Fisheries Division
Federal Aid Job Progress Report

Montana Statewide Fisheries Management

Federal Aid Project Number: F-113-R-6
July 1, 2016 – June 30, 2017

Project Title: Montana Statewide Fisheries Management

Job Title: Havre Area Warm Water Fisheries Management

Abstract: Paddlefish tagging was conducted on the Missouri River paddlefish population upstream of Fort Peck Reservoir. Throughout the sampling period, paddlefish tagging and harvest records were maintained. Two paddlefish creel stations were operational near the Fred Robinson Bridge, Missouri River, from May 1 - June 15. In addition, young-of-year paddlefish surveys (visual counts) were conducted in the headwaters of Fort Peck Reservoir. Overall harvest on this population has been reduced in recent years (regulation changes occurred in 2007, 2008, and 2016) to offset a decade of severe drought, resulting in poor spawning conditions and recruitment. The average size of adult fish remains stable, and recruitment has been excellent in recent years due to high spring flows and elevated reservoir levels (2008 and 2011).

Standardized gill netting and beach seining surveys were conducted at Fresno, Nelson, Dry Fork, and Beaver Creek Reservoirs. Select ponds were sampled throughout Hill, Blaine, and Phillips Counties to assess fish population levels, survival and recruitment. Self-creel boxes were also maintained at select ponds in Hill, Blaine, and Phillips Counties to assess fishing pressure. Results of all other sampling are presented.

OBJECTIVES AND DEGREE OF ATTAINMENT

Survey and Inventory- Objective is to survey and monitor the characteristics and trends of fish populations, angler harvest and preference, and to assess habitat conditions in selected waters. Objective accomplished, data presented.

Fish Population Management- Objective is to implement fish stocking programs and/or fish eradication actions to maintain fish populations at levels consistent with habitat conditions and other limiting factors. Objective accomplished, data presented.

Technical Guidance- To review projects by federal, state and local government agencies and private parties that have the potential to affect fisheries resources, and to provide technical advice or decisions to mitigate impacts on these resources. Provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources. Objective accomplished: (6) 310 and (13) 124 projects were reviewed along with one waste water improvement review with local agencies; attended five walleye unlimited meetings and helped with four school programs and fishing events related to the "Hooked on Fishing" program.

Angler Education- 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. Objective accomplished through staff participation in the "Hooked on Fishing" programs with local grade school children, planning and conducting of fall and winter fishing trips with area grade school and junior high students. Public presentations were also given on area fisheries in Havre and Malta. Staff also attended Walleye Unlimited meetings in Havre and Malta to provide information.

PROCEDURES, RESULTS, & DISCUSSION

Fort Peck Reservoir and Upper Missouri River Paddlefish Stock

The Fort Peck stock was isolated from the Yellowstone-Sakakawea population upon closure of the Fort Peck Dam in June of 1937. Completion of the Fort Peck Dam isolated the Fort Peck stock, but it also created productive rearing habitat, resulting in increased abundance and size of paddlefish, and created a valuable recreational snag fishery in the Upper Missouri River.

The alteration of flows from upstream dams and low water levels on Fort Peck Reservoir are thought to be a reason for poor reproductive success of paddlefish from 1999-2007 (Leslie 2007). Reduced size of adults and fecundity of females in the Upper Missouri River have also been observed and documented (Leslie 2007). In addition, the popularity of the fishery has increased during this time period, bringing into question whether or not natural reproduction and recruitment is adequate for long-term sustainable harvest.

The current management strategy is to provide a stable recreational fishery while ensuring a sustainable population size and diverse age structure of the spawning stock exists. To meet this goal, regulations were changed during the 2007-snagging season. These regulations limited harvest to one paddlefish per person and required anglers to choose the area they wanted to fish (Missouri River above Fort Peck Reservoir; Fort Peck Dredge Cuts; lower Yellowstone River/Missouri River below Fort Peck Reservoir). To distribute harvest and reduce size selective harvest, mandatory catch and release days (Sunday, Monday, & Thursday), and mandatory harvest days (Friday, Saturday, Tuesday, & Wednesday) were implemented. Additionally, snagging was limited from 6 am to 9 pm to reduce potential illegal take of paddlefish, and make enforcement of the regulations more manageable.

Based on the results of the 2007 season, additional changes were made during the 2008 season. A harvest cap of 500 fish was established, a season was set (May 1st to June 15th), hook size restriction were set, mandatory catch and release and harvest days were eliminated, and immediate release was further defined for paddlefish. Since 2008 the harvest season (number of days to obtain 500 fish harvest cap) continually decreased (i.e. in 2014 the harvest cap was obtained in four days). The harvest cap regulations shifted pressure towards the opening weekend and anglers voiced frustrations towards the crowding of people at campsites/facilities and fishing areas. In 2016 the Fish, Wildlife, and Parks (FWP) commission passed new regulations that implemented a lottery draw for 750 harvest tags. All paddlefish harvested have to be mandatorily reported via phone, email, or on-site. Anglers who don't draw a harvest tag are able to snag and release.

Data Collection Methods

For more effective management of the Fort Peck stock, a thorough understanding of several key aspects of their life history is necessary. Data collected includes: population estimates, harvest rates, spawning periodicity, age-structure, reproductive success, and recruitment.

Baseline data on the paddlefish population above Fort Peck Reservoir has been collected since the early 1970s. In 1993, a standardized monitoring program was established to assess population size, harvest rates, spawning periodicity, and to collect information on movement patterns and identify spawning sites. To gather this information, sampling occurs in the Upper Missouri River during the spawning period when paddlefish are staging around the Fred Robinson Bridge. Sampling typically occurs from April through May on the ascending arm of the hydrograph, typically at or above 8,000 cubic feet per second (cfs). Adult paddlefish are collected using drifted floating gill nets measuring 150 ft long, 8ft deep, with 6 inch mesh. Collected paddlefish are weighed, measured (eye-fork length), sexed, and tagged with an individually numbered metal jaw tag.

Beginning in 1996, concern over low flows and recruitment prompted the establishment of visual count surveys in the headwaters of Fort Peck Reservoir as a means of producing an annual index of year-class strength and recruitment of young of year (YOY) paddlefish. Visual counts have been found to be the most effective means to survey YOY paddlefish. Counts are conducted from an open bow powerboat using standardized methods and fixed transects. Observed YOY paddlefish are divided into age groups based on estimated length (YOY, sub-adult, and adult).

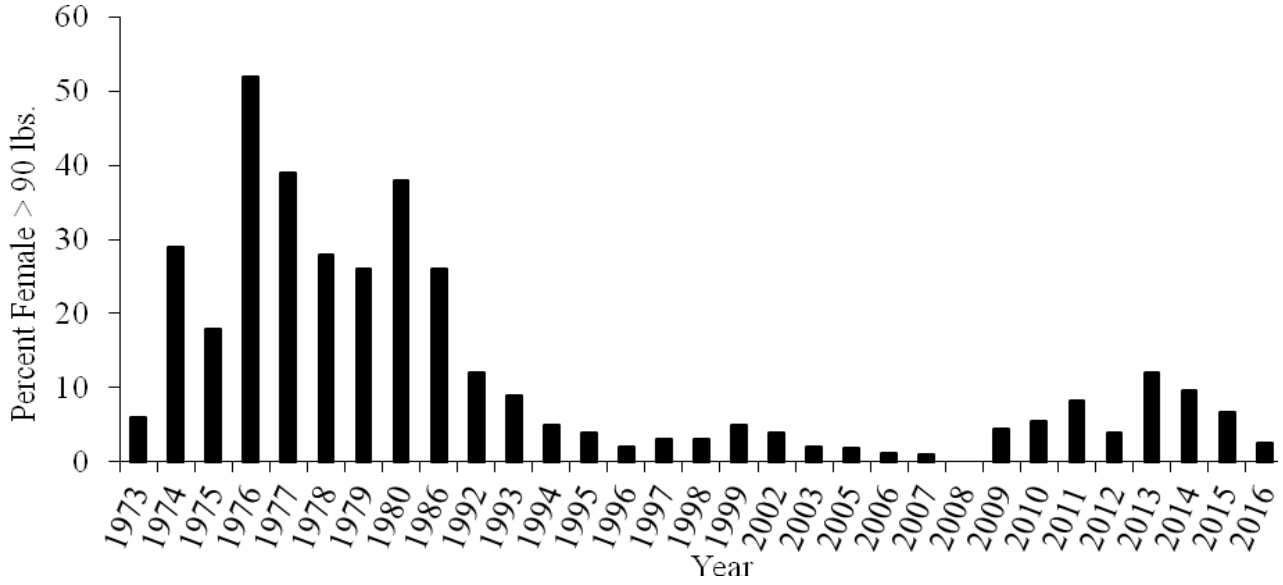
Adult Paddlefish Monitoring and Tagging

In 2016, paddlefish tagging started on April 19th and continued until May18th, when crews tagged our 408th paddlefish. Since tagging was initiated in 1977, 8,204 paddlefish have been tagged and 984 tagged paddlefish have been recaptured during annual drift netting surveys. On average, approximately 12.0% of the paddlefish captured in our drift nets is comprised of recaptured fish. In 2016, 23.3% of the paddlefish observed during our netting efforts were recaptured fish. Based on the tagging and recapture data, the reproductive periodicity of male paddlefish is one to two years and for females every two to three years. Since 1973, FWP has monitored the number of female paddlefish weighing greater than 90 pounds captured during our tagging efforts (Figure 1). This data has confirmed a long standing hypothesis that as Fort Peck Reservoir aged, the productivity within the reservoir would gradually decrease, resulting in smaller female paddlefish with lower fecundity. However, our data has shown a positive response in paddlefish condition and weight when Fort Peck Reservoir fills after several years of low pool conditions (nutrient plume; Figure 1). In 2016, 6.7% of all female paddlefish captured during our tagging efforts weighed more than 90 pounds (Figure 1). Females captured in 2016 averaged 69.3 pounds.

Since tagging was initiated in 1977, a total of 984-tagged paddlefish have been reported as harvested, which is about 12.0% of all tagged paddlefish. While paddlefish anglers are encouraged to report catches of tagged fish, reporting rates have been low in years when on-site creel surveys are not

conducted. In 2016, 41-tagged paddlefish were reported as harvested and 13-tagged paddlefish were reported as snagged and released, anglers harvested 3 paddlefish tagged in 2016.

Figure 1. Percent of female paddlefish captured during adult tagging efforts weighing more than 90 pounds from 1973-2016.



Preliminary Population Estimates

Estimates of population size of the recruited portion of the Fort Peck stock were developed from 1993 through 2016 based on mark recapture sampling associated with gill netting and tagging, conducted prior to and during the paddlefish snagging season. Point estimates and confidence intervals were developed using two approaches for estimate verification purposes: a modified Schnabel estimate and a modified Peterson estimate. Modifications, which allow for multiple years of marking and recapture data, were necessary because only a fraction of the recruited paddlefish stock matures and migrates upstream in a given year.

Population estimates were obtained using mark-recapture data and the Peterson-Lincoln estimator (or Peterson estimator). Four separate estimates were performed. Years with no reported harvest (1997, 1999, 2001, 2003, and 2004) and one year with limited tagging effort (i.e. 2008 with only 22 new fish being tagged) were excluded. In 2016, the four estimates suggest an adult population consisting of approximately 18,000 paddlefish (95% CI 12,000 – 20,000). Questions have been raised about the viability of these estimate models and more research is being conducted on a number of models/methods to estimate the population sizes of all stocks in the future.

Spawning and Recruitment

The spawning success and recruitment rate of paddlefish is directly influenced by the magnitude, timing, and duration of peak flows. Berg (1981) postulated that a minimum flow of 14,000 cfs maintained for a period of 30 days is required to trigger paddlefish to move out of their staging areas and migrate upriver to spawning locations. This requirement has been observed in the Fort Peck stock by monitoring flows (Table 1) and movement patterns, and comparing those to year class strength through ageing and YOY sampling. Our data suggests the closer flows resemble those postulated by Berg, the more likely we are to observe higher densities of YOY paddlefish during our visual counts. However, when flows are marginal to poor, our data suggests paddlefish in the Upper

Missouri are still reproducing, though the year-class is small when compared to year-classes observed under high flows.

During the 1990s and early 2000s, 7 of the 20 years met the requirements necessary for successful migration and spawning (Figure 2 and 3). From 2000-2007, flows did not meet the minimum flow and duration requirements (Figure 3). However, since 2008, paddlefish jaws aged from harvested fish contained age classes produced from these "poor" flow years. Flow requirements were met from 2008-2011 (Figure 4; Table 1). The historic spring flows experienced in 2011 on the Upper Missouri River were the fifth highest ever recorded at the USGS Landusky gauging station (peak flow > 72,000 cfs; Figure 4).

In 2016, warm winter temperatures and less than ideal snowpack created poor spawning conditions for paddlefish. The Missouri River at the Fred Robinson Bridge was free of ice cover by the first week of March. Flows remained low through mid May (flows < 10,000 cfs) and peaked at approximately 13,900 cfs on May 29th. Flows then quickly receded and fell below 8,000 cfs on June 20th. Peak flow never met trigger flows (Berg 1981) in 2016.

Hydrograph information (Figures 2, 3, and 4) suggests that good spawning conditions vary among years (Table 1). Poor recruitment due to low river flows and reduced water levels on Fort Peck Reservoir from 2000-2007 has been identified by YOY visual counts, which have been conducted annually since 1997 (Kozfkay & Scarnecchia 2002; Bowersox 2004; Miller 2005; Miller & Scarnecchia 2006). Effort has varied among years due to scheduling conflicts, limited personnel, and pit tagging efforts. Good recruitment of YOY paddlefish was observed in 1997, 1998, 2008, and 2011; when flows exceeded the historical hydrograph and Fort Peck Reservoir levels were high.

In 2016, no YOY and one sub-adult paddlefish were observed during the fixed transects between RM 1863.5 and 1878.5 (Table 2). In addition to the standardized counts, we applied a total of 10 hours of random search effort on August 2nd and 16th to identify habitats containing YOY paddlefish not sampled during the transect counts (Table 3). These random searches were conducted near the river/reservoir interface and outside of the standard transect area (RM 1868- 1880). Random counts yielded a total of one sub-adult and 25 adult paddlefish being observed (Table 3).

Table 1. Paddlefish spawning success ratings for the years 1974-2016, using trigger flow (> 14,000 cfs) incidence and duration as the sole criteria. Good rating is defined as trigger flow being met and exceeded for a minimum 30 consecutive days, marginal rating is trigger flow was met but didn't exceed 30 days, and poor rating is flow did not meet trigger flow requirement.

	Paddlefish Spawning Rating		
Year	Good	Marginal (#days> TF)	Poor
1974	X		
1975	X		
1976	X		
1977			X
1978	X		
1979		X (20)	
1980	X		
1981	X		
1982	X		
1983		X (29)	
1984	X		
1985			X
1986		X (19)	
1987			X
1988			X
1989		X (05)	
1990		X (03)	
1991	X		
1992			X
1993	X		
1994		X (06)	
1995	X		
1996	X		
1997	X		
1998		X (25)	
1999		X (13)	
2000			X
2001			X
2002		X (16)	
2003		X (05)	
2004			X
2005		X (05)	
2006		X (09)	
2007			X
2008	X		
2009	X		
2010	X		
2011	X		
2012		X (15)	
2013		X (15)	
2014	X		
2015		X (09)	
2016			X

[1]Flows measured at the Landusky Measuring Station

Figure 2. - Historical and observed Missouri River hydrograph at the USGS Landusky, MT gauging station 1990-1999.

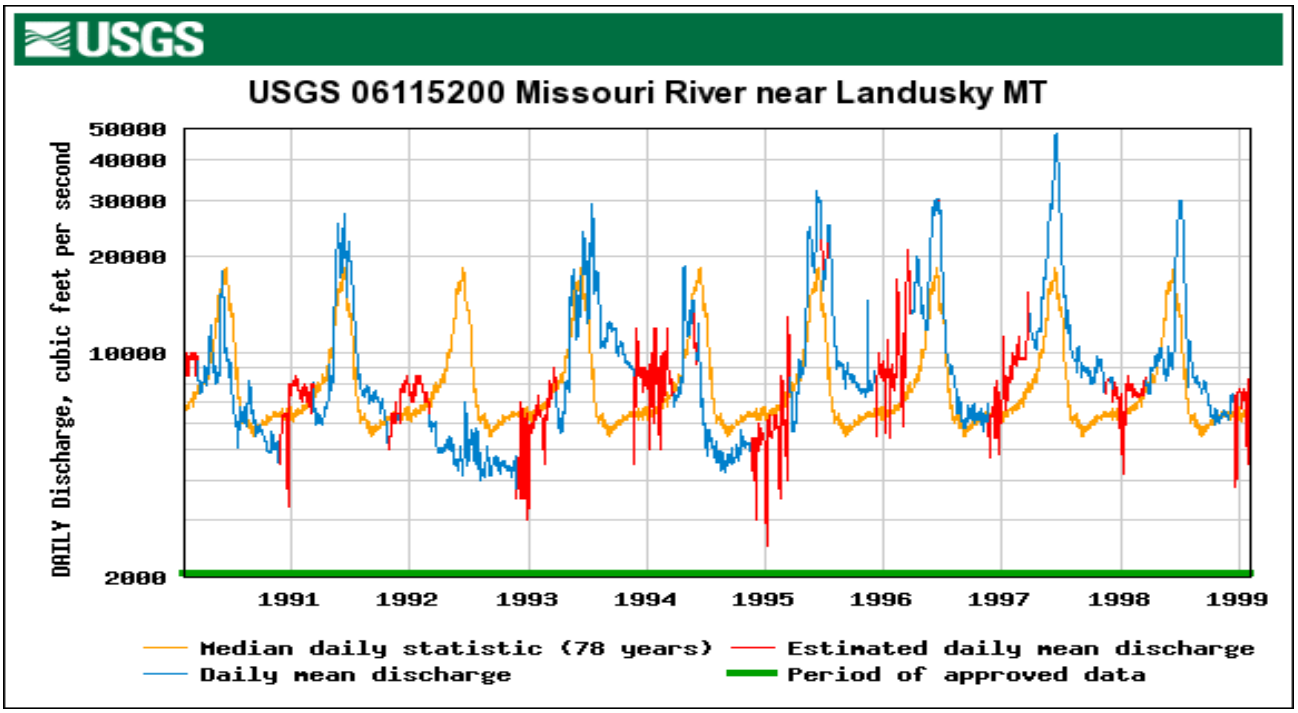


Figure 3. - Historical and observed Missouri River hydrograph at the USGS Landusky, MT gauging station 2000-2009.

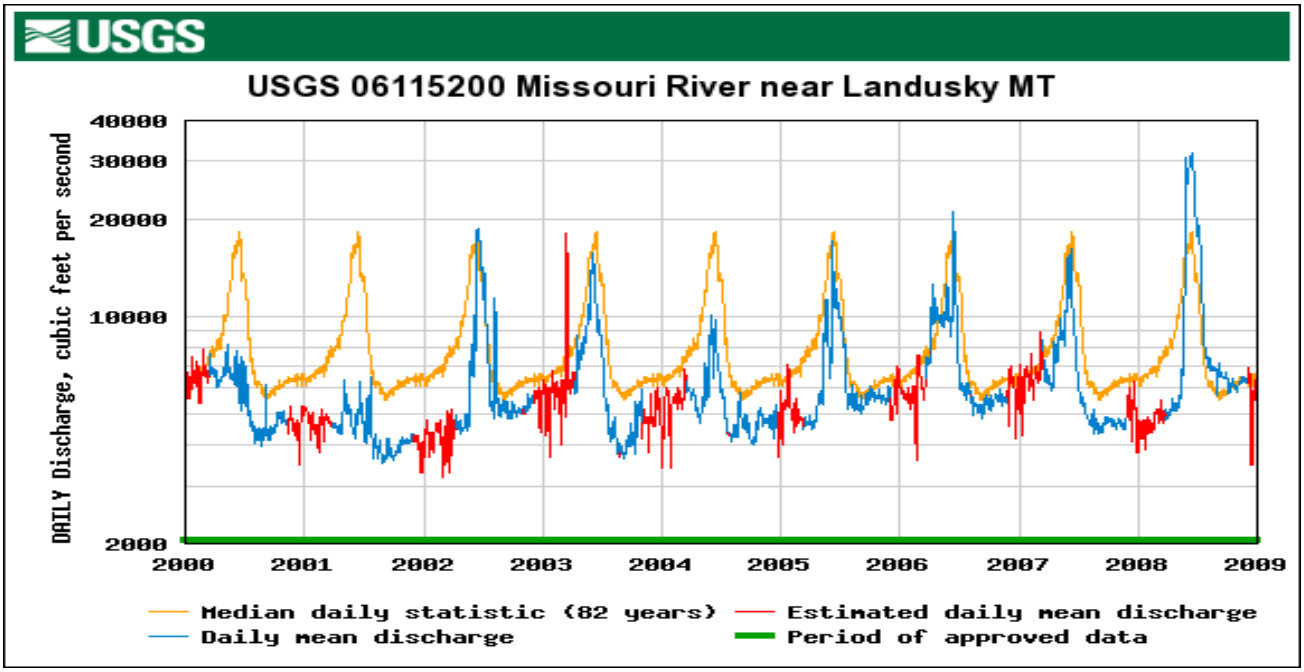


Figure 4. - Historical and observed Missouri River hydrograph at the USGS Landusky, MT gauging station 2009-2016.

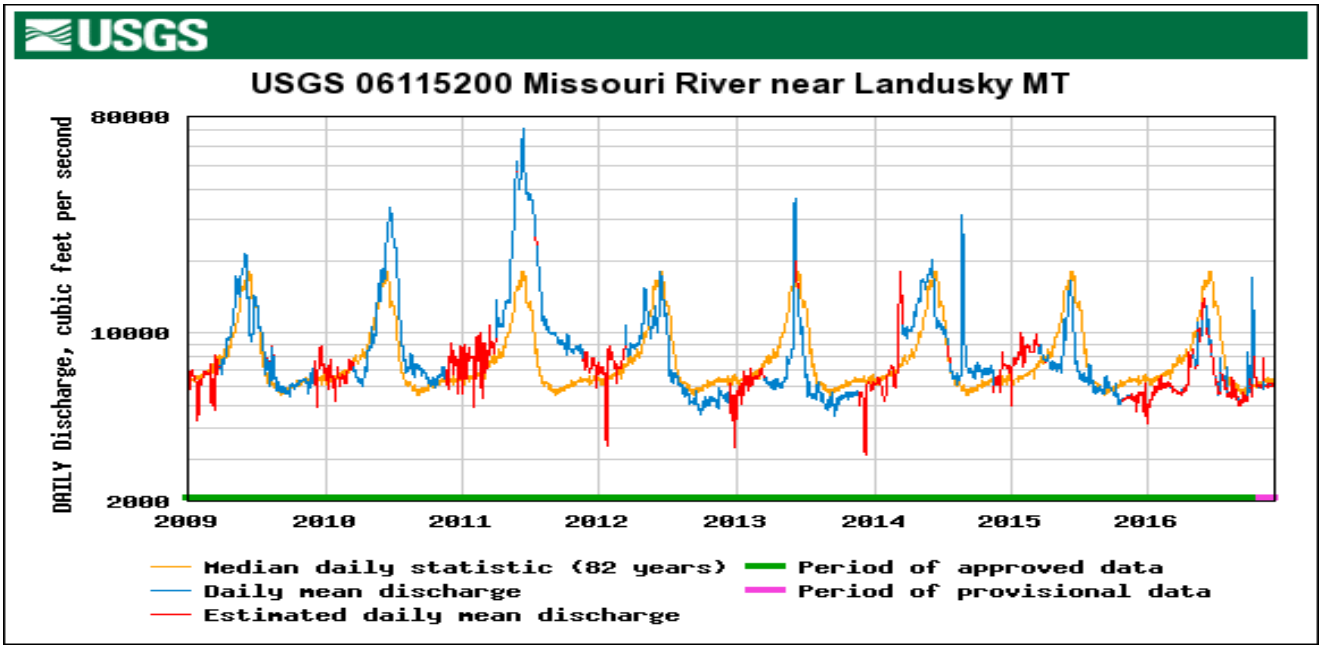


Table 2. - Results of standardized YOY paddlefish visual count surveys conducted in the headwaters of Fort Peck Reservoir from 1997 to 2016.

Year	Transect Dates	# Stations	Station Locations (RM)	# Transects	# YOY	# Sub-Adults	Reservoir Elevation (August)	Collector
1997				69	113	3	2248'	
1998	7/27 to 9/23	8	1888 to 1866	216	97	54	2239'	Kozfkay
1999	8/25 to 9/20	8	1888 to 1866	174	3	10	2236'	Kozfkay
2000				90	0	11	2230'	
2001				90	1	0	2221'	
2002			1862 to 1856 ?				2219'	Bowersox
2003			1862 to 1856 ?	54	2	4	2211'	Bowersox
2004			1853 to 1838	54	0	3	2201'	
2005	8/8 & 8/16	6	1853 to 1838	36	1	0	2202'	Miller
2006	7/24 & 7/30	6	1853 to 1838	36	2	1	2204'	Miller
2007	7/31 & 8/6	6	1854 to 1838	6	0	2	2201'	Miller
2008	8/6 & 8/12	6	1844 to 1858	12	4	3	2209'	Miller
2009	8/11 & 8/17	6	1843 to 1858	12	0	0	2220'	Miller
2010	7/27 & 8/3	6	1863.5 to 1878.5	12	0	0	2236'	Miller
2011	7/28 to 9/1	6	1866.5 to 1881.5	30	61	3	2242'	Hemingway
2012	7/30 & 8/9	6	1863.5 to 1878.5	12	1	3	2234'	Hemingway
2013	8/5 & 8/14	6	1855.5 to 1870.5	12	0	14	2226'	Hemingway
2014	7/28, 8/4, & 8/17	6	1859.5 to 1874.5	18	0	0	2230'	Hemingway
2015	8/3, 8/10, & 8/18	6	1866.5 to 1881.5	18	0	0	2236'	Hemingway
2016	8/2 & 8/16	6	1863.5 to 1878.5	12	0	1	2235'	Breen

Table 3. - Results of random YOY paddlefish visual count surveys conducted in the headwaters of Fort Peck Reservoir from 2008 to 2016.

Year	Transect Dates	Effort (Hours)	Station Locations (RM)	# YOY	# Sub-Adults	# Adults	Collector
2008	8/6-8/13	24	1859-1861	42	0	--	Miller
2009	8/11-8/17	12	1857-1862	2	3	--	Miller
2010	7/26-9/27	75	1874.5-1884	0	26	--	Miller
2011	7/25-8/8	27	1875-1888	205	2	13	Hemingway
2012	7/31/, 8/9-8/10	14	1869.5-1884.7	1	16	75	Hemingway
2013	8/ (6-7) (14-16) (21-22)	28	1859.5-1886	2	85*	196	Hemingway
2014	7/(29-30), 8/(5-6) (18-19)	27.25	1859-1887	0	7*	54	Hemingway
2015	8/4, 8/11, & 8/17	18	1865-1885	1	19*	42	Hemingway
2016	8/1, 8/2, & 8/16	10	1868-1880	0	1*	25	Breen

-- No data collected for observed period of record

* Majority of these fish were classified as sub-adults and most likely age-2 or 3 fish

Harvest: Paddlefish Creel Survey 2016

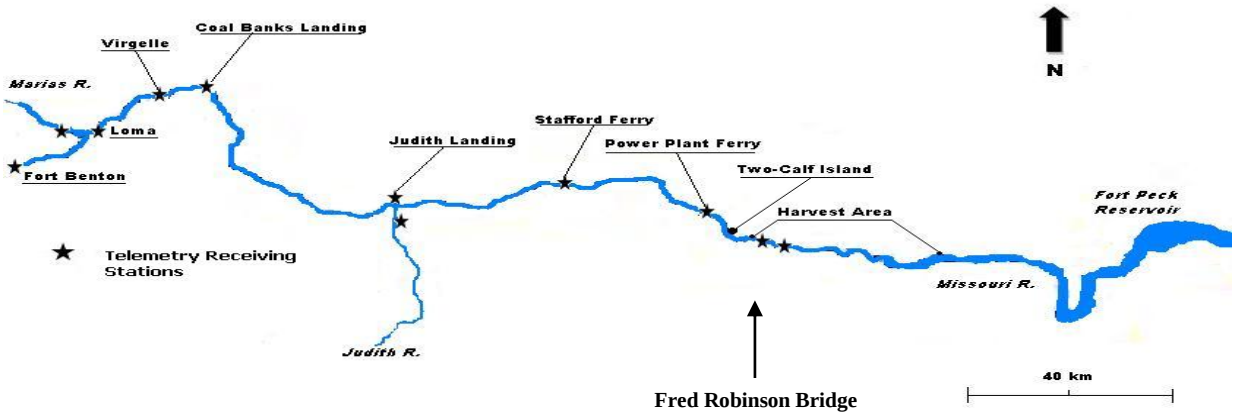
Methods

A five-year native species creel survey was conducted by FWP Region 6 personnel from 2005-2009 to better understand catch and harvest rates, age structure of harvested fish, angler pressure, and angler demographics from the Fred Robinson Bridge to Peggy's Bottom (Figure 5). From 2010-2015 the creel was conducted annually by vehicle and boat from May 1st to June 15th from the Fred Robinson Bridge to Peggy's Bottom, focusing solely on paddlefish and paddlefish anglers.

New regulations adopted on the Upper Missouri paddlefish fishery were implemented in 2016, changing the protocols surrounding the creel historically conducted during the paddlefish season. Anglers now have to mandatorily report a harvested paddlefish on the Upper Missouri. In 2016, creel clerks were stationed at two checkpoints located at the Kipp and Rock Creek campgrounds to provide a location for anglers to check in their harvested paddlefish and collect additional harvest data.

Schedules were divided to cover the entire week with overlapping schedules occurring on the weekends, when fishing pressure increased. Anglers were also able to submit harvest information via phone hotline or filling out the harvest collection card which was issued to them when they received their harvest tag. A phone creel was also used to collect participation, angling effort, and success from both harvest and snag and release anglers.

Figure 5. Map of the creel area including locations of fixed telemetry receiving stations in the Upper Missouri River above Fort Peck Reservoir. Harvest area encompasses RM 1897-1921.



Paddlefish Phone Creel (2003-2016)

Vic Riggs and Larry Brooks with the University of North Dakota (Riggs 2005) designed and conducted the paddlefish phone creel survey annually from 2003 to 2005. This survey was continued solely by FWP in 2006. The survey was originally conducted to: (1) determine the harvest of paddlefish at sites other than the Intake Fishing Access Site, (2) check on the accuracy of the Intake creel survey, (3) possibly replace the Intake creel survey, (4) obtain harvest statistics for the Fort Peck population and (5) assess angler support for changes to regulations.

Phone creel statistics have been obtained for the Fort Peck population since 2003 (Table 4). On average approximately 2,405 angler's snag for paddlefish above Fort Peck Reservoir annually, representing approximately 5,397 fishing days. On average approximately 1,696 paddlefish are caught annually above Fort Peck Reservoir with approximately 64% of the paddlefish being released (Table 4).

In 2016, three separate phone creels were performed based on angler type. The three categories were: 1) Harvest angler, 2) Snag and release (unsuccessful in lottery draw), and 3) Over the counter snag and release (didn't apply for harvest draw). All harvest tag holders were interviewed (n=752), whereas only a portion of anglers were interviewed from the other two categories (over the counter (n=188 (of 536)) and unsuccessful in draw (n=501 (of 1,431)).

Effort

In 2016, 2,717 anglers purchased an Upper Missouri River paddlefish license, via entering the draw or purchasing the over the counter snag and release tag. Three separate phone creels were performed based on angler type. The number (n) and respondents (r) of interviews conducted varied between categories. The three categories were: 1) Harvest angler (n=752, r=499), 2) Snag and release (unsuccessful in lottery draw (n=501, r=314)), and 3) Over the counter snag and release (didn't apply for harvest draw (n=188, r=113)).

Estimated paddlefish snagging effort for all three types totaled 5,354 angler days (Table 4), harvest effort alone totaled 1,237 angler days. In 2016, approximately 60% of the angling effort occurred from shore with an estimated 350 paddlefish being harvested and an additional 2,101 paddlefish being caught and released (Table 4). Approximately 73% of harvest tag holders fished for paddlefish in 2016, whereas only 39% of unsuccessful lottery draw anglers participated in catch and release. Approximately 83% of the over-the-counter catch and release anglers participated in 2016.

Table 4. –Summary of estimates for the Fort Peck paddlefish population from the Montana paddlefish telephone creel survey (2003-2016).

Missouri River Above Fort Peck														
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number of Tags Sold	2,545	2,473	2,329	2,605	2,481	2,284	2,118	2,366	2,460	2,439	2,356	2,087	2,410	2,717
Number of Anglers	1,902	2,859	2,705	2,476	--	1,816	1,579	1,729	1,901	1,910	1,911	1,599	2,082	1,549
Total Days Fished*	5,757	9,172	8,385	7,565	-	4,426	2,748	5,789	4,816	3,671	4,716	2,924	4,838	5,354
Total Hours Fished*	27,433	44,400	42,277	39,800	-	-	-	-	-	-	-	-	-	-
Number Caught	1,583	1,102	1,516	2,290	-	845	2,342	1,851	1,411	1,460	1,345	2,048	1,802	2,101
Number Harvested	868	787	1,028	1,067	634	300	564	575	598	381	292	307	334	350
Catch Rate (fish/day)	0.151	0.086	0.123	0.141	-	0.068	0.205	0.173	0.096	0.104	0.062	0.47	0.069	0.44
Harvest Rate (fish/hour)	0.032	0.018	0.024	0.027	-	-	-	-	-	-	-	-	-	
Percent Released	45.17%	28.58%	32.19%	53.42%	-	64.50%	75.90%	68.90%	57.62%	73.90%	78.30%	85.00%	81.50%	85.70%
Percent Contacted by FWP Creel Clerk/Mandatory Report						85.71%	62.14%	38.61%	60.00%	78.00%	76.00%	78.80%	83.60%	97.80%

* Includes hours spent catch and release fishing

Phone Creel-Supplemental Questions

In 2012, we asked anglers being phone creeled to answer additional questions relating to a possible lottery tag or mandatory report system being implemented on the Upper Missouri paddlefish season. The same questions were asked again during the 2014 phone survey. Anglers surveyed in 2014 weren't as satisfied (68.7%) with the current paddlefish season structure as they were in 2012 (79.7%). When asked about their recent experience on the river during the paddlefish season, 43.4% (67.2% in 2012) said it was a great experience while 61.4% (55.2% in 2012) said their experience was affected by overcrowding, or the harvest season closed too early.

In 2014, 78.8 % (84.9% in 2012) of the anglers surveyed liked the option to catch and release paddlefish and 83.9% (81.9% in 2012) said they would support mandatory reporting of harvested fish. When asked if they would be in favor of a lottery type draw for paddlefish 38.1% (33.6% in 2012) said yes. When asked if they would still purchase a license to catch and release if they did not draw a harvest tag, 45.8% (64.2% in 2012) said yes. When anglers were asked to provide additional comments, the most common responses related to: catch and release fishing, season closes too soon, and increasing the harvest cap.

The additional survey questions asked in 2012 and 2014 aided in FWP's decision to change the regulations to a lottery draw for harvest tags (750 allocated) on the Upper Missouri River and mandatory reporting requirements for harvested paddlefish throughout Montana.

In 2016, based on compiled responses from all three angler categories, 85% of anglers were satisfied with the lottery draw and mandatory reporting requirements established in 2016. When asked about their overall experience, approximately 60% of anglers said they were very satisfied. When asked if they would support a bonus point option if unsuccessful in the lottery, approximately 69% said they'd be in favor of such a system. If an angler said they did not participate, they were asked a follow up question as to why they didn't participate. Of the lottery tag holders who did not participate the most common reason (50%) for not participating was "didn't have time/too much going on". Of the unsuccessful draw, catch and release anglers, the most common reason (51.6%) for not participating was "I did not draw a harvest tag". Of the over the counter catch and release anglers, the most common reason (63.2%) for not participating was "didn't have time/too much going on".

Approximately 39% of participating anglers used a boat to access their snagging areas, and 28 fish (suspected paddlefish) were reported as hit by a boat.

Harvest and Catch

Anglers were required to provide the following information on their harvested paddlefish: angler harvest tag #, angler name, angler ALS #, harvest date, length (eye to fork), sex, jaw tag present, jaw tag color, and jaw tag #. Though not required, anglers could also provide the weight and piece of the lower jaw for ageing purposes. These samples were then sent to the University of Idaho for analysis.

Results

In 2016, a total of 752 harvest permits were issued via a lottery draw. Non-resident anglers, representing nine states, comprised 2.8% of the harvest tag holders (Figure 6). Harvest tag holders represented 136 cities; with Billings, Great Falls, Lewistown, Bozeman, Havre, Helena, Belgrade, and Laurel having the highest representation (Figure 7).

Of the 320 paddlefish reported as harvest, resident anglers comprised the majority of harvest (Figure 8). The top cities of angler origin, who reported harvesting a paddlefish, came from larger cities located in central and eastern Montana (Figure 9). A total of 90 cities were represented by harvest reporters in 2016. Angler's preferred to report their harvest via the on-site reporting stations located at Kipp and Rock Creek campgrounds (Figure 10).

Figure 6. State of origin of those anglers who successfully drew a paddlefish harvest tag on the Upper Missouri River in 2016.

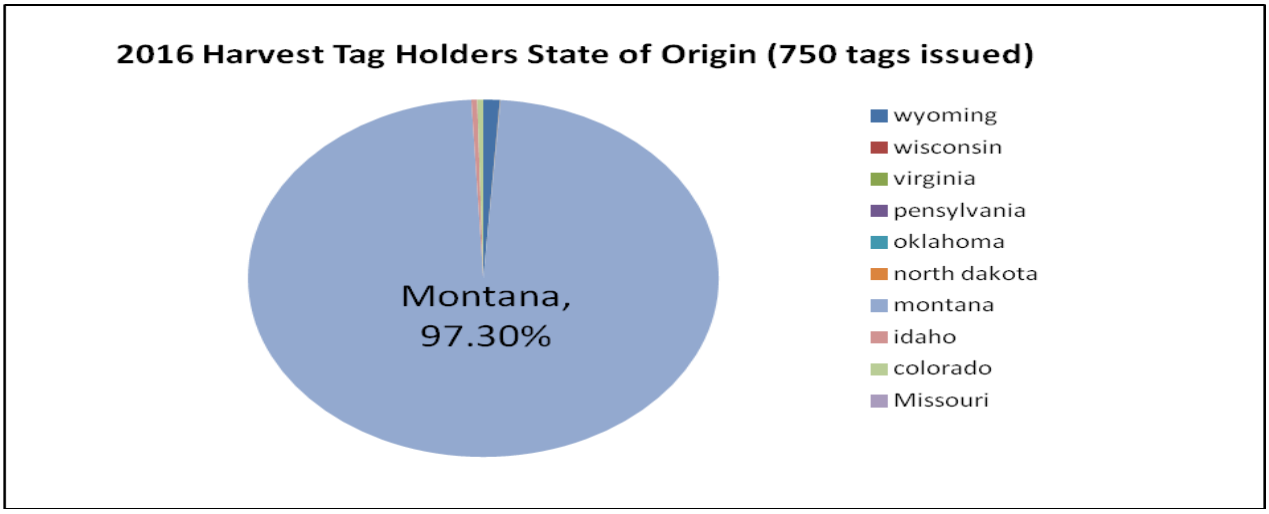


Figure 7. City of origin of those anglers who successfully drew a paddlefish harvest tag on the Upper Missouri River in 2016.

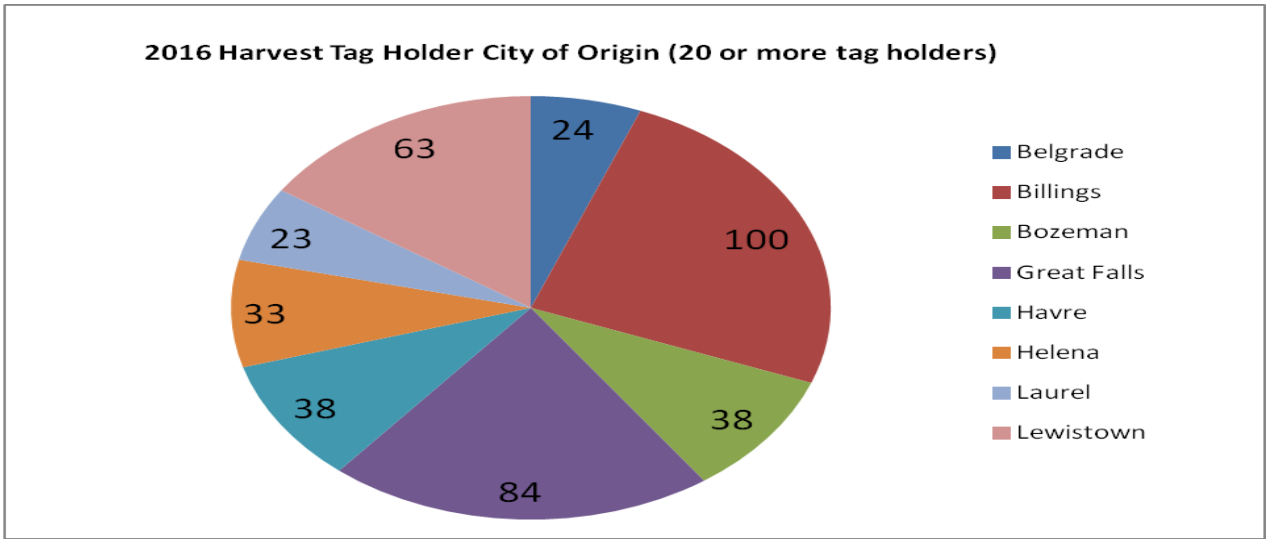


Figure 8. Residency of anglers who mandatorily reported a harvested paddlefish on the Upper Missouri River in 2016.

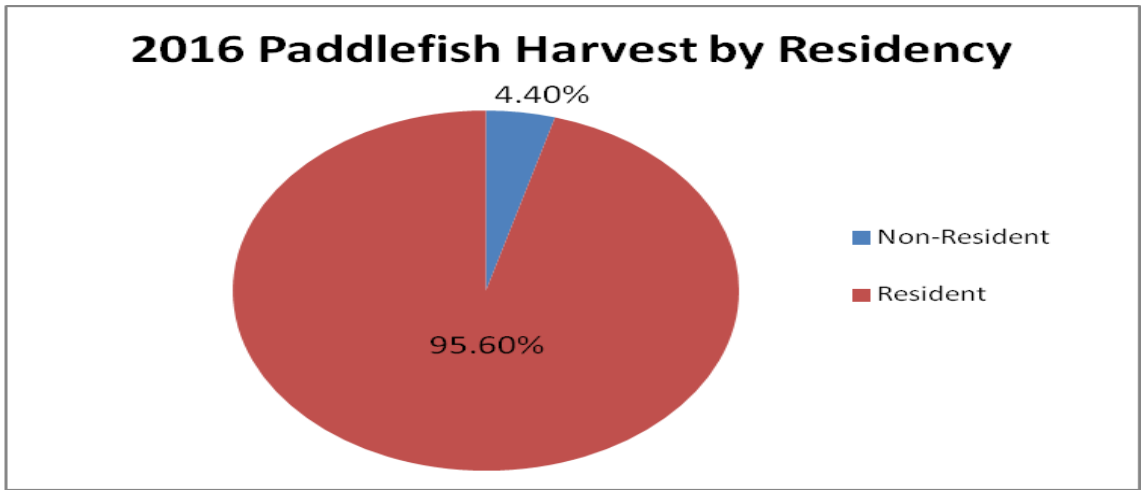


Figure 9. Anglers city of origin who mandatorily reported a harvested paddlefish on the Upper Missouri River in 2016. Cities displayed had a reporting rate of five or more paddlefish.

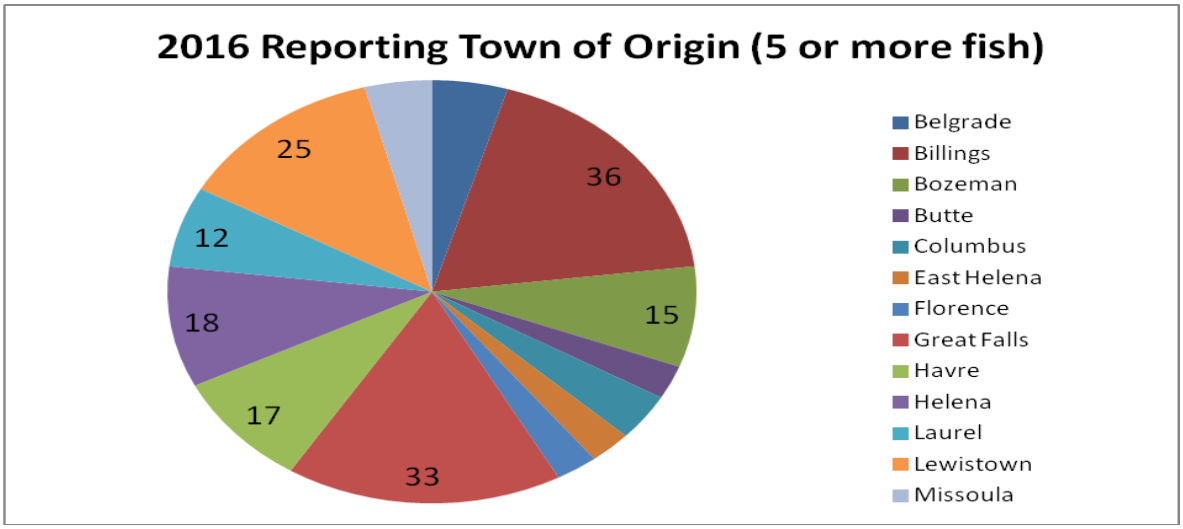
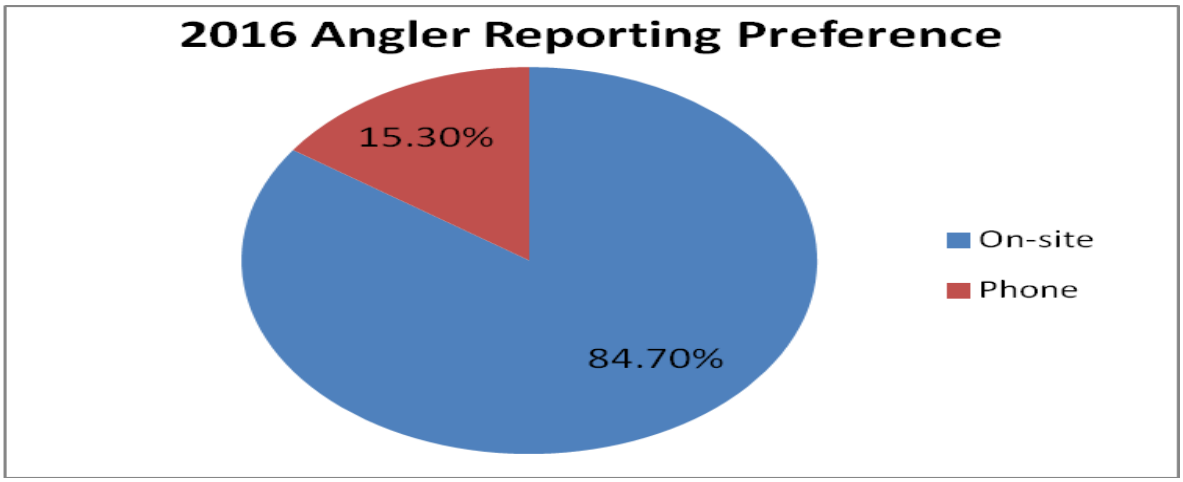


Figure 10. Reporting preference for anglers reporting a harvested paddlefish on the Upper Missouri River in 2016.



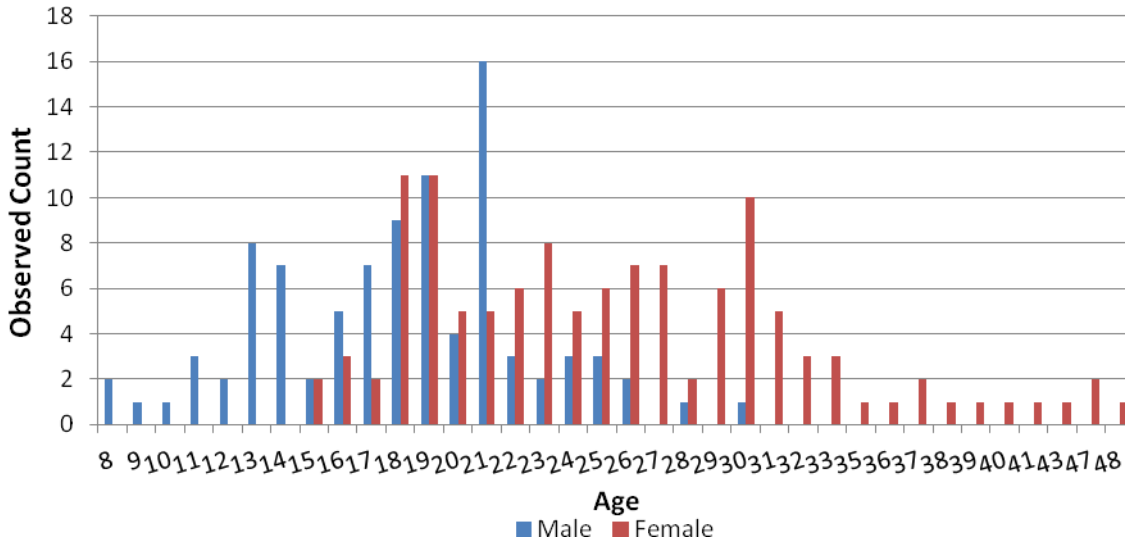
Harvest Statistics- Paddlefish

In 2016, anglers mandatorily reported harvesting 320 paddlefish on the Upper Missouri River. Harvested paddlefish ranged in length from 25.0 to 70.0 inches (eye-fork length) and weight from 18 to 119 pounds (Table 5 and Figure 7). Fifty-three percent of the harvested paddlefish sexed were females and 41/320 (12.8 %) of the harvested paddlefish and 13/2101 (0.6 %) of the released paddlefish had jaw tags. Harvested paddlefish ranged in age from 8 to 48 years with 48.7% of the harvested females (age 25-45) being classified as "prime spawners" and 5% of the harvested fish classified as new recruits (Figure 11).

]Table 5. – Length, weight, and condition indices of harvested paddlefish from anglers creeled in the Upper Missouri River (RM 1897-1921), May-June, 2005-2016.

Species	Year	Sample Size	Length Range (in.)	Length Avg.	Length SD	Weight Range (lbs.)	Weight Avg.	Weight SD
PF	2005	241	33.3-60.5	41.7	1.2	12.0-90.0	40.3	47.6
PF	2006	259	28.1-65.0	42.7	1.3	15.1-112.0	47.0	36.5
PF	2007	179	27.0-72.0	42.3	1.1	24.5-69.0	47.7	97.3
PF	2008	322	26.0-56.8	41.0	5.7	13.0-104.0	43.5	20.8
PF	2009	249	24.0-54	41.7	5.9	16.0-100	47.6	21.2
PF	2010	300	28.0-60.0	42.0	5.5	16.0-115	49.4	21.8
PF	2011	484	32.0-57.0	42.7	5.3	19.0-127.0	50.5	21.4
PF	2012	408	30.0-54.1	42.5	5.2	20.0-119.1	48.8	21.9
PF	2013	255	31.5-54.1	44.0	5.9	20.0-131.1	54.7	22.7
PF	2014	203	23.5-56.5	41.8	4.8	21.0-127.0	46.9	20.2
PF	2015	171	30.0-55.4	44.5	6.0	16.0-119.0	55.6	25.1
PF	2016	291	25.0-70.0	43.4	5.9	18.0-119.0	54.2	24.0

Figure 11. Age structure of harvested male (n=93) and female (n=119) paddlefish collected in the Upper Missouri River (RM 1897-1921) during the 2016 paddlefish season (May and June).



Discussion

Recruitment and growth is highly variable among years for this population (Table 2 and Table 3). Annual Fort Peck Reservoir pool elevations and flows in the Missouri River appear to influence the reproductive success, recruitment, and growth. Flows in the Missouri River from 1998-2007 were not consistently high enough to produce large year-classes of paddlefish due to prolonged drought conditions (Leslie 2005, 2006). In addition, the average size of adults has decreased over the last 30 years (Bowersox 2004). These declines, especially in growth, were believed to be the result of decreased productivity due to the aging of Fort Peck Reservoir (nursery grounds for paddlefish) and extremely low Fort Peck Reservoir levels from 1999-2007. However, since 2008 flows in the Missouri River have closely mimicked the historical hydrograph and in 2011 the fifth highest flow ever recorded at the Landusky gauge (77 years) was documented. In addition, Fort Peck Reservoir water levels increased in 2008, 2009, 2010, and in 2011 the spillway located on Fort Peck Dam was running water for the first time since 1997. Successful paddlefish reproduction is evident based on YOY transect observations, and adult fish captured during spring tagging efforts are in very good condition.

Upper Missouri River flows in 2016 were below average from March-late May, with a slight increase of flows for a short duration, suggesting marginal spawning conditions for adult paddlefish. YOY transects confirmed marginal spawning success when no YOY paddlefish were observed during our summer visual counts (Table 2 and Table 3). Recent drought conditions and altered reservoir water management along the Missouri River basin have increased the annual variability in pool elevations on Fort Peck. If these conditions persist for an extended period of time, zooplankton production will be reduced and could potentially impact adult condition and recruitment of YOY paddlefish into the existing population.

The combination of prolonged drought conditions affecting the low number of successful spawning years (based on observed trigger flow occurrence and duration; Table 1) and decreased size of adults has been noted and will continue to be monitored (Figure 1). It would be prudent to consider the effects of reduced recruitment and reduced fecundity of the adult population. However, the presence of paddlefish ranging in age from 8-13 that are showing up in the angler harvest, questions the specific flow requirements (velocity, duration, and timing) postulated by Berg (1981). These year-classes were produced under extreme drought conditions and minimal flows. Though they are showing up in the creel in small densities, their presence suggests spawning conditions are favorable to produce year-classes regardless of flows. Currently, YOY visual counts are the best sampling technique to confirm spawning success and have aided in identifying good year-classes (1997, 1998, 2008, and 2011) and year-classes produced under marginal or poor conditions (Table 2).

Anglers are allowed to immediately release a snagged paddlefish if they desire. Based on analysis of the fishery and public support, the fishing limit was reduced in 2007 from two paddlefish to one paddlefish annually. In 2008, the paddlefish season was reduced from a 365-day season to a 46-day season (May 1 to June 15), making monitoring total catch more feasible. Furthermore, an annual harvest cap of 500 paddlefish has been implemented since 2008. These regulation changes have resulted in a shorter season and fewer paddlefish being harvested annually.

In 2015 the FWP Commission passed regulations that changed the paddlefish season structure on the Upper Missouri River. With the aid of special creel surveys conducted in 2012 and 2014, on-site observations, on-site paddlefish creel survey, as well as face to face interactions with anglers during the paddlefish season, FWP concluded a change needed to occur to the season structure of this fishery. The harvest season was continually becoming shorter, complaints of over-crowding, not having time to attempt to harvest, and the aesthetic atmosphere associated with this season (from an anglers perspective) was reduced. Early observations based on angler responses to our phone creel suggest wide support for these recent changes to the Upper Missouri River paddlefish fishery established in 2016.

The Upper Missouri River paddlefish population continues to function as a self-sustaining fishery. The adult population continues to naturally reproduce and FWP has implemented regulations that reduce the likelihood of overharvest to occur.

Hill County Fishing Waters

Select waters throughout Hill County were sampled to determine fish abundance using sinking multi-filament experimental gill nets measuring125 feet in length and 6 feet deep, consisting of 25-foot panels of ¾", 1", 1 ¼", 1 ½", and 2" mesh unless otherwise specified. Voluntary creel boxes were maintained at many of the ponds to determine fishing pressure, catch rates, and satisfaction.

Bailey Reservoir

Bailey Reservoir covers approximately 70 surface-acres and has a maximum depth of 28 feet. This reservoir was open to public access by the landowners for over 30 years. In 2012, with the help of Montana Walleyes Unlimited, FWP was able to acquire approximately 108 acres surrounding the reservoir for development of a Fishing Access Site. Initial improvements included: maintenance to access road, improvements to existing fishing pier and shelter, new latrine and concrete boat ramp, designated parking areas, fire rings, and signage. The Fresno Chapter of Walleye Unlimited has donated an additional fishing pier as well.

Bailey was initially managed as a rainbow trout fishery, and rainbow trout thrived within the reservoir until 1980, when northern pike were illegally introduced. In 1984, the remainder of rainbow trout winterkilled due to severe drought. Chemical rehabilitation was considered, but at the request of the landowner a cool/warm water fishery was started. Yellow perch and black crappie were introduced in 1987, largemouth bass in 1988, and walleye in 1989. Rainbow trout are stocked periodically to supplement the fishery. The last rainbow trout stocking occurred in 2005 when 10,000 four-inch rainbow trout were stocked in late fall. Since 2005 Bailey Reservoir has received alternate year stocking of 10,000 walleye fingerlings and several supplemental stocking of pre-spawn adult yellow perch from the Kremlin Water Ponds.

Adult sport fish populations have been monitored since 1990 with two experimental gill net sets. In addition, trap netting and seining occurs periodically. In addition, a voluntary creel box was erected in the summer of 2005 and maintained through 2016 to determine angler use, catch, and satisfaction. Bailey ranked 36th in the region for angler pressure in 2015/2016 (369 +/- 369 angler days; MTFWP Fisheries Bureau 2016).

Netting surveys suggest the population of walleye, northern pike, and yellow perch are increasing (Table 6; Figure 12). From 1990-2002 Bailey Reservoir supported one of the best yellow perch and black crappie fisheries on the Hi-Line (Table 6; Figure 12). Extensive removal of spawning adult yellow perch and black crappie (from 1999-2007), combined with low reservoir levels, high northern pike densities, and less than ideal spawning conditions could be the most likely explanation for low population densities during that time period. Netting conducted in 2016 suggested an increase in relative abundance of all sport fishes, with the exception of black crappie.

In June, reports of dead black crappie were reported at Bailey's. FWP conducted a thorough investigation and collected tissue samples and visual investigations. Approximately 40 adult (7-10") crappie were observed, either dead or dying. Lab results haven't been processed yet and the source of the kill hasn't been identified. At this time we suspect a partial kill of adult black crappie. Seining surveys conducted in 2015 and 2016 suggest good reproduction of yellow perch and black crappie occurred (Table 7).

Table 6. - Catch rate (CPUE (fish/net)), average length (TL, in.), and average weight (lb.) of northern pike, yellow perch, black crappie, rainbow trout, walleye, and white sucker in Bailey Reservoir, 1985-2016.

		Northern pike			Yellow Perch			Black Crappie			Rainbow Trout			Walleye			White Sucker		
Year	Nets	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)	CPUE (#/net)	Len Avg (in.)	Wt Avg (lbs.)
1985	1	17	21.44	1.13	0	--	--	0	--	--	1	12.2	0.9	--	--	--	0	--	--
1990	3	8	18.1	1.23	11.33	7.7	0.26	7	5.7	0.1	0	--	--	--	--	--	0	--	--
1991	2	3.5	24.7	3.21	29	10.1	0.56	2	8.5	0.35	0	--	--	--	--	--	0	--	--
1992	2	3	26.8	4.29	17	8.1	0.29	8	4.7	0.08	0	--	--	--	--	--	0	--	--
1993	2	1	31.8	7.55	10.5	6.6	0.15	63.5	6.7	0.12	0	--	--	--	--	--	0	--	--
1994	2	3.5	20.1	2.59	19	6	0.1	21.5	6.3	0.14	0	--	--	--	--	--	0	--	--
1995										No Netting Conducted									
1996	2	7	23.8	3.54	43	7.2	0.19	7.5	6.8	0.21	0	--	--	--	--	--	0	--	--
1997										No Netting Conducted									
1998	2	1.5	22.2	2.43	66	8	0.26	16	9	0.44	0	--	--	--	--	--	0	--	--
1999										No Netting Conducted									
2000										No Netting Conducted									
2001										No Netting Conducted									
2002	2	0	0	0	16	9.9	0.49	15.5	11.2	0.82	0	--	--	1	25.7	6.79	1	17.9	2.41
2003										No Netting Conducted									
2004										No Netting Conducted									
2005	2	3.5	17.44	1.56	1.5	9.2	0.39	1	4.05	0.03	0	--	--	--	--	--	0	--	--
2006	2	16	17.23	1.2	3.5	7.29	0.28	0	--	--	0	--	--	6.5	9.54	0.31	0	--	--
2007	2	5.5	20.8	2.05	0.5	11.3	0.9	0	--	--	0	--	--	3	12.5	0.65	0	--	--
2008										No Netting Conducted									
2009	2	2	20.6	1.97	1	13	1.38	0	--	--	0	--	--	2	18.2	2.28	1	19	3.07
2010	2	0	--	--	0	--	--	0	--	--	0	--	--	0.5	19	2.22	0	--	--
2011	2	2	19.4	1.67	0.5	7.5	0.22	0	--	--	0	--	--	1.5	20.1	2.84	0	--	--
2012	2	3.5	19.5	1.58	7	7.5	0.26	0	--	--	0	--	--	0.5	22	4.16	0	--	--
2013	2	4	19.25	1.78	24	7.78	0.27	0	--	--	0	--	--	2	15.93	1.88	0	--	--
2014	2	0	--	--	1	9.25	0.42	0.5	6.3	0.16	0	--	--	1.5	12.27	0.67	0	--	--
2015	2	0	--	--	0	--	--	0.5	7.9	0.31	0	--	--	-- 0	--	--	0	--	--
2016	2	3	21.15	1.94	5	10.21	0.61	0	--	--	0	--	--	-- 1.5	17.47	2.06	0	--	--

Figure 12. Summary of relative abundance for yellow perch, black crappie, northern pike, fathead minnow, walleye, and rainbow trout captured by trap nets in Bailey Reservoir, 1981-2016.

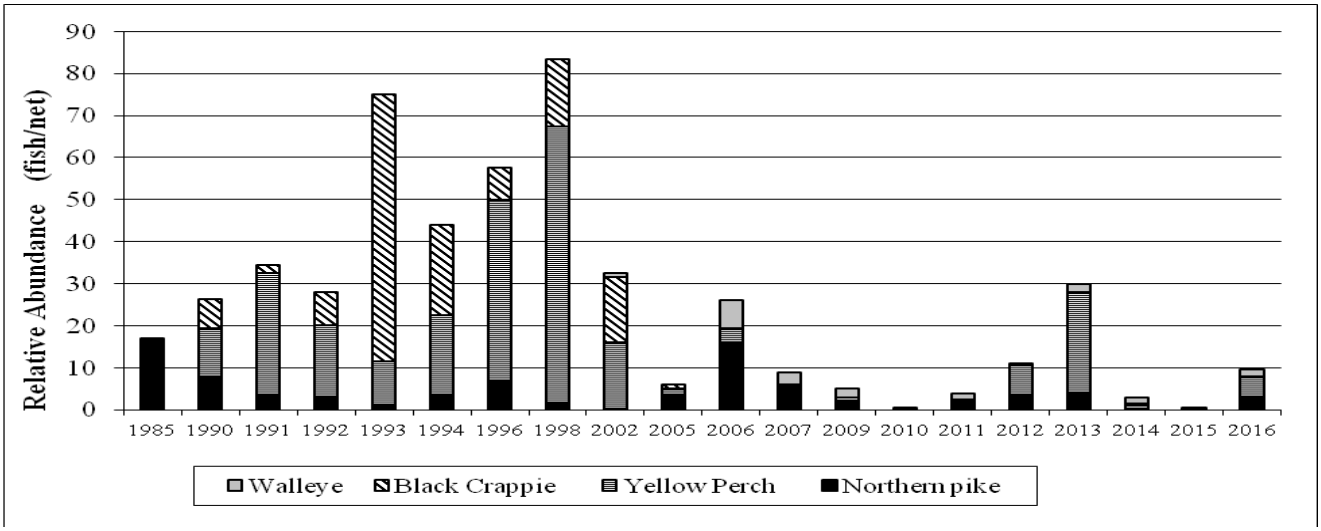


Table 7. Summary of young of year yellow perch (YP), black crappie (BLC), northern pike (NP), fathead minnow (FH MN), largemouth bass (LMB), walleye (WE), and rainbow trout (RB) captured by beach seining in Bailey Reservoir, 1982 to 2016.

Date	Year	Sites	YP (yoy)	YP (adult)	NP (yoy)	NP (adult)	WE (yoy)	WE (adult)	BLC (yoy)	BLC (adult)	RB	LMB	FH MN
9/6/1982	1982	3	--	--	--	--	--	--	--	--	3	--	--
8/6/1986	1986	5	--	--	46		--	--	--	--	66	4	45
8/4/1987	1987	4	--	1	--	44	--	--	76	--	25	--	356
8/11/1988	1988	3	38	--	--	2	--	--	12	2	--	24	24
8/7/1990	1990	4	--	1	1	--	--	--	309	21	--	--	--
9/26/1991	1991	5	68	--	--	--	--	--	--	--	--	9	--
9/10/1993	1993	5	1	70	--	--	--	--	60	--	--	--	--
7/27/1996	1996	4	--	1	1	--	--	--	5	--	--	40	--
7/29/2015	2015	4	809	--	2	1	--	--	39	--	--	--	--
7/27/2016	2016	4	426	3	7	0	3	--	1,322	--	--	--	--

Beaver Creek Reservoir

Beaver Creek Reservoir, located south of Havre, is a 200-acre reservoir, which has a maximum depth of 90 feet. Its proximity to the city of Havre makes this reservoir a valuable local resource and it has been managed intensively for a variety of species. Beaver Creek Reservoir ranked 9th in the region for angler pressure in 2015/2016 (5,104 +/- 2,078 angler days; MTFWP Fisheries Bureau 2016).

This reservoir was established as a rainbow trout fishery in 1975. However, the illegal introduction of northern pike (1980s) and yellow perch (1980s) resulted in variable rainbow trout stocking success. As a result, the fisheries management plan was expanded to include other warm water species, which were introduced to control undesirable species and enhance the fishing opportunity within the reservoir.

In an effort to maintain the balance between the rainbow trout fishery and the warm water fishery, the use of live minnows for bait has been allowed since March of 2000. The regulation was intended to increase harvest of northern pike and perhaps open up a winter fishery for walleye. Though fishermen use live minnows regularly, a winter fishery for walleye has not developed. The trout daily limit was reduced from 5/day to 3/day in March of 2002 due to increasing fishing pressure, many anglers have expressed their frustration with this regulation since. In 2016 the trout daily limit increased from 3/day to 5/day and 10 in possession.

Population Status of Adult and Young-of-Year Fishes

Water levels in September were down approximately one foot during our sampling effort, the highest pool elevations observed during these surveys in several years. Gill netting was conducted overnight with three sinking and three floating experimental gill nets. Prior to 1986, adult fish populations were monitored, however sampling was neither uniform, nor consistent enough to develop useful trend data on sport fish population size or composition. As a result this data was excluded from analysis and is only included within the tables for reference to the illegal introduction of northern pike and yellow perch.

The abundance and reproductive success of sport and forage fishes were monitored at six predetermined stations. Beach seining was conducted in early August using a 75'- x 9' x ¼" square mesh beach seine. The fish were sorted by species and counted.

Northern pike

Since their illegal introduction in the 1980s, northern pike abundance has remained stable within Beaver Creek Reservoir (Table 9). Northern pike abundance varies within Beaver Creek Reservoir due to water operations and variable spring water conditions. Good northern pike reproduction was documented in 2009, 2012, 2014, and 2015 (Table 8). However, extremely high reservoir pool elevations in 2011 and 2013, resulting in both the overflow and emergency spillways running for an extended period, limited the number of adult northern pike in Beaver Creek Reservoir due to entrainment (Table 8 and 9).

Yellow perch

Yellow perch were illegally introduced into Beaver Creek Reservoir in 1987. Since their introduction, yellow perch have thrived within the reservoir (Table 9). As a result, Beaver Creek Reservoir has become a popular ice fishing destination and has also been utilized as a donor source of yellow perch for kids fishing ponds, such as Home Run Pond in Glasgow.

Beaver Creek Reservoir's yellow perch population peaked in the late 1990s. Recently, yellow perch abundance has trended upward with the highest adult relative abundance recorded in 13 years during 2012 (Table 9). Since 2014, yellow perch relative abundance has dropped significantly and may reflect increased predation by a growing walleye population over the same timeframe (Table 9). The current population consists of quality and preferred size fish (TL > 8 in; Table 9). Summer seining efforts indicate that yellow perch reproductive success in 2012 and 2013 were the highest recorded in 17 years and successful reproduction was observed again in 2015 (Table 8). Recruitment has been good as almost 50% of the 2016 seining catch of yellow perch consisted of adults (Table 8). Stable to slightly rising spring water levels created excellent spawning conditions for yellow perch during these years.

Walleye

Walleye were initially stocked by FWP in 1987 to provide a greater diversity of fishing opportunities within the reservoir. Natural reproduction is limited within the reservoir and as a result, approximately 10,000 fingerling and 5,000 advanced walleye fingerlings are stocked annually.

Walleye within Beaver Creek Reservoir have slow growth rates but the population has remained stable over the years (Table 9). A good forage base consisting of yellow perch and high rainbow stocking rates allow the walleye in Beaver Creek Reservoir to achieve memorable and trophy lengths. Since their initial introduction, high quality walleye have thrived within Beaver Creek Reservoir and below its dam. Consecutive years (2010 and 2011) of high runoff increased adult walleye (> 15 inches) entrainment which might explain the reduced relative abundance of walleye during our fall gillnet surveys in 2011 (Table 9). Since 2011, walleye relative abundance has slowly increased to record high abundances observed (8.3 walleye/net; Table 9). The average length of walleye sampled in 2016 was 13.82 inches, these fish will continue to grow and contribute to the fishery (Table 9).

Smallmouth bass

Smallmouth bass were first introduced by FWP in 1997 and were stocked annually until 2000. There's now a self-sustaining population of smallmouth bass that exists in Beaver Creek Reservoir. Smallmouth bass have historically had low relative abundance during gill netting surveys due to the selectivity of the gear (Table 9). Catches of 8 to 16 inch bass by anglers are common. In addition, smallmouth bass reproduction has been good in most years due to relatively stable reservoir levels during early summer and good spawning and rearing habitat (Table 8).

Table 8. Summary of young of year yellow perch (YP), white sucker (W SU), spottail shiner (SP SH), Iowa Darter (IOWA), fathead minnow (FH MN), largemouth bass (LMB), northern pike (NP), walleye (WE), and other fishes captured by beach seining in Beaver Creek Reservoir, 1980 to 2016.

Date	Sites	YP (yoy)	YP (adult)	W SU	SP SH	IOWA	FH MN	LMB	SMB (yoy)	SMB (adult)	NP (yoy)	NP (adult)	WE (yoy)	WE (adult)	Other Sp.[1]
Jul-80	5	--		650	--	0	42	--	--		--		--		46
Jul-81	5	--		1,671	--	0	75	12	--		--		--		38
Jul-82	5	--		7	--	0	0	54	--		0		--		0
Jun-83	5	--		46	--	0	0	5	--		5		--		0
Aug-84	7	--		189	--	10	0	4	--		0		--		0
Sep-85	5	--		2,648	--	11	0	33	--		3		--		7
May-86	4	--		1,749	0	2	0	0	--		1		--		24
Jun-86	6	--		3,132	0	2	0	0	--		1		--		1
Aug-86	6	--		134	0	8	0	2	--		9		--		0
Sep-86	6	--		1,111	0	34	29	184	--		6		--		11
Jul-87	6	1,968		2,276	1	24	3	0	--		20		11		3
Aug-87	6	2,315		973	0	59	1	16	--		19		19		5
Jun-88	6	20		17	0	6	0	0	--		1		3		0
Aug-88	6	4,973		62	1	4	0	0	--		1		2		0
Aug-89	6	50		48	603	0	0	0	--		2		4		5
Aug-90	6	42		1	93	2	0	0	--		2		0		1
Aug-91	6	8,642		348	835	0	0	0	--		17		0		4
Aug-92	6	1,888		492	156	4	0	0	--		4		0		0
Aug-93	6	42		0	355	11	0	0	--		27		0		0
Aug-94	6	707		49	181	0	0	0	--		11		0		0
Aug-95	6	7,210		6	1,438	0	0	0	--		13		0		0
Aug-96	6	51		261	248	7	0	0	0		5		7		0
Aug-97	6	17		31	193	6	0	0	8		13		2		0
Aug-98	6	872		0	141	0	0	0	41		6		1		0
Aug-99	6	592		4	87	0	0	0	16		7		2		0
Aug-00	6	402		1	190	0	1	0	12		3		23		0
Aug-01	6	357		10	216	0	0	0	8		0		3		0
Aug-02	6	333		0	592	0	0	0	7		0		93		0
Aug-03	6	557		19	2,355	2	0	0	9		15		1		0
Aug-04	6	1,545		0	0	1	0	0	5		2		2		0
Jul-05	6	185		3	1	0	0	0	0		36		12		0
Aug-06	6	1,154		8	608	0	0	0	12		32		11		0
Jul-07	6	253		0	0	0	0	0	13		4		9		0
Jul-08	6	113		0	0	0	0	0	2		0		0		0
Aug-09	6	1,177	135	0	3	0	0	0	1	1	15	1	63	1	0
Aug-10	6	0	491	0	0	0	0	0	6	0	0	0	2	4	0
Aug-11	6	201	66	629	0	0	0	0	1	0	1	2	0	0	0
Aug-12	6	3,206	24	4	0	0	0	0	5	0	12	1	7	0	0
Aug-13	6	2,712	55	0	0	0	0	0	10	0	2	0	5	0	0
Aug-14	6	392	20	17	6	0	0	0	1	2	8	5	0	0	0
Aug-15	6	1,342	0	4	16	0	0	0	13	0	7	2	1	0	0
Aug-16	6	499	493	0	5	0	0	0	0	0	0	0	10	0	0

[1] Consists of emerald shiners, northern redbelly dace, lake chub, western silvery/plains minnow, brassy minnow, and longnose dace

Table 9. Summary of relative abundance (catch per unit effort (CPUE)), average total length, and relative weights of fishes collected in fall gill netting surveys in Beaver Creek Reservoir, 1974-2016.

			Rainbow Trout			Yellow Perch			Northern Pike			Smallmouth bass			Walleye			Longnose sucker		White sucker	
Date		Nets	CPUE (fish/net)	Ave TL (in.)	Rel Wt	CPUE (fish/net)	Ave TL (in.)	Rel Wt	CPUE (fish/net)	Ave TL (in.)	Rel Wt	CPUE (fish/net)	Ave TL (in.)	Rel Wt	CPUE (fish/net)	Ave TL (in.)	Rel Wt	CPUE (fish/net)	Ave TL (in.)	CPUE (fish/net)	Ave TL (in.)
Sep-74	1974	3	24.00	10.91	111.26	--	--	--	--	--	--	--	--	--	--	--	--	7.33	10.49	82.33	10.23
Nov-77	1977	3	35.00	10.05	86.31	--	--	--	--	--	--	--	--	--	--	--	--	2.33	9.66	113.00	9.75
Sep-80	1980	3	23.33	10.12	81.04	--	--	--	--	--	--	--	--	--	--	--	--	1.33	6.33	156.00	8.86
Sep-81	1981	3	7.33	10.88	82.77	--	--	--	--	--	--	--	--	--	--	--	--	6.67	8.78	165.33	8.70
Oct-82	1982	3	8.33	11.78	99.67	--	--	--	2.33	15.79	109.67	--	--	--	--	--	--	3.33	9.66	109.67	9.69
Oct-83	1983	3	3.33	11.79	94.66	--	--	--	3.67	25.10	117.07	--	--	--	--	--	--	1.33	--	98.33	--
Sep-84	1984	3	3.00	11.26	95.43	--	--	--	3.67	26.64	111.21	--	--	--	--	--	--	0.67	11.00	58.33	10.50
Sep-86	1986	6	15.00	11.50	98.90	--	--	--	4.17	16.68	109.86	--	--	--	--	--	--	0.00	--	42.00	--
Sep-87	1987	6	11.33	13.61	92.06	0.33	6.30	--	5.17	22.43	91.71	--	--	--	0.00	--	--	0.00	--	18.00	--
Sep-88	1988	6	9.67	14.74	90.40	8.17	5.93	105.50	3.00	27.55	123.61	--	--	--	0.67	10.58	86.48	4.00	--	14.00	--
Sep-89	1989	6	10.67	13.15	93.45	9.17	7.59	96.04	1.17	30.31	94.56	--	--	--	0.00	--	--	2.50	--	14.33	4.13
Sep-90	1990	6	18.50	11.96	88.66	4.00	8.51	95.13	0.67	20.95	100.49	--	--	--	2.67	13.69	81.72	9.17	8.04	9.67	14.12
Sep-91	1991	6	15.50	12.78	93.26	12.00	7.39	103.98	2.33	16.57	95.37	--	--	--	5.67	13.98	90.24	2.83	--	8.17	--
Sep-92	1992	6	13.67	13.74	93.42	6.00	6.37	91.54	3.33	25.64	113.39	--	--	--	2.33	17.84	94.80	1.33	--	7.67	--
Sep-93	1993	6	3.17	16.43	94.48	12.33	7.20	109.06	2.00	27.49	100.01	--	--	--	3.33	16.75	95.36	0.00	--	8.67	--
Sep-94	1994	6	27.67	11.73	99.87	23.83	7.65	101.80	2.83	25.52	114.54	--	--	--	1.67	17.39	103.33	0.00	--	6.00	--
Sep-95	1995	6	20.17	13.42	96.73	20.00	7.71	102.97	3.50	21.66	96.62	--	--	--	2.50	17.96	90.90	0.00	--	12.83	--
Sep-96	1996	6	7.83	12.56	96.59	38.00	7.58	105.79	2.83	24.86	103.02	0.17	10.10	119.26	3.33	16.68	96.53	0.00	--	11.00	3.75
Sep-97	1997	6	6.83	13.00	91.31	39.50	7.22	94.54	4.17	21.70	99.11	0.00	--	--	2.17	17.65	96.90	0.00	--	6.17	--
Sep-98	1998	6	4.50	15.53	86.75	47.17	7.55	93.84	4.83	24.43	94.79	0.33	11.65	114.91	4.33	18.04	96.05	0.00	--	10.17	13.74
Sep-99	1999	5	4.20	12.26	104.04	40.60	8.39	93.18	2.20	24.17	105.00	0.80	8.95	119.90	4.40	15.24	95.74	0.20	17.30	4.60	13.39
Sep-00	2000	6	1.00	15.07	93.40	25.00	7.52	96.67	2.50	25.33	99.20	0.50	7.80	104.56	4.67	16.66	96.31	0.00	--	4.17	0.00
Sep-01	2001	6	14.50	12.09	92.76	30.67	7.39	100.86	1.00	27.73	96.81	0.17	10.40	108.60	4.50	13.93	93.62	0.17	17.10	8.67	14.72
Sep-02	2002	6	3.33	11.98	96.85	21.67	7.98	100.11	1.17	25.76	96.31	0.50	9.43	99.04	7.67	14.90	89.57	0.17	--	5.33	--
Sep-03	2003	5	15.80	11.46	102.26	12.20	7.94	125.10	2.00	13.90	108.18	0.20	10.40	96.53	3.60	14.74	101.16	0.00	--	2.60	--
Sep-04	2004	6	12.83	11.62	93.09	16.17	8.34	99.43	0.67	23.90	103.89	0.33	8.20	103.42	2.50	15.32	68.68	0.17	19.20	5.17	15.99
Sep-05	2005	6	5.50	13.63	97.00	12.33	8.35	102.88	0.50	29.23	104.05	0.00	--	--	3.33	15.29	96.82	0.00	--	6.00	16.57
Sep-06	2006	6	3.00	13.38	143.90	23.00	7.71	101.30	1.50	26.94	97.10	0.00	--	--	3.00	15.08	98.10	0.00	--	3.00	16.89
Sep-07	2007	6	9.00	11.80	95.70	29.33	7.90	107.00	1.67	27.50	101.50	0.17	9.20	107.20	5.17	12.80	103.80	0.00	--	17.00	17.20
Sep-08	2008	6	10.00	12.05	104.30	26.50	8.01	102.48	1.00	28.10	97.53	0.17	14.00	113.20	2.67	19.80	94.20	0.00	--	1.83	16.89
Sep-09	2009	6	4.00	11.80	100.90	20.00	8.20	100.40	2.33	26.40	95.16	0.17	15.70	124.59	3.67	18.26	104.72	0.00	--	0.83	16.90
Sep-10	2010	6	3.67	12.12	110.10	19.20	7.35	106.30	0.83	24.32	92.23	0.17	10.20	113.73	1.33	14.48	87.10	0.00	--	1.17	16.59
Aug-11	2011	4	3.75	12.93	98.08	26.50	7.76	92.06	1.75	18.10	83.31	0.25	8.20	76.40	0.75	13.63	81.05	0.00	--	6.00	16.07
Sep-12	2012	6	12.33	11.75	105.68	36.33	8.53	157.05	1.00	24.07	106.95	0.33	9.40	111.89	3.83	11.76	99.32	0.00	--	3.20	15.14
Sep-13	2013	6	5.33	11.56	104.79	26.00	8.81	104.64	0.33	22.05	92.04	--	--	-- --	2.50	10.18	87.06	0.00	--	5.33	16.28
Sep-14	2014	6	14.00	12.22	98.22	8.50	8.34	92.12	1.50	25.46	100.97	0.33	13.50	104.83 --	1.83	15.25	83.76	0.00	--	2.66	16.31
Sep-15	2015	6	11.83	12.78	96.40	12.33	8.79	95.82	2.00	24.95	101.28	0.66	11.75	108.10	4.66	12.72	94.03	0.00	--	1.83	16.84
Sep-16	2016	6	4.33	13.57	95.91	5.00	8.24	98.79	1.16	23.23	95.79	0.83	13.50	103.27	8.33	13.82	89.11	0.00	--	2.50	17.64

Fresno Reservoir

Fresno Reservoir, located 12 miles northwest of Havre is a main-stem reservoir built in 1939 on the Milk River to function as an irrigation storage facility managed by the Bureau of Reclamation (BOR). Fresno is a highly fluctuating reservoir of 5,757 surface acres with a mean depth of 27 feet, and a maximum depth of 48 feet. Fresno was initially developed as a rainbow trout fishery in the 1940's and 50's, however an illegal introduction of northern pike in the 1940's resulted in a severe decline in the rainbow trout fishery. As a result, Fresno was developed as a warm-water fishery supporting walleye, yellow perch, black crappie, largemouth bass, smallmouth bass, Lake Superior whitefish, emerald shiner, and spottail shiners. Over the years, kokanee salmon, brown trout, and rainbow trout have been stocked to supplement the fishery when walleye and northern pike populations were low. Fresno ranked 2nd in the region for angler pressure in 2015/2016 (23,033 +/- 4,575 angler days; MTFWP Fisheries Bureau 2016). Fresno continues to build its reputation as one of the premiere walleye reservoirs in Montana.

The fishery in Fresno has varied over the years due to high fluctuations in reservoir water elevations. On average, water levels in Fresno fluctuate 10-21 feet per year with an annual water retention rate of 127 days (storage capacity (acre-feet)/average annual inflows (acre-feet)). The timing of this fluctuation greatly impacts the reproduction and survival of forage and sport fish.

The fishery was severely impacted in 2001 and 2002 when severe drought reduced the reservoir to 8% and 4% of storage capacity, respectively. Forage fish populations were drastically reduced and the abundance and condition of key sport fishes was at an all time low. As a result, a supplemental stocking of 170,000 pre-spawn adult yellow perch from Lake Mary Ronan was conducted from 2001-2004 to increase population levels. This management action was implemented to increase forage populations when water levels increased. In addition, 100,000 walleye fingerlings were stocked annually from 2003-2011. Since 2011, no walleye fingerlings have been stocked due to high adult relative abundance and the need to decrease the current population to more sustainable levels.

In an effort to maintain a favorable forage base under high predator densities, FWP has conducted six supplemental pre-spawn adult yellow perch stockings. From 2011-2016, 36,353 pre-spawn adult yellow perch were stocked in Fresno because water levels were forecasted to obtain and surpass full pool elevations, creating optimal spawning conditions. Yellow perch reproduction in 2011 and 2014 were the highest recorded in 18 and 25 years respectively (Table 10). Exceptional water conditions and supplemental stocking of pre-spawn adult perch are strongly influencing recent spawning success.

From 2005 to 2016, water levels have remained high during spring spawning and early summer rearing periods, allowing sport and forage fish populations to obtain densities never before documented. The continued production of this fishery is dependent on maintaining water levels that will allow the successful spawning, recruitment, and overwintering of forage and sport fishes.

Population Status of Young-of-Year Fishes

The abundance and reproductive success of sport and forage fishes were monitored at 12 fixed sites established in 1968. Beach seining was conducted in late summer using a 75- x 9-foot x ¼ inch square mesh beach seine. Fish were sorted by species and counted.

Historically, the abundance of YOY fishes is correlated with the magnitude of spring run-off and annual fluctuations in water levels within Fresno Reservoir. Extreme water draw downs in Fresno in 2001 and 2002 due to drought conditions, greatly reduced the reproductive success of most fishes (Table 10).

Excellent water conditions have persisted within the reservoir since 2008, water conditions never before documented over an eight-year period. The yellow perch population remains variable

from year to year and will continue to mimic these trends based on water management and predator densities.

From 2008-2016, Fresno filled to capacity and flooded a substantial amount of shoreline vegetation, creating prime spawning and rearing habitat. Summer seining efforts revealed walleye, northern pike, yellow perch, spottail shiner, and black crappie, have all benefited from this rise in water levels with excellent reproduction and survival (Table 10). In 2016, spawning conditions were good for all species and seining efforts identified average to slightly below average success for all species. Three additional sites were seined on the upper end of Fresno due to high pool elevations in August. These additional sites suggested a slightly better reproductive year for walleye and black crappie when compared to the 12 fixed sites surveyed annually. Crews captured an additional eight YOY walleye, 75 YOY yellow perch, and 408 YOY black crappie at the three sites located on the upper end of Fresno Reservoir.

Table 10. – A summary of forage fish and young-of-year forage and sport fish collected using a 100- x 9-foot x ¼ inch square mesh beach seine in Fresno Reservoir, 1968-2016.

Year	Seine Hauls	*Sanders*	Walleye	Sauger	Northern Pike	YP (yoy)	YP (adult)	Emerald Shiner	Crappie Sp.	Spottail Shiner	Sucker sp.[1]	Minnow sp.[2]	Other[3]
1968	12	16	--	--	6	2,909	--	147	552	0	0	161	0
1969	12	4	--	--	6	1,140	--	385	67	0	2	380	0
1970	12	27	--	--	45	10,151	--	521	883	0	1	122	0
1972	12	102	--	--	22	1,005	--	205	379	0	0	72	0
1974	12	13	--	--	59	1,583	--	29	1,355	0	0	25	0
1975	11	10	--	--	32	4,154	--	155	59	0	0	0	0
1978	12	22	--	--	42	10,684	--	12	3	0	0	0	0
1979	12	29	--	--	45	8,516	--	340	127	0	1	0	1
1982	12	102	--	--	70	8,993	--	121	166	0	0	0	3
1983	12	23	--	--	0	2,254	--	448	9	0	1	7	0
1984	12	247	--	--	0	197	--	375	0	2	40	55	0
1985	12	64	--	--	0	379	--	684	3	2	0	9	0
1986	12	0	--	--	23	6,077	--	142	2	20	1	5	1
1987 +	12	80	--	--	113	6,233	--	1,979	7	3	0	3	0
1988	12	53	--	--	4	3,122	--	182	0	20	0	1	0
1989 +	12	56	--	--	32	24,706	--	22	0	16	2	0	0
1990	12	8	--	--	57	2,033	--	7	465	44	1	2	0
1991 +	12	8	--	--	36	3,425	--	0	42	53	0	0	0
1992 +	12	45	--	--	2	6,550	--	28	0	48	0	1	0
1993 +	12	24	--	--	9	5,595	--	12	2	162	0	0	0
1994 +	12	19	--	--	19	2,960	--	3	287	1,421	1	0	0
1995	12	5	--	--	2	1,080	--	0	2	129	0	1	0
1996 +	12	52	--	--	21	3,576	--	0	1	1,484	42	0	0
1997 +	12	46	--	--	15	3,006	--	2	1	887	2	0	0
1998 +	12	44	--	--	1	1,413	--	9	0	1,041	1	3	0
1999	12	50	--	--	7	4,271	--	176	12	182	13	0	0
2000	6	29	--	--	0	1,396	--	2	2	30	2	0	1
2001	6	86*	--	--	0	39 -	--	3	0	3	3	1	0
2002	12	28*	--	--	2	86 -	--	128	400	154	4	29	0
2003 +	12	4	--	--	46	1,871 -	--	5,539	90	207	0	0	1
2004 +	12	--	12	2	10	2,898 -	--	69	48	56	0	2	1
2005 +	12	--	26	2	19	934	--	39	15	39	0	0	0
2006 +	12	--	27	0	57	2,283	--	80	5	923	0	0	0
2007 +	12	--	7	0	13	769	--	68	54	1,106	2	0	0
2008 +	12	--	65	0	1	2,329	--	5	721	287	11	0	0
2009 +	12	--	24	0	24	1,427	224	13	25	716	1	0	0
2010 +	12	--	10	0	7	1,247	4	6	4,517	849	0	0	0
2011 +	12	--	18	0	4	4,961 -	6	5	890	499	0	0	0
2012	12	--	27	0	9	661 -	4	2	43	41	0	0	0
2013	12	--	16	0	4	1,306 -	0	12	292	816	0	3	0
2014	12	--	47	0	4	6,834 -	27	0	575	3,011	0	1	0
2015	12	--	12	1	3	926 -	88	634	332	1,337	0	5	0
2016	12	--	21	0	1	399 -	5	263	357	641	0	6	0

[1]Consists of white and longnose sucker
[2]Consists of silvery minnows, lake chubs, flathead chubs, and fathead minnows
[3]Consists of burbot, smallmouth bass, pumpkinseed sunfish, and brook sticklebacks
+ Years in which walleye fry or fingerling were stocked
- Years in which pre-spawn adult yellow perch were supplementally stocked
* Primarily Sauger

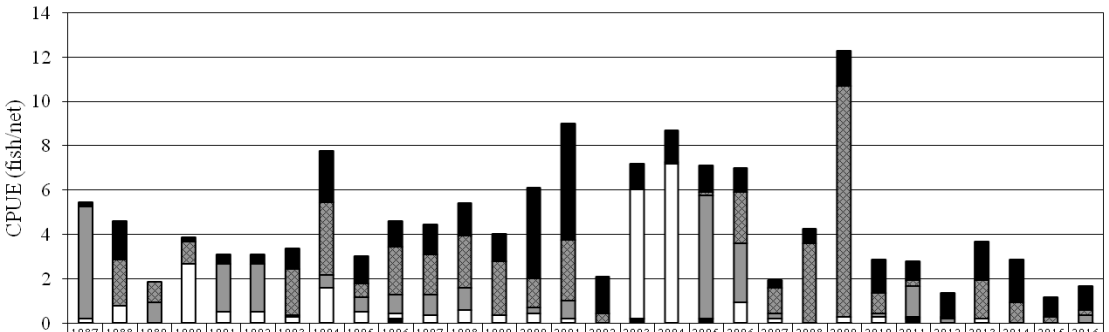
Population Status of Adult Fishes

Adult fish populations were monitored from 1965 to 1974 using systematic gill netting at predetermined sites. Sampling at 12 predetermined sites was resumed in 1987 to determine changes in sport fish abundance and species composition. Samples were collected over two days utilizing six sinking multi-filament experimental gill nets each day (12 net-days). The sinking multi-filament experimental gill nets measuring 125 feet in length and 6 feet deep consisting of 25-foot panels of ¾", 1", 1 ¼", 1 ½", and 2" mesh. Fish were measured for total length (TL, inches)) and weighed to the nearest 0.01 pound. Prior to 2005, scales were collected from all walleye and sauger for ageing purposes. From 2005 to 2016, otoliths were collected from walleye for ageing and oxytetracycline (OTC) analysis.

Lake Superior Whitefish

Lake Superior whitefish (whitefish) in Fresno Reservoir have historically comprised a portion of the gill net catch (Figure 13), but are rarely targeted by anglers. Whitefish exhibit fast growth rates in the reservoir and thereby avoid predation from all but the largest walleye and northern pike. Whitefish appear to successfully recruit into the population in years of stable over-winter storage.

Figure 13. - Relative abundance and size structure of lake whitefish collected with sinking experimental gill nets in Fresno Reservoir, 1987-2016.



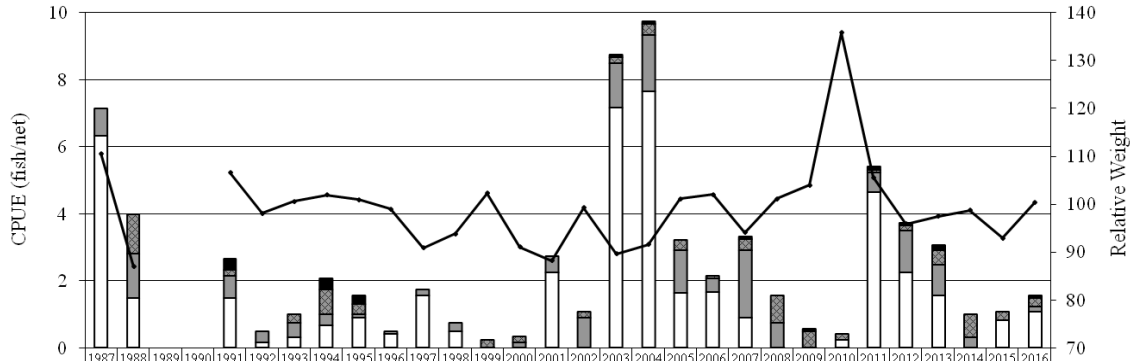
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>18.0 in.)	0.08	1.75	0.00	0.17	0.42	0.42	0.92	2.33	1.25	1.17	1.33	1.50	1.25	4.08	5.25	1.67	1.17	1.42	1.17	1.08	0.333	0.66	1.583	1.5	0.833	1.083	1.75	1.92	0.917	1.08
Preferred (14.0-17.9 in.)	0.08	2.08	0.92	1.00	0.00	0.00	2.08	3.25	0.58	2.17	1.83	2.33	2.42	1.33	2.75	0.42	0.00	0.00	0.17	2.33	1.17	3.5	10.42	0.917	0.25	0.083	1.75	0.92	0.167	0.25
Quality (11.0-13.9 in.)	5.08	0.00	0.92	0.00	2.17	2.17	0.08	0.58	0.67	0.83	0.92	1.00	0.00	0.25	0.83	0.00	0.00	0.08	5.58	2.66	0.25	0.08	0	0.166	1.42	0.166	0	0	0	0.25
Stock (6.0-10.9 in.)	0.08	0.75	0.00	2.67	0.50	0.50	0.25	1.58	0.50	0.25	0.25	0.58	0.33	0.42	0.17	0.00	5.83	7.17	0.00	0.92	0.167	0	0.167	0.25	0.083	0	0.083	0	0.083	0.083
Sub Stock (<6.0 in.)	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.08	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.17	0.00	0	0	0.083	0	0.166	0	0.083	0	0	0

The yellow perch population in Fresno was negatively impacted by drought in the early 2000s due to extreme draw downs in 2001 and 2002. Yellow perch were not able to successfully reproduce (Table 10) and population levels were drastically reduced (Figure 14). To remedy this situation, supplemental stocking of pre-spawn adult yellow perch occurred from 2001 to 2004, to increase population levels, approximately 170,000 yellow perch were transferred from Lake Mary Ronan. In 2003 and 2004, water levels increased, flooding shoreline vegetation, and successful spawning and recruitment of forage fish was documented (Table 10). Stocking of pre-spawn perch was discontinued in 2005. From 2011-2016, pre-spawn yellow perch were once again stocked due to excellent spring water conditions. However, high densities of adult walleye (due to increases in stocking effort) have limited the number of YOY yellow perch that actually recruit into the population, regardless of spawning conditions and success.

As soon as the supplemental stocking of yellow perch was discontinued (2005) in Fresno Reservoir, the abundance of yellow perch started to decrease, and mimicked pre-drought levels (Figure

14). Low water levels throughout the fall and winter months limit good rearing habitat and increases the vulnerability of YOY yellow perch to walleye and northern pike predation. However, nine good water years (2008-2016) have created better overwinter water conditions (average reservoir elevations from October-March have been approximately 10 feet higher than average), inundating littoral habitats and creating refuge areas for YOY yellow perch to successfully recruit into the population (Figure 14). Walleye densities remain high (Figure 16) and correlates with declining relative abundance of yellow perch during exceptional water conditions (Figure 14).

Figure 15. - Relative abundance, size structure, and relative weight of yellow perch collected with sinking experimental gill nets in Fresno Reservoir, 1987-2016.

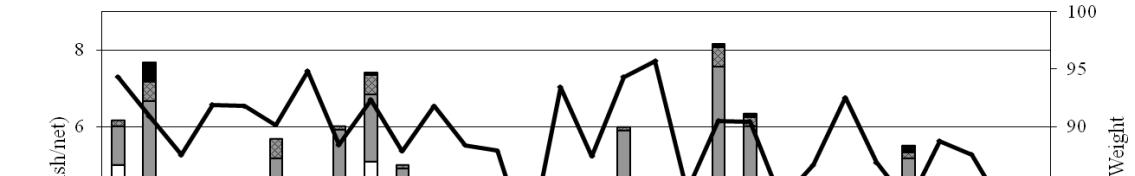


	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>12 in.)	0	0	0	0	0.33	0	0	0.33	0.25	0	0	0	0	0	0	0	0.08	0.08	0	0	0.083	0	0.083	0	0.083	0.083	0.166	0	0	0.083
Preferred (10-11.9 in.)	0	1.17	0	0	0.17	0	0.25	0.75	0.33	0	0	0	0.17	0.17	0	0.17	0.17	0.33	0.33	0.08	0.333	0.833	0.417	0.167	0.083	0.166	0.417	0.67	0.25	0.25
Quality (8-9.9 in.)	0.83	1.33	0	0	0.67	0.33	0.42	0.33	0.08	0.08	0.17	0.25	0.08	0.17	0.5	0.92	1.33	1.67	1.25	0.42	2	0.667	0.083	0	0.583	1.25	0.92	0.33	0	0.167
Stock (5-7.9 in.)	6.33	1.5	0	0	1.5	0.17	0.33	0.67	0.92	0.42	1.58	0.5	0	0	2.25	0	7.17	7.67	1.58	1.67	0.917	0.08	0	0.167	4.66	2.25	1.58	0	0.833	1.08
Sub Stock (<5 in.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0.083	0	0	0	0	0	0
Relative weight	110.6	86.99			106.6	98.12	100.6	101.9	101	98.99	90.84	93.84	102.3	91.07	88.25	99.3	89.66	91.6	101.1	102.0	94.1	101.1	104	135.8	105.6	95.91	97.48	98.74	92.96	100.3

Northern pike

Since the illegal introduction of northern pike in Fresno Reservoir during the 1940s, their population has fluctuated over the years (Figure 15). Extreme drought conditions from 2000 to 2002 reduced the abundance of northern pike. However, the population rebounded in 2003 with increased water levels and inundated shoreline vegetation. Northern pike continue to successfully reproduce, resulting in an increased relative abundance of adults following the record water year in 2011 (Figure 15). Northern pike relative abundance and weight dropped below the long-term average in 2014 and continues to decrease. Northern pike spawning success has also been poor over the last several years (Table 10). An insufficient forage base and perhaps suppression of recruitment due to walleye predation could be factors currently limiting the pike population in Fresno.

Figure 15. - Relative abundance, size structure, and relative weight of northern pike collected with sinking experimental gill nets in Fresno Reservoir, 1987-2016.



Walleye

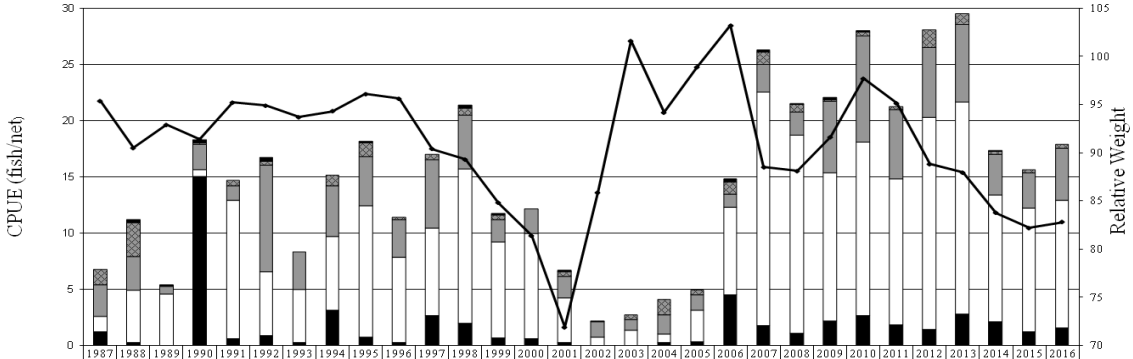
From 2003 to 2011 approximately 100,000 fingerling walleye were stocked annually in Fresno Reservoir. In 2006, 200,000 fingerling walleye were stocked due to unallocated productions at the Fort Peck Hatchery.

Since 1987, seven of the eight highest walleye relative abundances were documented from 2007-2013 (Figure 16). It is evident that stocking walleye fingerlings at a rate of 100,000/year was very successful and based on Oxytetracycline analysis these fish recruited and contributed to the adult population. However, this stocking rate led to concerns of the sustainability and balance with the forage base. A decrease in abundance was observed in 2011 due to increased entrainment of adult walleye over the Fresno spillway, caused by near record spring run-off and precipitation (Figure 16). In 2011, anglers were observed catching numerous walleye below the dam from April-October. In 2013, fall gill net surveys documented the highest walleye relative abundance ever recorded (29.5 walleye/net; Figure 16). No walleye fingerlings have been stocked the last five years in an attempt to decrease adult abundances to a more sustainable level. Summer seining surveys continue to document successful reproduction of walleye, and the population is showing signs of continued growth and stabilization, regardless of increased fishing pressure and harvest. Sampling efforts conducted in 2016 documented walleye relative abundance at 17.8 walleye/net, current densities remain above the long-term average of 15.0 walleye/net (Figure 16).

Water conditions and operations in Fresno directly benefit/impact this fishery and it's unclear if current walleye densities are favorable for the long-term health of this fishery. Since 2011, no walleye fingerlings were stocked in an effort to observe reproductive success of the current adult population, and to reduce stocking contributions to an already high walleye population. Walleye natural reproduction was observed, indicating good spawning habitat exists when water conditions are favorable (Table 10). Future walleye stocking rates should consider the current spawning adult density and potential of that population to naturally reproduce.

The high abundances observed from 2007-2013 coincided with the best water and forage conditions observed since Fresno Dam was built. Our data suggests adult walleye abundances have dropped since the record number recorded in 2013. However, we've observed a continued decline in walleye relative weights since 2010 (Figure 16). It is unclear at this time what effects might incur to this population (and the entire fish community) once water conditions revert back to a more normal cycle, or worse yet, experience conditions observed in 2001/2002.

Figure 16. - Relative abundance, size structure, and relative weight of walleye in Fresno Reservoir for the years 1987-2016.



	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	2014	2015	2016
Memorable (>25 in.)	0	0.33	0.17	0.29	0	0.33	0	0	0.08	0	0	0.25	0.08	0	0.08	0	0	0	0	0.25	0.17	0.08	0.166	0.166	0	0	0	0.08	0	0
Preferred (20-24.9 in.)	1.33	3	0	0.14	0.5	0.33	0	0.92	1.25	0.17	0.5	0.67	0.42	0	0.42	0.08	0.42	1.33	0.42	1.08	1.08	0.67	0.166	0.333	0.25	1.583	0.92	0.25	0.25	0.33
Quality (15-19.9 in.)	2.83	3	0.67	2.29	1.33	9.5	3.33	4.5	4.42	3.42	6.08	4.75	2	2.17	1.92	1.33	1	1.75	1.33	1.17	2.5	2.08	6.33	9.42	6.2	6.25	6.92	3.67	3.17	4.67
Stock (10-14.9 in.)	1.33	4.67	4.5	0.57	12.33	5.67	4.75	6.58	11.67	7.58	7.83	13.75	8.58	9.42	4	0.67	1.25	0.75	2.83	7.83	20.83	17.67	13.25	15.5	13	18.92	18.92	11.3	11	11.33
Sub-stock (<10 in.)	1.17	0.17	0	15	0.5	0.83	0.17	3.08	0.67	0.17	2.58	1.92	0.58	0.5	0.17	0	0	0.17	0.25	4.42	1.67	1	2.083	2.58	1.75	1.33	2.7	2	1.17	1.5
Relative weight	95.4	90.5	92.9	91.4	95.2	94.9	93.7	94.3	96.1	95.6	90.4	89.3	84.8	81.4	71.9	85.9	101.6	94.2	98.9	103.2	88.5	88.1	91.62	97.71	95.15	88.82	87.96	83.77	82.19	82.8

Black Crappie

Black crappie were most likely introduced into Fresno in the 1950s however the first record of stocking by FWP occurred in 1991. Since 1968, YOY crappie numbers have fluctuated greatly (Table 10). In 2010, YOY black crappie abundance was the highest observed since 1974 and good reproduction occurred again in 2011 and 2014 (Table 10). The recent spawning success of black crappie is attributed to good reservoir pool levels during the spawning period (June), with water levels rising or remaining stable during this period. Elevated water levels have also contributed to six good year-classes being observed (2008, 2010, 2011, 2014-2016), with variable success recruiting into the population (Figure 17).

The adult population of black crappie in Fresno Reservoir was at record highs in 2011 and remained good in 2012 (Figure 17). Since 2013 fall surveys suggest the population has slowly decreased to the lowest observed relative abundances observed since 2000 (Figure 17). Although successful reproduction and recruitment of black crappie has been documented in recent years, high predator densities have consumed a majority of the smaller black crappie (< 8 inches) and this has resulted in an unbalanced age and size structure on the current black crappie population.

Figure 17. - Relative abundance and size structure of black crappie collected with sinking experimental gill nets in Fresno Reservoir, 1987-2016.

Fresno Wildlife Management Area

The Fresno Wildlife Management Area is located near the headwaters of Fresno Reservoir and consists of a ~300 acre area that contains a reservoir (dike system)/backwater area adjacent to, and connected via overflow channels, to the Milk River. Two gill nets and two trap nets were set overnight on the south side of the dike (reservoir) and two gill and two trap nets were set overnight on the north side of the dike (Milk River backwater and channels).

Netting results on the south side of dike suggest this area may provide important spawning and rearing habitat. The gill nets contained one northern pike (TL=13.4 in.). The trap nets contained one northern pike (TL=13.5 in.), 27 yellow perch ($\bar{x}$ TL= 2.7 in.), and 23 fathead minnows.

Netting results on the north side of the dike suggest a potentially valuable recreational northern pike and yellow perch fishery. The gill nets captured 40 northern pike ($\bar{x}$ TL= 21.13 in) and eight yellow perch ($\bar{x}$ TL= 8.55 in). The trap nets contained two northern pike ($\bar{x}$ TL= 22.6 in.) and 1,218 yellow perch, the majority of perch captured were YOY ($\bar{x}$ TL= 2.83 in.). Northern pike approaching 30 inches and yellow perch approaching 12 inches were observed, suggesting overwintering habitats exist.

Fresno Reservoir has a well documented history of forage production struggles, specifically yellow perch production and recruitment. It has been hypothesized that good spawning habitat exists in the headwaters. Variable reservoir pool elevations and high rates of sedimentation in this area, makes sampling efficiency and navigation difficult. The results of our sampling effort near the headwaters of Fresno in 2016 suggest good spawning and rearing habitats exist in this area. However, at this time its unknown if these fish populations are connected or isolated from the Milk River and/or Fresno Reservoir seasonally or permanently. More research will be conducted to better understand these important habitats located upstream of Fresno Reservoir along the Milk River.

Blaine County Fishing Waters

Select waters throughout Blaine County were sampled to determine fish abundance using sinking multi-filament experimental gill nets measuring125 feet in length and 6 feet deep consisting of 25-foot panels of ¾", 1", 1 ¼", 1 ½", and 2" mesh unless otherwise specified. Voluntary creel boxes were maintained at many of the ponds to determine fishing pressure, catch rates, and satisfaction.

Anita Reservoir

Anita Reservoir is a 50-acre reservoir located on BLM land in northern Blaine County. The reservoir was originally constructed in 1996 to increase waterfowl habitat and create a fishery. Not long after construction, torrential rains quickly filled the reservoir. The dam's integrity was jeopardized and needed to be breeched. The reservoir was reconstructed and never re-filled. In 2011, the reservoir filled and FWP trap and transferred pre-spawn yellow perch, black crappie, and fathead minnows to establish a forage base within the reservoir. In 2014, walleye fingerlings were planted and the reservoir now receives alternate year plants of 5,000 walleye fingerlings. Since 2015, 5,000 fingerling Gerrard rainbow trout have been stocked annually.

Gill net surveys suggest a slow establishment of adult yellow perch and black crappie since their initial introduction in 2011 (Figure 18). Though yellow perch growth has been slow, trap net surveys suggest good reproduction occurs annually (Table 11). Walleye stocking has been successful, with age-2 walleye obtaining 13+ inches and are likely contributing to reduced yellow perch densities in our gill net surveys (Figure 18; Table 11). Rainbow trout (Gerrard) stocking has also been very successful and have exhibited good growth rates (Figure 18; Table 11).

Figure 18. Relative abundance of yellow perch, walleye, black crappie and rainbow trout collected using two sinking gill nets in Anita Reservoir 2013-2016.

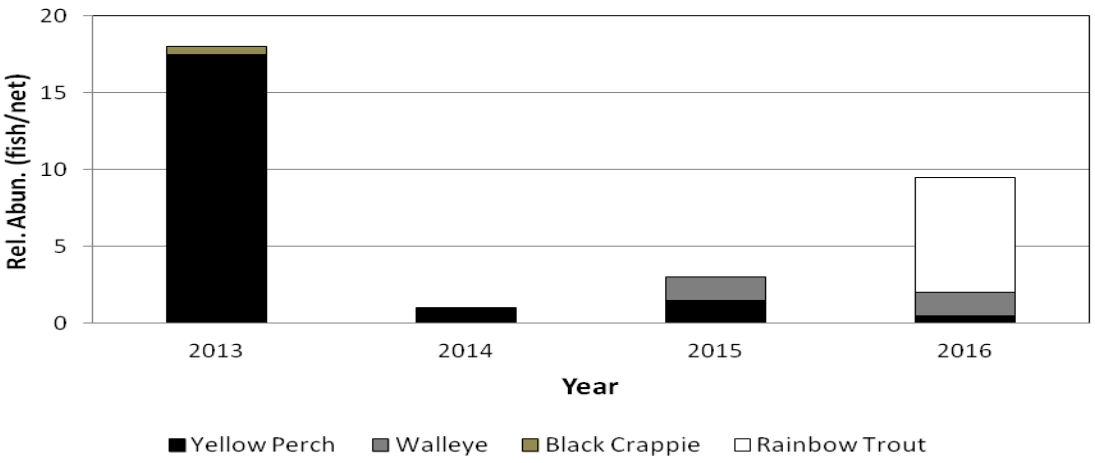


Table 11. Relative abundance (fish/net) and average length of yellow perch, walleye, black crappie, fathead minnow, brook stickleback and rainbow trout using trap nets in Anita Reservoir (2013-2016).

			Yellow Perch		Walleye		Black Crappie		Fathead Minnow	Brook Stickleback	Rainbow Trout	
Year		Net #	Rel. Abun.	Avg. Length	Rel. Abun.	Avg. Length	Rel. Abun.	Avg. Length	Rel. Abun.	Rel. Abun.	Rel. Abun.	Avg. Length
Jun-13	2013	2	47	3	--	--	--	--	1,149	24.5	--	--
Jun-14	2014	2	19.5	4.41	--	--	--	--	367	11	--	--
Jun-15	2015	2	8	4.60	0.5	7.50	--	--	2.5	1.5	--	--
Jun-16	2016	2	101.5	4.10	0.5	13.00	--	--	65	--	0.50	11.6

BR 047

BR 047 is an 11-acre BLM reservoir located approximately 6 miles north of Zurich. The reservoir was first stocked in 1940 with largemouth bass and black crappie; bluegill were stocked in 1943. Water levels rarely fluctuate more than one foot/year on BR 047 and in 2010 one gill net and two trap nets were set overnight to determine the fish composition, a depth profile was conducted to determine overwinter survival of game species. The gill net contained no fish and the trap nets combined captured 120 fathead minnows. The depth profile found a max depth of 11 feet. BR 047 was stocked in 2011 with bluegill. A windmill aeration system was installed to increase likely survival of fish through the winter months.

In 2014, one gill net and two trap nets were set overnight. The gill net captured one bluegill and the traps contained 4,150 fathead minnows and 156 bluegill ($\bar{x}$ TL= 4.06 in.). In 2015, 2,000 fingerling largemouth bass were stocked to diversify the fishery and to provide increased predation on an increasing bluegill population. In 2016, one gill net captured two bluegill and two trap nets captured one largemouth bass ($\bar{x}$ TL= 4.9 in.), 1,040 bluegill ($\bar{x}$ TL= 4.03 in.), two yellow perch ($\bar{x}$ TL= 4.7 in.) and 600 fathead minnows. The presence of yellow perch suggests an illegal introduction of this species into BR 047 by an unknown source. Monitoring of this species will continue.

Cow Creek Reservoir

Cow Creek Reservoir is a privately owned, 65 surface-acre reservoir, located in the Bearpaw Mountains. Cow Creek Reservoir has been managed as a warm water fishery since 1994 and is comprised of walleye, channel catfish, black crappie, tiger muskie, and yellow perch (illegally introduced in 2001). Currently, Cow Creek Reservoir receives 5,000 walleye fingerlings biannually. Channel catfish and tiger muskie are stocked as needed. Cow Creek Reservoir ranked 30th in the region for angler pressure in 2015/2016 (600 +/- 600 angler days; MTFWP Fisheries Bureau 2016).

In 2010, 12,000 pre-spawn yellow perch were transferred and stocked into Cow Creek Reservoir from the Kremlin Water Ponds and another 3,600 were transferred in the spring of 2013. Furthermore, 50 advanced fingerling tiger muskie from South Dakota were stocked in the fall 2010. The primary food sources for these sport fish are white suckers, fathead minnows, golden shiners, and northern red belly dace.

In 2016, water levels remained stable. Gill net surveys suggest yellow perch, channel catfish, and tiger muskie relative abundance remains low (Table 12). Both walleye and white sucker densities increased significantly when compared to historic trends, walleye average length also increased (Table 12) Seining surveys documented below average spawning success for all species.

Table 12. Relative abundance (fish/net) and average length of yellow perch, channel catfish, white sucker, walleye, and tiger muskie using gill nets in Cow Creek Reservoir (1994-2016).

			Yellow Perch		Channel Catfish			White Sucker		Walleye			Tiger Muskie	
Date	Year	Nets	Rel. Abun.	Avg. Length	Rel. Abun.	Avg. Length	Rel. Weight	Rel. Abun.	Avg. Length	Rel. Abun.	Avg. Length	Rel. Weight	Rel. Abun.	Avg. Length
Aug-94	1994	2.0		--	0.0	--		2.0	--	23.5	7.2		0.0	--
Sep-95	1995	1.0	0.0	--	0.0	--		2.0	--	15.0	10.0	82.5	0.0	--
Sep-96	1996	2.0	0.0	--	5.0	9.1	116.1	1.0	--	48.0	11.1	82.3	0.0	--
Sep-97	1997	2.0	0.0	--	9.5	10.5	118.1	1.0	--	30.5	11.9	86.9	0.0	--
Sep-98	1998	3.0	0.0	--	6.3	13.9	107.7	7.0	14.6	11.3	13.2	87.1	0.0	--
Sep-01	2001	2.0	0.5	5.6	4.5	17.0	103.7	0.5	--	12.5	13.3	94.7	0.5	15.7
May-03	2003	2.0	0.0	--	11.0	19.5	115.7	8.0	15.9	1.0	13.0	97.0	1.5	19.4
Jul-05	2005	2.0	1.0	9.8	9.0	21.3	104.3	6.0	17.6	8.0	14.7	85.5	0.0	--
Jul-06	2006	2.0	1.5	9.6	9.5	21.5	108.4	7.0	17.6	12.0	13.0	87.1	0.0	--
Jul-07	2007	2.0	0.5	10.3	7.0	23.5	118.8	0.0	--	7.5	11.8	92.2	1.5	21.5
Jul-08	2008	2.0	0.0	0.0	6.0	14.4	120.4	2.5	18.1	4.5	9.3	90.5	0.0	0.0
Jun-09	2009	2.0	0.5	10.4	8.0	22.7	111.3	1.5	15.2	13.0	10.0	96.1	0.5	19.7
Jun-10	2010	2.0	0.5	5.8	0.5	13.4	135.9	2.5	17.1	7.0	9.8	97.3	0.0	0.0
Jun-11	2011	No Sampling Occurred												
Jun-12	2012	2.0	3.0	8.3	14.5	18.1	136.7	4.0	14.8	6.5	11.3	83.3	0.0	0.0
Jun-13	2013	2.0	0.5	7.0	2.0	16.5	118.4	7.0	14.1	10.0	11.8	77.8	0.0	0.0
Jun-14	2014	2.0	1.0	9.3	3.5	18.1	116.1	17.0	13.5	3.5	13.1	86.0	0.0	0.0
Jun-15	2015	2.0	0.0	0.0	0.0	0.0	0.0	0.5	15.7	2.5	11.3	0.0	0.5	36.5
Jun-16	2016	2.0	0.5	10.5	2.0	20.4	116.2	30.0	13.7	12.5	12.4	87.1	0.0	0.0

Dry Fork Reservoir

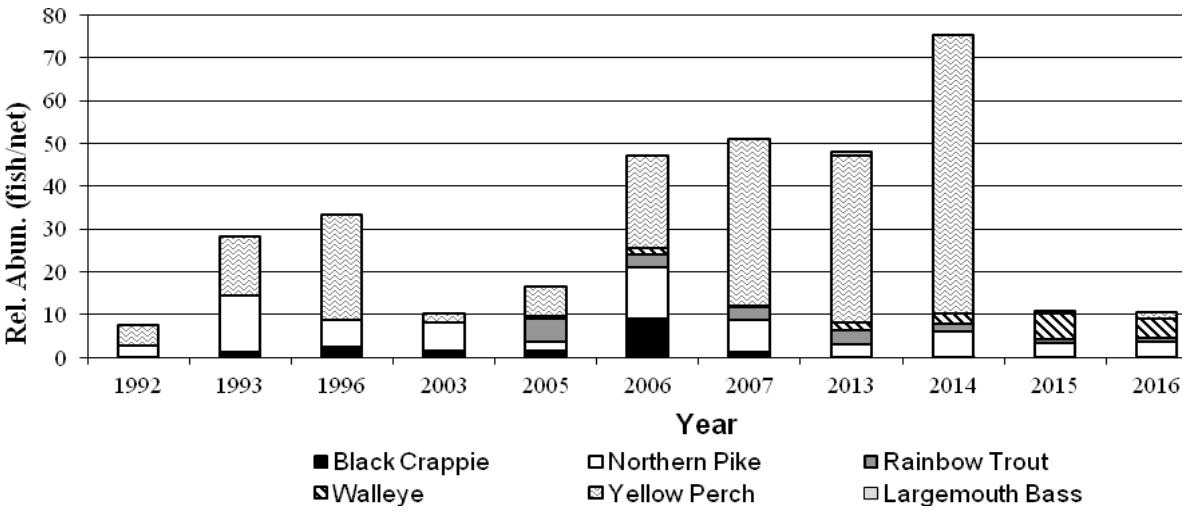
Dry Fork Reservoir is a 300 surface-acre reservoir located seven miles north of Chinook. Historically, Dry Fork has been a popular yellow perch and northern pike fishery, which has been limited by drought and subsequent water demands (irrigation) that severely reduce water levels and have eliminated this fishery twice (2001 and 2008).

In 2011, high spring runoff and rain events re-filled Dry Fork. To re-establish the fishery, FWP trap and transported 3,400 pre-spawn yellow perch, 3,000 fathead minnows, and 93 adult black crappie. In 2011, 10,000 rainbow trout were stocked as well, and largemouth bass were transferred via entrainment from up-stream impoundments. Walleye fingerlings have been stocked since 2012 at a rate of 10,000/biannually. In 2013, FWP continued to trap and transport adult northern pike (33) and the reservoir received 4,000 catchable rainbow trout. Dry Fork continues to receive supplemental rainbow trout stocking. In 2015/2016 this reservoir received 825 (± 439) angler days which ranked 28th in regional use (MTFWP Fisheries Bureau 2016).

In 2014 gill net surveys documented the highest relative abundances ever recorded for both walleye (2.33/net) and yellow perch (65.3/net; Figure 19). Northern pike abundance and growth continues to increase and the overall success of all sport fishes is evident based on recent statewide angling pressure surveys.

Water conditions have remained favorable and successful yellow perch reproduction was observed in 2016, based on seining surveys. Gill net surveys suggests northern pike and walleye densities are stabilizing (Figure 19). Average length for both species has also increased and has lead to increased demands for the larger (> 6") adult yellow perch (Figure 19).

Figure 19. Relative abundance of yellow perch, northern pike, black crappie, rainbow trout, largemouth bass, and walleye in Dry Fork Reservoir (periodic sampling 1992 to 2016).



Reser Reservoir

Reser reservoir is located in northwestern Blaine County. This reservoir has been managed as a fishery since 1981 and over the years has been stocked with fathead minnows, lake chub, northern redbelly dace, western silvery/plains minnows, golden shiners, largemouth bass, channel catfish, tiger muskie, black crappie, bluegill, and rainbow trout. This reservoir had frequent winterkills occur in the early 1990s and as a result a windmill aeration system was installed. Since the installation of the aeration system, two partial fish kills have occurred. One was suspected to have occurred as a result of chemical runoff from surrounding fields and the other occurred during the winter of 2010/2011.

Following the winterkill in 2010/2011, FWP stocked largemouth bass, rainbow trout, black crappie, and bluegill. Reser's fish assemblage was dominated by golden shiner and yellow perch (Figure 20). It is unclear why gill net surveys conducted in 2016 yielded only one largemouth bass as winter conditions in 2015/2016 were not favorable for winterkill. The largemouth bass stocked in 2011 have reached 14+ inches and are approaching three pounds, suggesting good forage conditions for this species. Trap netting also confirmed successful spawning and recruitment of stocked bluegill and black crappie (Figure 21). In 2015/2016 this reservoir received 254 (± 184) angler days (MTFWP Fisheries Bureau 2016). In 2015 the BLM improved the road accessing Reser by installing a new cattle guard, re-sloping and graveling the road, and creating a parking area on the south side of the dam.

Figure 20. - Relative abundance of rainbow trout, largemouth bass, yellow perch, golden shiner, black crappie, and bluegill collected with sinking experimental gill nets in Reser Reservoir, 1987-2016.

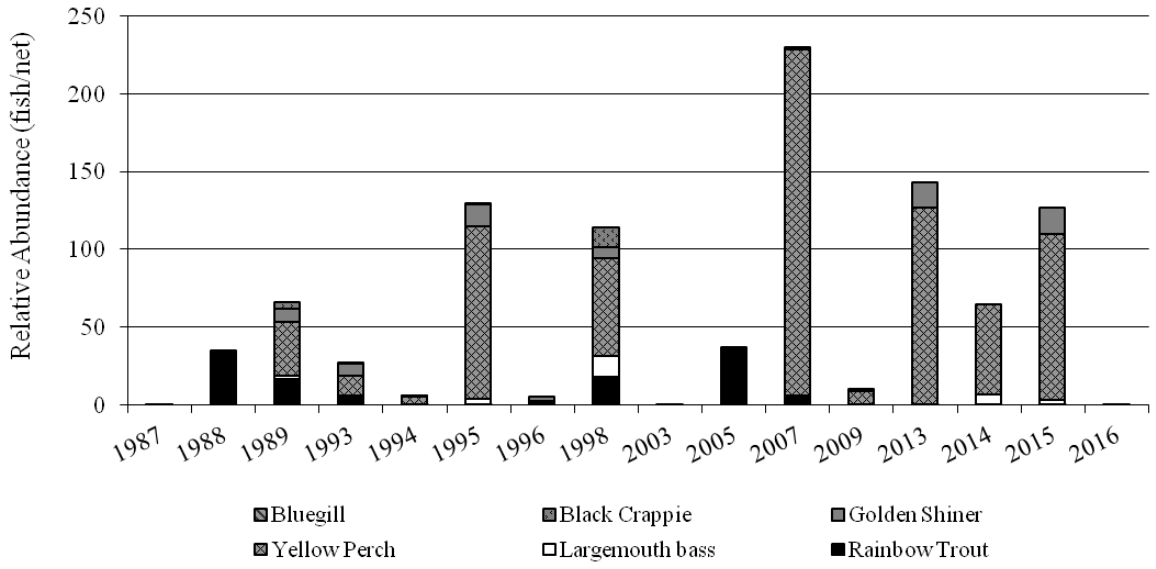
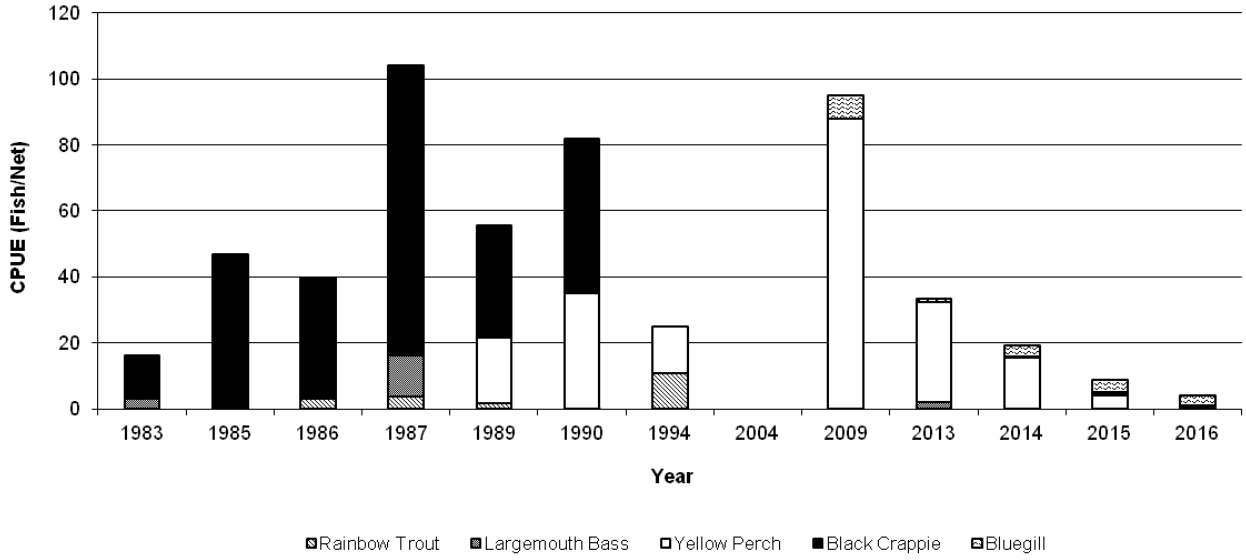


Figure 21. - Relative abundance of rainbow trout, largemouth bass, yellow perch, golden shiner, black crappie, and bluegill collected with trap nets in Reser Reservoir, 1983-2016.



Phillips County Fishing Waters

Select waters throughout Phillips County were sampled to determine fish abundance using sinking multi-filament experimental gill nets measuring 125 feet in length and 6 feet deep consisting of 25-foot panels of ¾", 1", 1 ¼", 1 ½", and 2" mesh. Voluntary creel boxes were maintained at many of the ponds to determine fishing pressure, catch rates, and satisfaction.

Bell Ridge Reservoir

Bell Ridge is a BLM pond, which was last stocked in 1999 with channel catfish. In 2009, the deepest point within the reservoir was 4 feet and it was approximately 10 feet below the spillway. Water levels used to be supplemented with well water, however that practice was terminated. Due to low water levels, Bell Ridge is no longer suitable as a fishery. A depth profile was completed in 2016, crews found a maximum depth of 12.5 feet, no fish were observed.

Cole Ponds

The Cole Ponds are a state fishing access site consisting of three ponds that are approximately 9 acres each. These ponds are old gravel pits and are very deep, clear ponds. The ponds contain self-sustaining populations of largemouth bass, yellow perch, northern pike, pumpkinseed sunfish, and black crappie. Rainbow trout are also stocked to increase angling opportunity. In 2015/2016 these ponds received 172 (± 172) angler days (MTFWP Fisheries Bureau 2016).

In 2016, three gill nets and three trap nets were set overnight to assess the fish community. Yellow perch (6.7/net) comprised the majority of fish captured with gill nets. Northern pike (0.67/net), pumpkinseed (0.66/net) and black crappie (0.33/net) were also captured. The trap nets captured yellow perch (11/net), pumpkinseed (21/net), black crappie (0.67/net), and northern pike (0.67/net).

Ester Lake

Ester Lake is a 139-acre reservoir located on state land and has been managed by FWP since the 1950s. In the 1960's Ester was a productive fishery with high numbers of yellow perch, black crappie, and walleye.

In 2009 and 2010, Ester received 8,000 and 2,600 pre-spawn yellow perch to boost the forage base that had been non-existent since the early 1980s (Figures 22 and 23). The supplemental plants of yellow perch have boosted the population and in 2011 approximately 3,900 fathead minnows were planted to establish a secondary forage species. In 2012, an additional 3,500 yellow perch were stocked to supplement the adult population and another 1,733 pre-spawn adult yellow perch were trap and transferred in 2014.

Netting surveys conducted since initiating the supplemental yellow perch stocking in 2009 suggest a more balanced fishery with very good abundance of yellow perch and northern pike (Figures 22 and 23). Abundance, growth, and condition of all species have been very good and the status of this fishery is the best we've documented in 30 years. In 2015/2016 Ester received 270 (± 202) angler days (MTFWP Fisheries Bureau 2016).

Figure 22. - Relative abundance of yellow perch, northern pike, black crappie, and walleye in Ester Lake (periodic gill net sets 1980 to 2016).

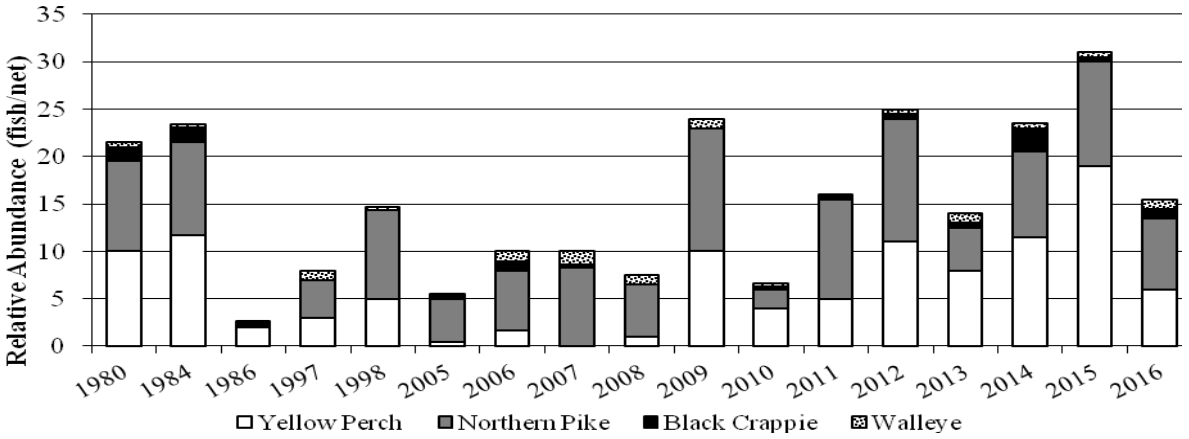
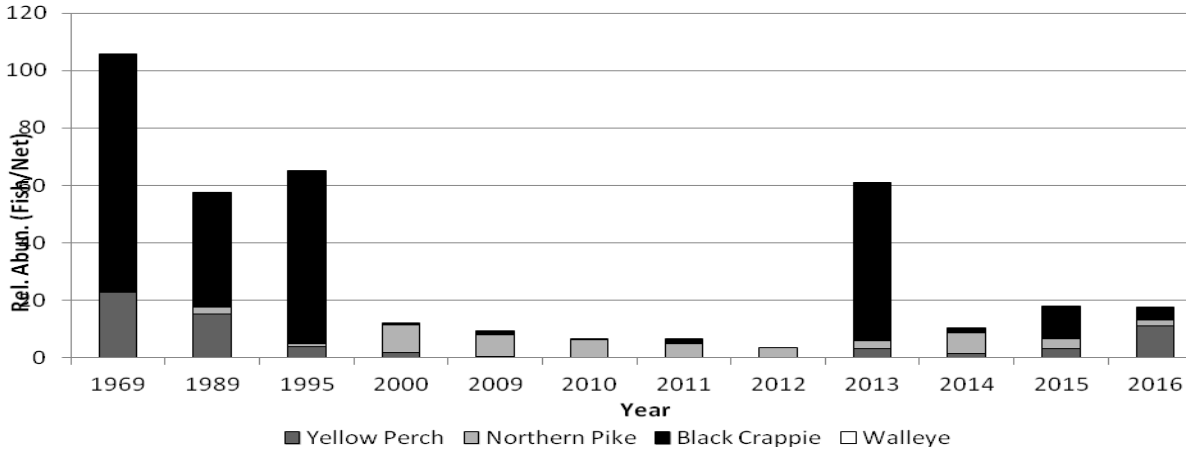


Figure 23. - Relative abundance of yellow perch, northern pike, black crappie, and walleye in Ester Lake (periodic trap net sets 1969 to 2016).



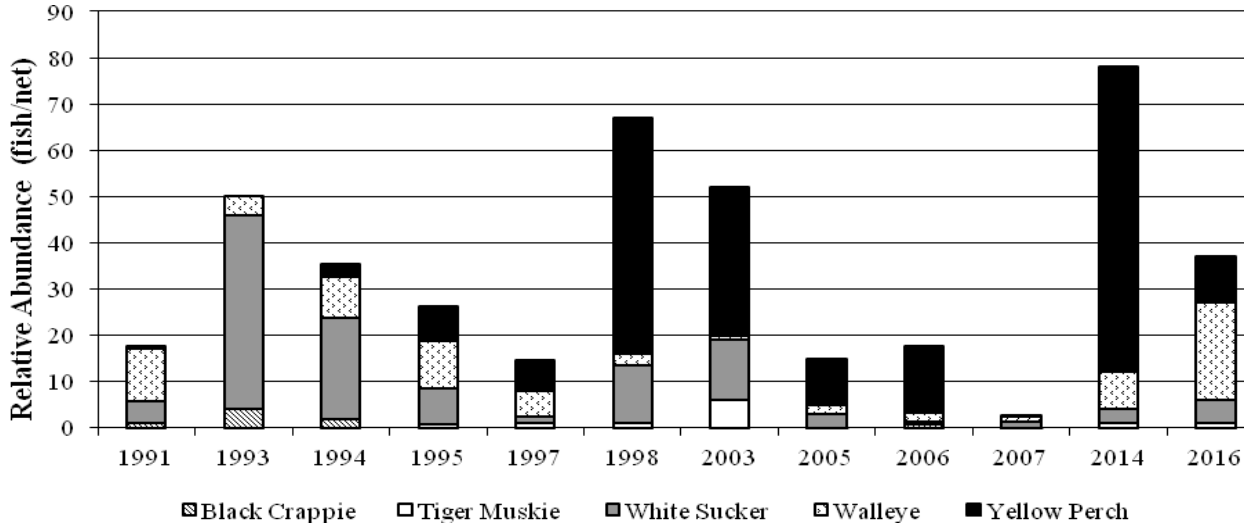
Little Warm Reservoir

Little Warm Reservoir is a privately owned 75-acre reservoir located in Phillips County. FWP has managed this pond (periodically) as a warm water fishery since 1989. Since 1989, black crappie, yellow perch, tiger muskie, and walleye have been introduced. Tiger muskies were introduced to control white sucker populations. Other species present within the reservoir include brook stickleback, Iowa darter, white sucker, shorthead redhorse, golden shiner, black bullhead, and fathead minnow.

In 2007, the landowners at the time closed Little Warm to public access. This continued for several years and all fisheries management (sampling, stocking, etc.) was ceased. In 2013, ownership of the reservoir changed and FWP initiated conversations pertaining to future access and fisheries management. In 2014, the new landowners were allowing some public access with permission and FWP was also allowed to sample the reservoir to assess the current fish population (Figure 24).

The ownership of Little Warm changed once again in 2015 and a detailed access plan was constructed using funds from the Private Lands Public Fishing Program for a five-year term. A historic rain event in September caused the dam to wash out, eliminating the fishery. At this time it is unknown whether or not this dam will be repaired.

Figure 24. – Relative abundance of black crappie, tiger muskie, white sucker, walleye, and yellow perch in Little Warm Reservoir (periodic gill nets1991-2016).



Nelson Reservoir

Nelson Reservoir, located 19 miles northeast of Malta is an off-stream storage reservoir constructed in 1915 for irrigation along the Milk River. At full storage capacity, Nelson covers approximately 4,320 surface acres, has a mean depth of 14.2 feet, and a maximum depth of 50 feet. Nelson is a relatively stable reservoir which is not affected by drought conditions, when compared to other regional reservoirs, with an average annual fluctuation of 8.36 feet and average water retention time of 610 days (storage capacity (acre-feet)/average annual inflow (acre-feet)).

Nelson was established as a fishery in the 1930s & 40s with the introduction of largemouth bass, black crappie, bullheads, and rainbow trout. Nelson has approximately 26 fish species and is managed primarily as a walleye fishery. Walleye reproduce naturally in Nelson; however walleye fingerlings have been stocked annually since 2003 to supplement an already good population. Increased stocking effort has had little impact to the walleye population thus far and has been monitored since 2007. Spawning shoals were constructed in 1993 at three locations within the reservoir to improve the spawning habitat for walleye. Their contribution to the overall spawning success of walleye is unknown and may function more as rearing habitat.

In 2016, Bureau of Reclamation commenced work on a safety of dam's project at Nelson Reservoir to repair the outlet structures and dikes. In order to complete the work, reservoir pool elevations were drawn down approximately 17.5 feet (elevation 2204'). The draw down was initiated in July and was completed by the end of August. Reservoir pool elevations remained below 2206' throughout the winter of 2016/2017.

Population Status of Adult and Young-of-Year Fishes

Since 1993, adult fish populations have been monitored at 10 fixed experimental gill netting stations. Gill netting is conducted over a two-day period utilizing five sinking experimental gill nets each day (10 net-days). In 2016, due to reduced pool elevations, only five gill nets were used over a one day period (five net-days). The sinking multi-filament experimental gill nets measure 125 feet in length and 6 feet deep consisting of 25-foot panels of ¾", 1", 1 ¼", 1 ½", and 2" mesh. Fish were measured for total length (TL: inches) and weighed to the nearest 0.01 pound (lb). Otoliths were collected from walleye for aging and oxytetracycline (OTC) analysis.

The abundance and reproductive success of sport and forage fishes were monitored at 10 predetermined sites. Beach seining was conducted in early August using a 75'- x 9' x ¼" square mesh beach seine. Fish were sorted by species and counted.

Table 13. - A summary of forage fish and young-of-year forage and sport fish collected conducted at nine fixed sites using a 100- x 9-foot x ¼ inch square mesh beach seine in Nelson Reservoir, 1982-2016.

	Shorline Seined (ft)	Walleye	Yellow Perch	YP (Adult)	Northern Pike	Spottail Shiner	White Sucker	Black Crappie	Goldeye	Buffalo sp[1]	Smallmouth Bass	Longnose Sucker
1982	660	0	4,553	--	3	0	202	245	0	0	0	0
1983	1,420	4	138	--	18	0	543	238	0	0	0	0
1984	1,530	0	133	--	0	0	0	0	0	0	0	0
1985	510	3	2,272	--	16	1	16	67	1	0	0	0
1986*	700	0	3	--	7	0	10	232	0	0	0	0
1987*	495	5	1,987	--	0	4	45	10	7	0	0	0
1988*	520	0	783	--	0	1	0	35	0	0	0	0
1989*	910	10	736	--	4	43	1,503	135	0	0	0	0
1990	1,320	7	2,631	--	1	56	181	21	0	0	0	0
1991*	660	8	77	--	1	54	33	26	0	0	0	0
1992	635	21	140	--	6	387	175	18	0	4	0	0
1993*	520	3	8,287	--	1	520	2,688	62	0	0	0	0
1994*	830	6	1,802	--	10	621	697	49	0	0	0	0
1995*	760	36	232	--	0	3,780	180	163	0	0	0	0
1996*	870	25	4,521	--	13	21	101	0	0	0	0	0
1997*	890	53	2,205	--	0	159	534	1	0	0	0	0
1998*	340	0	126	--	0	33	235	4	0	0	0	0
1999	750	11	1,489	--	2	222	497	1	0	0	0	0
2000*	440	4	449	--	2	189	258	5	6	0	0	0
2001	430	2	72	--	1	27	800	88	0	0	0	0
2002*	415	2	19	--	4	8	38	482	21	62	0	0
2003	530	3	361	--	33	49	235	6,597	0	0	3	0
2004*	443	10	1,781	--	0	19	195	5	1	0	10	0
2005*	754	5	423	--	2	34	155	278	23	5	1	0
2006*	831	3	773	--	8	66	319	89	0	3	1	0
2007*	489	6	586	--	2	75	596	5	0	12	9	0
2008*	500	10	62	--	0	8	272	1,237	11	94	11	0
2009*	750	4	4,522	--	4	3	478	20	8	2	61	14
2010*	750	11	2,914	184	3	98	224	131	0	0	115	2
2011*	750	8	2,404	530	6	34	181	69	0	0	40	0
2012*	750	2	685	312	1	66	49	935	0	7	6	1
2013*	750	1	362	2	6	48	24	261	0	7	8	0
2014*	750	6	345	280	4	36	38	2,564	6	112	7	0
2015*	750	1	883	8	5	6	26	80	0	2	60	0
2016*	750	11	126	16	0	108	213	1,362	0	1	2	0

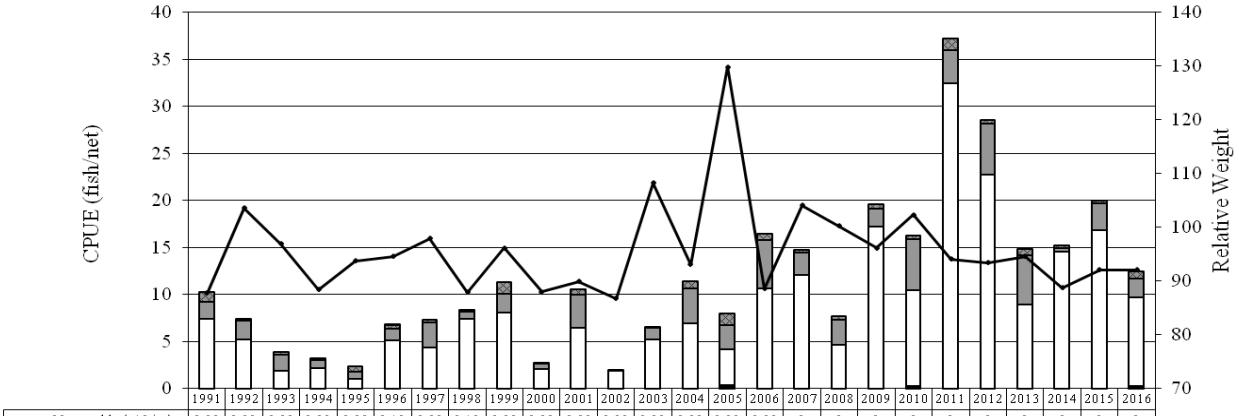
*Years in which walleye fry or fingerlings were stocked
[1] Consists of bigmouth buffalo and smallmouth buffalo

Yellow Perch

The yellow perch fishery in Nelson Reservoir has been cyclic over the last 20 years due to drought, timing of water fluctuations, and quality of available spawning habitat. In the early 1990s and in 2000 and 2002, the relative abundance of yellow perch was significantly reduced due to severe drought conditions and reduced pool elevations (Figure 25). However, since 2003 spring and summer rains have enabled water levels to flood shoreline vegetation and remain stable during crucial spawning and rearing periods (April-October), resulting in the highest yellow perch densities documented in Nelson (Table 13; Figure 25).

In 2011, yellow perch relative abundance was the highest ever recorded (37.1 perch/net) and consisted mostly of stock (5-7.9 in.) and quality (8.0-9.9 in.) sized fish. Yellow perch relative abundance remained high in 2012 (28.5 perch/net), densities have since dropped and stabilized (Figure 25). Current relative abundance of yellow perch remains above the long-term average (11.8 perch/net). The majority of fish sampled in 2016 consisted of stock sized yellow perch. The yellow perch population has responded well due to several consecutive exceptional water years.

Figure 25. - Relative abundance, size structure, and relative weight of yellow perch collected with sinking experimental gill nets in Nelson Reservoir, 1991-2016.



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>12 in.)	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	0
Preferred (10-11.9 in.)	1.00	0.20	0.20	0.20	0.60	0.40	0.30	0.10	1.30	0.10	0.60	0.00	0.10	0.80	1.20	0.70	0.3	0.3	0.4	0.4	1.2	0.4	0.7	0.3	0.3	0.8
Quality (8-9.9 in.)	1.80	2.00	1.80	0.90	0.70	1.20	2.70	0.70	2.00	0.60	3.50	0.10	1.20	3.70	2.60	5.10	2.4	2.7	1.9	5.4	3.5	5.4	5.2	0.4	2.8	2
Stock (5-7.9 in.)	7.40	5.20	1.80	2.10	1.00	5.10	4.30	7.40	8.00	2.00	6.40	1.80	5.10	6.90	3.80	10.60	12	4.6	17.2	10.2	32.4	22.7	8.9	14.5	16.8	9.4
Sub Stock (<5 in.)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.3	0	0	0	0	0.2	0	0	0	0	0	0.2
Relative weight	87.70	103.5	96.83	88.45	93.77	94.56	97.87	87.94	96.13	87.97	89.95	86.76	108.2	93.10	129.7	88.60	104	100.2	96.15	102.3	94.08	93.38	94.6	88.69	92.1	92.02

Walleye

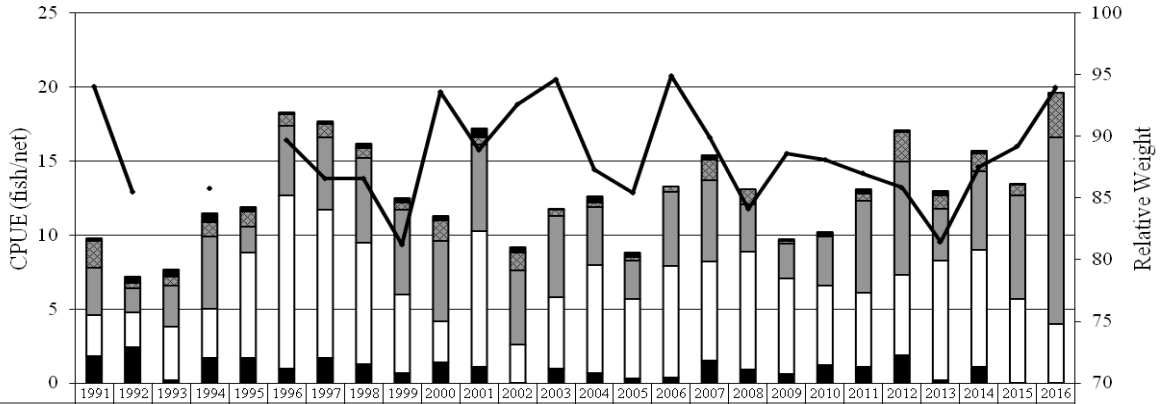
Historically, walleye fingerlings and fry have been periodically stocked into Nelson Reservoir to supplement natural reproduction. From 2002 to 2011 (with the exception of 2006), all walleye fingerlings stocked into Nelson Reservoir have been marked with 750 ppm OTC to allow the calculation of survival on stocked fish and to distinguish stocked fish from naturally reproduced fish. There was a miscommunication with the Fort peck Hatchery and no walleye fingerlings stocked in 2012 were marked, but OTC markings were completed in 2013-2016. In 2006, only half of the walleye stocked were marked with OTC due to problems with reaction of the walleye to the chemicals.

Even with the addition of these fish, catch of YOY walleye during seining surveys remained low when compared to pre-drought levels (Table 13). However, the high proportion of stock (10-14.9 in.) and quality size (15.0-19.9 in.) walleye in the population indicates good survival of YOY walleye from 2003 through 2016 (Figure 26). OTC analysis suggests the majority (> 70%) of YOY walleye recruiting into the population are naturally reproduced.

The relative abundance of adult walleye has historically remained stable over the years, regardless of walleye stocking densities and size (Figure 26). In 2016, walleye relative abundance was the highest documented since 1991 (19.6 walleye/net; Figure 26). The current walleye population consists of very balanced age structure and length classes (Figure 26).

Exceptional water and forage conditions are most likely the primary factors contributing to the increase in walleye densities observed since 2010. The walleye population in Nelson Reservoir has remained consistent and trend data suggests the contributions from supplemental stocking efforts aren't directly increasing walleye densities, and stocked fish may actually be replacing naturally reproduced walleye that would otherwise recruit into the population if no stocking would occur. Further evaluation on this species and subsequent stocking efforts are needed to better understand the current population trends.

Figure 26. - Relative abundance, size structure, and relative weight of walleye collected with sinking experimental gill nets in Nelson Reservoir, 1991-2016.



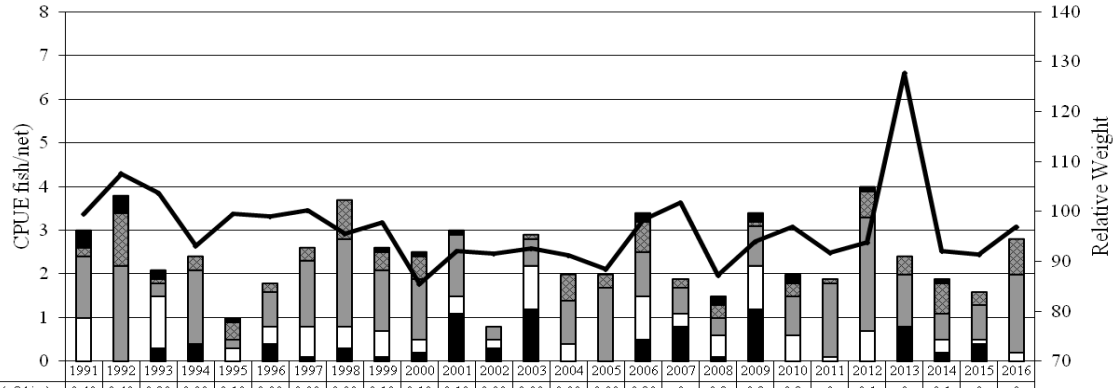
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>25 in.)	0.20	0.40	0.50	0.60	0.30	0.10	0.20	0.30	0.30	0.30	0.60	0.40	0.10	0.40	0.30	0.00	0.3	0	0.1	0.2	0.3	0.1	0.3	0.2	0.1	0
Preferred (20-24.9 in.)	1.80	0.40	0.60	1.00	1.00	0.80	0.90	0.70	0.50	1.40	0.50	1.20	0.40	0.30	0.20	0.40	1.4	1	0.2	0.1	0.5	2	0.9	1.2	0.7	3
Quality (15-19.9 in.)	3.20	1.60	2.80	4.90	1.80	4.70	4.90	5.70	5.70	5.40	5.80	5.00	5.50	3.90	2.60	5.00	5.5	3.2	2.3	3.3	6.2	7.7	3.5	5.3	7	12.6
Stock (10-14.9 in.)	2.80	2.40	3.60	3.30	7.10	11.70	10.00	8.20	5.30	2.80	9.20	2.50	4.80	7.30	5.40	7.50	6.7	8	6.5	5.4	5	5.4	8.1	7.9	5.6	4
Sub-stock (<10 in.)	1.80	2.40	0.20	1.70	1.70	1.00	1.70	1.30	0.70	1.40	1.10	0.10	1.00	0.70	0.30	0.40	1.5	0.9	0.6	1.2	1.1	1.9	0.2	1.1	0.1	0
Relative weight	94.03	85.50		85.80		89.70	86.60	86.60	81.20	93.60	88.90	92.60	94.60	87.30	85.40	94.90	89.9	84.1	88.59	88.1	86.98	85.84	81.42	87.51	89.2	93.99

Northern Pike

Historically, the relative abundance of adult northern pike has remained stable, consisting of a high proportion of quality and preferred sized fish (Figure 27). Northern pike populations were reduced in 2002 due to severe drought conditions, however the population quickly replenished itself with the recruitment of YOY fishes in 2003 (Table 13).

In 2012, northern pike relative abundance was at its highest level ever documented (4 fish/net) but has dropped and stabilized since (Figure 27). The current pike population is balanced. Exceptional water and forage conditions are most likely the primary factors contributing to the increased size structure of northern pike. Northern pike abundance should remain stable if the current water conditions persist.

Figure 28. - Relative abundance, size structure, and relative weight of northern pike collected with sinking experimental mesh gill nets in Nelson Reservoir, 1991-2016.

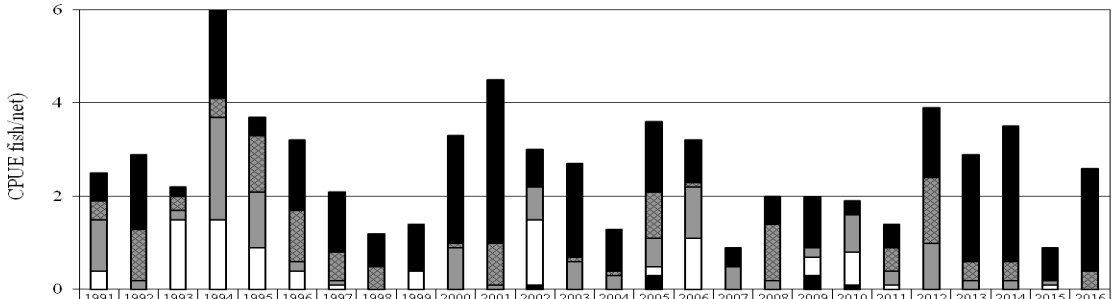


	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>34 in.)	0.40	0.40	0.20	0.00	0.10	0.00	0.00	0.00	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.20	0	0.2	0.2	0.2	0	0.1	0	0.1	0	0
Preferred (28-33.9 in.)	0.20	1.20	0.10	0.30	0.40	0.20	0.30	0.90	0.40	0.50	0.00	0.00	0.10	0.60	0.30	0.70	0.2	0.3	0.1	0.3	0.1	0.6	0.4	0.7	0.3	0.8
Quality (21-27.9 in.)	1.40	2.20	0.30	1.70	0.20	0.80	1.50	2.00	1.40	1.40	1.40	0.30	0.60	1.00	1.70	1.00	0.6	0.4	0.9	0.9	1.7	2.6	1.2	0.6	0.8	1.8
Stock (14-20.9 in.)	1.00	0.00	1.20	0.00	0.30	0.40	0.70	0.50	0.60	0.30	0.40	0.20	1.00	0.40	0.00	1.00	0.3	0.5	1	0.6	0.1	0.7	0	0.3	0.1	0.2
Sub Stock (<14 in.)	0.00	0.00	0.30	0.40	0.00	0.40	0.10	0.30	0.10	0.20	1.10	0.30	1.20	0.00	0.00	0.50	0.8	0.1	1.2	0	0	0	0.8	0.2	0.4	0
Relative weight	99.55	107.5	103.6	93.18	99.59	99.04	100.2	95.52	97.76	85.42	92.05	91.52	92.65	91.13	88.38	98.40	101.8	87.2	93.97	96.9	91.67	93.73	127.7	92.07	91.31	96.91

Lake Whitefish

The lake whitefish population has fluctuated since 1991 due to fluctuations in water levels and summer water temperature, which have reduced recruitment of YOY fish to the population (Figure 28). In 2007, there was a massive summer kill of lake whitefish reported and fall gill netting surveys indicated a decrease in the abundance of lake whitefish (0.9 fish/net; Figure 28; Leslie 2007). Gill netting surveys conducted in 2012-2014 revealed increased relative abundance and size. Relative abundance observed in 2015 reflected those numbers observed in 2007 and increased again in 2016 (Figure 28).

Figure 28. - Relative abundance, size structure, and relative weight of lake whitefish collected with sinking experimental mesh gill nets in Nelson Reservoir, 1991-2016

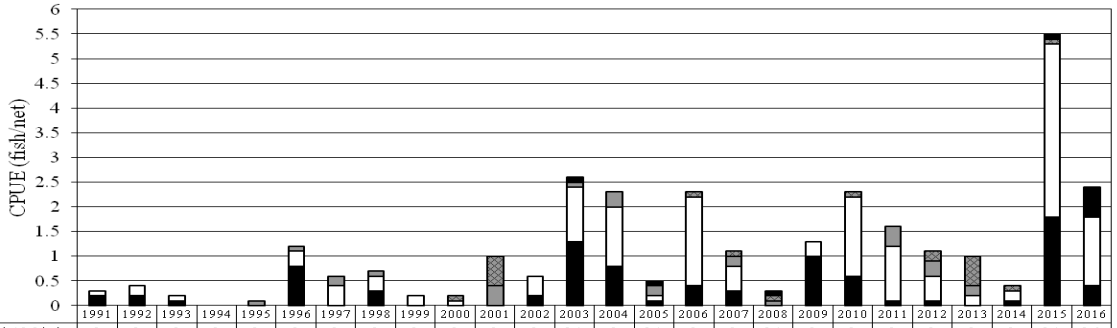


	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>18.0 in.)	0.6	1.6	0.2	1.9	0.4	1.5	1.3	0.7	1	2.3	3.5	0.8	2	0.9	1.5	0.9	0.4	0.6	1.083	0.3	0.5	1.5	2.3	2.9	0.7	2.2
Preferred (14.0-17.9 in.)	0.4	1.1	0.3	0.4	1.2	1.1	0.6	0.5	0	0.1	0.9	0	0.1	0.1	1	0.1	0	1.2	0	0	0.5	1.4	0.4	0.4	0	0.4
Quality (11.0-13.9 in.)	1.1	0.2	0.2	2.2	1.2	0.2	0.1	0	0	0.9	0.1	0.7	0.6	0.3	0.6	1.1	0.5	0.2	0.2	0.8	0.3	1	0.2	0.2	0.1	0
Stock (6.0-10.9 in.)	0.4	0	1.5	1.5	0.9	0.4	0.1	0	0.4	0	0	1.4	0	0	0.2	1.1	0	0	0.4	0.7	0.1	0	0	0	0.1	0
Sub Stock (<6.0 in.)	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.3	0	0	0	0.3	0.1	0	0	0	0	0	0

Black Crappie

Historically there has been a low abundance of black crappie in Nelson Reservoir. Since 2003, some of the highest (2003, 2008, 2012, 2014, and 2016) and most consistent year-classes of black crappie have been observed during annual seining surveys (Table 13). Recruitment of YOY crappie into the adult population has resulted in higher relative abundances of adult black crappie during that same timeframe (Figure 29). High reproductive success over the last ten years indicates the conditions within Nelson Reservoir have been favorable for black crappie, due to rising/stable water conditions during the month of June. If these conditions persist the population will continue to remain at good levels.

Figure 29. - Relative abundance, size structure, and relative weight of black crappie collected with sinking experimental gill nets in Nelson Reservoir, 1991-2016.



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Memorable (>12.0 in.)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1	0.6
Preferred (10.0-11.9 in.)	0	0	0	0	0	0	0	0	0	0.1	0.6	0	0	0	0	0.1	0.1	0.1	0	0.1	0	0.2	0.6	0.1	0.1	0
Quality (8.0-9.9 in.)	0	0	0	0	0.1	0.1	0.2	0.1	0	0	0.4	0	0.1	0.3	0.2	0	0.2	0.1	0	0	0.4	0.3	0.2	0	0	0
Stock (5.0-7.9 in.)	0.1	0.2	0.1	0	0	0.3	0.4	0.3	0.2	0.1	0	0.4	1.1	1.2	0.1	1.8	0.5	0	0.3	1.6	1.1	0.5	0.2	0.2	3.5	1.4
Sub Stock (<5.0 in.)	0.2	0.2	0.1	0	0	0.8	0	0.3	0	0	0	0.2	1.3	0.8	0.1	0.4	0.3	0	1	0.6	0.1	0.1	0	0.1	1.8	0.4

Other Fishes

A variety of other fishes are found within Nelson Reservoir, however they are rarely utilized as sport fish due to low abundances or their non-game status. Channel catfish, stonecats, bigmouth buffalo, smallmouth buffalo, and smallmouth bass are all present at low levels within Nelson Reservoir. Spottail shiners are also present and provide an important forage base, however in recent years their populations have been reduced and adult spottail shiners have not been present in high numbers within the annual seining surveys (Table 13).

It was reported that anglers are starting to figure out that Nelson has a very good adult population of smallmouth bass and the serious bass anglers are starting to target them. Good smallmouth bass reproduction has been documented in recent years (Table 13) and will continue to recruit and supplement the adult population.

PR 161 Reservoir

PR 161 is an 87-acre reservoir located on BLM land in south Phillips County. PR 161 was first stocked by FWP in 1937 with the introduction of largemouth bass and black bullheads. Northern pike were stocked in 1969 and have provided a self-sustaining fishery ever since. In 2008, PR 161 was sampled for the first time on record. Two sinking gill nets and one trap net were set for approximately 21 hours. The gill net contained one northern pike (TL = 23.5 in.); the trap contained one northern pike (TL = 19.4 in.) and 237 fathead minnows. PR 161 was stocked with 500 fingerling northern pike in 2009 and 2010.

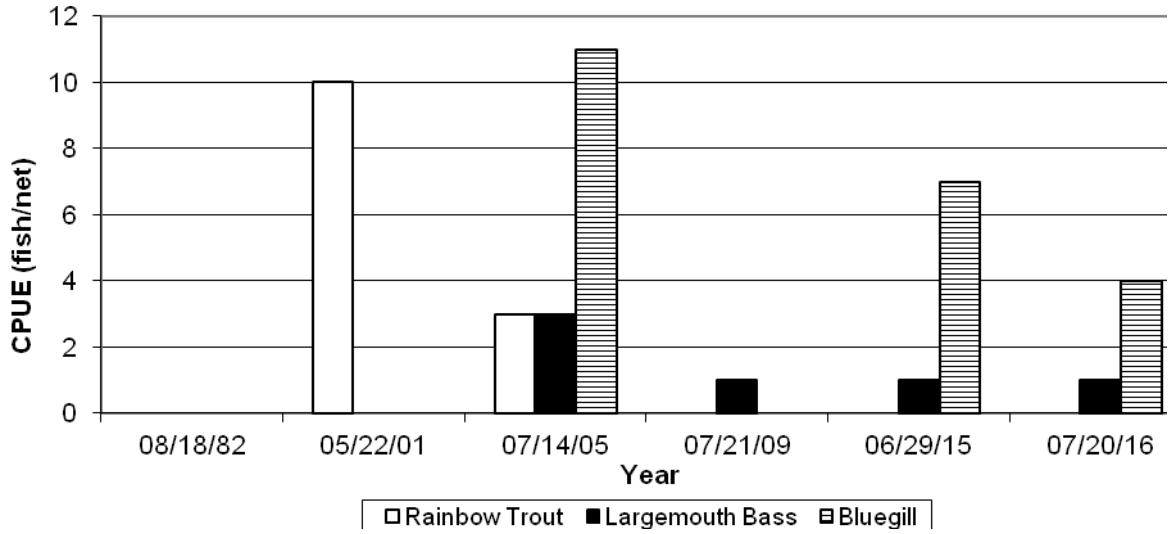
In 2016, two gill nets and two trap nets were set overnight to detect any changes in northern pike densities. Northern pike relative abundance was 19.5 pike/net, ranging in length from 12.3-27.4 inches ($\bar{x}$ TL= 20.5 in.). Stocking of northern pike was very successful and this population is naturally reproducing. The trap nets captured eleven northern pike. Failing to capture any fathead minnows may indicate an overpopulated northern pike fishery and increased pressure to the forage base. FWP will encourage anglers to fish PR 161 and harvest northern pike as well as closely monitor the forage base.

Sagebrush Reservoir

Sagebrush reservoir is a 5.2-acre BLM pond located in south Phillips County. Sagebrush was historically managed as a rainbow trout fishery until largemouth bass were introduced by FWP in 1989, followed by bluegill and channel catfish in 2001. Rainbow trout are stocked periodically, with

the last stocking occurring in 201. A windmill aerator system was installed in 2001 and this reservoir is currently full. Bluegill and largemouth bass populations are self-sustaining and rainbow trout have exhibited excellent growth when they recruit into the fishery (Figure 30). In 2015 one gill net collected one largemouth bass (TL=6.8 in.) and seven bluegill (Figure 30). One trap net collected 60 bluegill ($\bar{x}$ TL=5.6 in.). In 2016, one gill net collected one largemouth bass (TL=8.0 in.) and four bluegill ($\bar{x}$ TL=6.7 in.). One trap net collected 116 bluegill ($\bar{x}$ TL=5.0 in.).

Figure 30. - Relative abundance of rainbow trout, largemouth bass, and bluegill in Sagebrush Reservoir (periodic gill net sets 1982 to 2016).



Wild Horse Reservoir

Wild Horse is a mid-sized reservoir (255 surface-acres) located on state and BLM land in south Phillips County. Prior to 2008, no stocking or sampling data existed for this reservoir. However, local ranchers informed FWP of a good northern pike population that existed prior to the extensive drought experienced across the region in the early 2000's. In 2008, spring run-off filled Wild Horse to full capacity and two gill nets and one trap net were set overnight to assess the entire fish community. Gill net catch consisted entirely of common carp (Table 14). The trap net contained 305 fathead minnows.

In the summer of 2009, 1,350 adult yellow perch were trap and transferred from Bison Bone to establish a fishery and forage base in Wild Horse. In 2009 and 2010 5,000 fingerling northern pike were stocked to re-establish a sport fishery. Gill net surveys conducted in 2012 and 2016 suggest successful stocking of both northern pike and yellow perch (Table 14). Northern pike have exhibited good growth and condition, relying heavily on the high common carp densities that persisted since 2008, the common carp population is currently comprised of larger adults (Table 14). Netting surveys conducted in 2016 also captured several species not previously found in Wild Horse (white sucker, black crappie, and lake chub), most likely entrained from upstream reservoirs such as Ester Lake.

Table 14. - Relative abundance and average length of northern pike, yellow perch, black crappie, common carp, and white sucker captured during gill net surveys in Wild Horse Reservoir (periodic sampling 2008-2016).

	Northern Pike		Yellow Perch		Black Crappie		Carp		White Sucker	
Date	CPUE	Avg. Length	CPUE	Avg. Length	CPUE	Avg. Length	CPUE	Avg. Length	CPUE	Avg. Length
07/01/08	--	--	--	--	--	--	42	9.2	--	--
					--	--			--	--
07/02/12	36	20.4	5.50	8.14	--	--	26	15.5	--	--
07/06/16	7.5	24.49	0.50	5.5	0.50	4.40	4.50	23.12	0.50	11.70

RECOMMENDATIONS

Paddlefish: Fort Peck Stock

Annual tagging efforts should continue with over 300 new paddlefish being tagged annually. An on-site paddlefish creel survey should be conducted in 2016 to provide on-site mandatory reporting stations to collect harvest data such as length, weight, sex, and jaw samples to assist in determining the age structure of the Fort Peck Reservoir paddlefish stock. A phone survey should be conducted in 2017, using the database of anglers who drew harvest tags, as well as though anglers participating in snag and release, to assess angler demographics, effort, and success during the paddlefish season. YOY visual counts should be conducted to assess reproductive success and year-class strength.

Fresno and Nelson Reservoir

Standardized late-summer seining should continue to assess sport fish reproduction and forage fish abundance in Fresno and Nelson Reservoirs. Standardized sampling of adult sport fishes should be continued utilizing fall gill netting to gather recruitment information relating to walleye and other key sport and forage fish year-class strength and winter reservoir water levels. Walleye fingerling stocking program on Fresno and Nelson should continue to be evaluated to determine best stocking strategy for each reservoir.

Beaver Creek Reservoir

Standardized late-summer seining should continue to assess sport fish reproduction and forage fish abundance at Beaver Creek Reservoir. Standardized sampling of adult sport fishes should be continued utilizing fall gill netting to gather recruitment information relating to sport and forage fish year-class strength and to monitor growth and survival of stocked walleye, rainbow trout, and forage availability. Spring and fall plants of walleye fingerlings and advanced fingerlings should be continued.

Hill, Blaine & Phillips Co. Ponds

Sampling of adult sport fish populations should continue annually at Bailey Reservoir, Ester Reservoir, Dry Fork, and Cow Creek Reservoir. All other ponds should be sampled every two to three years to assess adult fish populations, growth, and recruitment. In addition, new self-creel survey boxes will be distributed and/or maintained throughout each county to assess the fishing pressure at these ponds. This information will allow us to tailor our management and stocking efforts to meet the needs of the public.

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Water Codes of Waters Referred To

164303 Anita Reservoir
154531 April Reservoir
154535 Bailey Reservoir
154570 Beaver Creek Reservoir
164789 Cow Creek Reservoir
155030 Don Reservoir
155036 Doucette Reservoir
155083 Dry Fork Reservoir
155120 Ester Lake
165140 Fort Peck Reservoir
155240 Fresno Reservoir
162500 Missouri River Sec. 05
162520 Missouri River Sec. 06
156480 Nelson Reservoir
156535 North Faber
167780 PR 020
158860 Reser Reservoir
168047 Sagebrush Reservoir
168475 Taint Reservoir
168815 Whiteface Reservoir

Key words:
Paddlefish, harvest, walleye, Lake Superior whitefish, northern pike, black crappie, yellow perch, goldeye, channel catfish, sauger, shovelnose sturgeon, pallid sturgeon, burbot, smallmouth buffalo, largemouth buffalo, age, water levels, creel census, population estimates, recruitment, tiger musky, stocking, Cisco, smelt

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