Montana Department of Fish, Wildlife and Parks
Fisheries Division

Job Progress Report

STATE: Montana **PROJECT: Yellowstone River Drainage Investigations**

STUDY TITLE: Tongue River Reservoir Investigations

PROJECT NO. F-113-R-7

PROJECT PERIOD: April 1, 2011 through March 30, 2012

ABSTRACT

Relative abundance of both adult and young-of-the-year (YOY) crappie was lower in 2011 than the historical average (1989-2011). Catch rates of walleye were above the management objective (2 fish per gillnet) and historical average (4.4 fish per gillnet) in 2011. Walleye, crappie, and yellow perch accounted for 59% of gillnet catch in 2011. Crappie YOY, and yellow perch YOY accounted for 72% of the seine catch. Catch rates of largemouth bass YOY and yellow perch YOY have been increasing since the dam rebuild in 1998. Changes to fish populations as a result of coal bed natural gas production have not been documented but may exist as they are difficult to quantify. Modified fyke nets (trap nets) were added to the current monitoring regime in 2010. They were used in June, August, and October to increase crappie sample size, and explore seasonal variation in catch rates. The results of trap netting efforts in 2010 and 2011 demonstrate that 10 trap net sets should be added to seine hauls and gillnets as a standard method during august trend sampling.

INTRODUCTION

Tongue River Reservoir provides a popular and unique fishing opportunity in the state of Montana. Managed primarily as a crappie fishery, it attracts people from across the state and region. Crappies are abundant, easy to catch, and with a liberal 30 crappie per day limit, the reservoir attracts anglers of all skill levels. It is particularly popular with families and sustains some of the highest angler days per surface acre of any reservoir in the state (McFarland and Meredith 2004, McFarland 2009). Overall angler satisfaction is moderate and comparable to Fort Peck Reservoir (McFarland 2009). Tongue River Reservoir offers angling opportunity in both summer and winter but use and satisfaction are higher in the summer (McFarland 2009). The popularity of Tongue River Reservoir with campers, anglers, and pleasure boaters has made the state park and reservoir prone to crowding. To reduce social conflicts (crowding at boat ramps and on the reservoir, competition for camping space) and to minimize impacts to the fishery, fishing

tournaments at Tongue River Reservoir are not permitted from May 1 to September 15. Fishing tournaments, including catch and release formats, during this time period can lead to increased physiological stress (Suski et al. 2003, Ostrand et al. 2004) and nest abandonment (Philipp et al. 1997, Siepker et al. 2009, Diana et al. 2012) for some species, particularly largemouth bass.

There was no daily limit on crappie prior to 1996. From 1996 to 2000 a daily limit of 15 fish was established to protect the population while the reservoir was drawn down to facilitate rebuilding the dam. Since 2001, the crappie daily limit has been 30 fish. After completion of the dam rebuild, storage capacity increased from 68,040 acre-feet to the current capacity of 79,071 acre-feet. This increased capacity raised the maximum water level by approximately six vertical feet. The new maximum water level has increased the amount of submerged woody habitat especially in the upper half of the reservoir where it has flooded and killed numerous cottonwood trees.

The development of coal bed methane has had an impact on the Tongue River drainage and reservoir. Wastewater from methane extraction is discharged into the Tongue River above the reservoir. This wastewater is generally of higher salinity and electro conductivity and if contributions are large enough may change the overall salinity and conductivity of water stored in the reservoir. Irrigators concerned with changes in water quality in Tongue River Reservoir have influenced dam operations, resulting in increased discharge during the spring to flush out the saline water prior to the start of the irrigation season. Changes to fish populations have not been documented but may exist as they are difficult to quantify.

Due to the importance of Tongue River Reservoir a monitoring program has been in place for several decades. Species specific management objectives for Tongue River Reservoir are:

(1) 20% of adult crappie from overnight gill nets > 250 mm (10 inches),
(2) Two walleye per overnight gillnet set, and
(3) Maintain viable populations of other game fish species.

In meeting these objectives Montana Fish, Wildlife and Parks ensures that quality sport fishing opportunities are available at Tongue River Reservoir.

METHODS

This report covers annual trend sampling and additional exploratory sampling efforts at Tongue River Reservoir in 2011. Annual trend sampling was conducted during the month of August using experimental gill nets and bag seines. Additional sampling to increase sample size of crappie was conducted June, August, and October using trap nets (i.e. modified fyke nets). Adult fish were sampled using experimental sinking gill nets with 25 ft panels of 0.75, 1.0, 1.25, 1.5, and 2.0-inch mesh (bar measure) for an overall length of 125 feet. Gill nets were set at standardized locations and fished for approximately 24 hours. Juvenile and forage-sized fish were sampled using a 100 ft bag

seine, 8 ft deep, with 0.25-inch mesh (bar measure). The seine was set from a boat and hauled to shore in a quarter circle pattern to capture fish. Both gill netting and seining consisted of a minimum of 10 net sets/seine hauls distributed between the upper and lower halves of the reservoir (Figure 1). Trap nets had 4 x 6 ft frames with 0.5-inch mesh (bar measure). All fish were identified to species, weighed (g), and measured (total length, mm). For abundant species, lengths and weights were collected from a sub-sample of 25-50 individuals.

Length and weight values were calculated for each species. The index catch per unit effort (CPUE) was used to describe the relative abundance of the fish sampled by netting. For gillnet and trap net sampling one net night (approx. 24 hr period) was one unit of effort. For seine sampling, one seine haul was one unit of effort. Proportional size distribution (PSD) and incremental PSDs were applied to describe the length structure of all game fishes sampled in august gill nets and trap nets. Relative weight (W_r) was applied to describe the body condition of all game fishes sampled in gill nets.

Reservoir storage (acre-ft) and water level (ft) were obtained from the Montana Department of Natural Resources and Conservation (DNRC) website and personnel (Sam Johnson). Discharge (ft^3/sec) and specific conductance (µS/cm at 25º C) values for the Tongue River upstream and downstream of the reservoir were obtained from US Geologic Service (USGS) website. A Secchi disc was used to measure water clarity (i.e. transparency). A water quality meter (YSI 85) was used to record temperature, dissolved oxygen, specific conductance and salinity in Tongue River Reservoir. A Hanna pH meter was used to record pH. A Garmin hand held GPS unit was used to record latitude and longitude for all fish and water quality sampling locations.

RESULTS AND DISCUSSION

A summary of the annual gill netting can be found in Table 1. A total of 236 fish was sampled using gill nets in August 2011. A summary of seine sampling data can be found in Table 2. A total of 1,746 fish was sampled using seines in August 2011. A summary of trap net sampling data can be found in Table 3. A total of 625 fish was sampled using trap nets in August 2011.

Crappie

The relative abundance of crappie in Tongue River Reservoir was 3.9 fish per gill net in 2011. This was a return to recent lows (2007-2009) after a modest spike in 2010 (Figure 2). The average gill-net catch of adult crappie from 2006 to 2011 ranged from 3.9 to 15.4 fish per net (Figure 2). The five-year (2007 through 2011) and ten-year (2002 through 2011) average catch rates for adult crappie were 6.4 and 8.2 fish per net. In 2004, the five-year (2000 through 2004) and ten-year (1994 through 2004) average catch rates were determined to be 13.5 and 12.0 fish per net (Riggs 2004). The ten-year average catch rate calculated in 2004 was influenced by large catches in 1994 and 2000 (Figure 2). A large portion of the adult catch in 1994 and 2000 was likely from individual year classes that appeared in seine samples four to five years prior as young-of-the-year (YOY) (Figure 3).

The lack of influence by a strong year class since 2000 may explain the lower five and ten year adult crappie average catch rates calculated in recent years. Alternatively the downward trend in crappie catch rates may be due to a related factor or an interaction of multiple factors such as the change in habitat post dam rebuild and its subsequent impact to the individual fish species or the assemblage as a whole. Another large class of YOY crappie was observed in 2008 (Figure 3). If the 2008 YOY recruit to catchable size, adult catch rate should be high around 2012.

Percentage of adult crappie greater than 250mm (total length) from gill nets was 18% in 2011, slightly lower than the management objective (20%) that has not been met since 1998 (Table 4). The management objective has only been met five out of the last thirty years. Calculation of the percentage of adult crappie greater than 250mm (total length) caught in trap nets during the same sample period (48%) suggests that sampling bias specific to gill nets may make this management objective unrealistic.

Proportional size distribution (PSD) values indicate preferred and memorable crappies are available (Table 5). Incremental PSDs demonstrate that the majority of crappie sampled with gill nets were in the stock and quality size categories. Incremental PSDs demonstrate that the majority of crappie sampled with trap nets were in the quality and preferred size categories. Gear bias and difference in sample sizes likely contribute to the slightly different outcomes in the incremental PSDs. Although the two species of crappie are managed together in Tongue River Reservoir, they are not caught in equal proportions. Gill nets and trap nets caught nearly the same number of white crappie but differed in the number of black crappie caught (Table 5). The two species likely prefer different habitat types within the lake. Ellison found white crappie grow faster than black crappie and have a tendency to shift to piscivory at a smaller size (1984). Identifying differences in growth rate for the two species in Tongue River Reservoir would require consecutive years of age structure collection and analysis of the resulting age and growth data. Mean relative weight (W_r) values for both crappie species were high and ranged from 85 to 143 (Table 5) Mean relative weights suggest that food sources for stock and quality size crappie is not fully exploited but that preferred and memorable size fish may be food limited.

Seine hauls throughout the reservoir have indicated crappie spawning success has been variable (Figure 3). In 2008, the relative abundance of YOY crappie was greater than observed in 1998, which was considered a relatively strong recruitment year (Riggs 2004). High counts of YOY are influential in adult catch rates in the following years but when plotted together catch rates of YOY and adult crappie do not have a consistent relationship with reservoir water levels (Figure 3). Crappie YOY abundance is cyclic and is likely related to a combination of reservoir water level and other environmental variables during the May-July spawning and nursery period. Annual rises in reservoir water levels in recent years should have been conducive for spawning success (Groen and Schroeder 1978, Beam 1983). However, vegetation in backwater areas important for spawning may have been flooded for as much as a month before optimal crappie spawning water temperature was observed in early June 2011 (Figure 9, Dagel and Miranda 2012). Other environmental variables have not been favorable including

unseasonably cool prolonged springs and a high rate of flow through the reservoir. Fluctuating water temperature and increased turbidity alone potentially reduced 2011 year class strength (Mitzner 1991).

Additional sampling with trap nets was done in June, August, and October to compare trap net catch rates and size range of crappie caught at different times of the year. Catch rates in August and October were both above 60 fish/net in 2011 (Tables 1 and 3). Combined trap net data from 2010 and 2011 had crappie catch rates above 40 fish/net in the months of April, August, and October but standard error associated with the small sample sizes suggests no month has significantly higher catch rates than any other (Figure 4). The data do indicate that August and October samples will provide larger sample sizes than gill nets (Figure 4). The August trap net samples in 2010 and 2011 provided a direct comparison between trap net and gill net gears (Figure 5). Results indicate trap nets sample a larger segment of the crappie population capturing fish less than 100mm TL that gill nets do not (Figure 5). The traps also caught more individuals in nearly every size class than gill nets with less total effort (Figure 5). Trap net sets should be added to gill net and seine methods in August as a standard monitoring method because of logistical convenience. Additional years of samples in April and October will reduce the standard error around these catch rates and may demonstrate that sampling during one or both of these time periods may be worth the additional effort. Trap net sampling in 2012 will minimally consist of 10 net sets, split between the two halves of the reservoir in the month of August.

Walleye

Catch rates of walleye were above the management objective (2 fish per gillnet) and historical average (4.4 fish per gillnet) in 2011. This management objective has been met consistently; all of the last 6 and 8 out of the last 10 years (Table 4). Walleye sampled in 2011 were generally small with no fish of memorable size or greater and relative weights ranged from 79 to 89 (Table 5).

Other Game Fish

Yellow bullheads and black bullheads were the third and fifth most abundant species sampled in gillnets in 2011 (Table 1). Black bullhead relative abundance was 2.8 in 2011 nearly a quarter of the relative abundance in 2010 (10.3) and 2009 (9.9). Abundances in 2009-2010 were much lower than previous years (2000-2008) when relative abundance was between 30 to 45 fish per net night (Abrahamse 2009).

Channel catfish continue to be caught in low numbers in August gill net samples, with only four fish caught in 2011 (Table 1). Less than two dozen channel catfish have been collected in seines from 1989 to 2011 and not all of these have been YOY. Four channel catfish were collected in seines in 2011, the first sampled since 1996 (Table 2). Consistent relative abundance values for adults through the years indicate limited spawning and recruitment are occurring (Figure 6). Sample sizes of channel catfish preclude analysis of size structure and body condition.

Gill net and seine collections in 2011 indicate presence of both adult and juvenile largemouth and smallmouth bass (Table 1, Table 2). The relative abundance of adult smallmouth bass in the gillnet samples has been low but consistent. Largemouth bass YOY were abundant in seine samples during the last three years (Table 2, Figure 7). Increased spawning success of largemouth bass in Tongue River Reservoir could be a function of high reservoir levels in recent years (Figure 3) and increased submerged woody debris in the reservoir since the dam rebuild (Keith 1975). Largemouth bass YOY relative abundance reached similar levels in 1991 and 1995 (Figure 7). Smallmouth bass YOY relative abundance remains low compared to 1991, 1996, and 1999 year classes (Figure 7).

Northern pike, a species that was the dominant game species during the 1970's (Elser 1980), and produced the standing State record fish (37.5 lbs) in 1972, were found in low abundance in 2011. Relative abundance in August 2011 gill nets was 0.9 fish per net (Table 1). Catch rates are low but appear to be stable (Figure 6). Northern pike YOY were sampled in seine hauls from 2005 through 2007, but have not been sampled since (Abrahamse 2009). Adult and juvenile catch rates suggest limited natural reproduction has occurred at Tongue River Reservoir in the last decade. Sample sizes of northern pike preclude analysis of size structure and body condition.

Pumpkinseed sunfish have increased in abundance over the last two decades in both gill nets and seine hauls in Tongue River Reservoir (Figure 8). Relative abundance of pumpkinseed was 0.1 fish per gill net and 0.3 fish per seine haul in 2003 (Riggs 2003). From 2005 to 2010 pumpkinseed relative abundance ranged from 0.7 to 1.7 in gillnet samples and 0.8 to 83.2 in seine samples (Abrahamse 2009). Relative abundances of pumpkinseed in 2011 were 0.2 fish per gill net and 11.2 fish per seine haul (Table 1 and Table 2). Mean W_r values for pumpkinseed were greater than 100 indicating that they were in extremely good condition (Table 5).

Historically, rock bass have been present in low abundance in Tongue River Reservoir but have not been sampled since 2000.

Sauger were not collected during 2011 sampling efforts. Elser et al. (1977) noted the first appearance of sauger in the reservoir in 1973 and Riggs (1978) documented high abundance of sauger in sampling efforts. However, sauger abundance has been low since the late 1980s. In 2004, the 10-year average (1994 to 2004) catch was reported to be 0.7 fish/net. One sauger was present in each of the 2005, 2007, and 2009 samples (Table 6). Sauger are a small component of the reservoir fishery. Sauger of this population likely prefer the Tongue River habitat above the reservoir through the growing season and overwinter in the reservoir. Catch rates from electrofishing methods in the reach of the Tongue River above the reservoir demonstrate a similar trend with consistent observations of sauger in low numbers (M. Backes, MTFWP, personal communication). In 2011 the combined sauger-walleye bag limit was modified above Tongue River Reservoir Dam. The modification reduced the possible number of sauger from 5 fish

daily and in possession to 1 daily and in possession. This was done to protect the small remnant population that exists in the reservoir and the reach of river above.

Adult yellow perch were abundant prior to completion of the dam rebuild (1992-1999), but initially declined after completion (2000-2002) and then remained at a reduced level for several years (2003-2008) (Figure 7). Yellow perch relative abundance appears to have steadily increased since 2009 with 4.5 fish per gill net in 2011 (Table 1). Yellow perch reproduction has also been on the rise since 2008. Relative abundance of YOY yellow perch went from being negligible (1997-2008) to rivaling crappie YOY as the most abundant component of seine hauls in 2011 (Table 2)

Water

Above average snowpack in the Big Horn Mountains and several above average spring rain events within the drainage resulted in above average water levels in Tongue River Reservoir for most of 2011(Figure 3). Reservoir storage was above the post dam reconstruction historical average (1999-2011) in 2011 and exceeded storage capacity during peak runoff (Figure 9). Elevated water levels in 2011 provided an abundance of flooded vegetation. Monthly mean discharge data demonstrates a reservoir filling trend from September to June and a reservoir emptying trend from June to September, with a brief period of reservoir emptying from March to April due to regional rain events (Figure 10). This floodwater release alone may have been enough to reduce year class strength (Beam 1983). Specific conductance is inversely related to discharge, building during periods of low discharge and diminishing as discharge increases (Figure 10). If coal bed methane extraction increases in the watershed, the increased activity may alter water quality. Response of fish populations will be difficult to quantify, as data collected from the reservoir is inherently variable.

MANAGEMENT RECOMMENDATIONS

Survey and inventory of the Tongue River Reservoir fishery has been conducted since the 1950's. The sampling methodology and management objectives have remained relatively unchanged in recent decades. A change in sampling methods could provide valuable information that has been previously unknown and allow greater understanding of the status of the fishery and the processes that impact the fishing opportunities for anglers. Restructuring the sampling regime to increase sample size and incorporate collection of aging structures would allow for improved analysis of crappie population dynamics in Tongue River Reservoir. Scales were collected and aged in 1983, 1989, and 2001 with results presented in the 2001-2002 report. Scales were collected in 2003 and summarized but have not been reported. Age data allows additional analysis and provides managers the ability to calculate length-age relationships, growth rates, and estimates of natural mortality. With these tools managers can better evaluate management objectives and develop realistic expectations of crappie size and abundance. Otoliths are the preferred aging structure for accurate age and growth estimation (Hammers and Miranda 1991). It is recommended that otoliths be collected in the future and be analyzed and reported with

past scale aging data. It is recommended that 10 trap net sets become a permanent part of the standardized sampling protocol in August and use at other times of the year is further explored.

Gill net and seine catches indicate that largemouth bass and yellow perch are becoming more abundant in the reservoir. Gill nets, trap nets, and seines do not effectively sample adult bass. The desire for adequate bass sampling has made necessary the addition of electrofishing to the current sampling methodology. It is recommended that electrofishing methods be explored in 2012 to gather data for determining the status of largemouth bass in Tongue River Reservoir. A sampling methodology including a suite of gear types (gill nets, seines, trap nets, and electrofishing) will increase the probability of accurately detecting shifts in the fish assemblage and may improve the managers' ability to influence desired changes.

Waters referred to: Tongue River Reservoir 7-21-9000-06

Key Words: Crappie, Walleye, Trap net, Coal-bed Methane

Prepared by: Caleb Bollman

Date prepared: January 28, 2013

Literature Cited

Abrahamse, M. 2009. Yellowstone River Drainage Investigations. | Tongue River Reservoir Investigations. F-113-R-5. Montana Department of Fish, Wildlife & Parks. Helena, Montana.

Beam, J. H. 1983. The effect of annual water level management on population trends of white crappie in Elk City Reservoir, Kansas. North American Journal of Fisheries Management 3:34-40.

DNRC (Montana Department of Natural Resources and Conservation). 2009. Water Resources Division, State Water Projects Bureau. Reservoir Contents report. http://www.dnrc.state.mt.us/wrd/febreservoir.pdf

Dagel, J. D. 2012. Backwaters in the upper reaches of reservoirs produce high densities of age-0 crappies. North American Journal of Fisheries Management 32:626-634.

Diana, M. J., A. L. Larsen, M. J. Siepker, and D. H. Wahl. 2012. Effects of tournament compared with catch and release angling on nest abandonment of largemouth bass. North American Journal of Fisheries Management 32:832-837.

Ellison, D. G. 1984. Trophic dymanics of a black crappie and white crappie population. North American Journal of Fisheries Management 4:355-364.

Elser, A.A., R.C. McFarland and D. Schwehr. 1977. The effect of altered stream flow on fish of the Yellowstone and Tongue Rivers, Montana. Old West Regional Tech. Report No. 9, Yellowstone Impact Study.

Elser, A.A. 1980. Fish Management Surveys, April 1, 1979 to March 31, 1980 for Fiscal Period July 1, 1979 through June 30, 1980; November, 1980 | Southeastern Montana Fisheries Investigations. Montana Department of Fish, Wildlife and Parks, Helena Montana. F-30-R-16.

Groen, C. L. and T. A. Schroeder. 1978. Effects of water level management on walleye and other coolwater fishes in Kansas reservoirs. Pages 278-283 in R. L. Kendall, editor. Selected Coolwater Fishes of North America. American Fisheries Society, special publication 11, Bethesda Maryland, USA.

Hammers, B. E., and L. E. Miranda. 1991. Comparison of methods for estimating age, growth, and related population characteristics of white crappies. North American Journal of Fisheries Management 11:492-498.

Keith, W. E. 1975. Management by water level manipulation. Pages 489-497 in H. Clepper, editor. Black Bass Biology and Management. Sport Fishing Institute, Washington, D.C., USA.

McFarland, R. C., and Meredith, D. 2004. Montana statewide angling pressure mail survey. Montana Department of Fish, Wildlife and Parks. Helena, Montana.

McFarland, R. C. 2009. Montana statewide angling pressure mail survey. Montana Department of Fish, Wildlife and Parks. Helena, Montana.

Mitzner, L. 1991. Effect of environmental variables upon crappie young, year-class strength, and the sport fishery. North American Journal of Fisheries Management 4:534-542.

Ostrand, K. G., S. J. Cooke, and D. H. Wahl. 2004. Effects of stress on largemouth bass reproduction. North American Journal of Fisheries Management 24:1038-1045.

Philipp, D. P., C. A. Toline, M. F. Kubacki, D. B. F. Philipp, and F. J. S. Phelan. 1997. The impact of catch-and-release angling on the reproductive success of smallmouth bass and largemouth bass. North American Journal of Fisheries Management 17:557-567.

Riggs, V.L. 1978. Age and growth of walleye and sauger of the Tongue River Reservoir, Montana. Master of Science Thesis. Montana State University. Bozeman, Montana.

Riggs, V. 2003. Yellowstone River Drainage Investigations. | Tongue River Reservoir Investigations. F-113-R-4. Montana Department of Fish, Wildlife & Parks. Helena, Montana.

Riggs, V. 2004. Yellowstone River Drainage Investigations. | Tongue River Reservoir Investigations. F-113-R-4. Montana Department of Fish, Wildlife & Parks. Helena, Montana.

Siepker, M. J., S. J. Cooke, D. H. Wahl, and D. P. Philipp. 2009. Individual reproductive success of largemouth bass and smallmouth bass subjected to different components of competitive angling events. Transactions of the American Fisheries Society 138:818-825

Suski, C. D., S. S. Killen, M. B. Morrissey, S. G. Lund, and B. L. Tufts. 2003. Physiological changes in largemouth bass caused by live-release angling tournaments in southeastern Ontario. North American Journal of Fisheries Management 23:760-769.

USGS (United States Geological Services) 2010. Water Resources, Real-Time Data for Montana Report, United States Geological Services.

Table 1. Results of 10 overnight experimental gill-net sets at Tongue River Reservoir, August, 2011.

Species	Number Caught	Average per Net	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)	Percentage of Catch (%)
Black Bullhead	28	2.8	262	283	190 - 283	90 - 280	11.9
Black Crappie	6	0.6	225	207	149 - 300	40 - 410	2.5
Channel Catfish	4	0.4	415	788	294 - 580	210 - 1740	1.7
Common Carp	7	0.7	515	2237	198 - 675	120 - 4170	3.0
Northern Pike	9	0.9	759	3057	540 - 960	780 - 5350	3.8
Pumpkinseed	2	0.2	170	120	170	110 - 130	0.8
Sauger	0	0.0	0	0	0	0	0.0
Shorthead Redhorse Sucker	9	0.9	432	939	334 - 514	380 - 1410	3.8
Smallmouth Bass	4	0.4	248	225	158 - 305	40 - 320	1.7
Walleye	56	5.6	365	503	237 - 560	120 - 1680	23.7
White Crappie	33	3.3	214	151	118 - 304	20 - 370	14.0
White Sucker	0	0.0	0	0	0	0	0.0
Yellow Bullhead	33	3.3	244	213	176 - 290	60 - 380	14.0
Yellow Perch	45	4.5	196	102	138 - 283	40 - 220	19.1

Table 2. Results of 10 seine hauls at Tongue River Reservoir, August 2011.

Species	Number Caught	Number per Seine Haul	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)	Percent of Catch (%)
Black crappie	3	0.3	144	70	118 - 185	30 - 130	0.2
Channel catfish	4	0.4	172	108	101 - 360	20 - 370	0.2
Common carp	1	0.1	546	2170	546	2170	0.1
Green sunfish	1	0.1	97	10	97	10	0.1
Largemouth bass	9	0.9	133	47	90 - 182	15 - 100	0.5
Northern pike	2	0.2	468	565	466 - 470	560 - 570	0.1
Pumpkinseed	21	2.1	106	28	90 - 165	15 - 100	1.2
Shorthead redhorse sucker	4	0.4	106	20	104 - 108	20	0.2
Smallmouth bass	27	2.7	190	98	100 - 276	10 - 260	1.5
Spottail shiner	89	8.9	46		40 - 52		5.1
Walleye	3	0.3	133	28	125 - 145	15 - 50	0.2
White crappie	12	1.2	236	205	195 - 280	120 - 350	0.7
Yellow perch	93	9.3	117	16	98 - 160	10 - 50	5.3
Common carp YOY	1	0.1	108	30	108	30	0.1
Crappie YOY	842	84.2	52		32 - 76		48.2
Largemouth bass YOY	95	9.5	72		45 - 96		5.4
Pumpkinseed YOY	91	9.1	73		48 - 89		5.2
Smallmouth bass YOY	30	3.0	67		50 - 85		1.7
Yellow perch YOY	418	41.8	62		50 - 73		23.9

Table 3. Results of 8 trap net sets at Tongue River Reservoir, August 2011.

Species	Number Caught	Average per Net	Mean Length (mm)	Mean Weight (gm)	Length Range (mm)	Weight Range (gm)	Percentage of Catch (%)
Black Bullhead	6	0.8	283	338	262 - 293	280 - 410	1.0
Black Crappie	137	17.1	239	244	120 - 345	30 - 620	21.9
Common Carp	1	0.1	608	2910	608	2910	0.2
Pumpkinseed	3	0.4	152	87	150 - 153	80 - 90	0.5
Shorthead redhorse sucker	8	1.0	402	893	213 - 523	100 - 1550	1.3
Smallmouth Bass	11	1.4	244	256	120 - 410	30 - 950	1.8
Walleye	5	0.6	369	498	253 - 520	100 - 1200	0.8
White Crappie	31	3.9	239	220	145 - 325	110 - 510	5.0
Yellow Bullhead	13	1.6	243	252	185 - 290	110 - 480	2.1
Yellow Perch	52	6.5	126	25	109 - 185	10 - 100	8.3
Crappie YOY	312	39.0	67		48 - 80		49.9
Pumpkinseed YOY	46	5.8	79		61 - 110		7.4

Table 4. Summary of management objective results in Tongue River Reservoir. Walleye gill-net catch rates and mean length. Percentage of crappie greater than 250 mm total length caught in gill nets, 1980-2011.

Year	Walleye Catch rate	Walleye Mean Total Length (mm)	Percent of Crappie greater than 250 mm Total Length
2011	5.6	369.2	18.2
2010	2.2	311.0	11.3
2009	2.0	364.0	5.8
2008	2.7	341.0	1.0
2007	3.0	308.0	7.9
2006	3.1	371.0	2.7
2005	1.6	366.7	4.6
2004	3.5	422.7	3.4
2003	0.5	447.6	7.0
2002	2.5	449.0	0.0
2001	3.9	438.0	7.5
2000	4.0	424.0	2.9
1999	8.5	411.0	13.5
1998	8.3	341.0	25.0
1997	4.2	384.0	24.2
1996	5.0	395.0	20.0
1995	2.4	335.0	21.2
1994	5.3	349.0	2.2
1993	1.1	308.0	0.7
1992	8.4	325.0	0.8
1991	3.9	383.0	19.9
1990	4.1	349.0	2.9
1989	15.7	343.0	12.8
1988	19.4	332.0	18.9
1987	5.6	279.0	4.2
1986	1.6	273.0	0.0
1985	0.6	463.0	2.7
1984	0.4	417.0	1.2
1983	0.2	427.0	3.4
1982	2.0	397.0	1.7
1981	5.6	377.0	27.8
1980	4.3	319.0	11.4

Table 5. Summary of proportional size distribution (PSD), incremental PSDs, and mean relative weight (W_r) values for game fish sampled with gill nets and trap nets, August 2011.

Gill nets

		PSD					Wr				
Species	N	S-Q	Q-P	P-M	M-T	T	S-Q	Q-P	P-M	M-T	T
Black bullhead	26	12	88	-	-	-	67	92	-	-	-
Black crappie	6	33	33	17	17	-	105	118	85	88	-
Channel catfish	4	50	50	-	-	-	93	101	-	-	-
Northern pike	9	-	56	-	44	-	-	82	-	91	-
Pumpkinseed	2	-	100	-	-	-	-	109	-	-	-
Smallmouth bass	3	33	67	-	-	-	106	85	-	-	-
Walleye	51	73	22	6	-	-	88	86	89	-	-
White crappie	26	15	69	12	4	-	123	104	96	87	-
Yellow bullhead	33	21	79	NA	NA	NA	91	94	NA	NA	NA
Yellow perch	40	65	25	10	-	-	95	94	69	-	-

Trap nets

		PSD					Wr				
Species	N	S-Q	Q-P	P-M	M-T	T	S-Q	Q-P	P-M	M-T	T
Black bullhead	6	-	100	-	-	-	-	87	-	-	-
Black crappie	135	23	27	40	10	-	129	104	95	86	-
Pumpkinseed	22	86	14	-	-	-	129	114	-	-	-
Smallmouth bass	8	63	25	13	-	-	96	92	88	-	-
Walleye	5	80	-	20	-	-	80	-	79	-	-
White crappie	31	6	52	39	3	-	143	109	96	96	-
Yellow bullhead	13	31	69	NA	NA	NA	116	109	NA	NA	NA
Yellow perch	10	100	-	-	-	-	97	-	-	-	-

Table 6. Sauger gillnet catch rates from 1988-2011.

Year	Count	CPUE (fish/gill net)
2011	0	0
2010	0	0
2009	1	0.1
2008	0	0
2007	1	0.1
2006	0	0
2005	1	0.1
2004	0	0
2003	0	0
2002	0	0
2001	2	0.2
2000	0	0
1999	0	0
1998	3	0.3
1997	2	0.2
1996	0	0
1995	0	0
1994	0	0
1993	0	0
1992	0	0
1991	0	0
1990	0	0
1989	2	0.2
1988	8	0.8

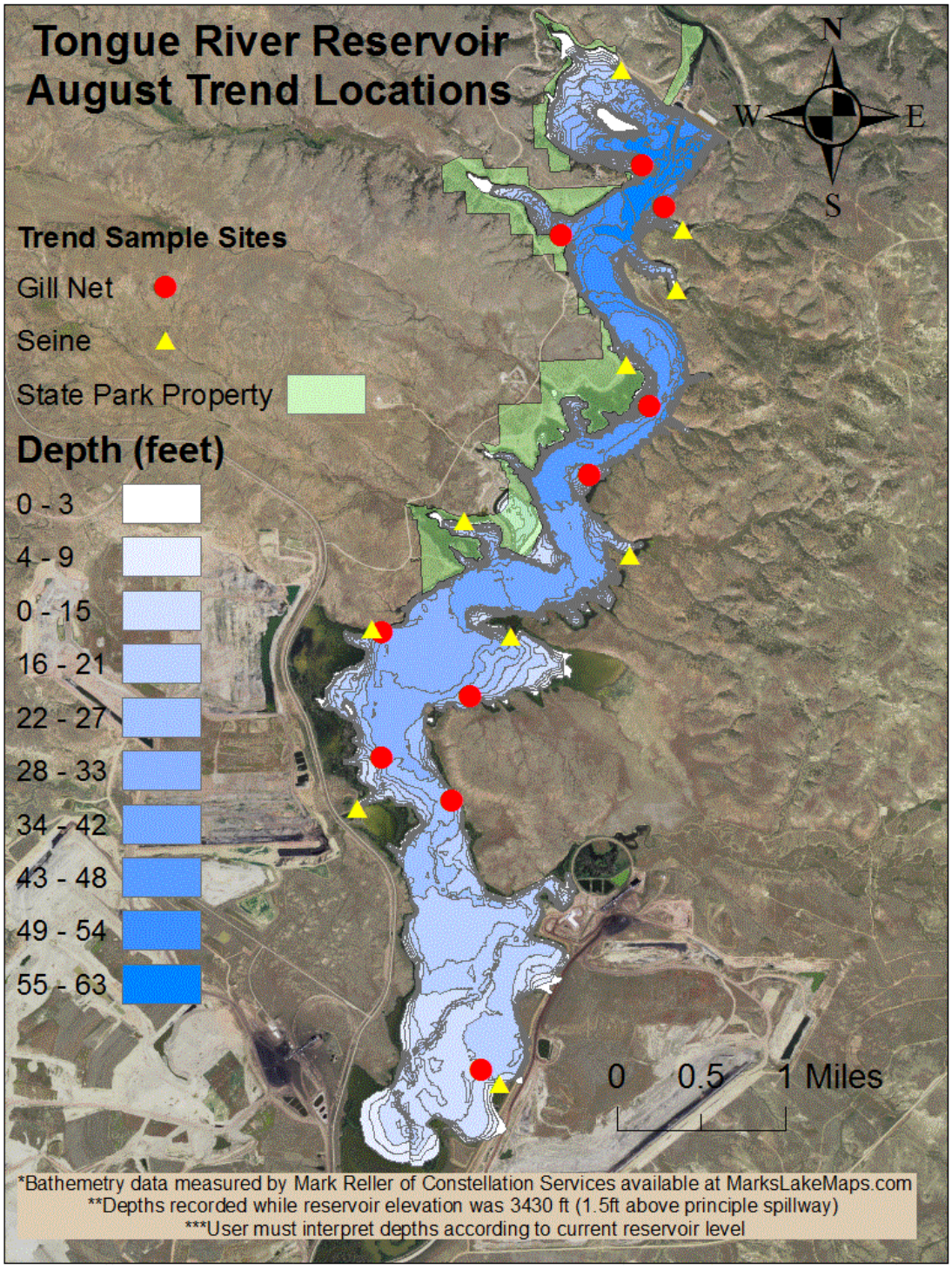

Figure 1. Map of Tongue River Reservoir, Decker, Montana with August gill net and seine haul trend sample locations.

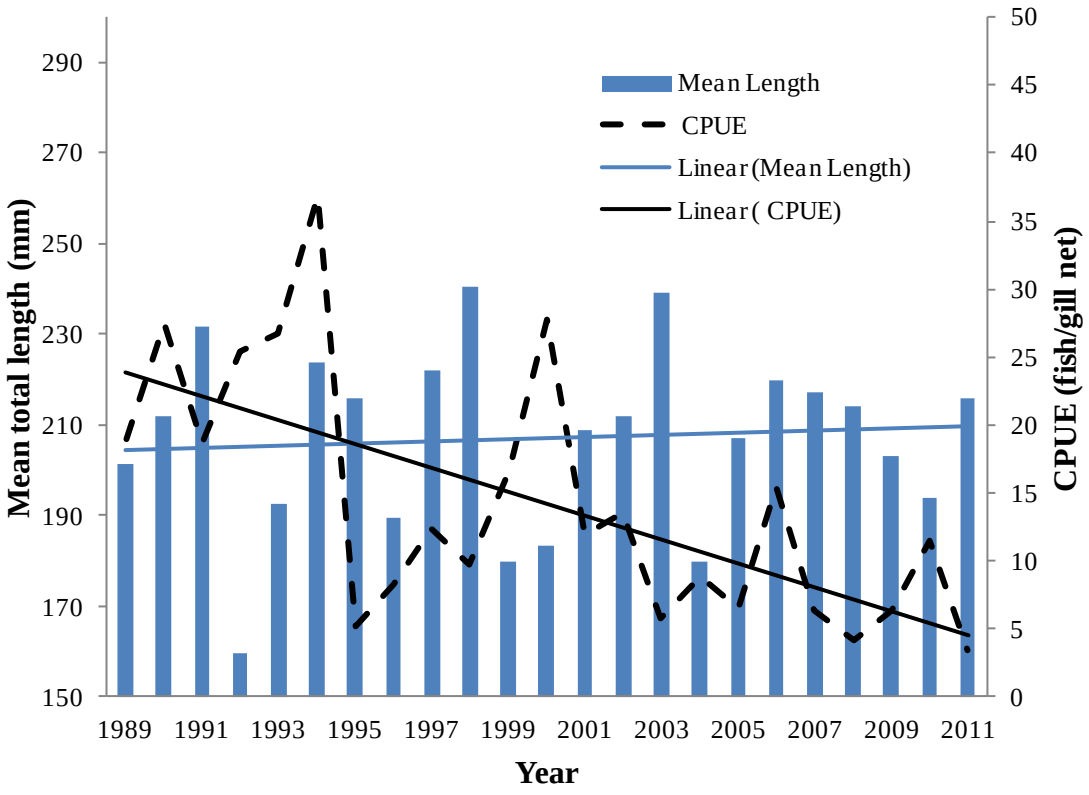

Figure 2. Mean total length (mm) of crappie (blue bars) with trend line (blue line) on the primary Y-axis; and relative abundance measured in CPUE (fish/gill net) of crappie (dashed black line) with trend line (black line) on the secondary Y-axis as a function of year on the X-axis from Tongue River Reservoir gillnets, 1989-2011.

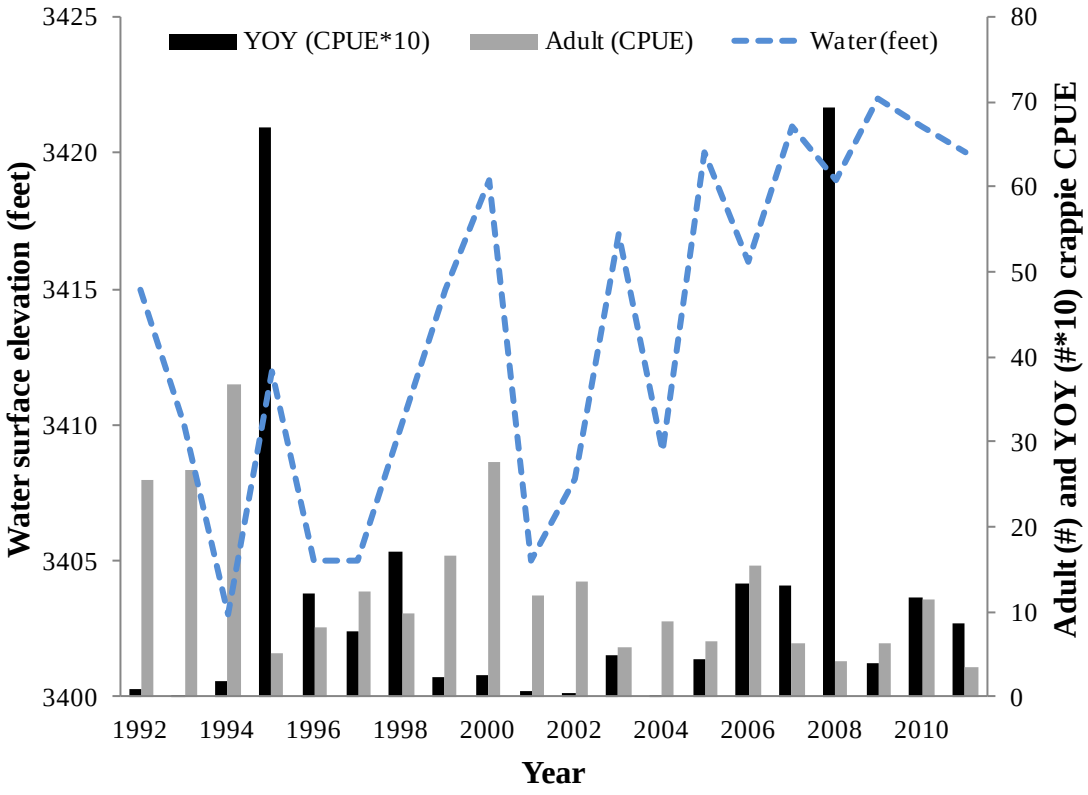

Figure 3. Water surface elevation measured in feet (primary Y-axis), relative abundance of young-of-the-year (YOY) crappie measured in CPUE (fish per seine haul)*10 and relative abundance of adult crappie measured in CPUE (fish per gill net) (secondary Y-axis) as a function of year (X-axis) from Tongue River Reservoir 1989-2011.

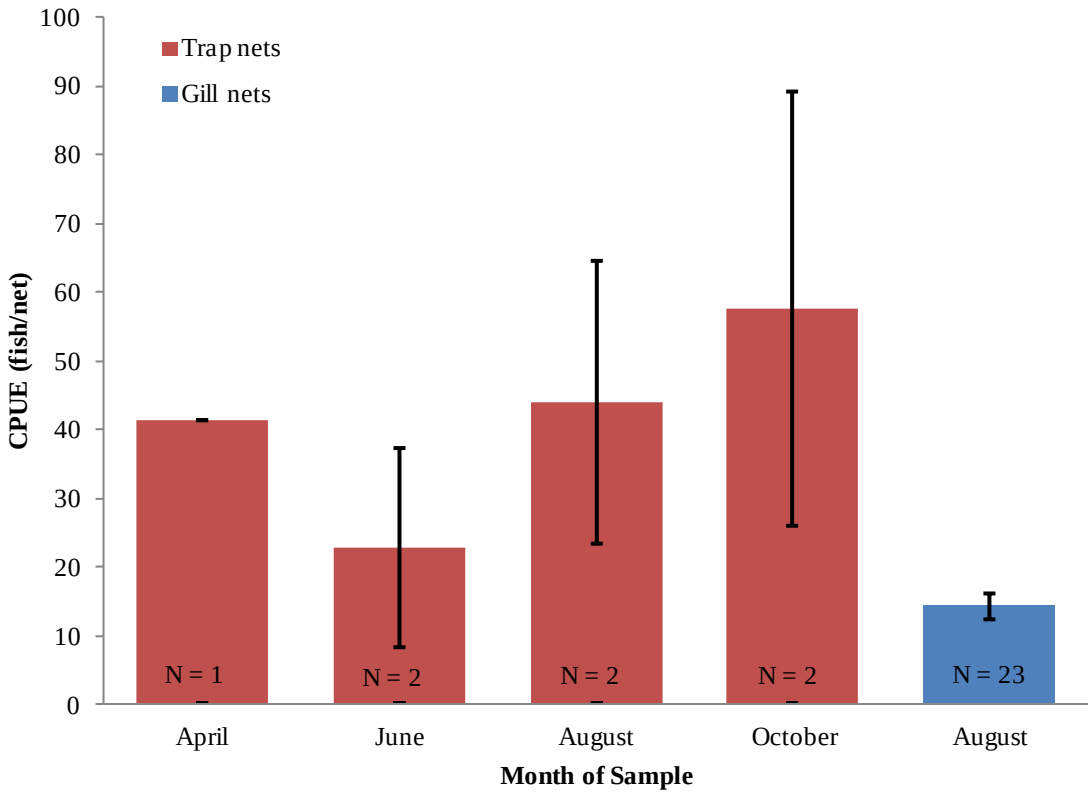

Figure 4. Relative abundance of crappie (Y-axis) measured in CPUE (fish/net) with standard error and sample size (N) as a function of month of sample (X-axis) in Tongue River Reservoir 2010-2011 (Trap nets) 1989-2011 (Gill nets).

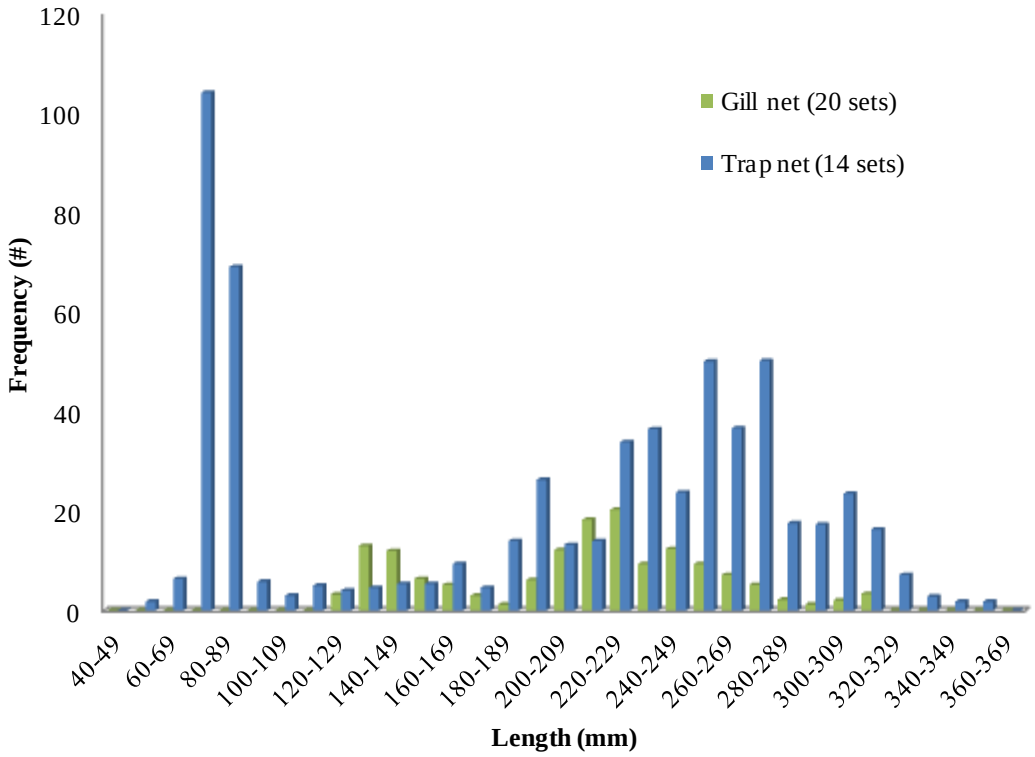

Figure 5. Length frequency distribution of crappie caught in gill nets and trap nets in August 2010-2011.

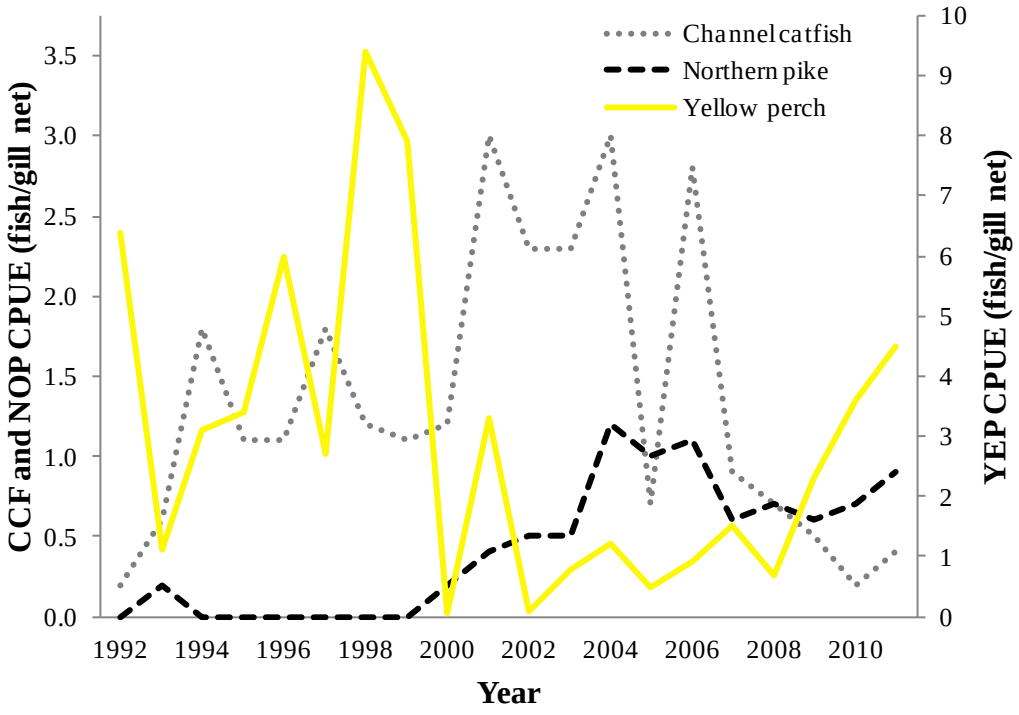

Figure 6. Relative abundance of channel catfish and northern pike (primary Y-axis) and yellow perch (secondary Y-axis) measured in CPUE (fish/gill net) as a function of year (X-axis) in Tongue River Reservoir 1989-2011.

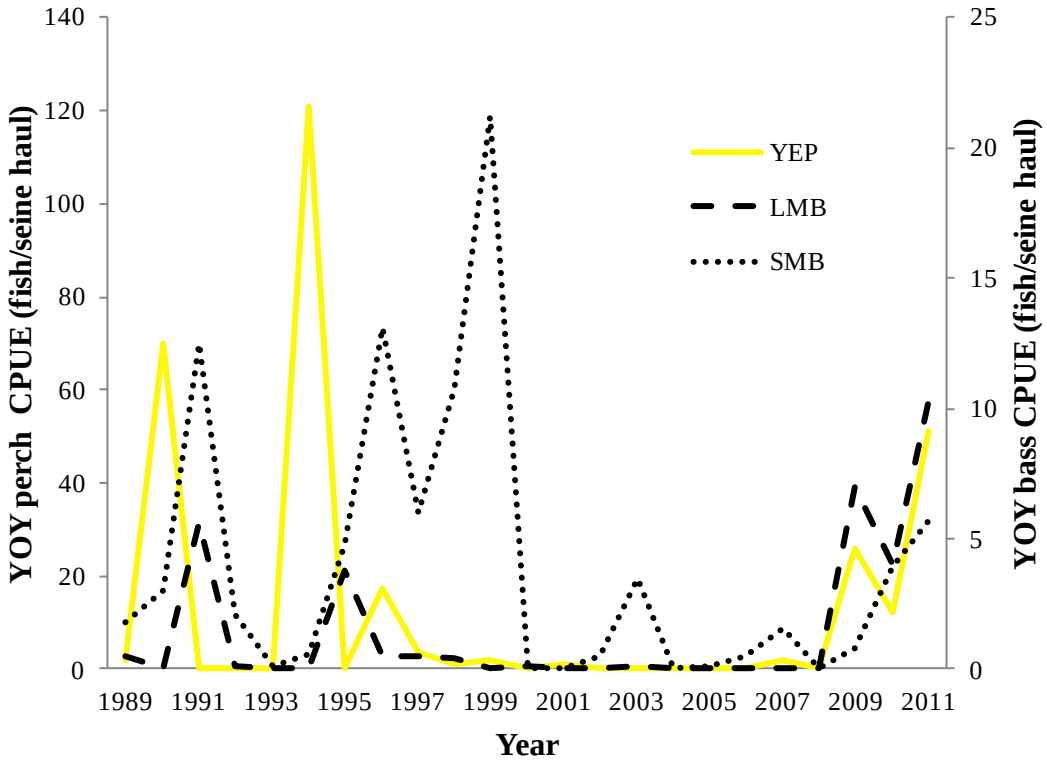

Figure 7. Relative abundance of young-of-the-year (YOY) yellow perch (primary Y-axis), largemouth bass, and smallmouth bass (secondary Y-axis) measured in CPUE (fish/seine haul) as a function of year (X-axis) from Tongue River Reservoir seines, 1989-2011.

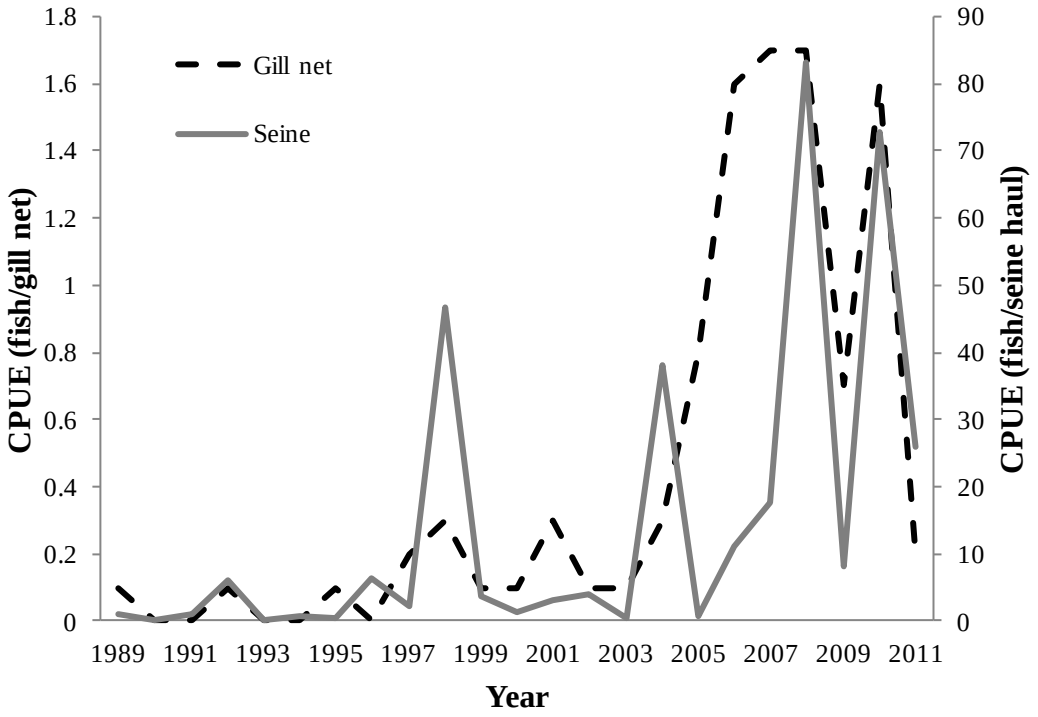

Figure 8. Relative abundance of all pumpkinseed sunfish caught in gill nets (primary Y-axis) and seine hauls (secondary Y-axis) measured in CPUE as a function of year (X-axis) in Tongue River Reservoir 1989-2011.

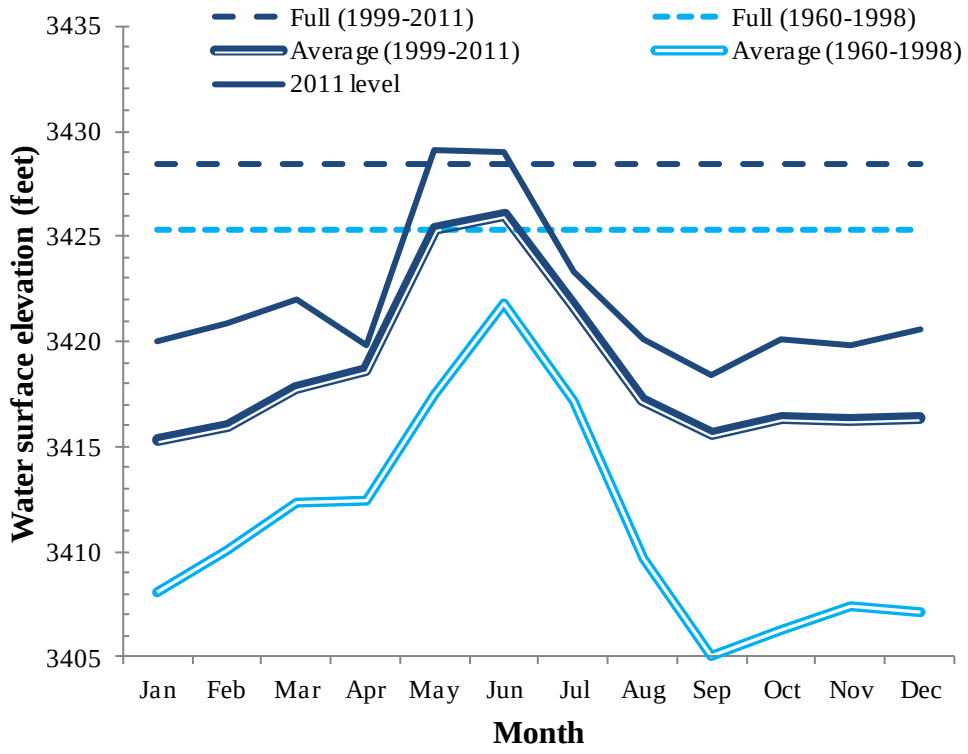

Figure 9. Tongue River Reservoir 2011 water surface elevation in feet by month with full pool reference lines and historical mean storage level pre (1960-1998) and post (1999-2011) dam reconstruction, data provided by DNRC website.

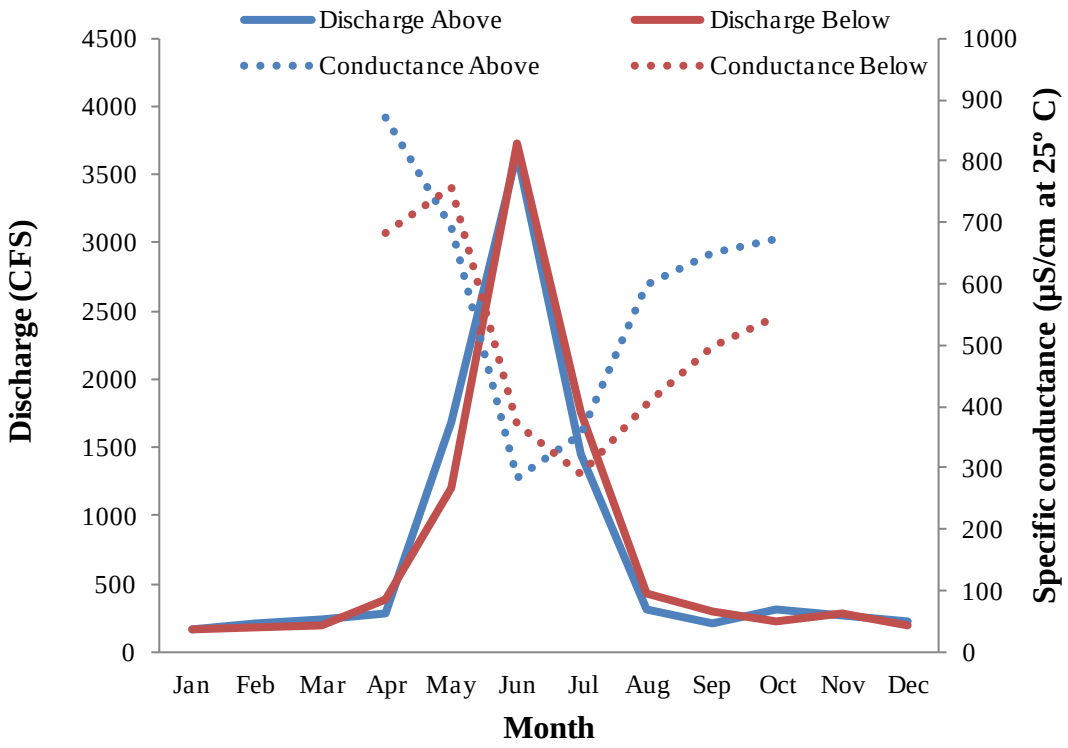

Figure 10. Monthly mean discharge measured in cubic feet per second (primary Y-axis) and specific conductance measured in microseimens per cm at 25º C (secondary Y-axis) by month (X-axis) from USGS gauging stations 06306300 Tongue River at state line and 06307500 Tongue River at Tongue River dam, Decker MT.