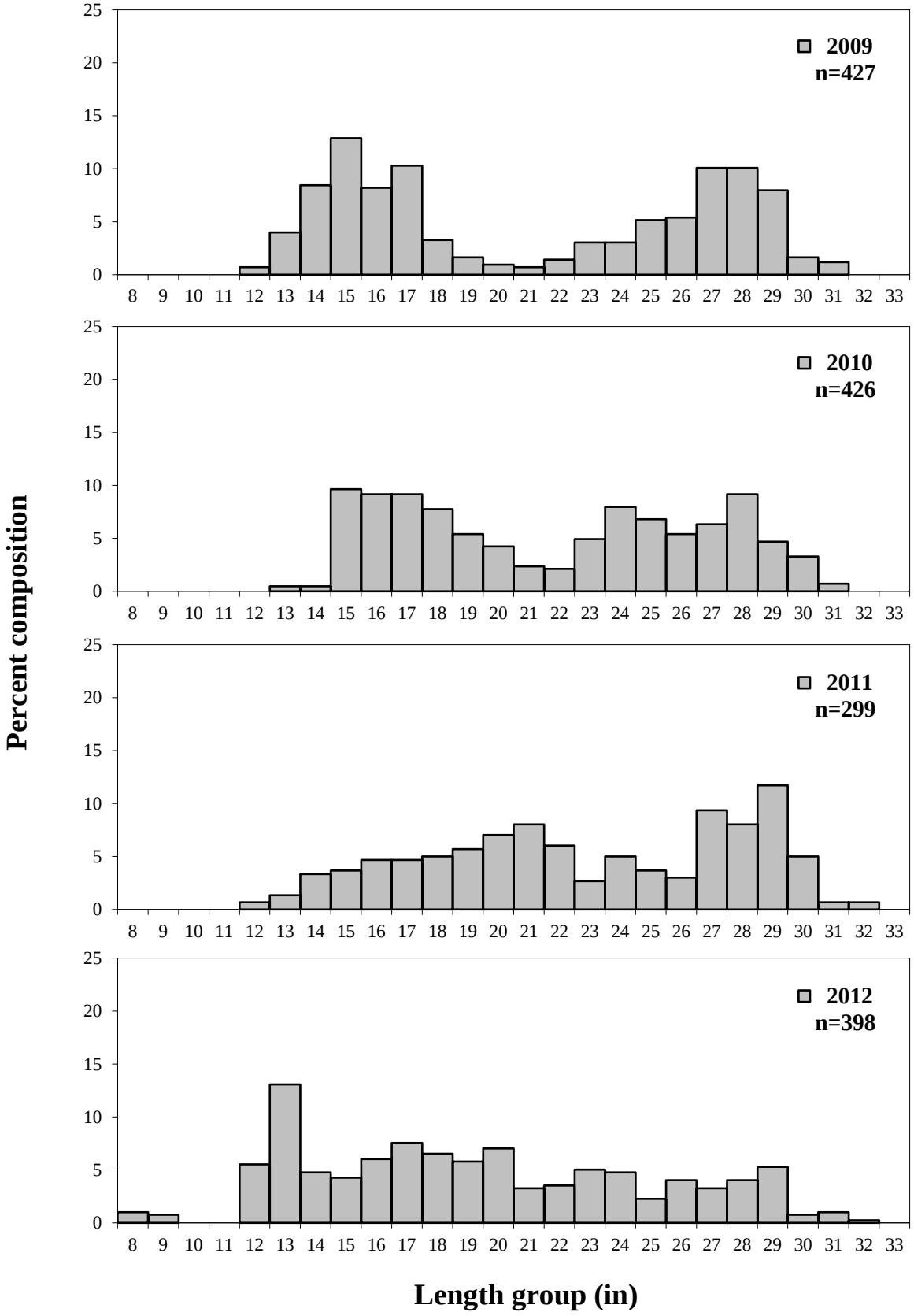


Figure 3. Length frequency of subsampled walleye collected during spring trap netting in the upper Big Dry Arm of Fort Peck Reservoir, 2009-2012.

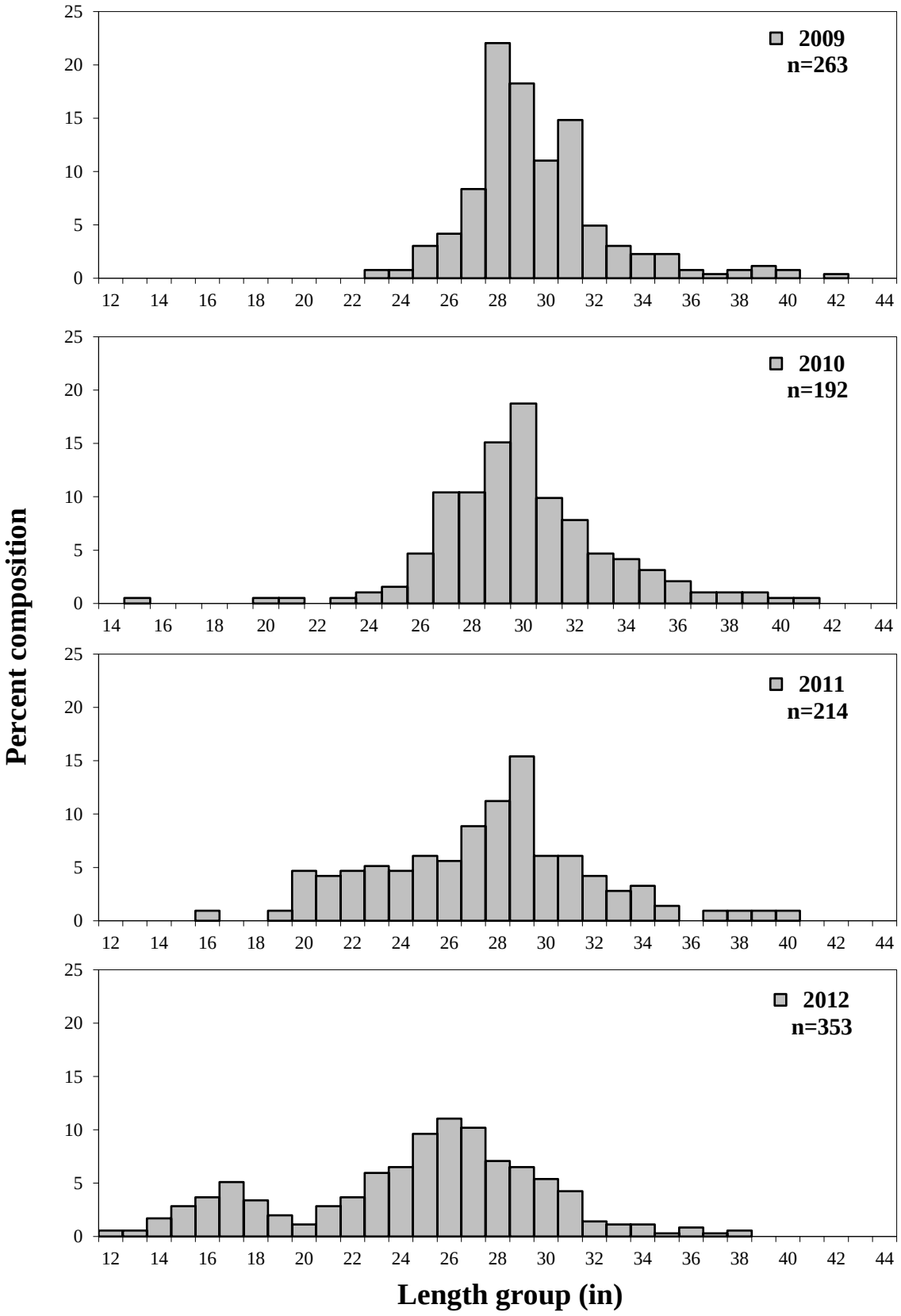


Figure 4. Length frequency of subsampled northern pike collected during spring trap netting in the upper Big Dry Arm of Fort Peck Reservoir, 2009-2012.

RESERVOIR-WIDE GILL NETTING

Standard experimental gill nets were set in throughout the reservoir from July 17th to August 1st, 2012 when water surface temperatures ranged from 67°F to 84°F. Gill netting provides information on species distribution; composition, relative abundance, population parameters, and stomach contents of game species. Nineteen species were captured for a total of 2,952 fish (Table 4). Walleye, northern pike, and yellow perch were the most abundant species captured overall, with catch rates of 6.8, 5.0, and 3.1 per net night, respectively. Fish with catch rates equal to or greater than 1.0 per-net night include: channel catfish, common carp, freshwater drum, goldeye, shorthead redhorse, smallmouth bass, and smallmouth buffalo. Other less common species in order of declining relative abundance include; river carpsucker, sauger, black bullhead, white sucker, black crappie, cisco, shovelnose sturgeon, bigmouth buffalo, and pallid sturgeon. The one pallid sturgeon captured was a hatchery reared juvenile. Hatchery reared juvenile pallid sturgeon have been routinely captured in the upper Missouri arm (near the headwaters of Fort Peck Reservoir) since 2005.

Walleye

Relative abundance of walleye increased substantially during the 2012 reservoir-wide gill netting surveys. Relative abundance increased from 2.8 walleye per net in 2011 to a record 6.8 per net in 2012 (Figure 5). This was above the long term average of 3.6 per net from 1984 to 2012. The three-year running average goal of 3.6 per net was met (4.4 per net in 2012) 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 10.5 per net (Table 5). The lowest catch rate of 5.6 walleye per net was documented in the lower Missouri arm.

Length frequency distributions of walleye in 2012 indicated a large year class present with a majority of these fish in the 13 to 15 to inch range (Figure 6). This group represented 42% of all walleye gill netted in 2012. Length frequency distributions in 2011 indicated this year class was also present as indicated by a group of fish in the 11 to 13 inch range. Similarly, this size group represented 42% of all walleye sampled in 2011. In 2012, 55% of the walleye collected in experimental gill nets were less than 15 inches indicating continued recruitment to the fishery.

Walleye from the 2008 year class (4-year old) comprised 36% of all walleye aged in 2012 and 45% of all walleyes aged in 2011 (Table 6). The 2008 year class correlates with the first year of improved reservoir elevations and increase in shoreline forage fish relative abundance. It is likely these factors resulted in improved growth and survival of younger walleye. Mean length-at-age for 4-year old walleye in 2012 was 15.3 inches compared to 13.1 inches in 2007. In addition, higher mean lengths-at-age were observed for age-2 through age-7 walleye indicating favorable growth over the last few years. It should also be noted that a large group of 2-year old fish were observed in 2012 and comprised 28% of all walleye aged.

Relative weights decreased for all length groups of walleye in 2012. However, relative weights for all length groups of walleye in 2012 were greater than those observed during the drought years and low forage abundance (Figure 7). Decreasing reservoir elevations beginning in 2011coincided with a decrease in shoreline forage relative abundance. In addition, young-of-year cisco relative abundance in 2012 reached an all time low. Cisco have been found to be an important prey item for walleye greater than 15 inches in Fort Peck Reservoir (Mullins 1991).

Table 4. 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, 2012. *N* is total number collected for length and weight measurements.

			Length		Weight	
Species	Number	CPUE	Inches	*N*	Pounds	*N*
Bigmouth buffalo	1	<0.1	12.9	1	1.0	1
Black bullhead	50	0.5	5.9	50	0.1	50
Black crappie	31	0.3	7.8	31	0.3	30
Channel catfish	272	2.7	17.4	272	1.8	272
Cisco	7	0.1	7.9	7	0.3	5
Common carp	193	1.9	20.3	193	4.1	193
Freshwater drum	131	1.3	13.1	131	1.4	131
Goldeye	160	1.6	13.3	160	0.8	158
Northern pike	503	5.0	23.6	503	3.6	502
Pallid sturgeon	1	<0.1	17.0	1	0.5	1
River carpsucker	84	0.8	21.4	84	5.0	83
Sauger	80	0.8	14.7	80	0.9	80
Shorthead redhorse	99	1.0	14.6	99	1.4	98
Shovelnose sturgeon	2	<0.1	26.6	2	3.0	2
Smallmouth bass	163	1.6	11.5	163	0.9	162
Smallmouth buffalo	135	1.4	23.1	132	8.6	126
Walleye	683	6.8	15.1	683	1.4	683
White sucker	50	0.5	15.1	50	1.6	50
Yellow perch	307	3.1	6.6	306	0.1	306

Table 5. 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, 2012.

	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	1	<0.1	0	--	0	--	0	--	0	--	1	<0.1
Black bullhead	12	0.6	38	1.9	0	--	0	--	0	--	50	0.5
Black crappie	5	0.3	0	--	0	--	0	--	26	1.3	31	0.3
Channel catfish	33	1.7	2	0.1	5	0.3	34	1.7	198	9.9	272	2.7
Cisco	3	0.2	1	<0.1	2	0.1	0	--	1	<0.1	7	0.1
Common carp	21	1.1	26	1.3	65	3.3	48	2.4	33	1.7	193	1.9
Freshwater drum	7	0.4	12	0.6	17	0.9	19	1.0	76	3.8	131	1.3
Goldeye	32	1.6	6	0.3	49	2.5	14	0.7	59	3.0	160	1.6
Northern pike	166	8.3	107	5.4	65	3.3	96	4.8	69	3.5	503	5.0
Pallid sturgeon	0	--	0	--	0	--	0	--	1	<0.1	1	<0.1
River carpsucker	21	1.1	4	0.2	2	0.1	12	0.6	45	2.3	84	0.8
Sauger	4	0.2	16	0.8	21	1.1	16	0.8	23	1.2	80	0.8
Shorthead redhorse	10	0.5	0	--	2	0.1	15	0.8	72	3.6	99	1.0
Shovelnose sturgeon	2	0.1	0	--	0	--	0	--	0	--	2	<0.1
Smallmouth bass	30	1.5	23	1.2	21	1.1	43	2.2	46	2.3	163	1.6
Smallmouth buffalo	57	2.9	8	0.4	11	0.6	29	1.5	30	1.5	135	1.4
Walleye	209	10.5	127	6.4	111	5.6	119	6.0	117	5.9	683	6.8
White sucker	10	0.5	14	0.7	16	0.8	9	0.5	1	<0.1	50	0.5
Yellow perch	65	3.3	49	2.5	74	3.7	80	4.0	39	2.0	307	3.1
Total	688	34.4	433	21.7	461	23.1	534	26.7	836	41.8	2,952	29.5

[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 Cr.
[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.

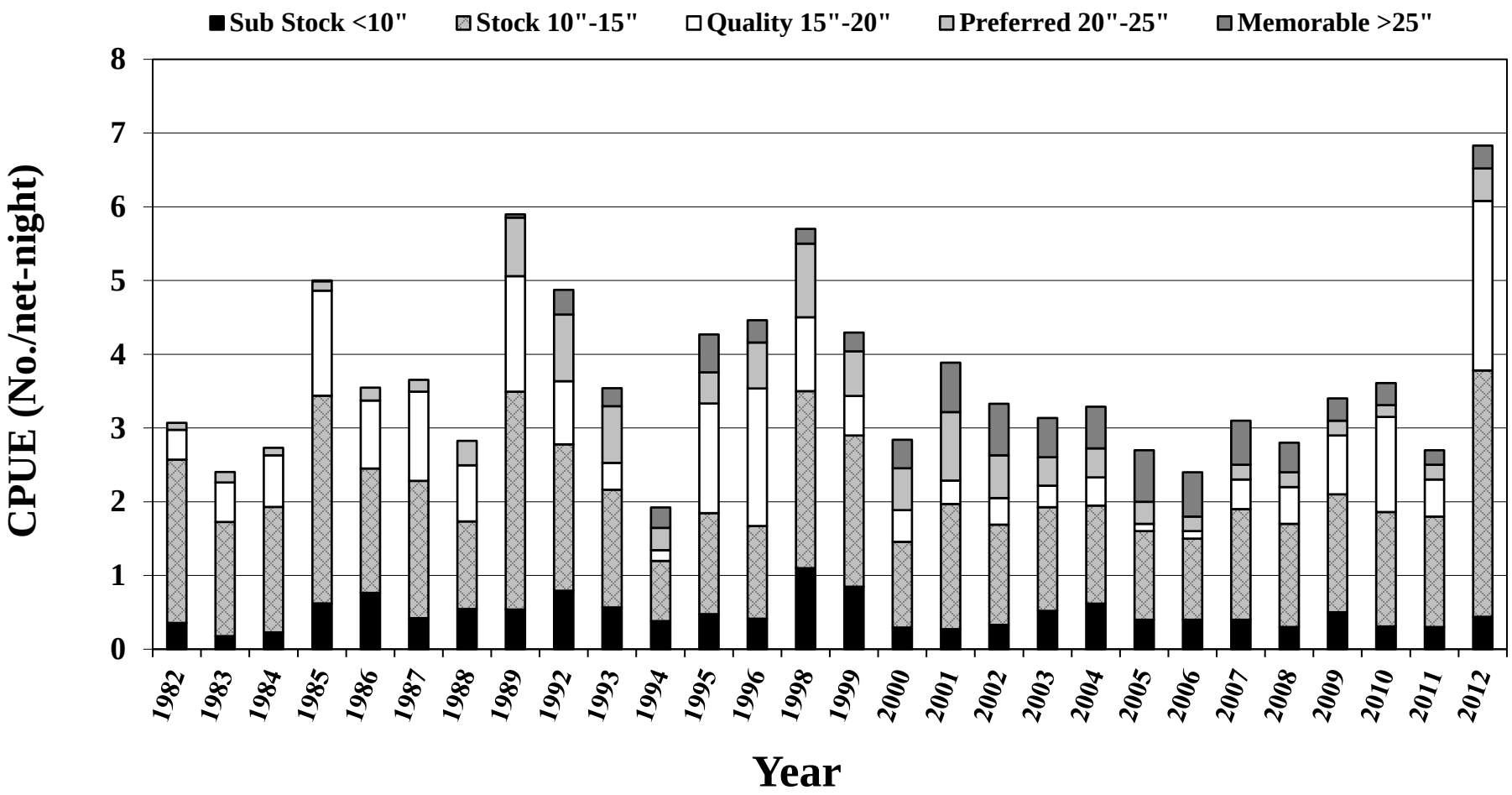


Figure 5. Length structure, in terms of catch per unit effort (CPUE), of walleye collected by experimental gill nets in Fort Peck Reservoir during July-August, 1982-2012 (no data for 1990-1991 and 1997).

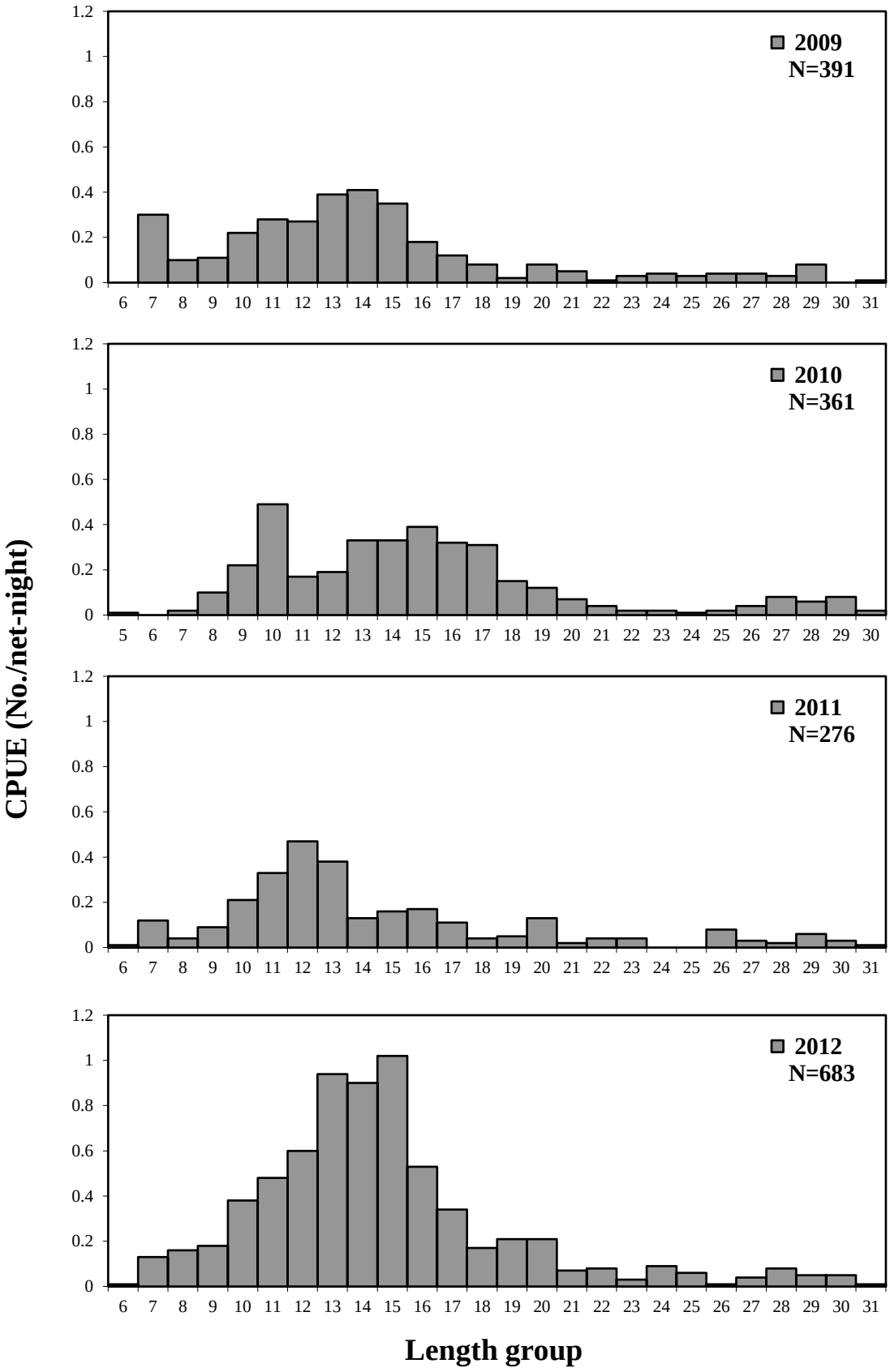
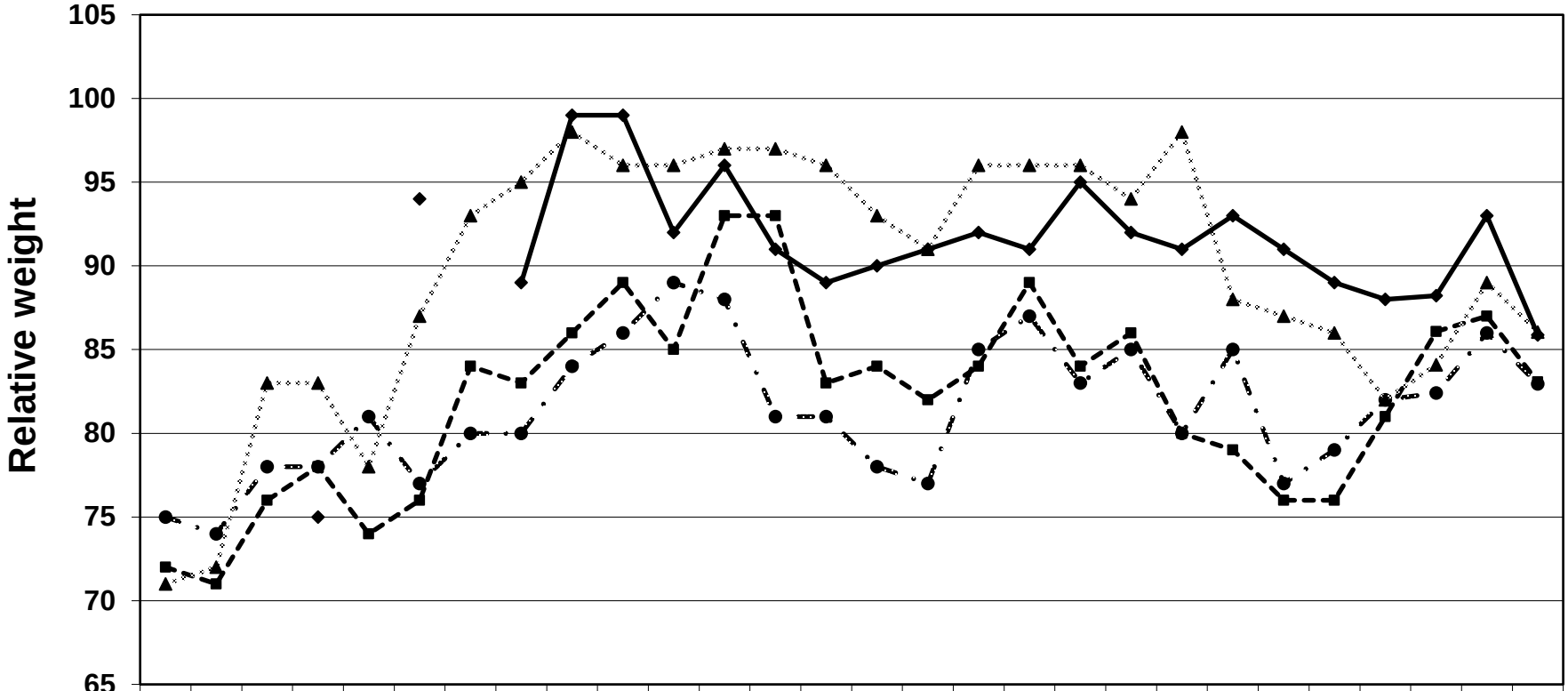


Figure 6. Length frequency, as catch per unit effort, of walleye collected by experimental gill nets in Fort Peck Reservoir during July-August, 2009-2012.



	1982	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
Stock 10"-15"	75	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
Quality 15"-20"	72	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
Preferred 20"-25"	71	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
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

Figure 7. Relative weights for stock, quality, preferred, and memorable length groups of walleye collected by experimental gill nets in Fort Peck Reservoir, 1982-2012 (no data for 1990-1991 and 1997).

Table 6. Mean length-at-age at time of capture (in) for walleye collected in experimental gill nets, 2007-2012, on Fort Peck Reservoir. All walleyes were aged from sectioned otoliths.

Year		Length at age at capture (in)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
2007	Mean	8.0	9.9	12.1	13.1	14	15.7	15.6	13.5	20.9	20.3	24.4	27.5	27.4	27.5
	N	7	55	19	37	36	19	6	2	2	11	6	5	8	2
	SE	0.3	0.1	0.3	0.2	0.2	0.5	0.8	0.7	6.6	1.4	1.5	0.9	0.9	1.1
	Range	6.9-9.1	7.7-12.8	10.0-13.9	11.5-15.2	12.0-17.0	11.7-20.8	13.8-18.4	12.8-14.2	14.3-27.6	13.3-26.6	17.1-27.2	24.5-29.7	23.5-31.2	26.3-28.6
2008	Mean	8.1	10.6	11.9	13	14.3	14.9	17.5	15.8	16.4	19.5	23.9	24.2	25.6	26.3
	N	12	31	57	14	15	21	23	8	3	2	5	4	2	2
	SE	0.2	0.2	0.2	0.3	0.5	0.3	0.6	0.7	0.8	4.9	2.2	1.5	3	1.8
	Range	7.9-9.3	8.0-12.3	9.1-15.4	11.4-14.6	9.5-19.4	12.1-18.0	13.8-24.8	13.1-19.7	14.9-17.3	14.6-24.4	15.4-28.3	20.3-27.4	22.5-28.6	24.5-28.1
2009	Mean	7.8	10.8	12.7	14.5	15.1	16.2	17.3	17.8	19.5	15.7	23	15.6	26.7	26.4
	N	47	57	49	100	16	20	27	14	6	1	1	1	4	4
	SE	0.1	0.2	0.2	0.1	0.4	0.4	0.5	0.7	1.4	--	--	--	1.9	1
	Range	7.0-9.3	7.8-14.0	10.5-15.7	11.7-18.3	13.0-18.3	13.8-21.2	13.4-22.3	14.0-21.6	14.6-23.3	--	--	--	21.5-29.5	24.2-29.0
2010	Mean	7.4	10.3	13.3	14.9	16.1	16.5	17.8	19.1	18.7	23.6	--	--	27.8	26.3
	N	2	95	40	50	79	12	18	15	5	2	--	--	1	1
	SE	1.5	0.1	0.2	0.2	0.2	0.6	0.6	0.6	1.4	3.1	--	--	--	--
	Range	5.9-8.2	7.6-15.0	7.6-15.1	10.4-19.4	11.0-22.5	14.4-21.3	13.3-22.9	14.4-23.2	14.0-23.1	20.5-26.8	--	--	--	--
2011	Mean	7.6	9.7	12.4	14.2	17.3	18.4	14.5	21.3	20.7	26.5	--	--	--	28.8
	N	11	22	120	36	17	32	1	5	5	1	--	--	--	2
	SE	0.2	0.3	0.1	0.3	0.5	0.5	--	1.6	1.2	--	--	--	--	1.2
	Range	6.5-8.7	7.3-12.2	9.3-17.7	11.6-16.9	13.8-22.4	12.9-22.9	--	17.9-26.3	17.3-23.9	--	--	--	--	27.6-30.1
2012	Mean	8.4	12.2	13.0	15.3	16.7	18.3	19.8	18.8	21.1	21.8	18.9	17.7	20.3	28.6
	N	34	181	67	235	42	28	22	3	5	7	2	1	1	2
	SE	0.2	0.1	0.2	0.1	0.3	0.3	0.5	1.6	1.4	1.6	2.8	--	--	0.4
	Range	6.1-10.5	7.9-16.7	10.4-17.0	10.6-20.6	13.6-20.5	15.5-21.1	14.7-22.9	15.7-21.3	16.7-24.6	15.9-27.3	16.1-21.8	--	--	28.2-28.9
Mean of means		7.9	10.5	12.4	13.9	15.1	16.3	16.5	19.0	19.7	21.4	23.4	22.3	26.0	27.0

Walleye (continued)

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 2012 with a value of 47. RSD-P was 12 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 7). A ratio between 10 and 20 is considered desirable as a RSD-P for a balanced population. The young to adult ratio (YAR) decreased from to 10 in 2011 to 7 in 2012. A ratio of 20 to 30 would be considered good for YAR.

Northern Pike

Since 2006, relative abundance of northern pike has increased as a result of natural reproduction following several favorable water years where reservoir water levels were increasing and flooding suitable habitat (Figure 8). Relative abundance increased from 2.9 per net in 2011 to a record 5.0 per net in 2012. This was above the long term average of 1.9 per net from 1984 to 2012. The three-year running average goal of 2.0 northern pike per net was met (3.3 per net in 2012) as outlined in the FPRFMP. Average length and weight of northern pike in 2012 was 23.6 inches and 3.6, respectively, which was lower when compared to the drought years (2000-2006; Table 8). This was a result of smaller individuals recruiting into the population. Furthermore, 62% of the northern pike captured in 2012 were less than 25 inches (Figure 9). 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 2012, northern pike PSD was 75 and RSD-P was 15 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 99 in 2012 which was similar to 100 in 2011.

Channel Catfish

Relative abundance of channel catfish captured by gill netting increased to 2.7 per net in 2012. This was a slight increase from 2.4 per net in 2011 and above the 26-year average of 1.8 per net (Figure 10). The increase in 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 17.4 inches and 1.8 pounds, respectively. This was slightly higher than the long term average of 16.1 inches and 1.6 pounds (Table 9). Relative abundance continues to be highest in riverine portions of the reservoir with the Upper Missouri Arm containing 9.9 per net (Table 5). Relative weights of channel catfish decreased from 91 in 2011 to 88 in 2012. Catfish PSD and RSD-P was 65 and 3.3, respectively, indicating a population comprised of good numbers of larger fish.

Table 7. 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, 1988-2012 (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

[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 8. 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, 1984-2012.

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

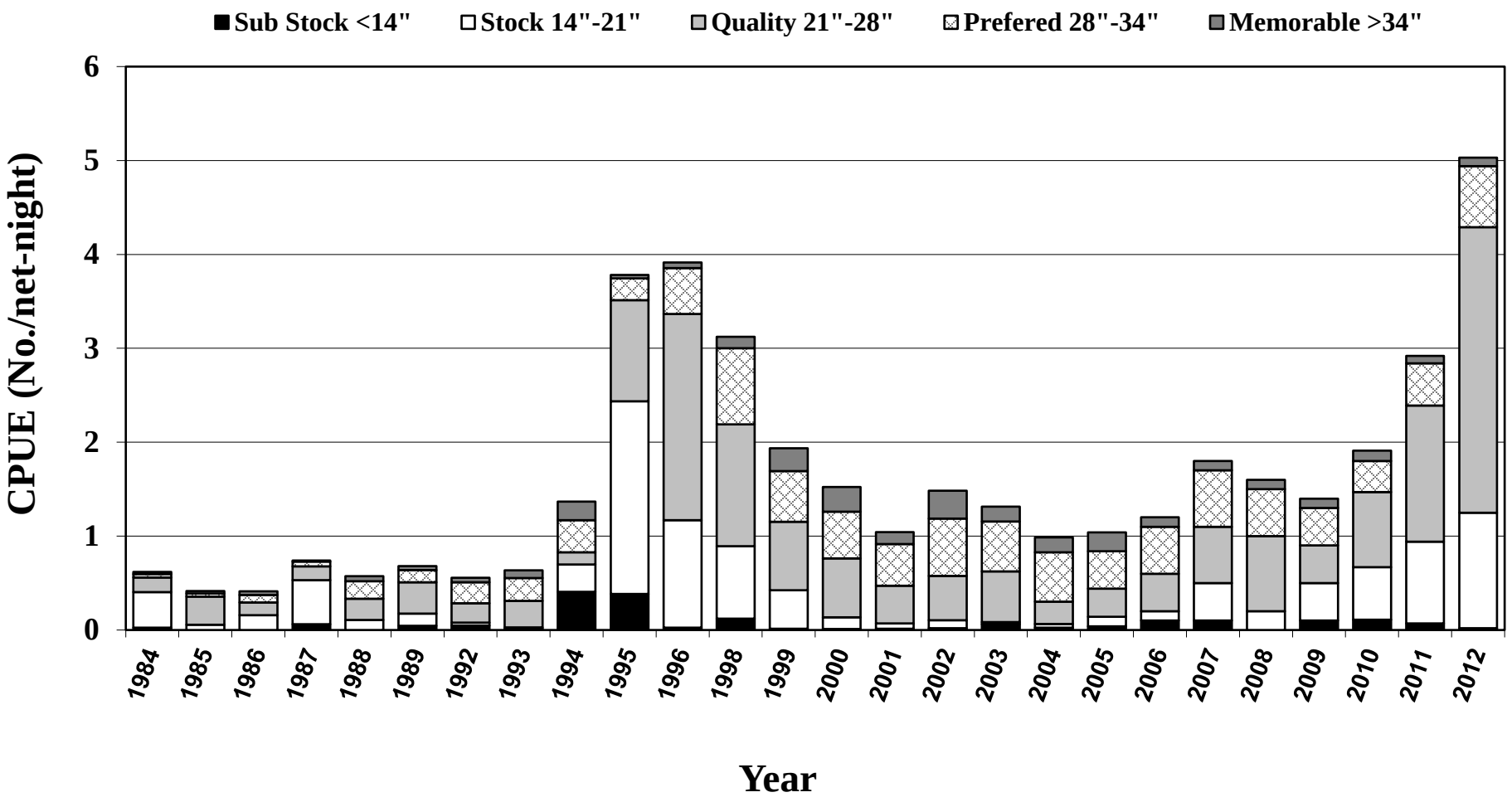


Figure 8. Length structure, in terms of catch per unit effort (CPUE), of northern pike collected by experimental gill nets in Fort Peck Reservoir during, July-August, 1984-2012, (no data for 1990-1991 and 1997).

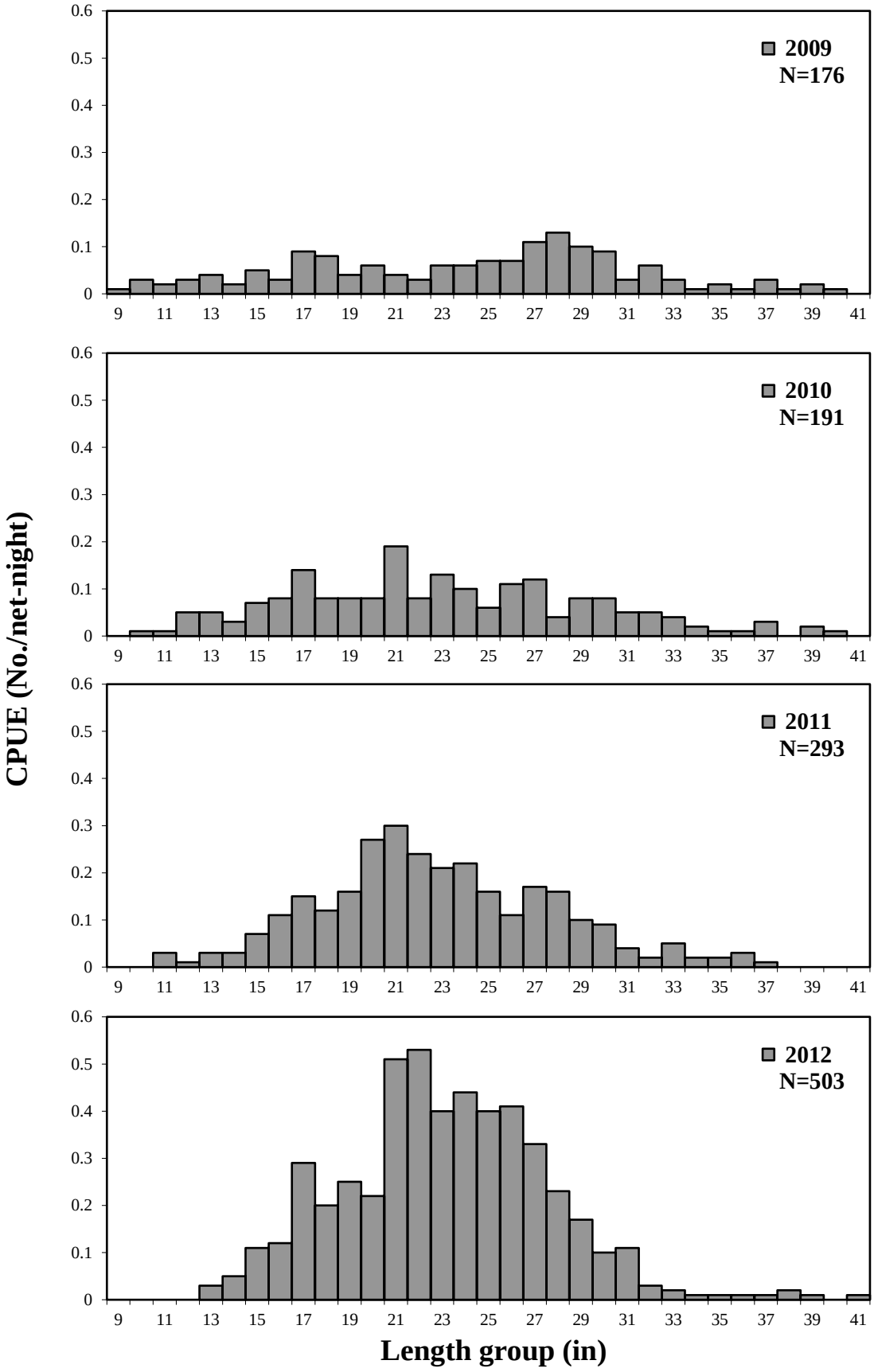
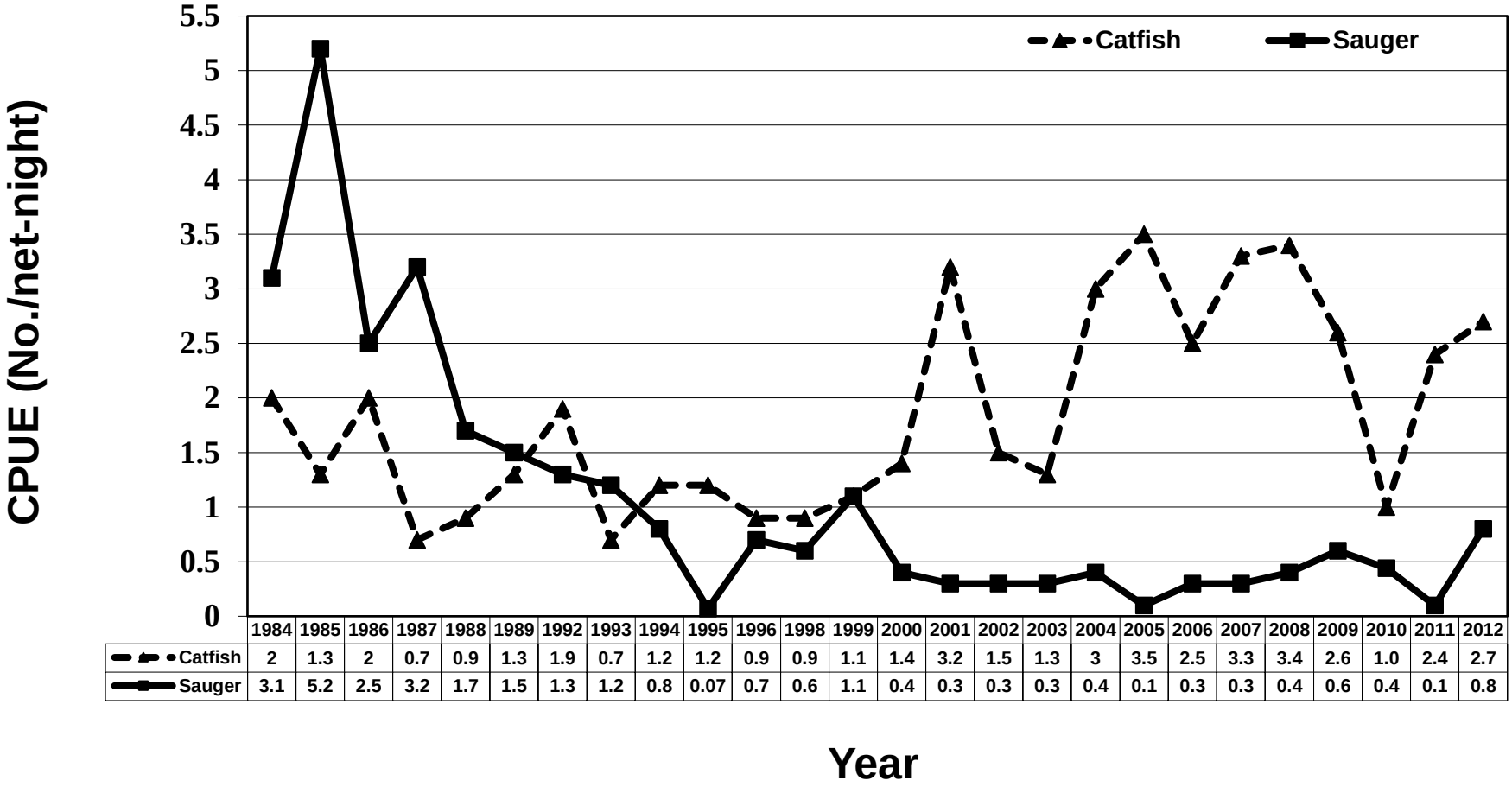


Figure 9. Length frequency, as catch per unit effort (CPUE), of northern pike collected by experimental gill nets in Fort Peck Reservoir during July-August, 2009-2012.



	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
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
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

Figure 10. Mean catch per unit of effort (CPUE; No./net-night) of channel catfish and sauger collected by experimental gill nets in Fort Peck Reservoir, 1984-2012 (no data for 1990-1991 and 1997).

Table 9. 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, 1984-2011.

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

Sauger

Sauger numbers have declined in Fort Peck Reservoir since 1985 and have remained low since then (Figure 10). 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 2012 was 0.8 per net which was a slight increase from 0.1 per net in 2011. Average size of sauger in 2012 was 14.7 inches and 0.9 pounds with a relative weight of 77. 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 1.2 per net (Table 5).

STOMACH CONTENTS OF GILL NETTED GAME FISH

Stomach contents of walleye, northern pike, sauger, and smallmouth bass captured in experimental gill nets from July 17th to August 1st, 2012 were examined for the presence of forage items. Walleye had the most diverse diet followed closely by northern pike (Table 13). Invertebrates were the most commonly identified items found in walleye at 5.7% followed by yellow perch at 3.1%. Cisco were the most commonly identified fish found in northern pike at 13.6% followed closely by yellow perch at 4.7%. As usual, 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 10. 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 2012. Sample size is given in parentheses.

Forage items	Northern pike (*N*=485)	Sauger (*N*=76)	Smallmouth bass (*N*=114)	Walleye (*N*=647)
Chinook salmon				0.2%
Cisco	13.6%		1.8%	1.4%
Crayfish	0.6%		7.0%	
Emerald shiner				0.2%
Empty	74.8%	86.8%	51.8%	75.3%
Goldeye	0.2%			
Invertebrates	0.2%	7.9%	12.3%	5.7%
Lake trout	0.2%			
Spottail shiner				0.2%
Unknown	5.6%	3.9%	26.3%	13.8%
Walleye		1.3%		0.3%
Yellow perch	4.7%		0.9%	3.1%

BEACH SEINING

Shoreline beach seining was conducted to determine reproductive success of age-0 game and non-game fish from August 1st to September 10th, 2012. Seine hauls at 100 locations throughout the reservoir captured 16 species of young-of-year and forage fish for a total of 17,782 fish (Table 11). Relative abundance of shoreline forage typically follows changes in reservoir elevations (Figure 14). In 2012, reservoir elevations increased slowly after April due to limited amounts of spring precipitation and mountain snowpack (Figure 11). Reservoir elevations decreased sharply in July due to evacuation of water to provide flood storage capacity.

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 been found throughout the reservoir while conducting shoreline beach seining surveys. Seining surveys in 2011 indicated that it was present at 73% of the seining sites. This trend increased in 2012 with over 90% of the seining sites containing EWM. It should be noted that seining surveys were difficult due to dense stands of EWM and fish were observed escaping under the seine. Therefore, it is possible that relative abundance of shoreline forage fish may be underestimated in the 2012 results.

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.

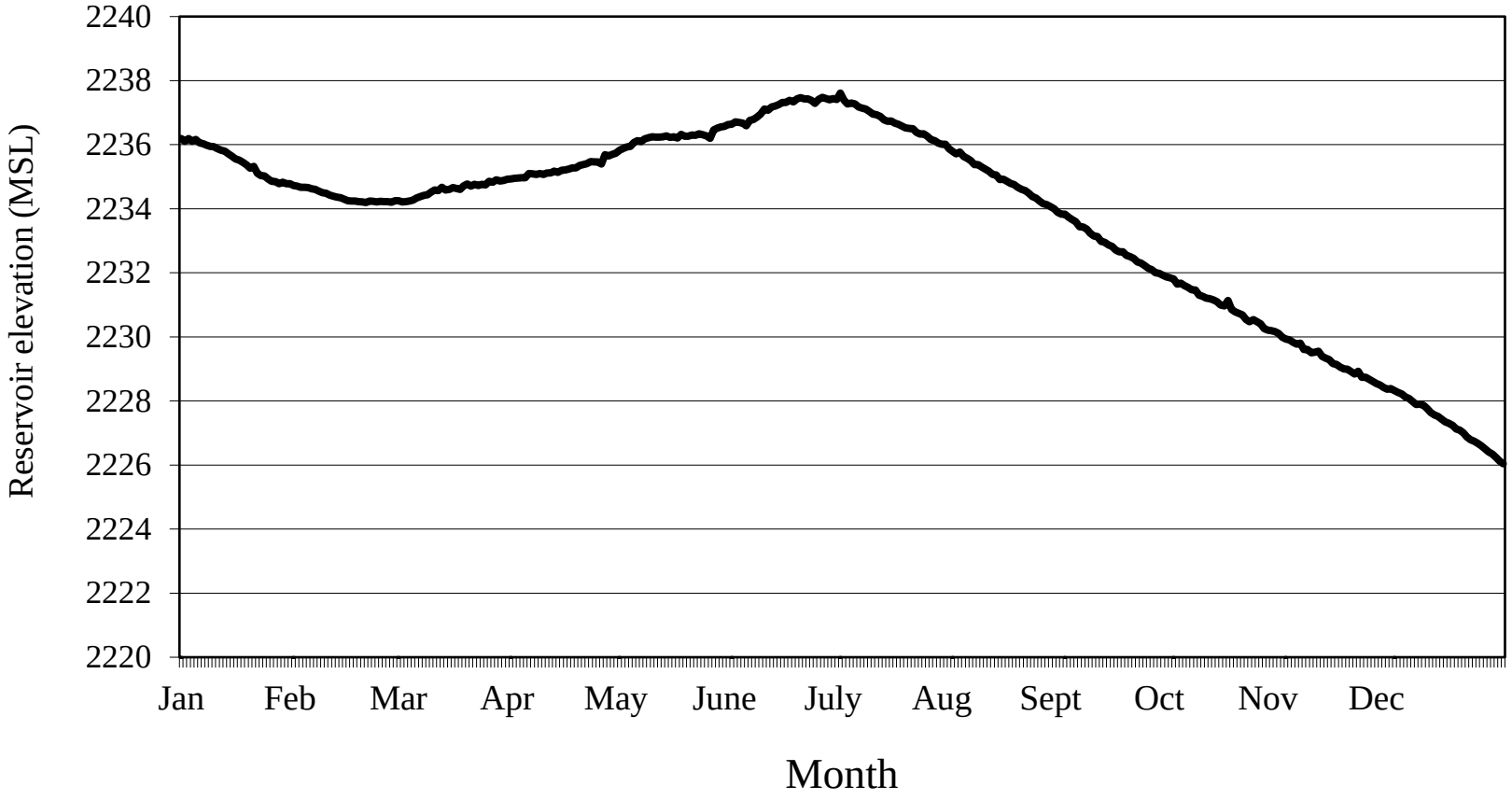


Figure 11. Average daily reservoir elevation for Fort Peck Reservoir from January 1, 2012 to December 31, 2012 (data provided by USACE).

Table 11. Number (*N*) and mean catch per unit effort (CPUE; No./haul) for fish species collected by seine hauls in Fort Peck Reservoir during August 2012. 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	1	<0.1	0	--	0	--	0	--	0	--	1	<0.1
Common carp	1	<0.1	2	0.1	2	0.1	2	0.1	12	0.6	19	0.2
*Pomoxis spp.**	310	15.5	377	18.9	891	44.6	2,173	108.7	623	31.2	4,374	43.7
Emerald shiner*	5	0.3	0	--	8	0.4	37	1.9	1,509	75.5	1,559	15.6
Freshwater drum	0	--	0	--	0	--	1	<0.1	43	2.2	44	0.4
Green sunfish	0	--	0	--	0	--	1	<0.1	0	--	1	<0.1
*Hybognathus spp.**	0	--	0	--	0	--	0	--	3	0.2	3	<0.1
Northern pike	1	<0.1	1	<0.1	0	--	3	0.2	0	--	5	0.1
River carpsucker	0	--	0	--	0	--	0	--	1	<0.1	1	<0.1
Sauger	0	--	0	--	0	--	0	--	3	0.2	3	<0.1
Smallmouth buffalo	0	--	0	--	0	--	0	--	1	<0.1	1	<0.1
Smallmouth bass	26	1.3	12	0.6	22	1.1	140	7.0	100	5.0	300	3.0
Spottail shiner*	176	8.8	288	14.4	486	24.3	1,956	97.8	113	5.7	3,019	30.2
Walleye	0	--	1	<0.1	2	0.1	0	--	0	--	3	<0.1
White sucker	0	--	0	--	1	<0.1	0	--	0	--	1	<0.1
Yellow perch	1,482	74.1	1,961	98.1	1689	84.5	2,323	116.2	993	49.7	8,448	84.5
Total	2,002	100.1	2,642	132.1	3,101	155.1	6,636	331.8	3,401	170.1	17,782	177.8

*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 2012 continues to be near an all time low throughout the sampling period (Figure 12). A total of 3 walleye fingerlings were caught for a catch rate of 0.03 per seine haul reservoir wide. In 2012, walleye fingerlings were only captured in the lower Big Dry and lower Missouri arm (Table 11). In previous years, they have been captured in all regions with the upper Missouri arm containing the highest catch rates (Brunsing 1998). The Missouri River above Fort Peck Reservoir has been shown to support walleye spawning activity (Billington et al. 2005; Bellgraph et al. 2008). In addition, no walleye fry or fingerlings are released in this area suggesting all fingerlings captured were a product of natural reproduction because dispersal of young-of-year walleye has been shown to be limited 2 to 3 months after release (Paragamian and Kingery 1992). Pyloric caecums were counted to identify *Sander spp*. in question.

Sauger

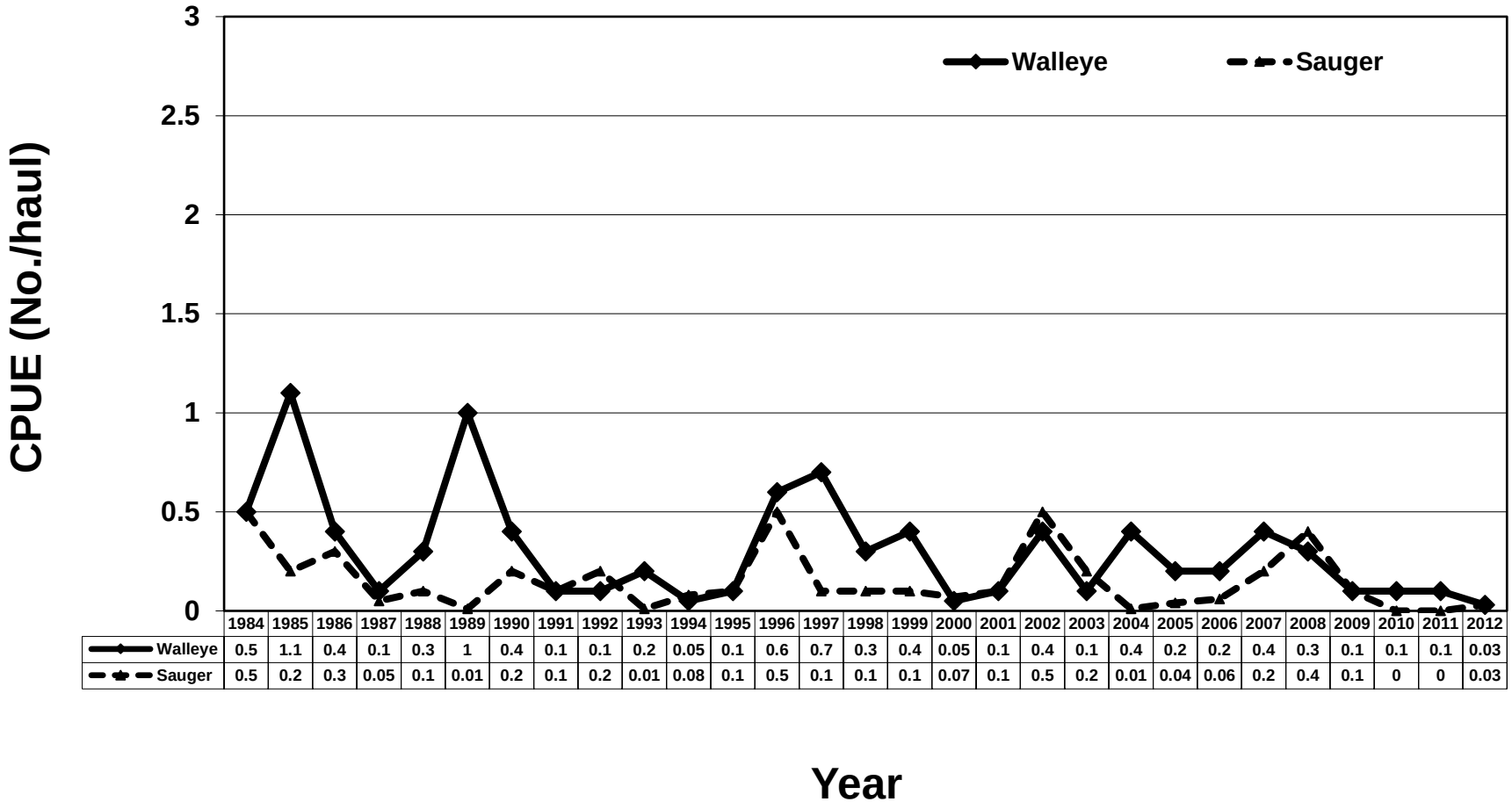
Relative abundance of young-of-year sauger in 2012 was similar to those observed during the years of 1987, 1989, 1993, and 2004 through 2006 (Figure 12). These years of low relative abundances coincide with severe drought conditions (i.e., low reservoir elevations and low inflows) and have been suggested to be the reason for decline of sauger populations (McMahon and Gardner 2001). In contrast, conditions experienced in 2010-2012were characterized by increased reservoir elevations and higher flows. Therefore, it is uncertain what is contributing to the lack of young-of-year sauger in the the upper stretches of the reservoir. 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 from 2.9 per seine haul in 2011 to 0.05 per seine haul in 2012. This was one of the lowest catch rates observed over the sampling period (Figure 13). The decrease in relative abundance of young-of-year northern pike can be attributed to declining reservoir elevations which prohibited inundation of shoreline vegetation in 2012. Typically, young-of-year northern pike are captured in all sampling regions of the reservoir. However, no young-of-year northern pike were captured in the lower Missouri arm or upper Missouri arm in 2012 (Table 11).

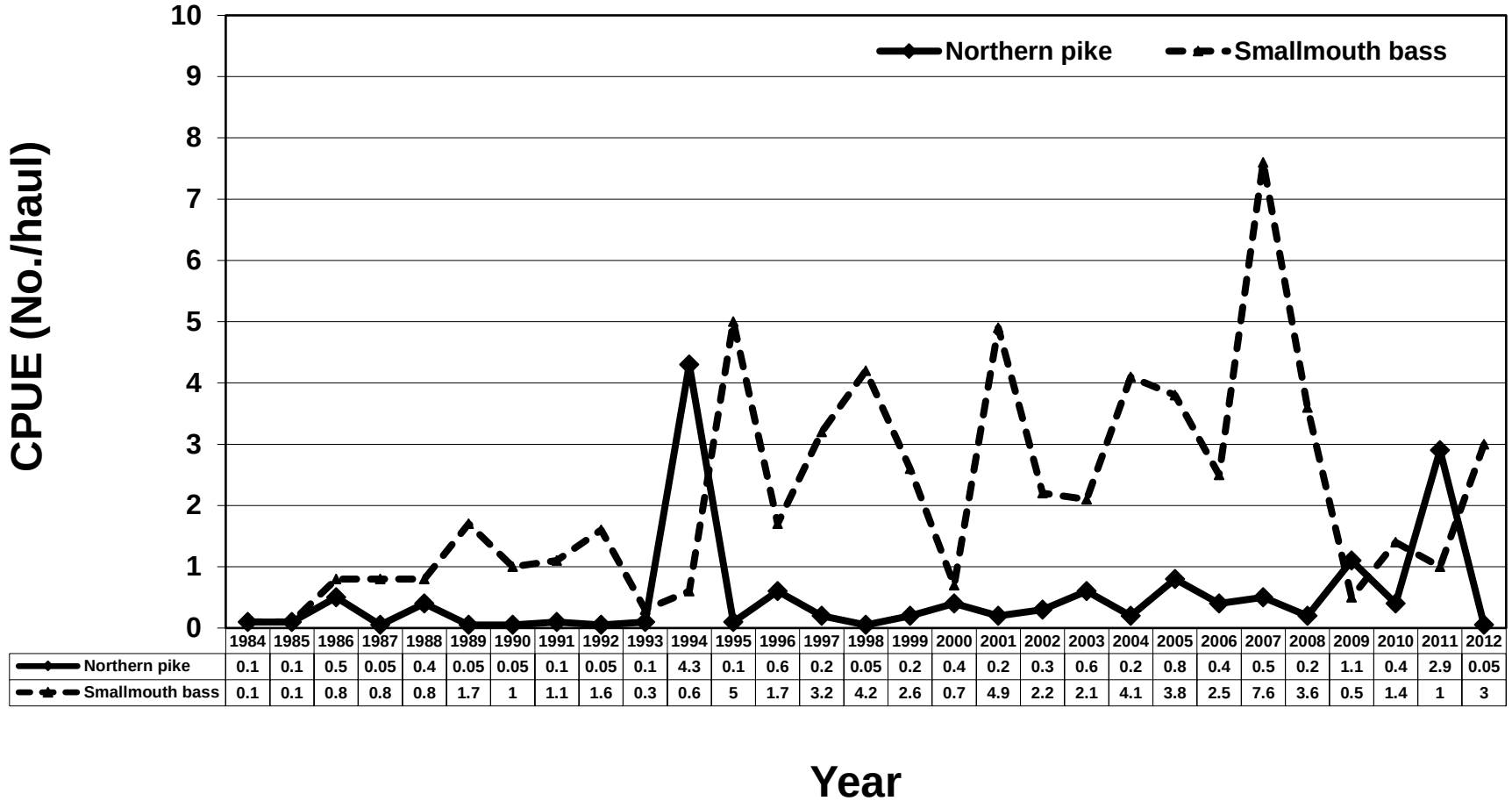
Smallmouth Bass

Smallmouth bass have been one of the most abundant game species captured during annual seining surveys. Relative abundance increased from 1.0 per seine haul in 2011 to 3.0 per seine haul in 2012. Over the last few years, relative abundance has remained relatively low and now resembles those of the early 1990's before the population expanded (Figure 13). Smallmouth bass were captured in all regions with the highest catch rate in the middle Missouri Arm at 7.0 fish per haul (Table 11). 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
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
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

Figure 12. Mean catch per unit effort (CPUE; No./haul) of walleye and sauger young-of-year collected by seine hauls in Fort Peck Reservoir from 1984-2011.



	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
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	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
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	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

Figure 13. 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 1984-2012.

Yellow Perch

Relative abundance of young-of-year yellow perch have gradually increased since 2007 due to stable and rising reservoir elevations that provided additional spawning and rearing habitat (Figure 14). Young-of-year yellow perch relative abundance in 2012 decreased slightly to 84.5 per seine haul from 91.8 per seine haul in 2011. However, relative abundance of young-of-year yellow perch in 2012 remains above the long term average of 31.2 per seine haul from 1984 to 2012. It's possible this continued reproductive success was due to previously inundated vegetation. Yellow perch were most abundant in the middle Missouri Arm with a catch rate of 116.2 per seine haul (Table 11).

Crappie

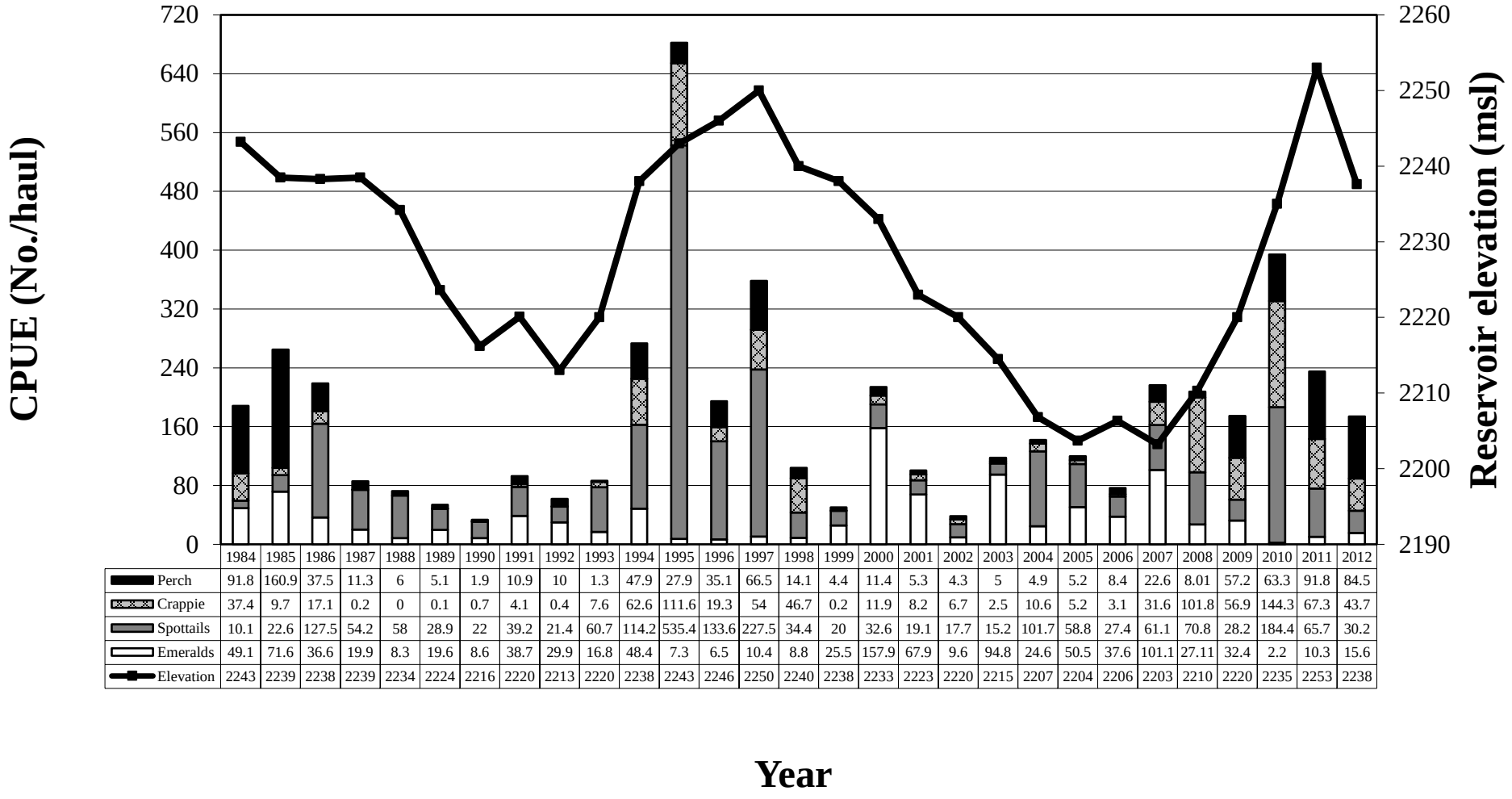
Young-of-year crappie relative abundance decreased in 2012 to 43.7 per seine haul from 67.3 per seine haul in 2011. However, relative abundance of young-of-year crappie still resembles those observed during the mid to late 1990's when the reservoir began to fill (Figure 14). In 2012, the largest percentage of young-of-year crappie were collected in the middle Missouri Arm (50%; Table 11). 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 2012 was 15.6 per seine haul, which was slightly higher than 10.3 per seine haul in 2011. 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 14). A possible explanation for these decreases could be upstream movement into more riverine type habitat. In 2012, 97 % of emerald shiners were captured in the upper Missouri arm (Table 11).

Spottail Shiner

Relative abundance of spottail shiners decreased from 65.7per seine haul in 2011 to 30.2 per seine haul in 2012. Similar to previous years, relative abundance was highest in the main lake portions (lower Big Dry, lower Missouri arm, middle Missouri arm) of the reservoir with the middle Missouri arm containing the most with 97.8 per seine haul. In 2012, 90% of spottail shiners were collected in the main lake portion of the reservoir (Table 11). Decreases in relative abundance of spottail shiners have been documented during declining reservoir elevation from 1998 to 2003, with catch rates ranging from 15.2 per seine to 34.4 per seine haul (Figure 14). This trend was evident in 2012 and should continue into 2013 if reservoir elevations continue to decline.



	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
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	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
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	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
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	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
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	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
Elevation	2243	2239	2238	2239	2234	2224	2216	2220	2213	2220	2238	2243	2246	2250	2240	2238	2233	2223	2220	2215	2207	2204	2206	2203	2210	2220	2235	2253	2238

Figure 14. 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 1984-2012.

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 (FPRFMP 2012; Table 12). Spring stocked fish were reared to a larger size in an attempt to create salmon large enough to avoid predation. A total of 181,319 spring-stocked chinook salmon were released in June averaging 32 per pound. Both North and South Dakota Game and Fish have used this strategy in the past and have been successful in developing a return run from fewer, but larger spring and fall stocked chinook salmon (Lott et al. 1997; Figure 15 and 16). 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 try and create a more stable fishery and more fish for spawning beginning in 2000 (Figure 15 and 16).

Return of salmon to the release site has been variable over the years. In 2012, the number of females spawned and eggs collected doubled compared to the previous year (Figure 17). The 2012 egg-take effort for Montana resulted in 574,000 green eggs which averaged approximately 3,416 eggs per female. North Dakota and South Dakota were able to supplement eggs needed to approach the goal of 200,000 fingerlings needed for the 2012 stocking requirements. 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 3rd to October 25th in various embayments adjacent to the marina, spillway, off the face of the dam, Duck Creek, and Bear Creek.

Biological data was collected from adult chinook salmon during spawning to provide more information on age, growth, and stocking-and-rearing history. In 2012, 55% of females spawned were 4-year olds and 41% were 3-year old females (Table 14). In contrast, the majority of females spawned in 2011 were 4-year olds (66%) and the remaining were 3-year old females (34%; Table 13). A greater return from the 2009 brood year (3-year old) in 2012 was anticipated due to larger size at spring stocking compared to previous years (30/pound;Table 16) and improved growing conditions (i.e., increases in coldwater habitat due to increase in reservoir elevations). In addition, relative abundance of young-of-year cisco has improved since 2006 and is likely playing a crucial role in growth and survival rates of younger chinook salmon. Cisco have been found to be the primary forage item of age 1+ chinook salmon in Fort Peck Reservoir (Brunsing 1998; Headley 2010).

In 2012, the mean weight of pre-spawn female chinook salmon was 15.3 pounds which was an increase from the mean weight of 14.1 pounds in 2011. When examining the mean weight at each age, both male and female salmon collected in 2012 were higher than those collected in 2011 (Table 13; Table 14). Three and four year old males averaged 13.0 and 17.5 pounds, respectively in 2012 compared to 9.5 and 15.4 pounds in 2011. Similarly in 2012, three and four year old females averaged 12.4 and 17.2 pounds, respectively compared to 10.2 and 16.1 pounds in 2011. It is apparent that the higher relative abundance of cisco from 2009 to 2011 has contributed to the increased weights observed in 2012. Improved growth rates would also explain the larger percentage of mature 3-year old fish in 2012 as increases in fish growth have been shown to mature at earlier ages (Lott et al. 1997).

Table 12. Chinook salmon stocked by number, size, and location in Fort Peck Reservoir, 2001-2012.

Date	Number	Pounds Stocked	No./lb	Mark	Location
6/11/2001	88,283	2,207	40	None	Marina Bay
6/12/2001	46,247	575	80.5	None	Milk Coulee Bay
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

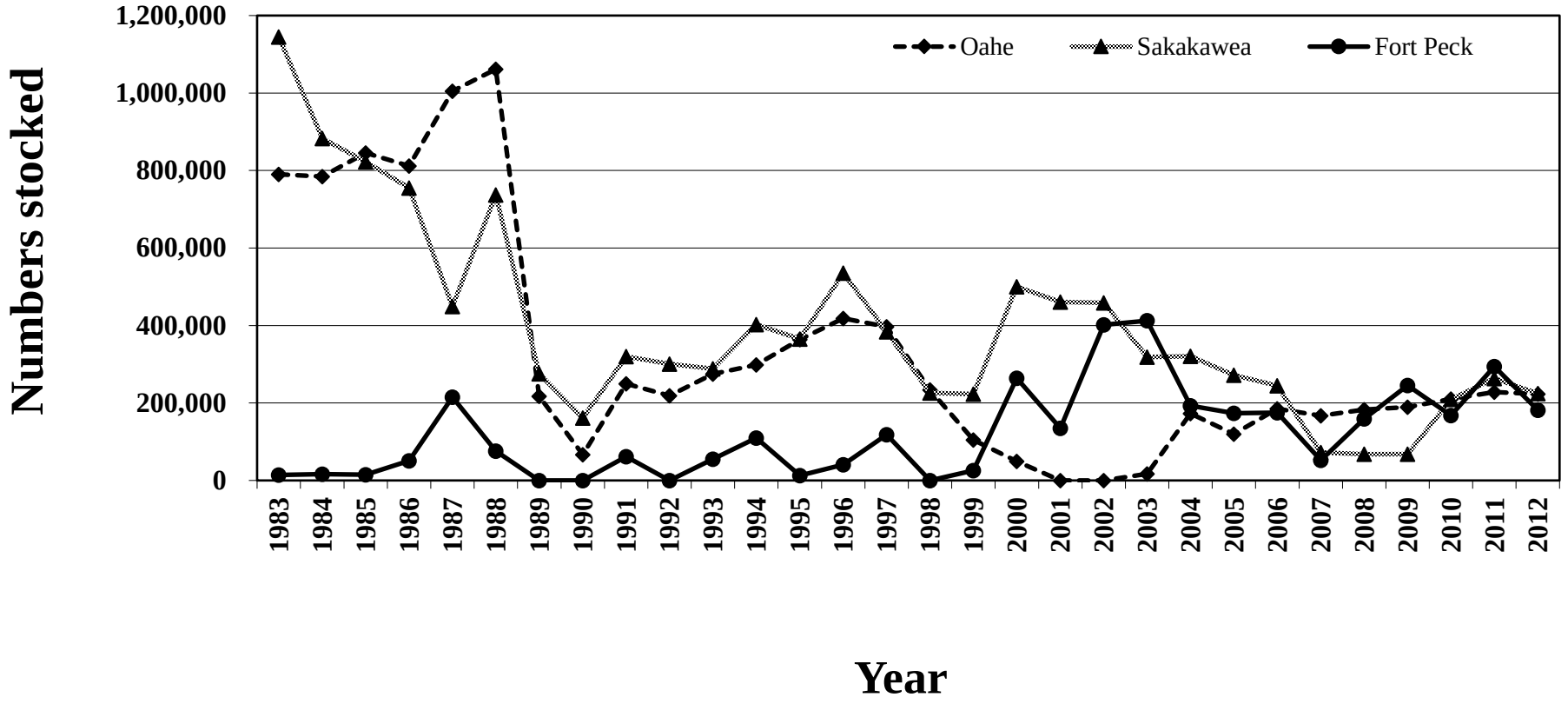


Figure 15. Annual comparison of total chinook salmon numbers stocked in Oahe, Sakakawea, and Fort Peck Reservoir, 1983-2012.

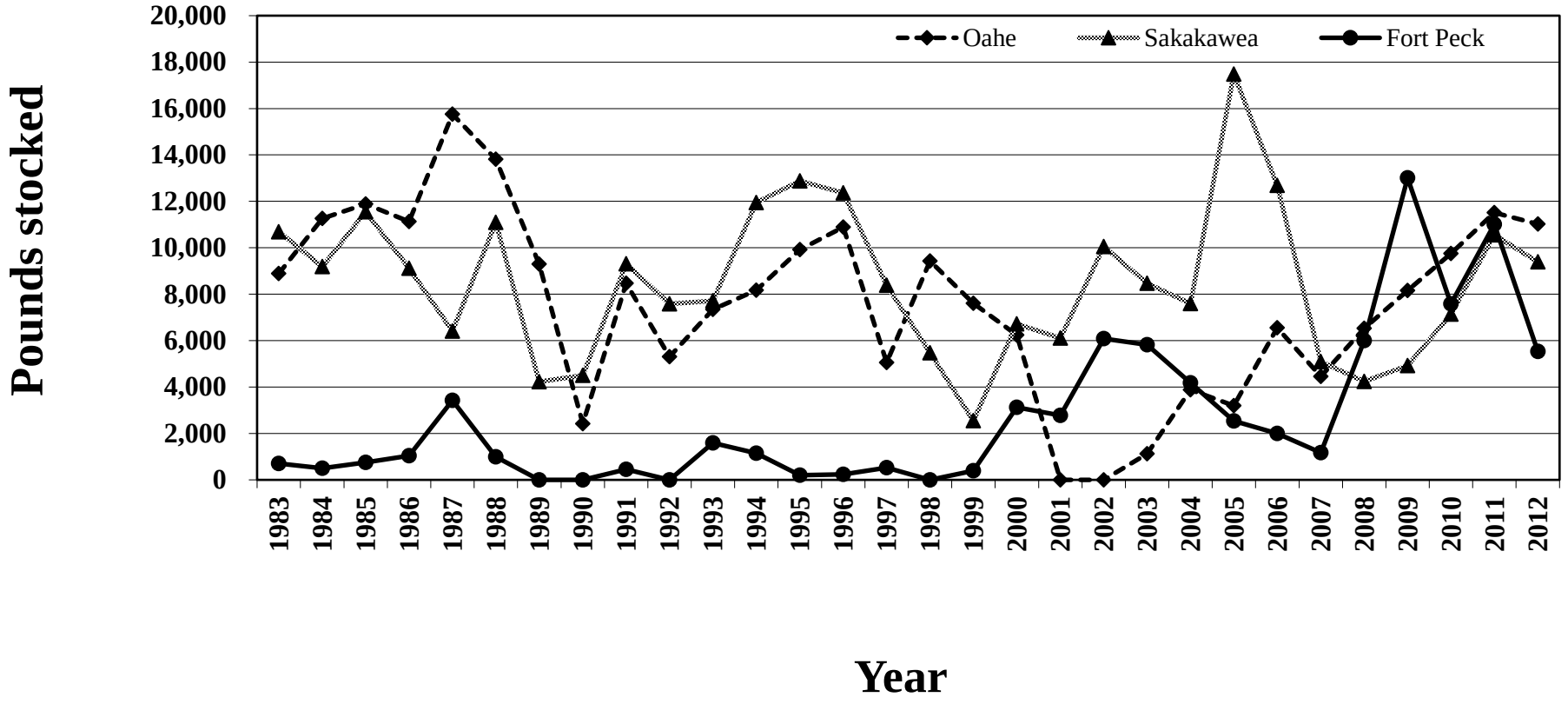


Figure 16. Annual comparison of total chinook salmon pounds stocked in Oahe, Sakakawea, and Fort Peck Reservoir, 1983-2012.

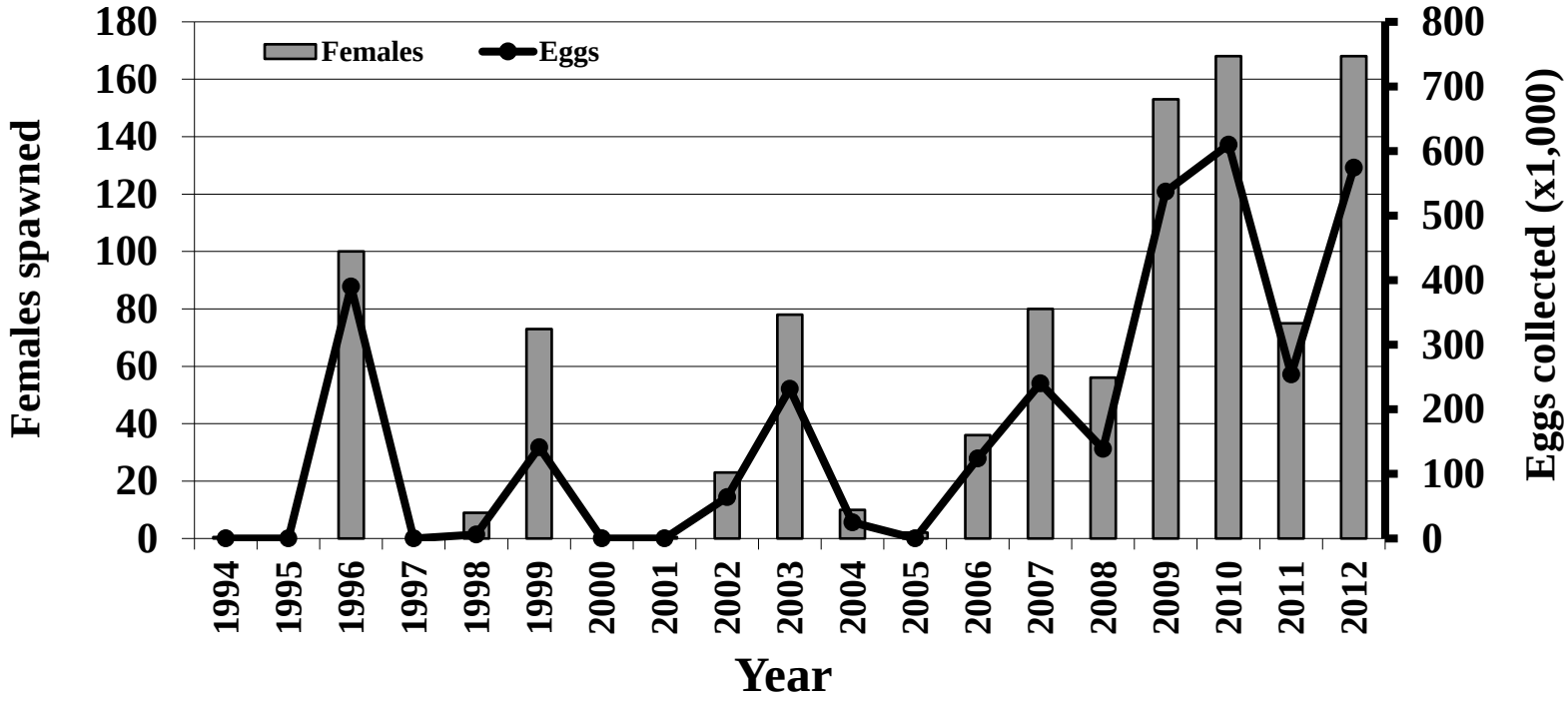


Figure 17. Annual comparison of female chinook salmon spawned and eggs collected from Fort Peck Reservoir, 1994-2012.

Table 13. Age composition, length and weight of 162 chinook salmon collected by electrofishing, fall 2011.

Age	Sex	Brood year	Number	Mean length (in)	Range	Mean weight (lb)	Range
1	Male	2010	0	--	--	--	--
	Female		0	--	--	--	--
2	Male	2009	18	21.5	19.0-23.6	4.4	3.0-5.6
	Female		2	25.9	24.5-27.3	8.3	6.0-10.7
3	Male	2008	53	27.3	23.5-31.7	9.5	4.4-14.2
	Female		25	27.4	24.1-31.1	10.2	6.7-16.8
4	Male	2007	11	32.6	28.4-36.0	15.4	9.0-20.6
	Female		53	32.9	26.0-36.9	16.1	6.9-25.8
5	Male	2006	0	--	--	--	--
	Female		0	--	--	--	--

Table 14. 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

Cisco Vertical Gill Netting

Young-of-year cisco

Relative abundance of young-of-year cisco fell to less than one per net-night in 2012; down from 144 per net-night in 2011. This was well below the long term average of 72 per net-night from 1986 to 2012. Young-of-year cisco relative abundance on Fort Peck Reservoir has fluctuated greatly over the years and similar trends have been observed in other reservoirs where cisco populations occur (Dave Yerk, personal communication; Table19). A total of 7 young-of-year cisco and 23 adults were captured in 2012.

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). 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 13th, 1985 and December 21st, 2000 resulting in two of the largest year classes ever produced. Ice cover occurred late on January 20th, 2012 and opened early on March 20th, 2012 resulting in the poorest 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 18). Although declines in reservoir elevation weren't as severe 2012, it's likely that late 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 15. 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 2002-2012.

	Young-of-year cisco CPUE										
Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Lower Big Dry											
Bear Creek West	1	1	18	0	37	26	44	155	12	24	0
Sandy Arroyo	--	3	--	--	--	--	--	--	--	--	--
Spring Creek	--	3	13	16	--	--	--	--	--	--	--
Bobcat	--	--	2	3	100	13	16	221	11	11	0
Lower Missouri Arm											
Duck Creek	6	13	31	321	139	102	263	185	53	36	2
Fifth Coulee	--	--	--	--	200	42	281	201	152	51	0
Marina	3	1	2	26	256	5	17	7	39	31	0
Milk Coulee	18	19	--	121	--	117	174	366	60	77	0
Sage Creek	--	1	1	82	201	13	33	188	44	67	0
Shaft Houses	11	1	86	--	70	--	--	--	--	--	--
Bear Creek	5	11	213	261	58	58	225	897	120	249	2
Middle Missouri Arm											
Cattle/Crooked Creek	--	7	2	77	67	5	107	--	96	879	1
Pines Bay	--	2	14	55	225	12	76	239	122	102	1
Gilbert Creek	--	2	9	22	270	51	20	285	21	119	2
Hell-Sutherland	--	14	--	--	--	--	--	--	--	--	--
7th Point	--	--	8	32	--	--	--	--	--	--	--
8th Point	--	--	8	82	27	8	108	--	107	81	0
Mean CPUE	6	3	31	84	137	37	113	274	70	144	<1.0

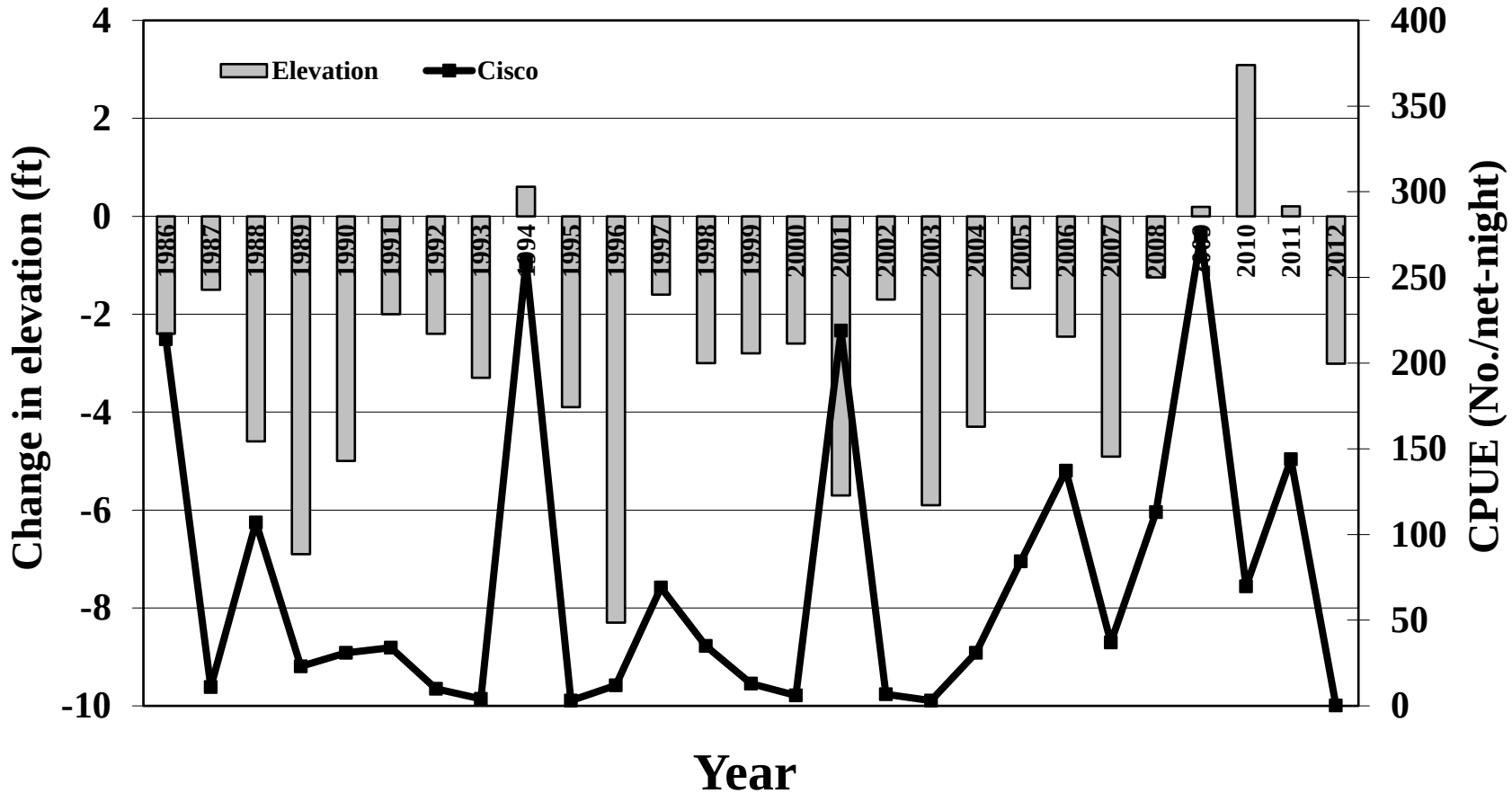


Figure 18. Change in reservoir elevation from December high to March low in contrast to mean CPUE (No./net-night) of young-of-year cisco collected in vertical gill nets on Fort Peck Reservoir, 1986-2012.

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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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 2012 by date, region, location, and size.

Date	Location	Region[1]	Fry	Fingerling	Advanced	Hatchery
4/30/2012	Nelson Creek	UBD	2,575,000			Fort Peck
5/2/2012	Nelson Creek	UBD	2,900,000			Fort Peck
5/4/2012	Nelson Creek	UBD	429,165			Fort Peck
5/7/2012	McGuire Creek	UBD	1,300,000			Fort Peck
6/14/2012	Nelson Creek	UBD		221,901		Miles City
6/19/2012	Lost Creek	UBD		146,228		Fort Peck
6/20/2012	Short Creek	UBD		79,520		Fort Peck
6/20/2012	Lone Tree Creek	UBD		79,520		Fort Peck
6/21/2012	McGuire Creek	UBD		74,925		Fort Peck
5/14/2012	Rock Creek - Old state ramp	LBD	4,050,000			Fort Peck
6/18/2012	Box Creek	LBD		159,355		Fort Peck
6/18/2012	Rock Creek - Old state ramp	LBD		40,378		Fort Peck
6/19/2012	Rock Creek - Old state ramp	LBD		15,274		Fort Peck
6/29/2012	Box Elder	LBD		61,919		Fort Peck
6/29/2012	North Fork Rock Creek	LBD		4,010		Fort Peck
6/29/2012	Sand Arroyo	LBD		57,625		Fort Peck
7/6/2012	Bobcat Creek	LBD		31,351		Fort Peck
7/6/2012	Spring Creek	LBD		104,505		Fort Peck
5/16/2012	Duck Creek	LMA	480,000			Fort Peck
6/20/2012	Duck Creek	LMA		90,880		Fort Peck
6/21/2012	Skunk Coulee	LMA		74,397		Fort Peck
6/21/2012	Third Coulee	LMA		74,398		Fort Peck
6/26/2012	Bear Creek	LMA		151,058		Fort Peck
6/26/2012	Marina	LMA		110,717		Fort Peck
6/27/2012	North Fork Duck Creek	LMA		40,639		Fort Peck
6/28/2012	Fourth Coulee	LMA		69,797		Fort Peck
6/29/2012	Duck Creek	LMA		21,731		Fort Peck
7/3/2012	Marina	LMA		37,252		Fort Peck
7/3/2012	Duck Creek	LMA		28,797		Fort Peck
7/6/2012	Haxby	LMA		26,785		Fort Peck
7/19/2012	Marina	LMA			707	Fort Peck
4/30/2012	Hell Creek	MMA	3,600,000			Miles City
5/7/2012	Hell Creek	MMA	2,500,000			Miles City
6/13/2012	Hell Creek	MMA		113,628		Miles City
6/13/2012	Sutherland Bay	MMA		113,629		Miles City
6/15/2012	Hell Creek	MMA		55,093		Miles City
6/18/2012	Hell Creek	MMA		93,475		Miles City
6/18/2012	Upper Duck Creek	MMA		93,475		Miles City
6/22/2012	Pines Bay	MMA		141,578		Fort Peck
6/28/2012	Gilbert Creek	MMA		69,797		Fort Peck
6/28/2012	Sixth Coulee	MMA		67,579		Fort Peck
7/2/2012	Cattle/Crooked Creek	MMA		51,757		Fort Peck
Total			17,834,165	2,602,973	707	

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

Appendix 3. 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

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

Appendix 4. 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 2002-2012, 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

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