Montana Fish, Wildlife & Parks

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Lewistown Area Fisheries Management

2012 Annual Report

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ABSTRACT

Following the historic flooding and water year of 2011, the Judith, Musselshell, Smith River Basins experienced an average snowpack in winter 2011-2012. As a result, Central Montana experienced more typical stream flows. Below average precipitation accumulated from June-October 2012 increased downstream water demands which lowered most on-stream reservoirs to elevations not observed since 2009. In addition, irrigation withdrawals and evaporation during the dry summer months have lowered many Lewistown-area small reservoirs significantly. Marginal depths could result in winterkill events during winter 2012-2013.

Nineteen reservoirs were sampled with gill nets in the Lewistown Management Area in 2012. Ackley Lake rainbow trout (*Oncorhynchus mykiss*) had improved length, weight, and condition, exceeding the 24-year average. The trout fishery at Bair Reservoir appears to have improved greatly over the past six years. In 2012, rainbow trout mean total length was a record high. Additionally, first-year growth and the mean length of first-year rainbow trout were both above average. Martinsdale Reservoir rainbow trout catch rates continue to decline and the 2012 stocking class was not well represented in fall sampling; however mean total length was a record high. Catch rates of yellow perch (*Perca flavescens)* remain above average and mean total length was a near record high in Petrolia Reservoir. Additionally, walleye (*Sander vitreus)* catch rates improved to above average and mean total length was the second highest on record. Yellow Water Reservoir white sucker (*Catostomus commersoni)* and common carp (*Cyprinus carpio)* catch rates declined substantially from 2011 when they were first observed following a prolonged absence. Rainbow trout catch rates improved, and two age-classes were sampled from 2011 and 2012 post-winterkill stocking. The yellow perch and sauger (*Sander canadense)* combination appears to work well in turbid Jakes Reservoir; however as an aging sauger population diminishes the yellow perch age structure shows evidence of compaction and condition was the lowest observed since 2000.

Casino Creek Reservoir, Dry Blood Reservoir, and East Fork Reservoir were sampled with trap nets in 2012. The Casino Creek Reservoir fishery shows signs of improvement. The compressed age structure previously observed in the yellow perch population is no longer exhibited; likely due to the loss of substantial numbers of fish due to rapid flow through during 2010 and 2011. Yellow perch catch rates were above average and mean length was a record high at 8.8". The rainbow trout catch rates and mean length improved. Black crappie (*Pomoxis nigromaculatus*) and white crappie (*Pomoxis annularis*) planted in 2011 were not detected in Dry Blood Reservoir sampling. The City of Lewistown drained East Fork Reservoir in 2012 for scheduled maintenance. An effort was made to remove northern pike (*Esox lucius)* from the system prior to draining to protect the downstream trout fishery. Eighty-seven northern pike were removed and six other species were sampled including: bluegill (*Lepomis macrochirus)* brook trout (*Salvelinus fontinalis)*, brown trout (*Salmo trutta)*, longnose sucker (*Catostomus Catostomus)*, white sucker, and yellow perch. The reservoir began to fill in September 2012, and by January 2013 was at ~75% full pool with anglers reporting both northern pike and yellow perch persisting.

Trout population estimates were completed on two sections of Big Spring Creek, Machler and Carroll Trail. Population trends of total trout ≥10 inches in both sections continued to decline. There has been a large shift in the predominant trout species from rainbow trout to brown trout in Big Spring Creek in recent years. Brown trout (≥10 inches) declined in both sections from the record highs observed in 2011; however, the trend was similar to the population in 2009 and 2010. Rainbow trout continued to decline in 2012, and were at the lowest number per mile observed since 1978. Recruitment of 6-10" rainbow trout is poor, and the estimate of ninety-six per mile at Carroll Trail was the lowest on record.

Brown trout redd surveys were conducted in December on seven Big Spring Creek fishing access sites. Above Lewistown counts were similar to 2011 at Burleigh FAS and remained slightly above the 10-year average. At Brewery Flats FAS counts were well above the mean and tied for the highest on record. Below Lewistown brown trout redds generally declined from 2011 numbers; the exception being Reed and Bowles FAS which has had above-average counts since 2009 and was a record high in 2012. Flows were monitored on four sites on Big Spring Creek: below the Hatchery, at the Ash Street Bridge, at the Mill Ditch, and at the Reed and Bowles Fishing Access Site. The Big Spring discharge has declined from winter 2011/12 base flows, but remains higher than normal. Winter 2012/13 base flows at the lower sites are similar to those observed pre-2011 flood event; however, due to the filling of East Fork Reservoir, the minimum instream flow requirement being released into East Fork Spring Creek is likely the limiting factor to the hydrograph at these sites.

A population estimate of the Dry Pole trend section of the South Fork Judith River was completed in 2012. *Oncorhynchus sp*. declined slightly from the record high estimated in 2006; however, remained well above average. Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) were observed in greater abundance. Mountain whitefish (*Prosopium williamsoni*) declined and were below the long term average. Minimal sampling of the Musselshell River from river mile 9-21 was conducted in 2012. Twelve species were observed as a result of a combination of hoop net sets and seining. Three species not recorded in recent years were observed: black crappie (*Pomoxis nigromaculatus*), spottail shiner (*Notropis hudsonius),* and yellow perch.

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OBJECTIVES

The purpose of this project is to implement the Fisheries Program in the Lewistown Management area in central Montana. Major watersheds include the Judith and Musselshell. The mission of the Fisheries Bureau of Montana Fish, Wildlife and Parks (FWP) is to preserve and enhance aquatic species and their ecosystems to meet public demand for recreational opportunities while assuring stewardship of aquatic life. The Fisheries Program is described in detail in Tews and Horn (2006).

STUDY AREA AND PROCEDURES

The study area is in central Montana on the eastern edge of Region 4. It does not include the Missouri River on its northern boundary. The eastern boundary is the Musselshell River. The western boundary is the headwaters of the Musselshell, Judith and Arrow Creek drainages (Figure 1). It includes all of Fergus and Petroleum counties and parts of Meagher, Judith Basin and Chouteau counties.

In still water, fish populations were sampled using 125 x 6 ft experimental multifilament nylon gill nets with 25 ft sections of 0.75, 1.0, 1.25, 1.5 and 2.0 inch square mesh, 2 x 3 ft frame traps (0.25 inch mesh), and 4 x 6 ft frame trap nets (1.0 inch square mesh). Gill nets were fished either sinking or floating. Trout populations on Big Spring Creek were surveyed using a fiberglass drift boat equipped with a mobile electrode or a plastic scanoe equipped with a mobile electrode and a Smith Root VVP15 (or similar) to rectify AC to DC. Power was obtained from a 240-volt generator. Fish populations in small streams were sampled with a Smith Root Model 12-B battery powered backpack electrofishing unit. Large river fish populations were sampled using baited one-inch mesh 2ft hoop nets, baited ½ inch mesh 30 inch hoop nets, and seine hauls. Each seine haul consisted of a 30-ft (with bag) seine with ¼ inch heavy delta mesh pulled for about 30 yards downstream. Fish total length was measured to the nearest 0.1-inch or 1 mm and weighed to the nearest 0.01 lb or 1 gram. All game fish were typically measured. The first 50 fish of other species were measured from each net or sampling event. Big Spring Creek mark-recapture estimates from 2012 were analyzed with the FIS program (MFWP 2011). Mark-recapture estimates from 2004 – 2011 were analyzed with the FA+ program (MFWP 2004). Older estimates utilized the MR-4 program (MFWP 1994) or the FA+ program. Most estimates were completed using partial log-likelihood statistics. Modified Peterson estimates were used when data sets did not fit the partial log-likelihood model. Dorsal spines from yellow perch (*Perca flavescens*), sauger (*Sander canadense),* walleye (*Sander vitreus*), largemouth bass (*Micropterus salmoides),* channel catfish (*Ictalurus punctatus*) and bluegill (*Lepomis macrochirus)* were collected. Spines were cross-sectioned with an Isomet Low Speed Saw and prepared as described in Tews (2005). Cleithra from northern pike were collected. Cleithra were frozen until analysis, at which time they were cleaned by simmering in 60-70°C water for five minutes to remove remaining flesh (Casselman and Crossman 1986). The samples were air dried and read under a dissecting microscope against a black background using reflected light. Year classes were based on size structure and age-structure analysis. Equations from Anderson and Neuman (1996) and Bister et al. (2000) were used to calculate relative weight (W_r).

Reservoir water levels are from Montana Department of Natural Resources and Conservation (DNRC) reservoir contents reports at http://www.dnrc.mt.gov/wrd/water_op/water_measurement_prog/default.asp (DNRC 2012). Onset temperature loggers were installed in Big Spring Creek. Continuous stage height near the Ash Street Bridge, Big Spring Creek, was measured with a Stevens Recorder. Stage heights in Big Spring Creek near the hatchery and in the Mill Ditch were measured electronically with a Trutrack encased in a pipe. At the Reed and Bowles Fishing Access Site (FAS) a stilling well and Trutrack system was used. Flow was measured at different discharges with a Marsh McBirney Flowmate model 2000 to develop or confirm rating curves.

Brown trout *(Salmo trutta)* redd surveys were completed on Big Spring Creek during clear-water conditions, by one person with polarized glasses walking downstream. A redd was counted if it had a defined upstream margin, a depression, and a pillow consisting of loose, sorted substrates that was not covered with periphyton. Redds were called "test redds" if there appeared to be some excavation (as indicated by substrate free of periphyton), but no distinct pillow of loose, sorted substrate. All redds were tallied and GPS waypoint recorded. Whirling disease sentinel cage studies were conducted on Big Spring Creek. Following a 10 day exposure sentinel fish were transported back to the Pony research facility for the incubation phase of the study. Histology results were performed by Washington Animal Disease Diagnostic Laboratory.

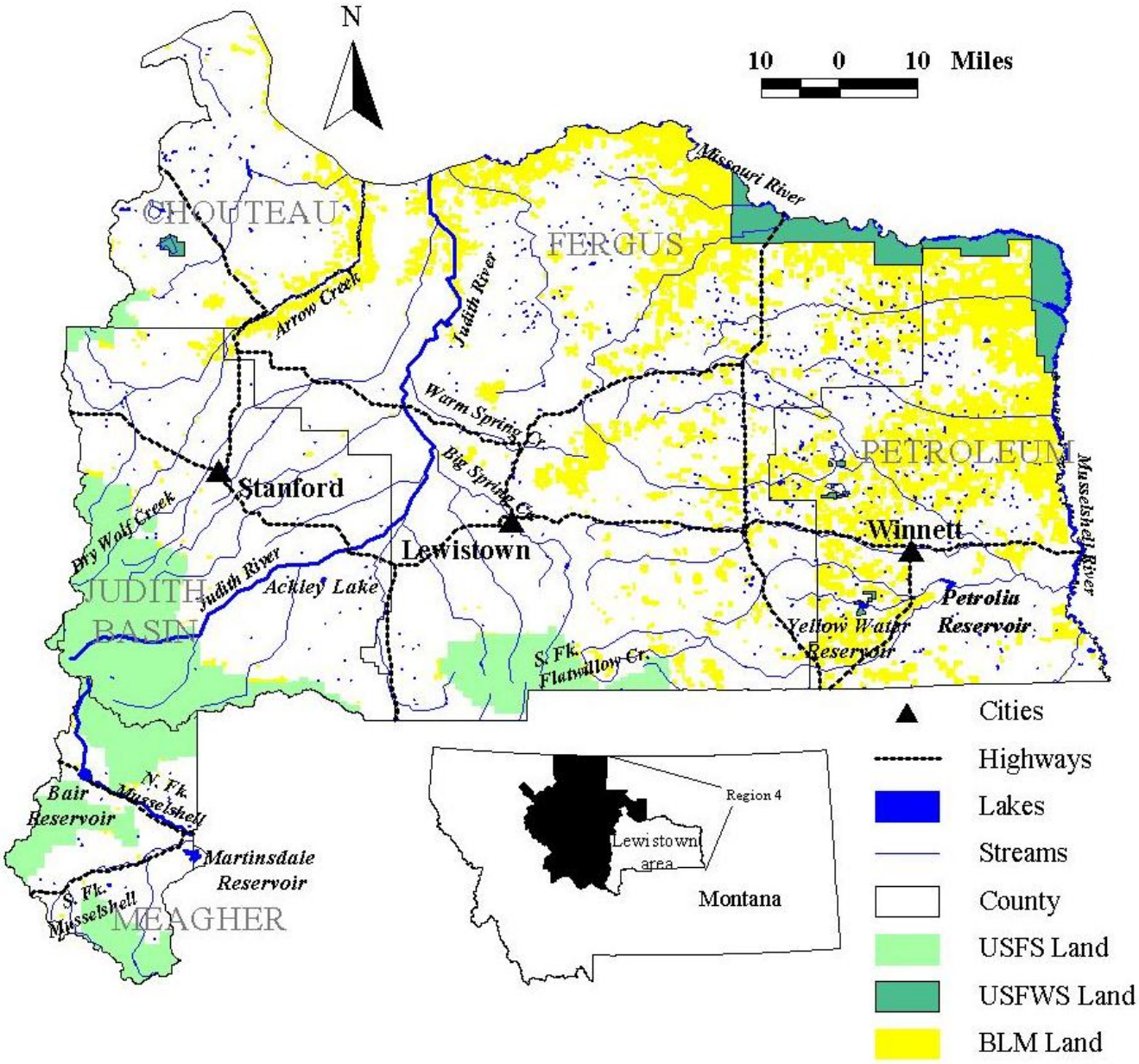

Figure 1. Map of the Lewistown fisheries management area.

Results and Discussion

Nineteen reservoirs were sampled in 2012; fish were captured in fifteen of these (Table 1 & 2). No fish were sampled in the following reservoirs: Anderson Coulee, Benes Pond #3 (Nelson), Slivka #1, and Wolf Coulee #2. October water levels of DNRC reservoirs are down from those observed in 2010 and 2011; however, Bair and Yellow Water pool size remains over 130% the long term average while Ackley and Martinsdale were at 91% and 83% respectively (Figure 2). Inflow/outflow and stream flow records are not available for most central Montana Reservoirs. However, average snowpack in the Judith, Musselshell, and Smith River Basins, combined

with little precipitation accumulated from June-October 2012, increased downstream water demands resulting in the lower elevation of these on-stream reservoir fisheries.

Ackley Lake – Despite October pool content being lower than 2009-11 levels, Ackley Lake remains at 91% the long term average (Figure 2). Rainbow trout (*Oncorhynchus mykiss)* numbers in gill nets exceeded the 24-year average, and have continued an upward trend since 2008 (Figure 3). In addition, W_r improved dramatically over 2010-11 values, and in 2012 exceeded the 24-year average (Figure 4). First year length gain was below average, but similar to growth observed in 2010-11 (Appendix 1). Improvement was also observed in mean total length of rainbow trout which exceeded the 24-year average (Figure 5). White sucker *(Catostomus commersoni)* catch in gill nets was similar to 2011 values, remaining well above average, and the second highest recorded since 2006 sucker removals (Figure 3). White sucker W_r dropped slightly from 2010-11 values and was slightly below average (Figure 4). Mean total length increased slightly to near average (Figure 5).

Bair Reservoir – The October 2012 pool content was lower than observed in 2010-11; however, the pool remained 132% of normal (Figure 2). Since 2010, rainbow trout average length has remained well above average, and in 2012 tied the record high observed in 2010 at 12.4" (Figure 6). Additionally, rainbow trout gill net catch increased from record lows in 2009-11, to slightly above average in 2012 (Figure 7). W_r decreased from 2009-11 values, but remained at the long term average (Figure 8). First year growth and the mean length of first year rainbow trout at 8.3 inches were both above average (Appendix 1). Westslope cutthroat trout *(Oncorhynchus clarkii lewisi)* averaged over 11 inches long (Table 1). Average total length of white suckers was above average (Figure 6), and gill net catch was average (Figure 7). W_r, as observed in rainbow trout, decreased substantial from the near record highs of 2009-11 to a value close to the long term average (Figure 8).

The trout fishery at Bair Reservoir appears to have improved greatly in the past 5 years; total length and first year growth have been above average 5 of 6 years. There is no clear reason for the improvement in the Bair Reservoir trout fishery. It seems unlikely that the removal of 2.7 tons of white suckers in 2007 (Tews and Horn 2007 report, Tews et al. 2011 Draft) resulted in such long term benefits. The only recent management change occurred in 2005, when westslope cutthroat trout replaced Yellowstone cutthroat trout *(Oncorhynchus clarkii bouvieri)*. Reservoir filling following more than a decade of low levels may have mimicked new reservoir conditions, thereby increasing zooplankton biomass as reported for new impoundments (Paterson et al. 1997). However, the increase in rainbow trout catch rate in 2012 could be the result of a reduction in pool content from 2010-11 values, thus concentrating fish and making them more susceptible to capture in the gear. Additionally, the declines observed in both rainbow trout and white sucker W_r and 2012 stocked rainbow trout W_r could be indictors that nutrient availability declined in 2012, and competition for overlapping food sources likely increased. Future sucker removals, similar to those conducted in 2007, may be implemented in the future.

Table 1. Statistics from fish captured by 2012 gill netting in the Lewistown management area.

Location (Date) Nets	Species (Stocking Year)	N	Length (inches) Min	Mean	Max	Weight (pounds) Min	Mean	Max	W_r Mean
Ackley	Brown trout	7	17.2	20.6	23.5	1.93	3.91	5.95	109.8
(9/18/2012)	Longnose sucker	10	11.0	15.9	18.5	0.44	1.80	2.77	
1 Sinker	Mountain whitefish	1		14.3			1.27		118.5
1 Floater	Rainbow trout	66	6.7	12.9	17.2	0.12	0.84	1.50	89.3
	2012	16	6.7	8.0	8.9	0.12	0.20	0.23	88.8
	2011+	48	12.5	14.6	17.2	0.73	1.06	1.50	78.9
	White sucker[1]	82	6.8	13.0	18.6	0.12	1.07	2.93	97.1
Bair	Brook trout	1		8.3			0.18		84.2
(9/13/2012)	Rainbow trout	57	7.3	12.4	17.7	0.12	0.65	1.53	78.6
1 Sinker	2012	14	7.3	8.3	9.3	0.12	0.18	0.25	71.6
1 Floater	2011+	43	11.2	13.7	17.7	0.45	0.81	1.53	71.5
	Westslope cutthroat	5	9.1	11.2	13.1	0.27	0.52	0.73	86.1
	White sucker[1]	122	6.9	11.9	16.0	0.08	0.71	1.60	83.3
Carpenter	Rainbow trout	42	8.0	10.7	13.7	0.24	0.45	1.00	91.5
(6/8/2012)									
1 Sinker									
Holland	Largemouth bass	26	5.3	9.8	12.1	0.05	0.84	1.34	138.2
(5/3/2012)									
1 Sinker									
Jakes	Sauger	16	17.2	19.3	22.7	1.56	2.50	4.42	89.8
(5/3/2012)	Yellow perch	83	5.4	6.9	11.1	0.05	0.12	0.58	67.8
1 Sinker									
1 Floater									
Martinsdale	Brown trout	4	13.8	18.1	23.8	1.03	2.86	6.00	104.2
(9/13/2012)	Longnose sucker	12	8.9	12.7	14.4	0.29	0.80	1.08	
1 Sinkers	Rainbow trout	12	8.8	14.4	16.4	0.33	1.23	1.75	100.7
1 Floater	2012	2	8.8	9.1	9.4	0.33	0.36	0.39	110.2
	2011+	10	14.4	15.4	16.4	1.14	1.41	1.75	88.5
	White sucker[1]	106	8.9	13.2	18.9	0.25	0.99	2.56	90.1
Olson	Rainbow trout	8	6.5	7.7	8.8	0.09	0.17	0.26	94.0
(5/9/2012)									
1 Sinker									
Petrolia	Carp	10	10.0	18.2	22.8	0.49	2.78	5.31	90.4
(9/18/2012)	Northern pike	5	23.1	25.9	31.8	3.06	4.52	7.90	101.1
2 Sinkers	Walleye	57	12.4	16.4	26.1	0.69	1.81	7.10	99.7
2 Floaters	White sucker	5	11.6	13.2	16.3	0.64	0.88	1.48	82.8
	Yellow perch	37	8.2	10.3	14.2	0.23	0.56	1.06	91.2

Slivka #2	Lake chub	2	5.8	6.2	6.5	0.09	0.10	0.10	
(5/11/2012)	Largemouth bass	2	5.4	6.1	6.8	0.08	0.13	0.18	118.2
1 Sinker	White sucker	52	9.2	10.9	17.3	0.30	0.56	2.01	89.4
Wolf Ranch (Lower) (6/8/2012) 1 Sinker	White sucker	87	7.0	13.3	15.6	0.12	0.99	1.70	87.3
Wolf Ranch (Upper) (6/8/2012) 1 Sinker	Rainbow trout	32	12.7	15.1	16.9	1.06	1.53	1.95	112.8
Yellow	Carp[1]	50	2.7	11.4	14.7	0.04	0.86	1.53	93.5
Water	Rainbow trout	53	8.5	12.7	17.2	0.24	0.95	2.11	103.9
(9/18/2012)	White sucker	10	6.1	8.7	10.4	0.15	0.32	0.46	109.7
1 Sinker 1 Floater									

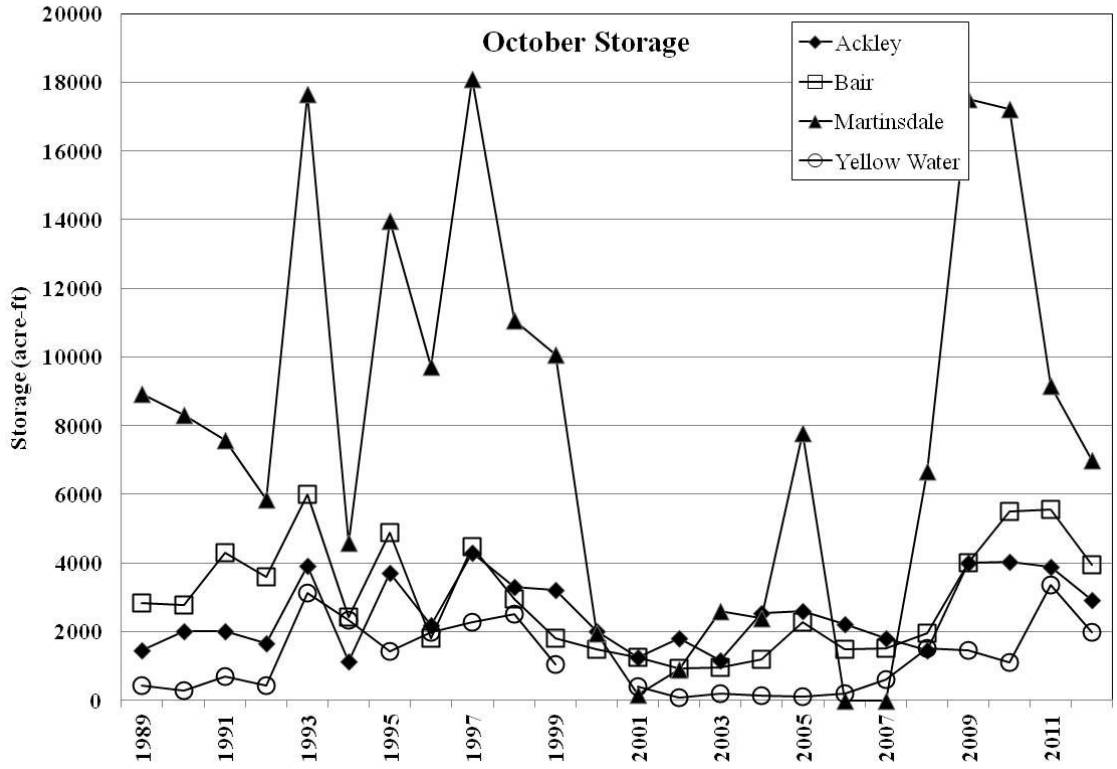

Figure 2. October water storage at four central Montana Reservoirs from 1989 – 2012 (data from DNRC).

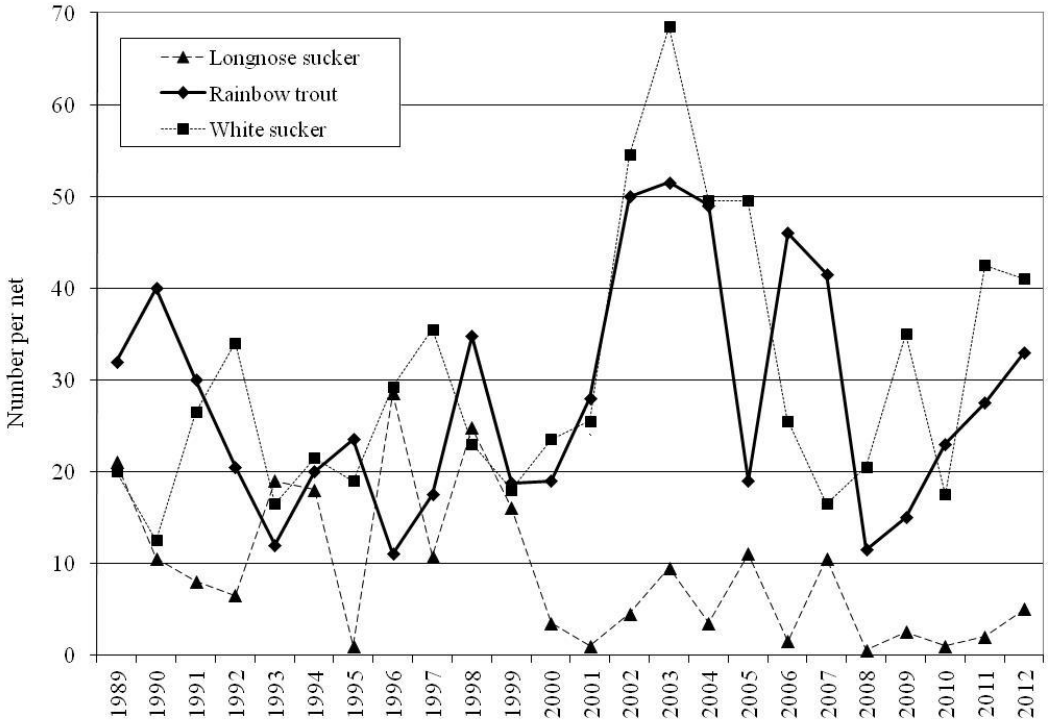

Figure 3. Catch rates of common species from fall gill netting in Ackley Lake, 1989 – 2012.

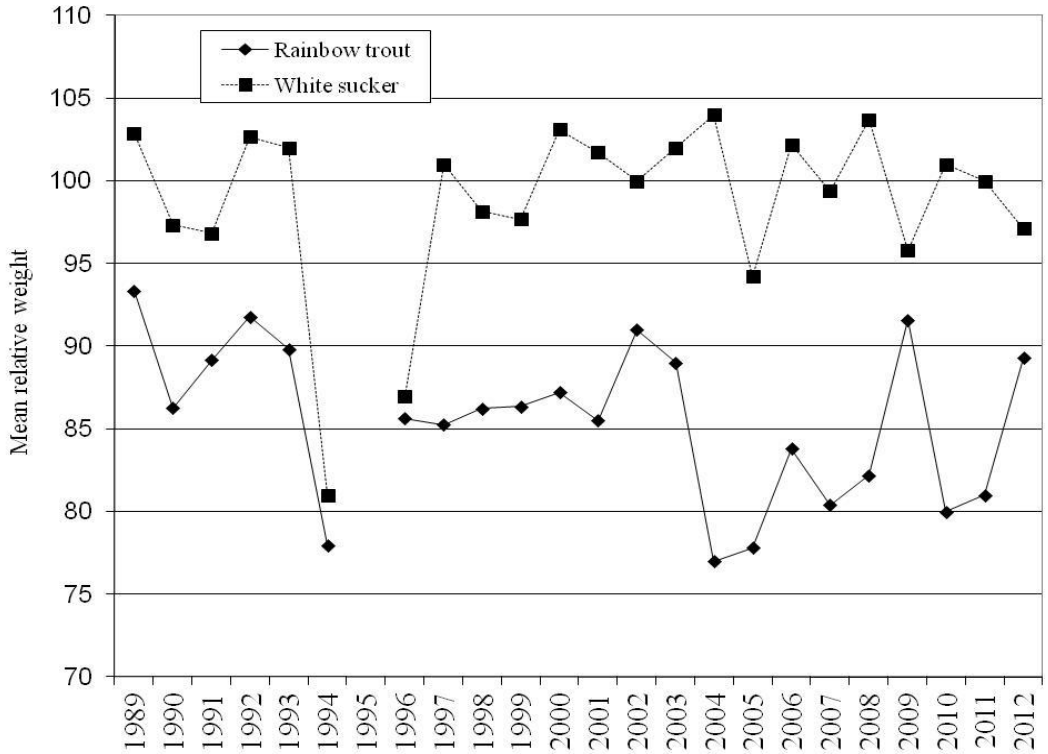

Figure 4. Mean W_r of common species from fall gill netting in Ackley Lake 1989 – 2012.

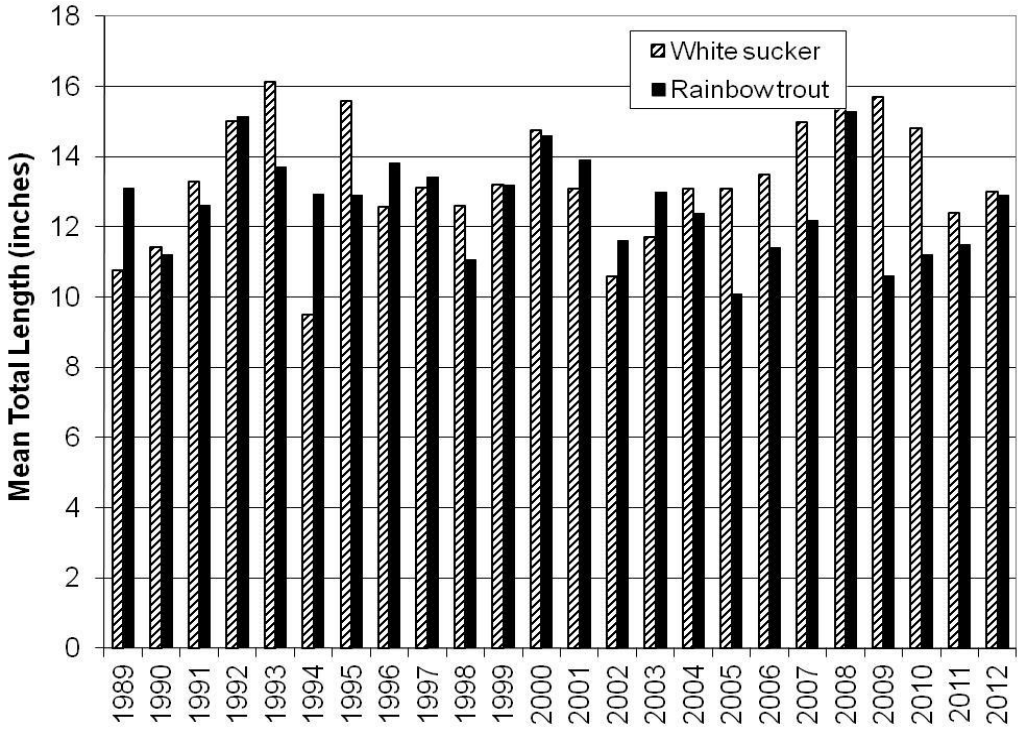

Figure 5. Mean total length of rainbow trout and white suckers from fall gill netting in Ackley Lake, 1989 – 2012.

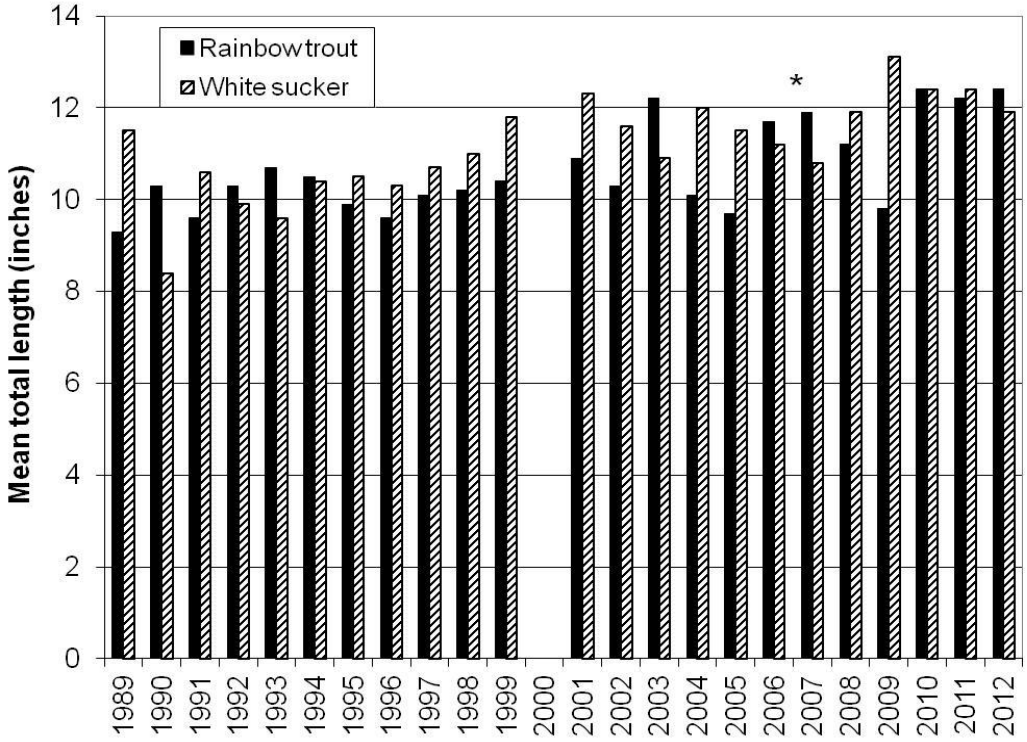

Figure 6. Mean total length of rainbow trout and white suckers from fall gill netting in Bair Reservoir, 1989 – 2012. * rainbow trout were stocked in late fall 2005.

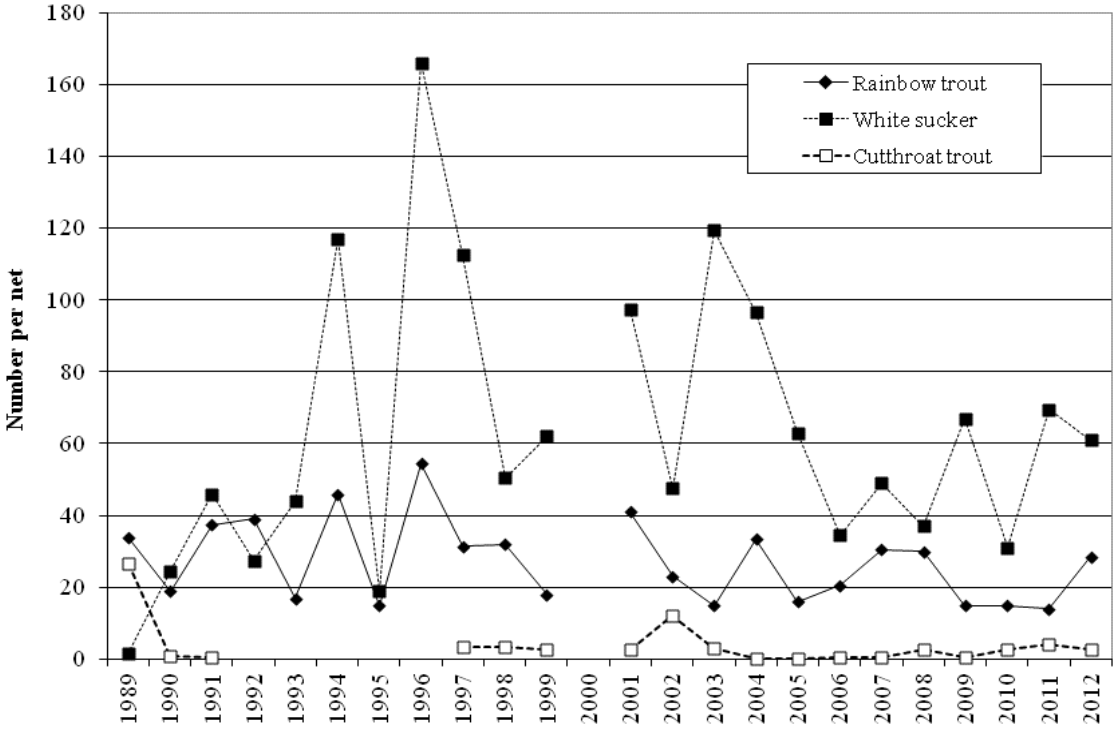

Figure 7. Catch rates of common species from fall gill netting in Bair Reservoir 1989 – 2012.

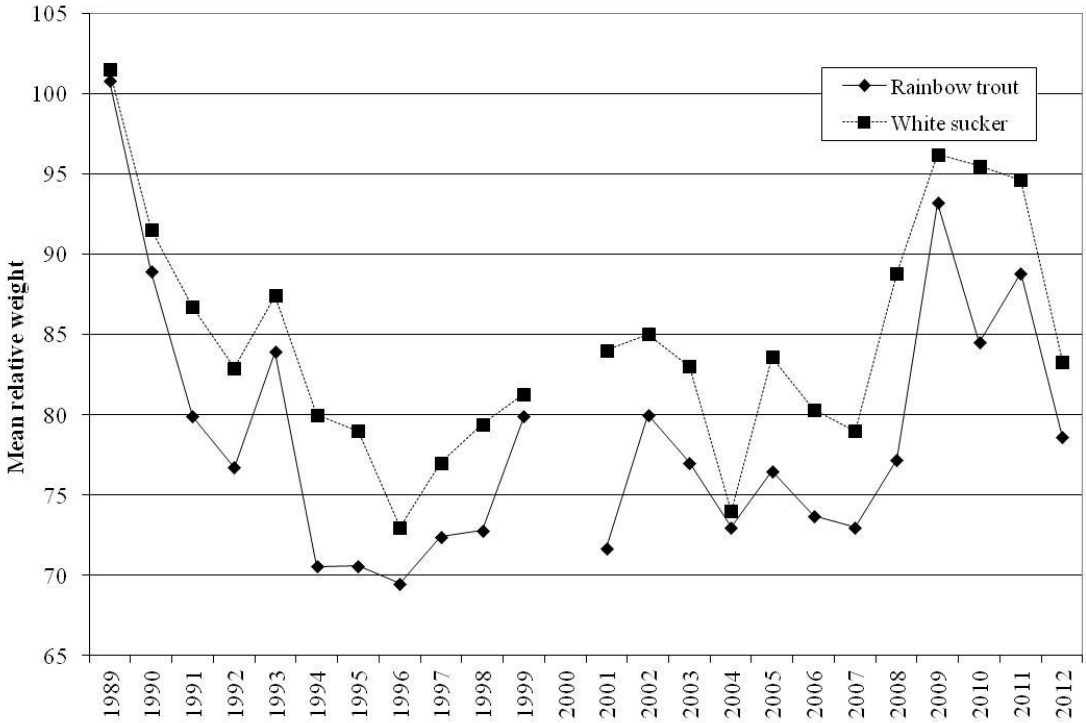

Figure 8. Mean W_r of common species from fall gill netting in Bair Reservoir, 1989 – 2012.

Casino Creek Reservoir (Big Casino Reservoir) – This reservoir has had several management changes in recent years (Tews and Miller, 2008 report). The reservoir has been stocked with about 500, 7 – 10 inch rainbow trout three times annually since 2008. We have sought to maximize stocked trout length to increase length in the creel; stocking length is currently about 7 inches in spring and 11 inches in September. Yellow perch (*Perca flavescens*) and white suckers are abundant. Casino Creek Reservoir was not sampled in Spring 2011 due to high water conditions; however, in 2012, spring trap netting was conducted. Yellow perch catch rate had declined from Spring 2010 (Figure 9). It is likely many perch were washed downstream in 2010 and 2011 due to rapid flow through times. Mean yellow perch total length has continued to increase since 2005, and was a record high at 8.8 inches (Figure 11). Relative weight of both yellow perch and rainbow trout remain similar to values observed since 2008 (Figure 10). This population is no longer exhibiting the compressed age structure observed in 2010 (Tews and Miller, 2010 report). Many sampled yellow perch were old; however, a steady average annual growth of 0.5 inches continued through age-11 resulting in Age-10 perch measuring 10.1 inches in 2012 versus 8.1 inches in 2010 (Appendix 2). The rainbow trout population appears to be improving here. Average rainbow trout length increased to about 12 inches in FWP nets (Figure 11), an improvement from 2006 - 2010. Maximum rainbow trout length was 15.6 inches and was the longest captured since September 2005. The catch rate of rainbow trout was about average (Figure 9). White sucker catch rate increased substantially from 2010, exceeding the catch rate observed prior to 2001 sucker removal. Mean total length declined, and was similar to those observed prior to sucker removal (Figure 11).

Table 2. Statistics from fish captured by trap netting in the Lewistown management area, 2012

Location (Date) # Trap Nights	Species	N	No. per Night	Length (inches)			Weight (pounds)			W_r
				Min	Mean	Max	Min	Mean	Max	Mean
Big Casino (4/26/2012) 13	Brook trout	14	1.1	9.5	11.2	14.3	0.28	0.51	0.95	90.3
	Rainbow trout	36	2.8	7.3	12.1	15.6	0.12	0.65	1.40	89.1
	White sucker[1]	986	75.8	4.5	12.4	18.3	0.07	0.99	3.09	106.3
	Yellow perch[1]	1221	93.9	6.3	8.8	11.5	0.09	0.34	0.76	93.0
Dry Blood (9/17/2012) 1	Largemouth bass	32	32.0	2.8	3.3	8.0	---	---	---	---
East Fork (4/2-4/11/2012) 25	Bluegill	2	0.1	6.9	7	7.1	0.28	0.29	0.29	105.9
	Brook trout	23	0.9	11.9	14.3	16.8	0.46	0.99	1.73	86.12
	Brown trout	1	0.0		13.3			0.74		
	Longnose sucker	5	0.2	7.1	15.5	19.7	0.11	1.19	2.89	80.91
	Northern pike	87	3.5	13.9	19.7	29.5	0.43	1.76	7	88.27
	White sucker	239	9.6	9.5	17.4	20.1	0.31	2.51	3.76	108.3
	Yellow perch	2002	80.1	5.4	8.6	13.1	0.06	0.36	1.56	99.56
Upper Carter (4/9/2012)	Bluegill	2	1.0	8.9	9	9.1	0.76	0.77	0.78	124.5
	Rainbow trout	193	96.5	6.5	12.2	17.8	0.12	0.86	2.19	108.2

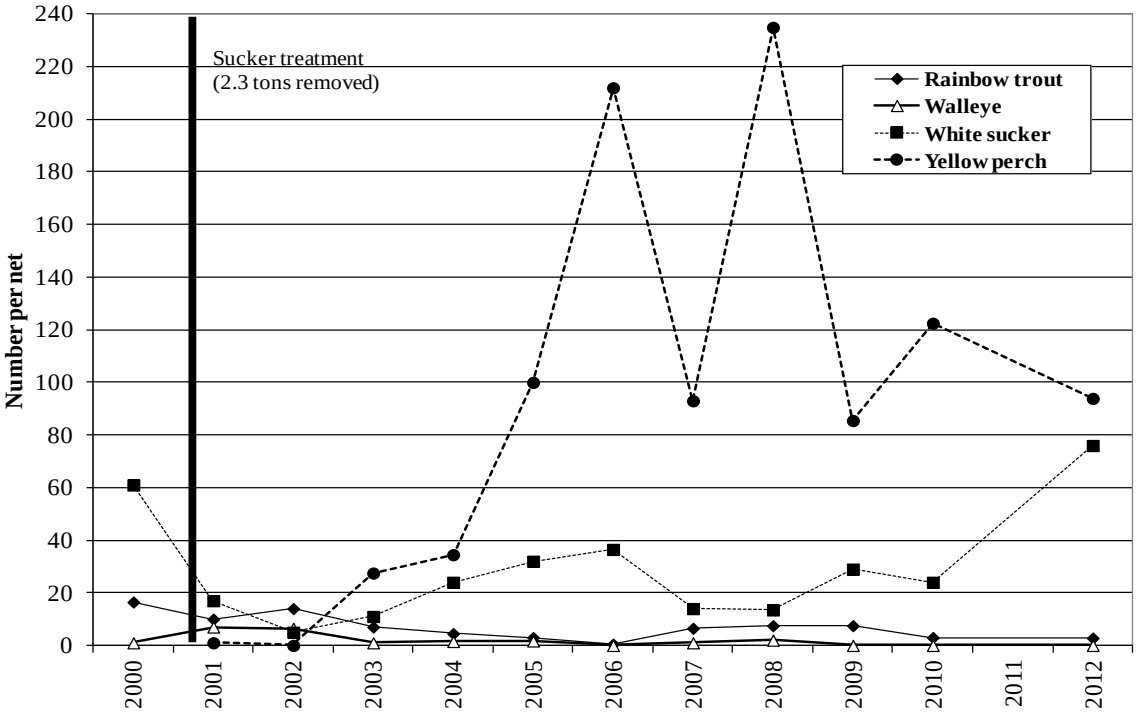

Figure 9. Catch rates of common species from spring trap netting in Casino Creek Reservoir, 2000 – 2012.

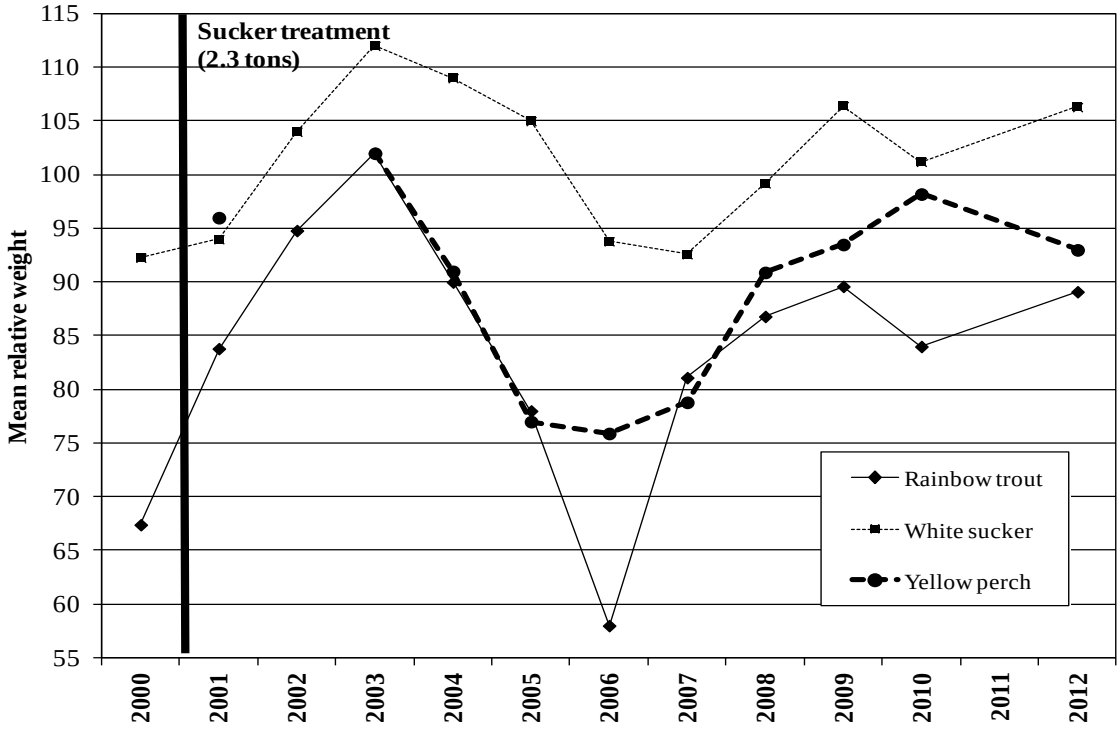

Figure 10. Mean W_r of common species from spring trap netting in Casino Creek Reservoir, 2000 – 2012.

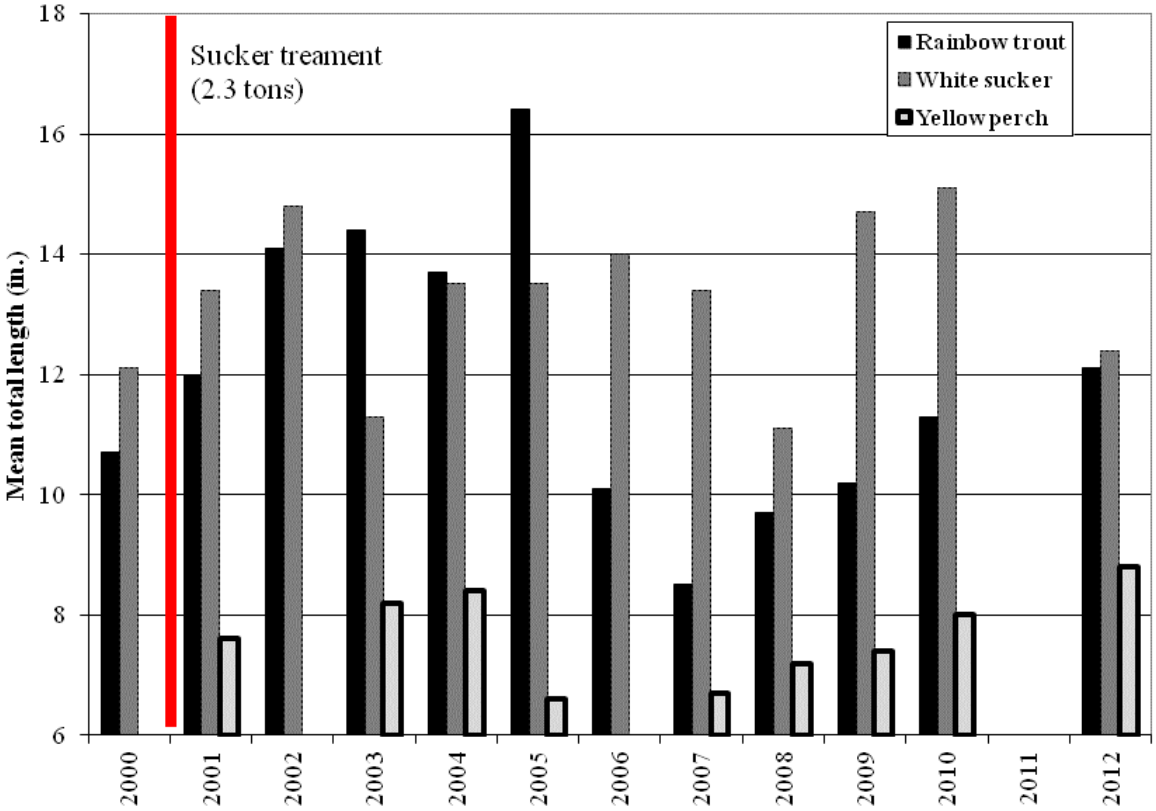

Figure 11. Mean total length of common species from spring trap netting in Casino Creek Reservoir, 2000 – 2012.

East Fork Reservoir – The City of Lewistown drained East Fork Reservoir in 2012 to repair the control gate of the dam (Figure 12). Draining began on July 23, 2012, and continued to August 28, 2012. The gate was repaired on August 29th, and for the remainder of 2012 only the mandated instream flow was released below the dam allowing for the reservoir to fill to ~75% full pool by January 2013. Anglers have reported catching brook trout (*Salvelinus fontinalis*), northern pike (*Esox lucius*), and yellow perch in East Fork during winter 2012/13. These species will likely persist and repopulate the reservoir. In the interim, FWP plans to stock both rainbow and brown trout to diversify angler opportunity.

Public concern about northern pike entering the trout fishery of Big Spring Creek during the reservoir draining resulted in FWP conducting northern pike removal in April 2012. Four large fyke nets were deployed in the reservoir for a total of twenty-five trap nights. Eighty-seven northern pike were removed. Northern pike catch rates were similar to those observed since 2005, and fish ranged from 13.9-29.5 inches with a mean total length of 19.7 inches (Table 2). Six species were sampled as by-catch of the removal action: bluegill (*Lepomis macrochirus*), brook trout, brown trout (*Salmo trutta*), longnose sucker (*Catostomus catostomus*), white sucker, and yellow perch. Yellow perch averaged 8.6 inches and 0.36 pounds, with the largest measuring 13.1 inches and 1.56 pounds. First recorded in 2011, twenty-three brook trout were sampled in 2012, and mean total length and weight was 14.3 inches and 0.99 pounds. These

Figure 12. Drawdown of East Fork Reservoir in summer 2012.

brook trout, as well as the one brown trout observed in 2012, were displaced from the waterways upstream during the 2011 flood event.

Cleithra were removed from northern pike and anal fin rays were removed from yellow perch. Captured northern pike ranged in age from 4-18 years old and yellow perch ranged from 3-12 years old. The majority of northern pike sampled were Age-4 to Age-6. Age-4 northern pike averaged 17.5 inches, Age-5 averaged 18.8 inches, and Age-6 averaged 19.9 inches. The majority of yellow perch sampled were Age-8 to Age-10. Age-8 yellow perch averaged 9.8 inches, Age-9 averaged 10.2 inches, and Age-10 averaged 10.3 inches. Sex was recorded for both northern pike and yellow perch when an aging structure was removed in order to investigate sexual dimorphism in both species. Sexual dimorphism was not as apparent in northern pike, but female growth rates generally accelerated over males at Age-5 and by Age-7 male growth slowed dramatically resulting in a 10 inch length range of Age-8 northern pike when both sexes were pooled (Figure 15). Sexual dimorphism was apparent in all represented age-classes of yellow perch. For example, cumulatively Age-8 yellow perch ranged in length from 7.4-12.0 inches. However, separation of sexes revealed mean length of males was 8.4 inches (7.4-9.8") and females was 10.7 inches (9.6-11.6") (Figure 14).

Martinsdale Reservoir – October water level of Martinsdale Reservoir was the lowest since 2007. The reservoir was drained to 40% capacity for dam repairs in late-2011, and only filled to 88% capacity in Spring 2012. Irrigation withdrawals resulted in a 30% reservoir content pool at the October measurement. Rainbow trout catch rate further declined from that

observed in 2011, and at 6 rainbow trout/net remains well below the long-term average (Figure 16). The 2012 stocking class was not well represented in sampling gear, and only two were collected. Rainbow trout mean total length at 14.4 inches was a record high; however, W_r of 2011+ age-classes remained low at 88.5. White sucker catch rate declined from the record high observed in 2011, but remains above the long-term average. White sucker W_r was near a record low, and the lowest observed in the last decade. Brown trout and longnose suckers were sampled in small numbers, and westslope cutthroat trout were not observed in 2012. Brown trout averaged 18.1 inches, with the largest measuring 23.8 inches and 6.0 pounds.

Petrolia Reservoir – Despite spilling for much of 2011, irrigation withdrawals had lowered Petrolia Reservoir 14.5 feet at the time of September 2012 sampling. FWP 2012 sampling found improved catch rates of walleye (*Sander vitreus*) and near record high mean total length of yellow perch. Both walleye catch rate and mean total length were well above average. Mean total length of 16.4 inches was the second highest on record and a catch rate of 14 walleye/net was the highest observed since 2003 (Figures 16 and 17). Walleye up to 26.1 inches and 7.10 pounds were captured and W_r was above average at 99.7. Yellow perch catch rates, while reduced from 2011, remain well above the long-term average. Additionally, yellow perch mean total length was the second highest on record at 10.3 inches (Figure 18). Yellow perch up to 14.2 inches and 1.06 pounds were captured.

Several large northern pike were captured in 2012, and catch rates improved over 2011, approaching the long-term average. Northern pike averaged 25.9 inches and 4.52 pounds, with the largest fish measuring 31.8 inches and 7.90 pounds. Common carp (*Cyprinus carpio*) and white sucker catch rates remain low.

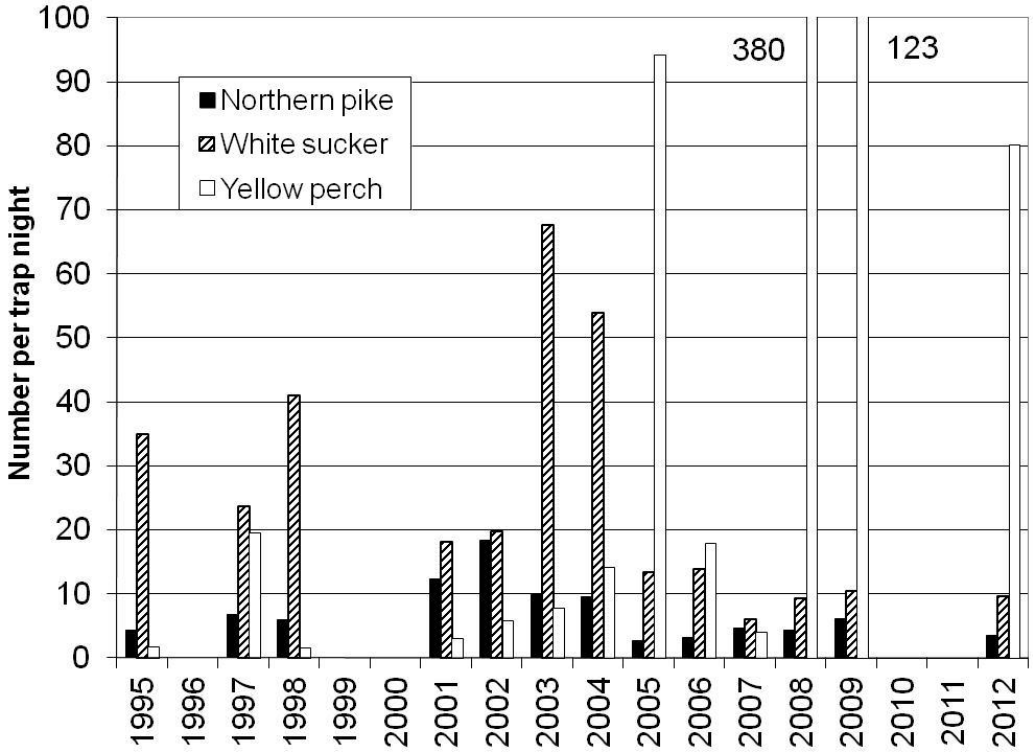

Figure 13. Catch rates of common species from spring trap netting in East Fork Reservoir, 1989–2012.

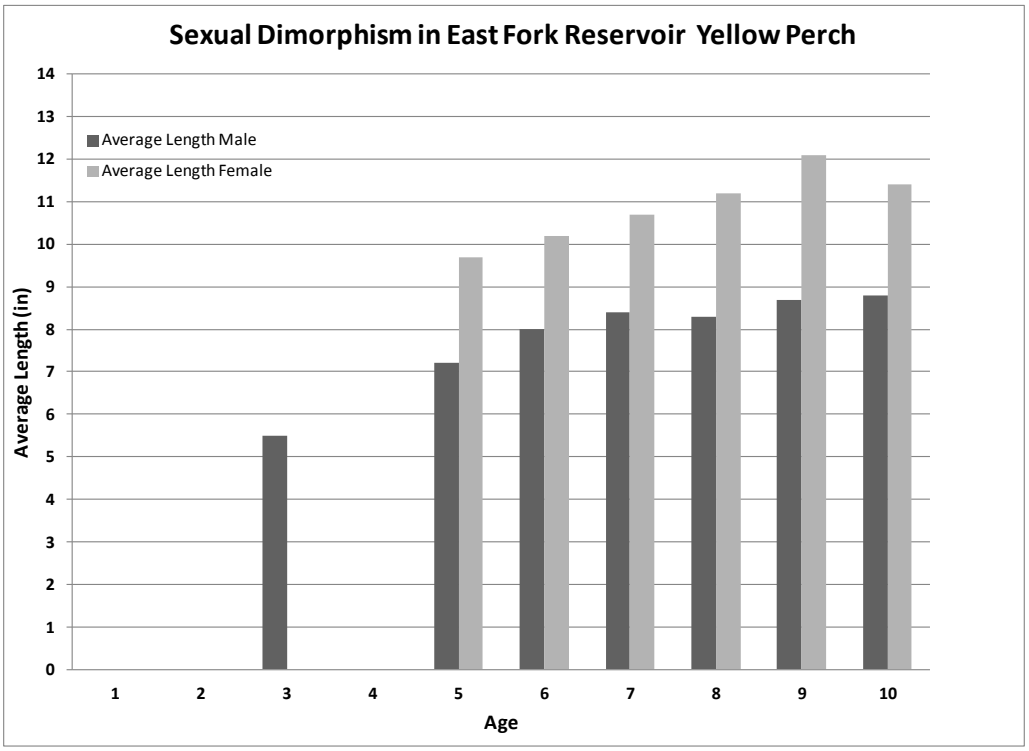

Figure 14. Sexual dimorphism exhibited in East Fork Reservoir yellow perch.

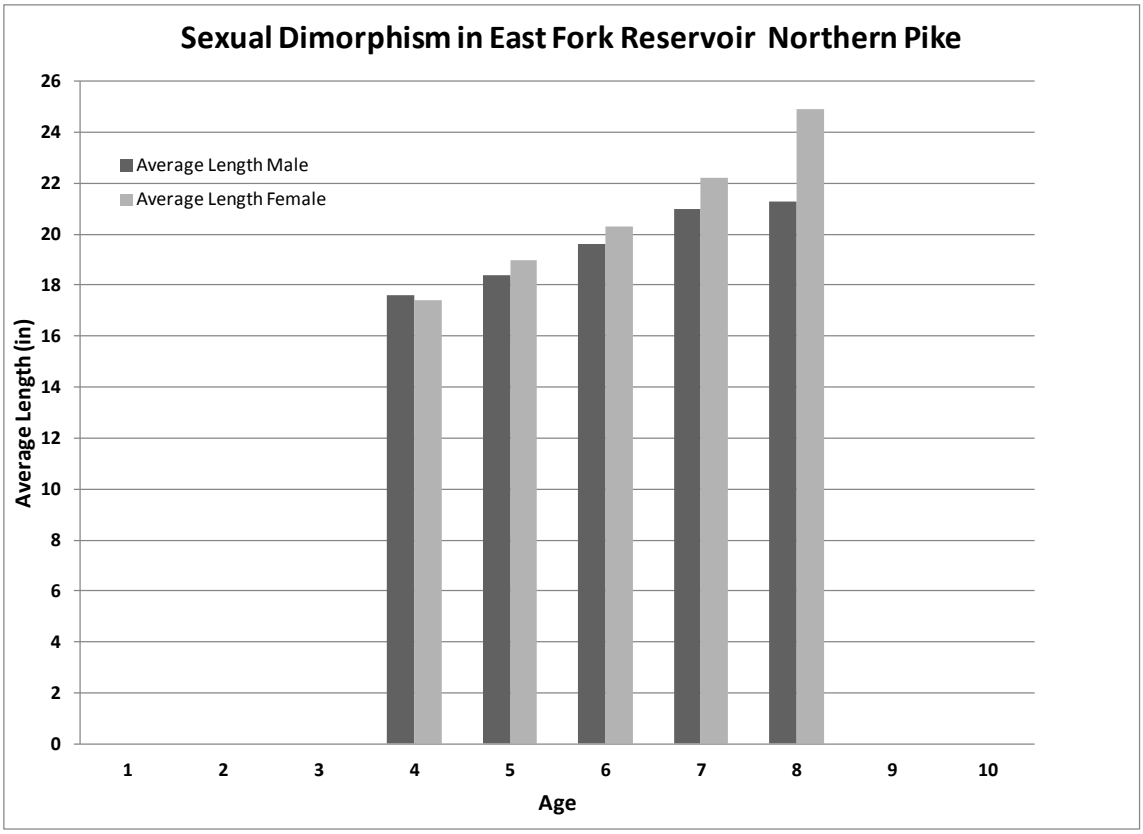

Figure 15. Sexual dimorphism exhibited in East Fork Reservoir northern pike

Yellow Water Reservoir – While the water level of Yellow Water is down from 2011 levels; at 50% full pool, water content remains 176% the long-term average. Fall 2012 sampling revealed two age-classes of rainbow trout (2011 and 2012 stockings), as well as white suckers and common carp. No older age classes of rainbow trout were detected, further supporting that a complete winterkill took place in winter 2010-2011. First detected in 2011, common carp and white suckers persist in the reservoir as a result of 2011 flood flows that introduced these species from upstream waterways. Neither species had been detected since the reservoir began to fill above the drought pool in 2007.

Rainbow trout catch rate improved from 2011, with mean total length of 12.7 inches and mean weight of 0.86 pounds (Table 1). Maximum rainbow trout length and weight was 17.2 inches and 2.11 pounds. Both white sucker and common carp catch rates declined substantially; catch was 22% and 19% respectively of 2011 capture. A broad size range of both species was captured in the sampling equipment. Common carp ranged from 2.7-14.7 inches and white suckers ranged between 6.1-10.4 inches.

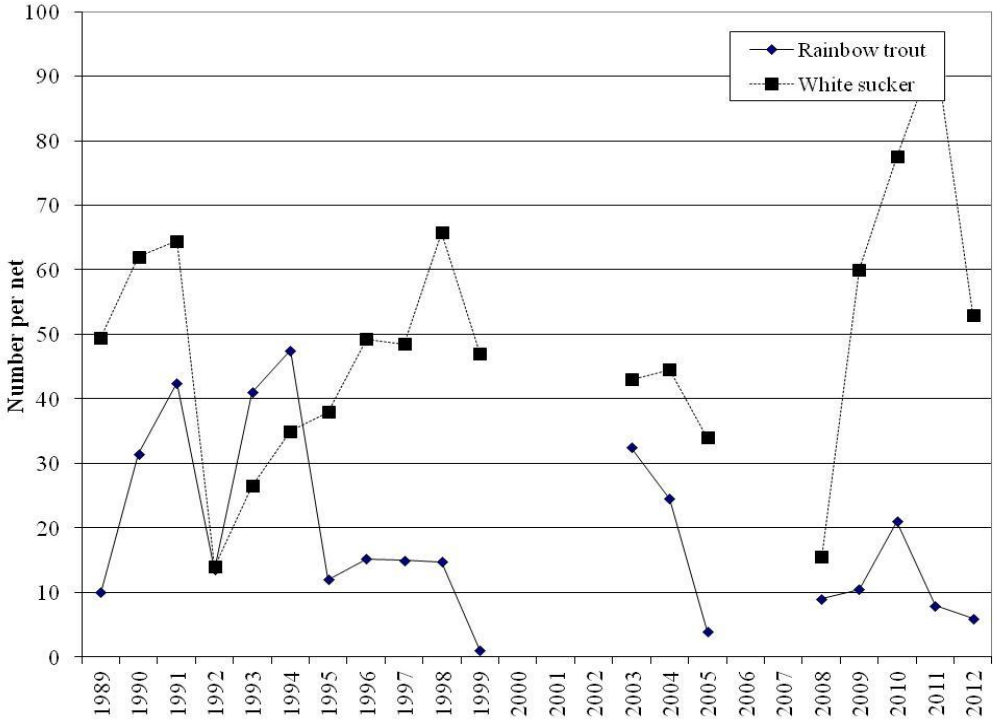

Figure 16. Catch rates of common species from fall gill netting in Martinsdale Reservoir 1989-2012

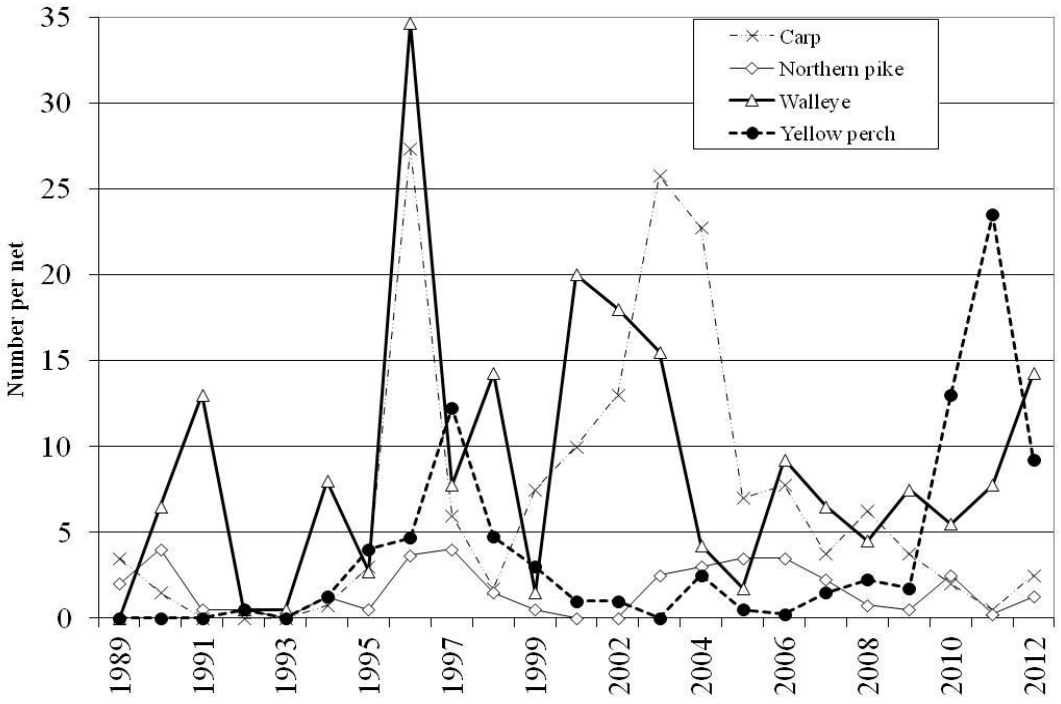

Figure 17. Catch rates of common species from fall gill netting in Petrolia Reservoir, 1989 – 2012.

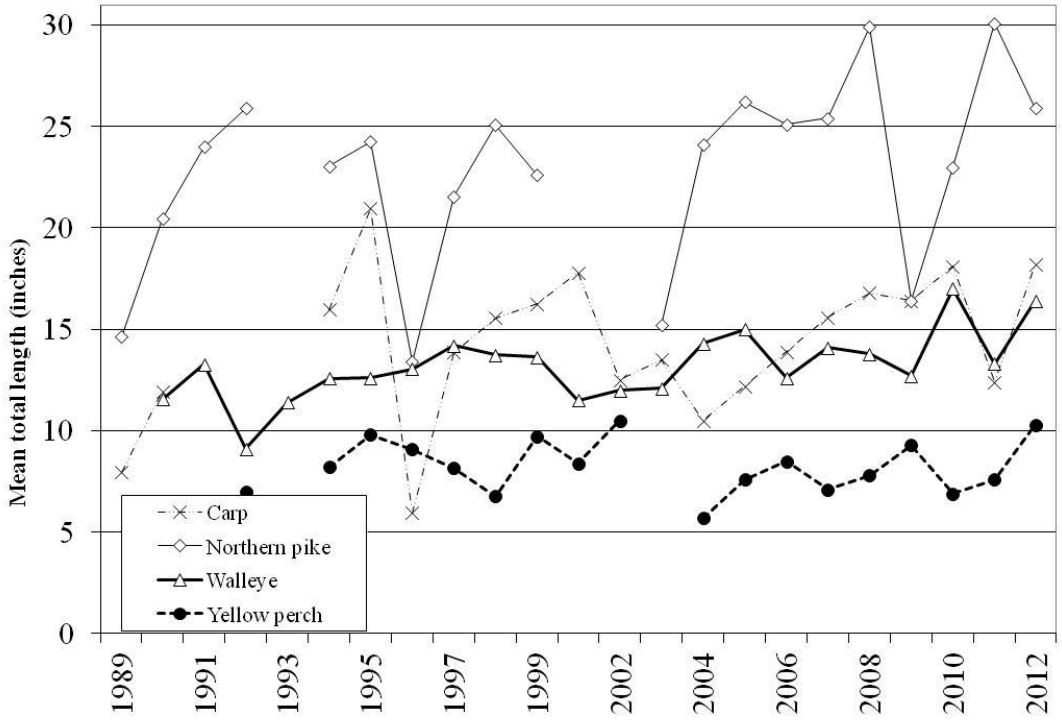

Figure 18. Mean total length of common species from fall gill netting in Petrolia Reservoir, 1989 – 2012.

Small Reservoirs

Irrigation withdrawals and evaporation during the dry summer months have lowered many Lewistown-area small reservoirs significantly. Marginal depths could result in winter-kill events during winter 2012-2013. The BLM and FWP implemented a windmill aeration program in 2010 in response to chronic winter-kill at several of these reservoirs. During 2010-2011, windmill aeration systems were installed at **Whisker**, **Holland**, **Payola**, and **South Fork Blood**. In 2012, the dam of **Wolf Coulee #2** was breached eliminating the largemouth bass (*Micropterus salmoides*) fishery, and the dam of **Peterson** is scheduled to be breached in 2013, eliminating the current rainbow trout fishery.

Jakes Reservoir-- Yellow perch average total length remained the same as 2011 at 6.9 inches; however, W_r continued to decline, and at 67.8, was the lowest observed since 2000. Sauger continue to be sampled, with the 2003 stocking class being the sole representative. Sauger mean total length increased to 19.3 inches, with the largest fish measuring 22.7 inches and 4.42 pounds. Five sauger were recaptured in 2012; two were tagged in 2011 and three were tagged in 2009. Average annual growth was 1.67 inches.

The yellow perch/sauger combination appears to have worked well in turbid Jakes Reservoir, with excellent sauger survival and increased yellow perch size. However, as sauger numbers in the system have declined in recent years, predation on yellow perch has also declined resulting in the negative mean length and W_r trends currently observed. Furthermore, derived

from fin ray cross-sectional aging, length at age has declined in recent years to the current compressed age-structure observed in 2012. Sauger should be stocked in Jakes every few years, and submission for a wild fish transfer to introduce addition sauger into this system will likely take place in 2013.

Carter Ponds (Upper and Lower) – Dams on both ponds were repaired late in 2008. Upper Carter has been full since 2009. Lower Carter did not fill until spring 2010. Neither reservoir was gill netted in 2012; however, trap nets were deployed in Upper Carter to investigate reports of bluegill. Four bluegill representing three separate age-classes were captured, confirming an illegal introduction which likely occurred soon after the reservoir filled. Bluegill ranged from 1.7-9.0 inches. In 2012, anglers also reported bluegill presence in Lower Carter.

Additionally, 193 rainbow trout were sampled in the three overnight fyke net sets. Upper Carter rainbow trout averaged 12.2 inches and 0.86 pounds, with a maximum length and weight of 17.8 inches and 2.19 pounds. Rainbow trout relative weight was excellent at 108.

Winifred/Denton Reservoirs – Eight reservoirs were sampled in the Winifred/Denton area in 2012. Fish were not detected in three of those: **Anderson Coulee**, **Benes Pond #3** (Nelson), and **Slivka Pond #1**. No fish were detected in Slivka #1 in 2009, nor in Benes #3 in 2008 and 2009. Both reservoirs will likely be removed from future stocking requests. Additionally, white suckers were the only species detected in **Wolf Ranch Pond (Lower)**. Stocked rainbow trout were not detected in 2009 sampling either. Largemouth bass may be substituted in Wolf Ranch Pond (Lower) in 2013.

Stocked species were detected in **Carpenter**, **Olson**, **Slivka #2**, and **Wolf Ranch Pond (Upper).** Slivka #2 was first stocked in 2010 with largemouth bass. Three species, lake chub (*Couesius plubeus*), largemouth bass, and white suckers were detected in 2012 sampling. Rainbow trout in Olson Reservoir ranged in length from 6.5-8.8 inches representing only two age-classes, the 2011 and 2012 stocking classes. This suggests that Olson likely winter-killed during winter 2010-11. Rainbow trout were plentiful in both Carpenter and Wolf Ranch Pond (Upper) during 2012 sampling. Forty-two rainbow trout were captured in Carpenter Reservoir, having a mean total length of 10.7 inches and maximum length and weight of 13.7 inches and 1.00 pounds. Thirty-two rainbow trout were captured in Wolf Ranch Pond (Upper). The mean total length and weight of rainbow trout samples in Wolf Ranch Pond (Upper) was 15.1 inches and 1.53 pounds.

"Breaks" Reservoirs – **Dry Blood**, **Holland**, and **Wolf Coulee #2** were the reservoirs sampled in the Missouri River Breaks in 2012 in addition to the long-term monitoring of Jakes Reservoir (discussed above). No fish were captured in Wolf Coulee #2, and the breaching of the dam in summer 2012 has eliminated this fishery. Largemouth bass continue to be the only species observed in Holland Reservoir. Twenty-six largemouth bass averaging 9.8 inches and a W_r of 138 were captured in one overnight gillnet set. Length ranged from 5.3-12.1 inches and dorsal ray aging suggests the 2010 and 2011 stocking classes were represented. The BLM aeration system installed on Holland likely prevented a winterkill event in winter 2010-11.

A wild fish transfer was conducted in Summer 2011 transferring Tongue River Reservoir black crappie *(Pomoxis nigromaculatus)* and white crappie *(Pomoxis annularis)* into Dry Blood

Reservoir. One small fyke net was set overnight in Dry Blood in 2012 to assess the success of this introduction. Crappie were not observed; however, thirty-two largemouth bass were captured. These largemouth bass ranged in length from 2.8-8.0 inches, and represented three stocking-classes of fish, 2010, 2011, and 2012. During spring 2013, fyke nets should be deployed in Dry Blood Reservoir to further assess crappie presence/absence.

Catfish/Crappie Wild Fish Transfers – A 2011 wild fish transfer of channel catfish *(Ictalurus punctatus)* from the Musselshell River to Wolf Coulee #1 pond was postponed until 2012 due to historically high spring flows and continued high flows throughout the summer months. Two attempts were made in 2012 with four hoop nets deployed overnight on both occasions. The May 1, 2012 attempt resulted in the capture of seven catfish; an insufficient quantity to warrant transfer. The second attempt took place on July 2, 2012 and resulted in the capture of seventeen channel catfish ranging in length from 9.3-13.7 inches which were successfully planted in Wolf Coulee #1. More channel catfish should be supplemented in 2013-14 to enhance this fishery.

Black crappie were transferred from Largent Bend to Whisker Reservoir on April 18, 2012. A total of 222 Age-1 fish were successfully planted.

STREAMS

Big Spring Creek (Table 5), Collar Gulch Creek, South Fork Judith River, and the Musselshell River were sampled in 2012. In addition, a preliminary investigation of Chicago Gulch Creek was carried out to access the possibility of future chemical treatment to remove brook trout and reintroduce native westslope cutthroat trout. Data from temperature loggers retrieved in 2012 are summarized in Appendix 3. Flows were monitored on Big Spring Creek (Appendix 4).

South Fork Judith River—A three-pass depletion estimate of the South Fork Judith River was completed at the Dry Pole trend section in 2012. Four species were detected: brook trout, mountain whitefish (*Prosopium williamsoni*), rainbow trout, and westslope cutthroat trout (Table 3). In addition, westslope cutthroat trout/rainbow trout hybrids were sampled.

Oncorhynchus sp. numbers were the second highest on record, and similar to the record high observed in 2006 (Figure 19). In 2006, three hybrids and one westslope cutthroat trout were sampled; however, in 2012 four hybrids and fourteen westslope cutthroat trout were sampled. In 2006 a barrier was constructed at river mile 9, and significant effort has taken place to manually remove non-native rainbow trout and brook trout. Additionally, westslope cutthroat trout have been stocked annually above the barrier in an effort to genetically 'swamp' this artificially closed system. The increase in westslope cutthroat in the Dry Pole estimate section can be attributed to these upstream restoration efforts. Eight of the fourteen captured westslope cutthroat trout had removed adipose fins, positively identifying them as fish planted above the barrier.

Mountain whitefish numbers had declined significantly from 2006 and were below the long term average (Figure 19). Six brook trout were sampled in 2012; an increase from one brook trout observed in 2006.

Table 3. Summary statistics from fish captured from streams and rivers of central Montana electrofishing surveys of 2012.

Water (Date) Location Length	Species	N	Length (inches)			Weight (pounds)			W_r
			Min	Mean	Max	Min	Mean	Max	Mean
S. Fk. Judith River (7/18/2012) Dry Pole 895 ft	Brook trout	6	7.2	9.1	11.2	.15	.27	.53	94.4
	Mtn whitefish	22	5.9	7.6	10.0	.07	.16	.32	96.5
	Rainbow trout	139	2.8	7.4	12.7	.01	.19	.70	105.0
	RBxCT hybrid	4	7.3	8.6	11.0	.18	.26	.48	---
	Westslope cutthroat	14	6.1	7.3	9.9	.08	.19	.33	124.5

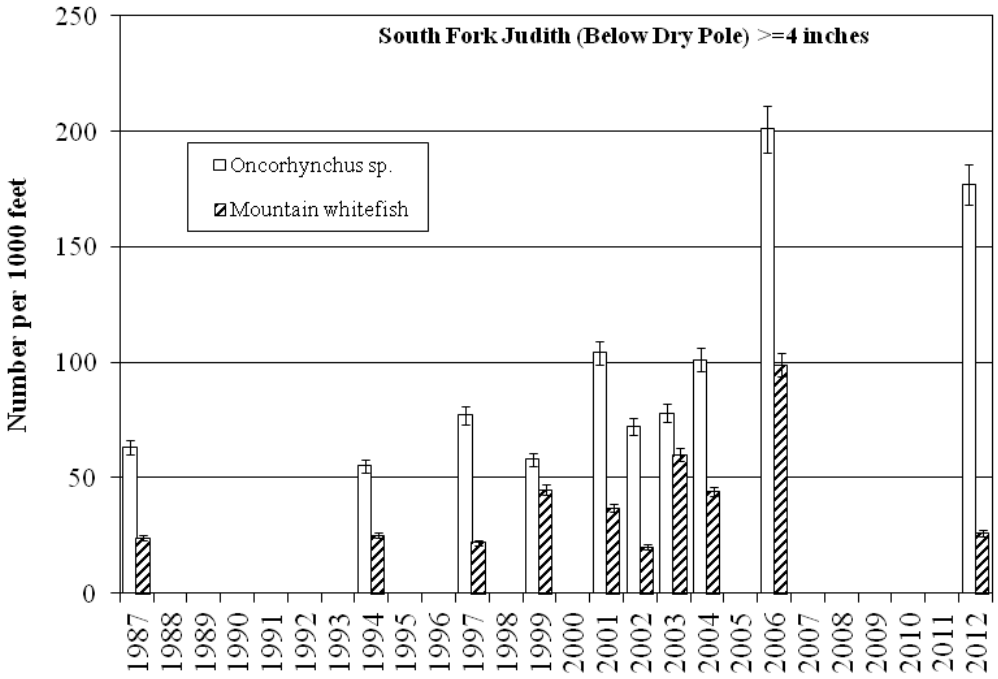

Figure 19. Trends in abundance of *Oncorhynchus sp.* and mountain whitefish on the S. Fk. Judith below Dry Pole Creek (95% CI shown).

Big Spring Creek

In 2012, trout population estimates were completed on the Machler and Carroll Trail sections of Big Spring Creek (Table 2, Figure 20). Population trends of total trout ≥10 inches in both sections continued to decline from the recent highs observed in 2010 (Figure 20). The Machler and Carroll Trail sections had similar densities of 10-inch plus trout, with Carroll Trail

supporting approximately 12% more trout per mile (Figure 21). The Carroll Trail estimate was below the 10-year (80%) and 30-year (87%) averages. Brown trout (≥10 inches) declined in both sections from the record highs observed in 2011; however, the trend was similar to the population in 2009 and 2010 (Figure 22). The Carroll Trail estimate of 10-inch plus brown trout was above the 10-year (118%) and the 30-year (182%) averages. Rainbow trout (>10 inches) continue to decline in both sections, and in 2012 were at the lowest number per mile observed since 1978 (Figure 23). The Carroll Trail estimate of 10-inch plus rainbow was well below the 10-year (52%) and 30-year (48%) averages.

In recent years, low catch rates of 6-10 inch rainbow trout have made it difficult to obtain good estimates. Beginning in 2006, the percentage of rainbow trout comprising the overall trout population at Carroll Trail began to decline (Figure 24). Furthermore, a rather drastic decline in percent rainbow trout occurred at both Carroll Trail and Machler between 2010-2011. The percent composition in 2012 (37%) increased only slightly over the 2011 record low. The estimate of 6-10 inch rainbow trout (96) at Carroll Trail was the lowest on record and well below the 10-year (19%) and 30-year (15%) averages.

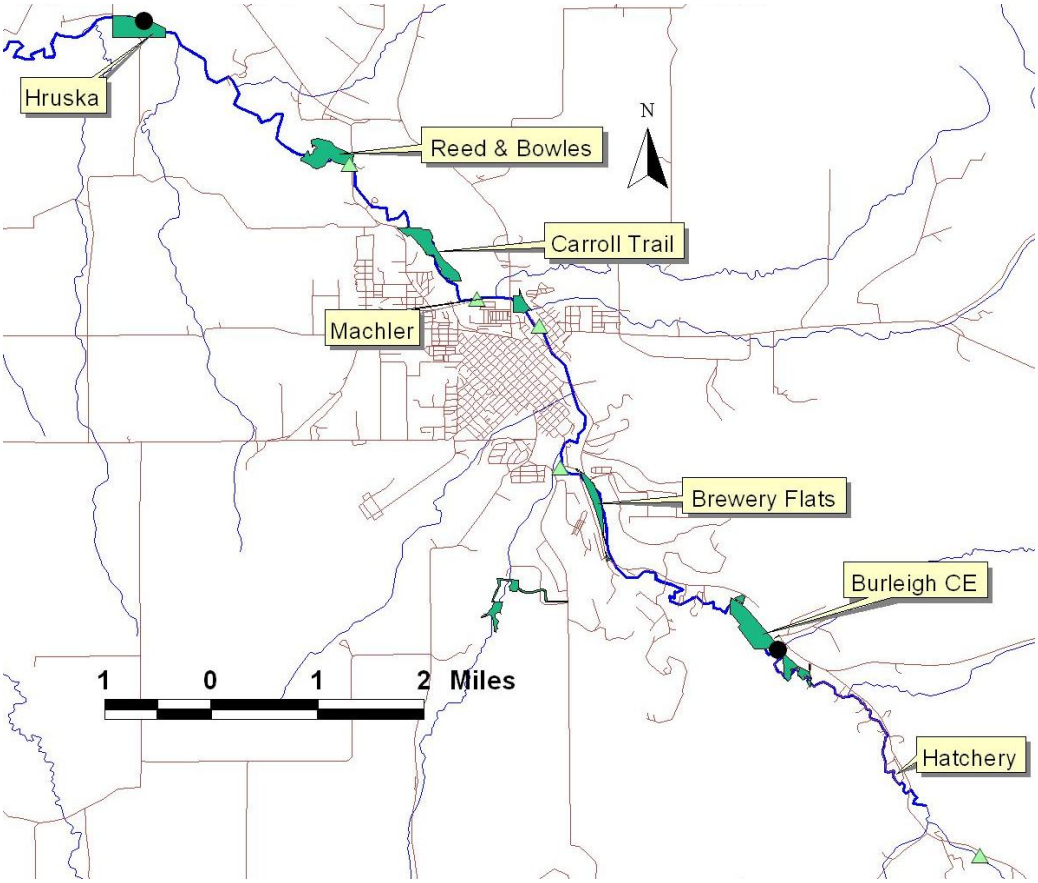

Figure 20. Map of estimate sections, flow and thermograph stations on Big Spring Creek. Black circles are thermograph locations, green triangles flow monitoring locations.

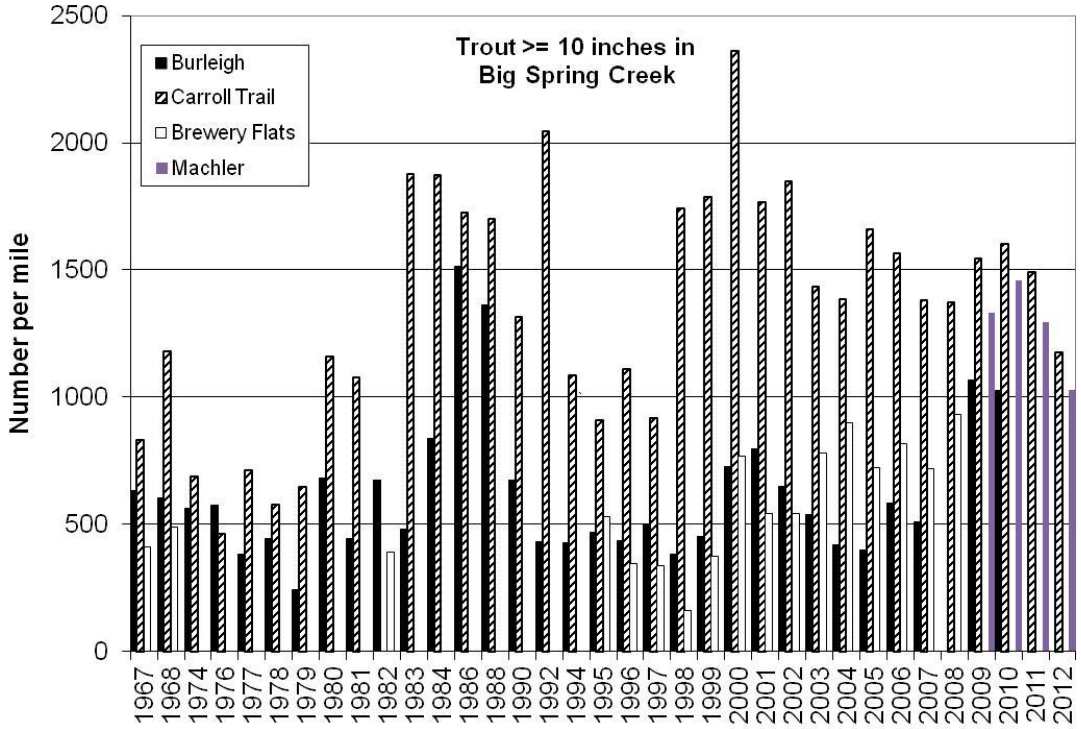

Figure 21. Population trends for all trout (≥10 inches) on Big Spring Creek, 1967-2012.

Table 4. Mark recapture statistics from population estimates from Big Spring Creek during 2012. SD in parenthesis.

Rainbow trout 2012

Section	Date Marked	# Marked	# Captured	# Recaptured	Pooled (P)	#/mile 6-10 inches	#/mile ≥10 inches	#/mile ≥6 inches	Biomass/ Mile (lbs.)
Machler 3410 ft	8/28	122	120	45	.055	74	423	497 (42)	354 (58)
Carroll Trail 5600 ft	8/28	154	192	55	.206	96	428	524 (43)	341 (45)

Brown trout 2012

Section	Date Marked	# Marked	# Captured	# Recaptured	Pooled (P)	#/mile 6-10 inches	#/mile ≥10 inches	#/mile ≥6 inches	Biomass/ Mile (lbs.)
Machler 3410 ft	8/28	189	235	87	0.548	206	607	813 (46)	572 (92)
Carroll Trail 5600 ft	8/28	347	399	122	.665	323	746	1069 (42)	680 (64)

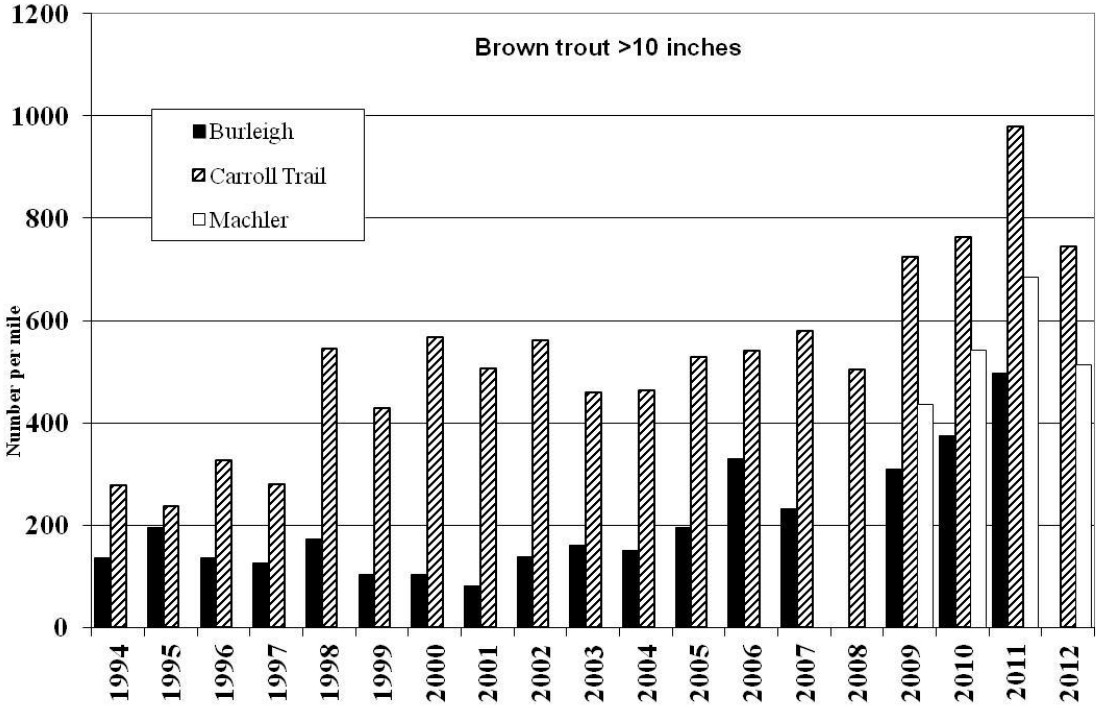

Figure 22. Brown trout (≥10 inches) population trends for three sections of Big Spring Creek.

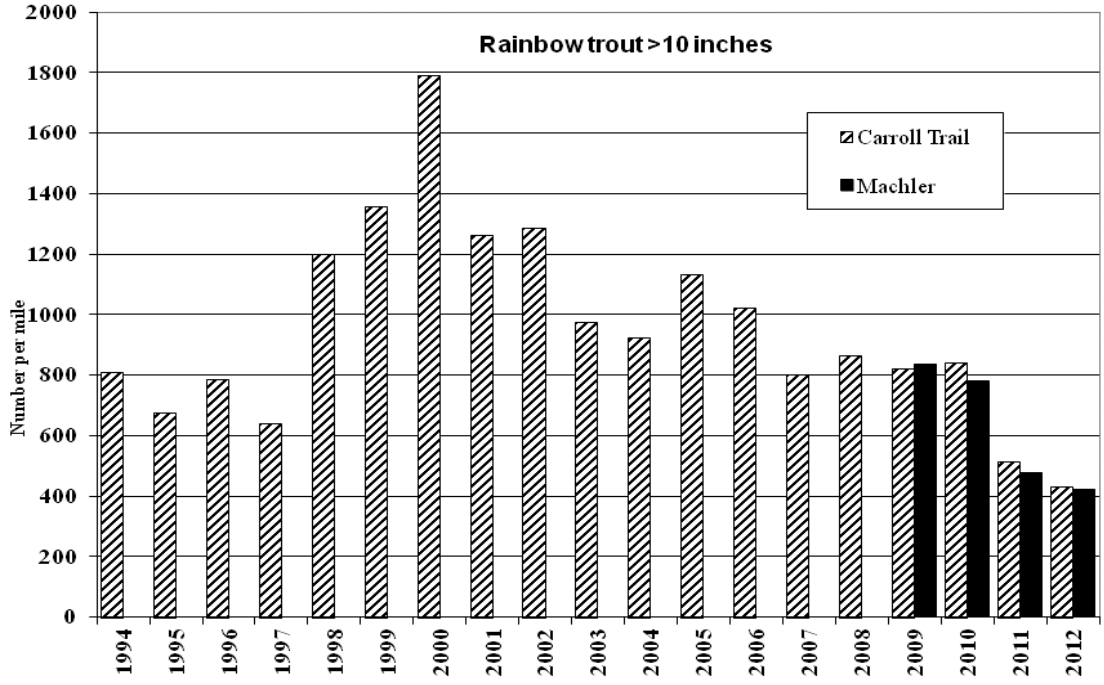

Figure 23. Rainbow trout (≥10 inches) population trends for two sections of Big Spring Creek.

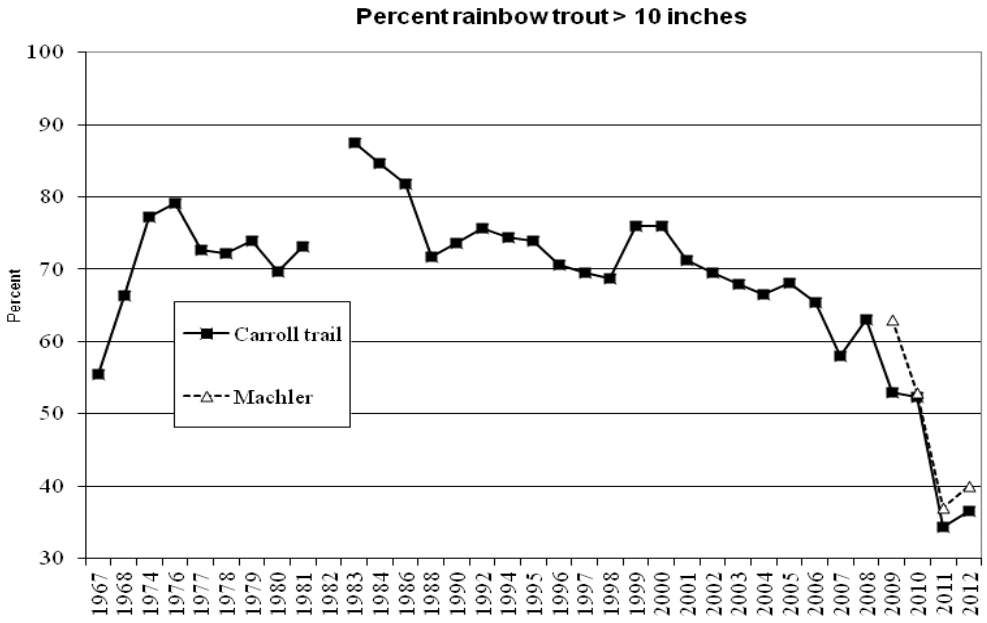

Figure 24. Percent rainbow trout >10 inches for two sections of Big Spring Creek.

Redd Surveys –Brown trout redd surveys were conducted between December 10 and December 20, 2012 on seven fishing access sites on Big Spring Creek. Trend counts were completed as early as 2002 at five of these sites (Table 5). Above Lewistown counts were similar to 2011 at Burleigh FAS and remained slightly above the 10-year average. At Brewery Flats FAS counts were well above the mean and tied for the highest on record. Below Lewistown brown trout redds generally declined from 2011 numbers; the exception being Reed and Bowles FAS which has had above-average counts since 2009 and was a record high in 2012. Lazy KB, Machler, Carroll Trail, and Hruska redd densities all declined in 2012 to below the 10-year average.

Physical parameters --Central Montana experienced more typical flows in 2012, particularly when compared to the historic and destructive flooding of 2011. The annual precipitation for the Smith-Judith-Musselshell River Basins was 124% of normal in water year 2011. In water year 2012, these basins were 94% of the long-term average and 82% of 2011 total precipitation. As a result of channel morphology and hydrologic changes, in 2012 new rating curves were developed at the Hatchery Trutrack site, Ash Street Stevens recorder site, and Reed and Bowles Trutrack site. Additionally, the Reed and Bowles stilling well was repaired, and operational throughout Summer 2012. Two hydrograph peaks occurred on Big Spring Creek in 2012, one on March 5th (441cfs) and the other on May 1st (368cfs) (Figure 25). Draining of East Fork Spring Creek Reservoir resulted in a ~40cfs increase to downstream flows on July 25, 2012, but as draining completed releases were scaled back and flows returned to pre-draining values on August 18, 2012.

Big Spring Creek

Hatchery: The Hatchery site is upstream of East Fork Big Spring Creek and did not experience the Late July-August influx of flow from the draining of East Fork Spring Creek Reservoir. The deployed trutrack functioned flawlessly in 2012; thus, a complete dataset for the year is available. Three flow measurements were taken at this site in 2012 and applied to post-flood 2011 flow measurements to develop a new flow curve. High spring flows in 2011 scoured watercress from the stream bottom. The watercress has been slow to re-colonize, and the vegetation correction required in past years was no longer needed in 2012. The hydrograph peaked on May 1, 2012 at 198 cfs. This peak flow was 62% of that observed in 2011 and the duration was much shorter, resulting in steep ascending and descending limbs. Overall the Big Spring discharge has increased 20-30 cfs since winter 2010/2011 base flows of 119 cfs. Hatchery base flow dropped slightly from December 2011 average flow of 156 cfs to December 2012 base flow of 141 cfs.

Ash Street: The Ash Street Stevens recorder remained operational throughout 2012. Four flow measurements were taken at this site in 2012 and applied to post-flood 2011 flow measurements to develop a new flow curve. 2011 flood flows resulted in a large pool forming upstream of the Ash Street bridge and continuing downstream of the bridge to the first meander. As a result, the flow measurement site had to be relocated downstream of the Ash Street bridge and upstream ~70 yards from the footpath bridge. The hydrograph peaked on two occasions in 2012, once on March 5th (441 cfs) when a terrestrial temperature spike resulted in the flashy melting of lowland snowpack, and once on May 1st (368 cfs) when the mountain snowpack lose peaked. A spike of 36 cfs was observed on the Ash Street hydrograph on July 25, 2012; two days after draining commenced at East Fork Spring Creek Reservoir. Draining releases were incrementally scaled down and flows stabilized on August 18, 2012. Average December 2012 flow (148 cfs) was 86% of average December 2011 flow (175 cfs). Despite continued high discharge from the Big Spring origin, winter 2012-13 flows are similar to those observed pre-2011 flooding. This discrepancy is likely due to the minimum outflow from East Fork Big Spring Creek Reservoir as it continues to fill to full pool.

Mill Ditch: The Mill Ditch trutrack remained operational throughout 2012. Flow measurements have confirmed that the original weir discharge formula used to calculate Mill Ditch was flawed. Six flow measurements taken from 2009-2012 have been used to generate a flow curve that Mill Ditch trutrack measurements are now applied to. This new flow curve was applied to all of 2012. The flow curve projected that peak flow at Mill Ditch was 253 cfs on May 1, 2012. The draining of East Fork Spring Creek Reservoir resulted in a 33 cfs flow increase on July 26, 2012. Between April 27-October 15, 2012 over 110 cfs was diverted into Mill Ditch for all but nine days. A comparison of Ash Street and Mill Ditch September flows suggest that an average of only 11.6 cfs or 8% of the total flow was being allowed to pass through town in the Big Spring Creek channel. This issue was corrected on October 16, 2012 and Mill Ditch flow was diminished to ~40 cfs. Average December 2012 Mill Ditch discharge was 24 cfs; thus 124 cfs or 84% of the total flow was allowed to pass through town in the Big Spring Creek channel.

Reed and Bowles: The Reed and Bowles stilling well was compromised during 2011 flooding. When river stage surpassed the top of the stilling well the internal pressure displaced the top cap allowing for fine sediment to fill the internal chamber and inlet pipes. Sediment was removed in 2011; however, blockage persisted in the inlet pipes resulting in an underestimate of water level and discharge by the deployed trutrack. The inlet pipes were cleared of obstruction on April 5, 2012, resulting in a properly functioning stilling well and trutrack system. The trutrack remained operational until October 12, 2012 when a battery failure prevented download of remaining 2012 data. Five flow measurements were taken at this site in 2012 to develop a new flow curve. The Reed and Bowles hydrograph peaked on May 1, 2012 at an estimated 367 cfs. A 41 cfs increase in discharge occurred on July 26, 2012 when the influx of water from the draining of East Fork Big Spring Creek Reservoir reached this site.

Table 5. Brown trout redd count trends on Big Spring Creek.

		Number Observed		Number Redds/1000 feet											
Section	Date	Redds	Section Length (ft)	02	03	04	05	06	07	08	09	10	11	12	$\bar{x}$
Burleigh	13-Dec	159	11563	22	20	15	14	9	8	8	10	10	15	14	13
Brewery Flats	18-Dec	159	5104	12	14	31	20	22	10	17	23	23	17	31	20
Lazy KB	20-Dec	13	900	----	16	17	10	9	11	----	9	34	27	14	16
Machler	20-Dec	38	3410	----	----	----	----	----	----	----	4	10	21	11	12
Carroll Trail	20-Dec	63	5600	31	----	13	9	16	13	15	12	18	19	11	16
Reed & Bowles	10-Dec	82	3749	19	----	12	16	11	8	----	19	21	20	22	16
Hruska	13-Dec	21	3115	44	33	25	21	15	8	26	12	10	19	7	20

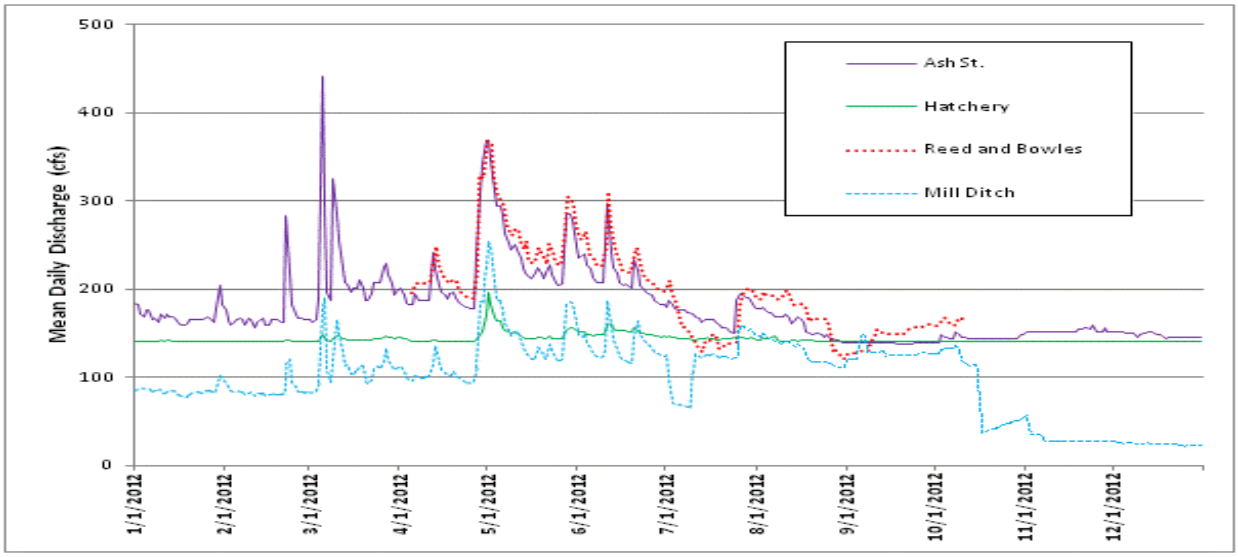

Figure 25. Flows at four different locations on Big Spring Creek 2012. The combination of water level recording device and stilling well failure at Reed and Bowles limited the hydrograph to between April 5th-October 11, 2012.

Musselshell River Drainage

The Lower Musselshell River experienced the highest flows on record in 2011. The USGS has rated the discharges in excess of 20,000cfs observed at Mosby as a 500-year flood event. Above average flows continued throughout the summer resulting in the cancelation of a scheduled wild fish transfer in which the Lower Musselshell River was the source population of channel catfish. Two attempts to capture channel catfish were made in 2012 with four hoop nets deployed overnight on both occasions. Aside from the target, channel catfish, three other species were sampled as by-catch: black crappie, flathead chub (*Hybopsis gracilis*), and shorthead redhorse (*Moxostoma macrolpidotum*).

A total of four seine hauls were completed in July 2012, two at river mile 20.0 and two at river mile 9.0. A total of eleven species were captured: channel catfish, common carp, emerald shiner (*Notropis atherinoides*), flathead chub, river carpsucker (*Carpiodes carpio*), sand shiner (*Notropis stramineus*), shorthead redhorse, spottail shiner (*Notropis hudsonius*), white sucker, western silvery minnow (*Hybognathus argyritus*), and yellow perch.

Black crappie, spottail shiner, and yellow perch are three species that have not been observed in the Lower Musselshell River in recent years. Increased prevalence of these three species was noted in the Missouri River above Fort Peck Reservoir following the 2011 flood event. The rise of Fort Peck Reservoir water elevation and resulting inundation of several river miles of both the Musselshell and Missouri Rivers likely created favorable conditions for these normally lentic fishes.

Habitat Protection – In the Lewistown area, 21 Natural Streambed and Land Preservation Act "310" permits and 8 Montana Stream Protection Act "124" permits were processed during 2010. Environmental Assessments were written for 4 private ponds, 2 wild fish transfers and 3 potential FWP stocked ponds. Several grants and assessments were evaluated/written for the Machler Restoration Project

Fish Species Involved

Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Emerald shiner	*Notropis atherinoides*
Flathead chub	*Hybopsis gracilis*
Lake chub	*Couesius plubeus*
Largemouth bass	*Micropterus salmoides*
Longnose sucker	*Catostomus catostomus*
Mountain whitefish	*Prosopium williamsoni*
Northern pike	*Esox lucius*
River carpsucker	*Carpiodes carpio*
Rainbow trout	*Oncorhynchus mykiss*
Sauger	*Sander canadense*
Sand shiner	*Notropis stramineus*
Shorthead redhorse	*Moxostoma macrolpidotum*
Spottail shiner	*Notropis hudsonius*
Walleye	*Sander vitreus*
Western silvery minnow	*Hybognathus argyritus*
Westslope cutthroat trout	*Oncorhynchus clarkii lewisi*
White crappie	*Pomoxis annularis*
White sucker	*Catostomus commersoni*
Yellow perch	*Perca flavescens*
Yellowstone cutthroat trout	*Oncorhynchus clarkii bouvieri*

Code Numbers of Waters Referred to in this Report:

16-310	Big Spring Creek, Sec 2
16-4260	Upper Carter Pond
16-4261	Lower Carter Pond
16-4300	Ackley Lake
16-3470	Slivka #1
16-3520	South Fork Judith
16-4304	Anderson Coulee
16-4461	Benes #3
16-4610	Carpenter
16-4628	Casino Creek Reservoir
16-4950	East Fork Spring Creek Reservoir
16-6070	Jakes Reservoir
16-7359	Olsen Pond
16-7642	Peterson Pond
16-8290	Slivka #2
16-8805	Whisker Reservoir
18-7180	Musselshell River Section 1
18-7565	Dry Blood Reservoir
18-7750	Bair Reservoir
18-7839	Holland Reservoir
18-8380	Martinsdale Reservoir
18-8700	Payola Reservoir
18-8720	Petrolia Reservoir
18-8976	Wolf Creek Ranch, Upper
18-8977	Wolf Creek Ranch, Lower
18-9150	South Fork Blood Reservoir
18-9480	Upper Wolf Coulee (Dry Wolf)
18-9479	Wolf Coulee #2
18-9500	Yellow Water Lake

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Appendix 1. First season growth (June – September) from rainbow trout stocked in three central Montana Reservoirs. Length gain is estimated from stocking records and mid September gill netting.

	Ackley Lake					Bair Reservoir					Martinsdale Reservoir				
Year	Length Stocked	Length netted	N	Length Gain	Mean W_r	Length Stocked	Length netted	N	Length Gain	Mean W_r	Length Stocked	Length netted	N	Length Gain	Mean W_r
2012	2.9	8.0	16	5.1	88.8	3.2	8.3	14	5.1	71.6	3.6	9.1	2	5.5	110.2
2011	3.2	8.0	23	4.8	82.8	3.4	8.5	10	5.1	95.3	3.5	9.0	7	5.5	93.0
2010	3	8.2	23	5.2	83.0	3.2	8.7	10	5.5	89.9	4.1	9.8	22	5.7	98.0
2009	3.6	7.8	20	4.2	94.8	3.4	8.4	22	5.0	96.6	4.4	10.8	13	6.4	102.2
2008			0			3.2	7.8	15	4.6	88.4	5.3	11.0	16	5.7	109.6
2007	3.3	8.6	34	5.3	80	3.1	8.6	14	5.5	82.6		N/A			
2006	3.0	9.3	46	6.3	85.4	3.0	8.3	8	5.3	77.0	4.6	N/A			
2005	3.2	7.8	18	4.6	75.3	3.2	7.9	17	4.7	76.1	3.6	10.2	5	6.6	106.2
2004	4.2					4.1	8.6	44	4.5	77.3	5.1	10.3	27	5.2	90.0
2003	3.7*	9.2	1	5.5	98.4	4.3		0			5.0	10.4	36	5.4	106.4
2002	3.3	9.3	27	6.0	100.9	3.1	8.6	26	5.5	85.2		N/A			
2001	3.3	8.5	14	5.2	93.6	2.8	7.7	12	4.9	81.1		N/A			
2000	3.1	8.8	5	5.7	86.5	3.9	N/A					N/A			
1999	3.3	8.9	2	5.6	86.1	3.2	7.8	13	4.6	87.4	4.9	10.9	2	6.0	110.0
1998	3.1*	8.5	97	5.1	85.1	3.1	7.8	26	4.7	72.8	4.5	9.1	40	5.4	93.6
1997	3.3	9.2	27	5.9	86.4	3.1	8.1	10	5.0	73.9	5.0	10.8	12	5.4	99.1
1996	3.5	9.9	16	6.4	87.0	2.9	7.9	59	5.0	71.8	4.9	11.1	26	6.2	99.2
1995	3.7	8.9	14	5.2		3.8	7.9	12	4.1	74.5	5.0	10.7	20	5.7	121.5
1994	3.8	9.5	23	5.7	77.1	3.4	8.3	30	4.9	74.9	5.1	10.7	74	5.6	100.4
Mean	3.3	8.7	23	5.4	86.8	3.3	8.2	19	4.9	81.0	4.6	10.3	23	5.7	102.8

* Includes fish stocked through July

Appendix 2. Length at Age of spiny-rayed fishes in the Lewistown study area, 2012.

Lewistown Area Yellow Perch (Length at Age)

	Big Casino		East Fork		Jakes	
Age	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**
1	--	----------	--	----------	--	----------
2	--	----------	--	----------	--	----------
3	11	6.7 (6.3-6.9)	2	5.5 (5.4-5.5)	1	5.4
4	14	7.3 (7.0-7.6)	--	----------	19	6.0 (5.8-6.3)
5	7	7.7 (7.2-7.9)	8	8.0 (6.6-10.0)	24	7.2 (6.3-8.3)
6	6	8.0 (7.4-8.3)	6	9.9 (8.0-10.6)	11	7.7 (6.0-9.2)
7	6	9.0 (8.1-10.3)	16	9.3 (7.4-10.8)	1	8.7
8	24	9.6 (8.3-11.1)	34	9.8 (7.4-12.0)	4	8.1 (7.6-8.5)
9	17	9.9 (8.3-11.3)	25	10.2 (7.7-13.1)	1	11.1
10	11	10.1 (8.7-11.4)	22	10.3 (7.5-13.0)	--	----------
11	3	10.6 (9.3-11.5)	8	11.6 (10.3-13.1)	--	----------
12	--	----------	1	11.9	--	----------

Lewistown Area Misc. Fishes (Length at Age)

	East Fork (BG)		Upper Carter (BG)		Holland (LMB)		Jakes (SGR)		Musselshell (CCAT)	
Age	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**	**N**	**Mean (Min-Max)**
1	--	----------	--	----------	--	----------	--	----------	--	----------
2	--	----------	1	4.6	7	5.7 (5.3-6.0)	--	----------	--	----------
3	--	----------	--	----------	19	11.3 (10.4-12.0)	--	----------	--	----------
4	--	----------	--	----------	--	----------	--	----------	--	----------
5	1	6.9	--	----------	--	----------	--	----------	4	10.8 (9.8-11.5)
6	2	7.6 (7.1-8.2)	2	9.0 (8.9-9.1)	--	----------	--	----------	1	13.5
7	1	8.5	--	----------	--	----------	--	----------	4	17.3 (16.9-17.9)
8	--	----------	--	----------	--	----------	--	----------	--	----------
9	--	----------	--	----------	--	----------	11	19.8 (18.0-22.7)	--	----------
10	--	----------	--	----------	--	----------	--	----------	--	----------
11	--	----------	--	----------	--	----------	--	----------	--	----------
12	--	----------	--	----------	--	----------	--	----------	1	28.7
[redacted]										
19	--	----------	--	----------	--	----------	--	----------	1	32.3

Appendix 3. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters in 2012.

Burleigh FAS Bridge 2012 N 47.026990, E109.377089

2012	January			February			March			April			May			June		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1				46.4	47.4	49.0	46.6	47.7	50.1	48.3	49.7	51.7	48.3	49.7	51.7	50.3	54.0	58.0
2				47.1	47.7	48.6	46.5	47.6	49.8	47.2	49.2	52.6	47.2	49.2	52.6	51.4	54.4	58.5
3				46.7	47.5	49.9	47.1	48.3	50.8	46.6	49.9	53.9	46.6	49.9	53.9	51.0	54.8	58.8
4				46.8	47.7	50.4	45.9	48.3	51.5	48.0	50.7	54.4	48.0	50.7	54.4	52.2	55.9	60.3
5				46.9	47.8	50.2	40.3	44.9	48.6	48.2	49.0	50.3	48.2	49.0	50.3	54.0	56.9	61.4
6				47.2	47.7	48.4	40.8	42.9	44.7	46.7	47.4	48.5	46.7	47.4	48.5	52.9	55.7	59.1
7				46.6	47.4	49.0	43.7	45.4	47.2	45.9	48.7	52.5	45.9	48.7	52.5	51.7	55.1	59.2
8				46.5	47.6	50.4	45.4	47.4	50.1	46.5	49.4	53.3	46.5	49.4	53.3	53.2	55.6	59.7
9				47.2	48.0	49.4	43.3	47.3	51.8	47.4	49.9	53.6	47.4	49.9	53.6	52.2	53.7	55.3
10	45.6	47.7	48.8	46.4	47.3	48.3	42.7	45.4	49.2	47.6	49.9	53.2	47.6	49.9	53.2	50.7	51.3	52.6
11	45.9	46.5	48.0	46.1	47.3	50.2	44.1	46.5	50.0	48.3	51.0	54.7	48.3	51.0	54.7	50.7	54.0	58.2
12	46.3	47.2	48.7	46.9	48.1	50.4	44.6	46.8	49.4	48.2	49.9	50.8	48.2	49.9	50.8	51.3	55.0	59.8
13	47.0	47.5	47.9	48.1	48.4	49.2	46.4	48.1	51.5	46.6	49.9	53.9	46.6	49.9	53.9	53.2	55.3	58.5
14	46.9	47.9	49.1	46.4	47.7	48.7	45.9	47.2	49.1	47.3	50.5	54.2	47.3	50.5	54.2	51.8	55.2	59.4
15	46.3	47.0	47.7	46.4	47.5	50.2	46.9	48.6	50.7	47.5	48.7	50.0	47.5	48.7	50.0	52.2	54.8	58.8
16	45.8	46.5	47.6	46.5	47.8	50.0	47.2	48.4	50.7	47.1	49.5	52.9	47.1	49.5	52.9	51.5	54.9	58.3
17	45.5	46.6	48.0	47.1	48.3	50.1	47.3	49.1	52.0	48.9	50.6	52.9	48.9	50.6	52.9	53.4	54.8	57.7
18	44.5	45.2	45.8	46.9	48.1	49.9	47.1	48.7	50.8	48.7	50.0	52.5	48.7	50.0	52.5	51.6	55.0	59.1
19	45.0	46.0	47.2	47.2	48.1	50.1	42.2	44.6	47.9	47.6	50.0	53.0	47.6	50.0	53.0	52.0	54.1	56.5
20	44.5	46.7	48.5	47.0	47.8	48.7	45.2	46.6	47.9	48.3	50.6	54.0	48.3	50.6	54.0	51.9	53.5	56.3
21	47.7	48.6	49.8	47.0	48.2	49.0	46.6	48.9	52.5	49.4	51.5	54.2	49.4	51.5	54.2	51.4	55.6	60.3
22	46.7	47.4	48.9	42.2	45.9	48.6	47.6	49.3	52.7	49.2	52.7	57.2	49.2	52.7	57.2	53.1	55.5	58.1
23	46.5	47.5	49.2	42.9	44.9	46.6	47.1	48.7	52.1	50.4	53.5	58.1	50.4	53.5	58.1	53.4	56.9	61.6
24	46.1	47.3	49.2	45.9	47.2	49.5	47.1	48.1	50.1	51.1	54.0	57.7	51.1	54.0	57.7	55.0	57.7	62.2
25	46.9	47.9	49.5	45.2	46.9	49.0	46.5	48.9	52.3	51.1	53.9	57.7	51.1	53.9	57.7	55.1	58.2	63.1
26	45.8	47.9	49.1	45.4	46.8	48.5	47.0	49.0	52.5	52.2	53.3	55.3	52.2	53.3	55.3	54.7	58.2	62.4
27	45.8	47.1	48.6	46.2	47.3	49.6	46.3	48.5	51.6	45.0	49.2	52.2	45.0	49.2	52.2	52.4	55.6	59.4
28	46.6	47.7	49.4	46.1	47.4	49.6	46.4	48.6	51.6	44.6	45.6	46.6	44.6	45.6	46.6	52.1	56.0	60.6
29	47.3	48.0	48.5	46.3	47.6	49.7	46.5	48.6	51.0	46.3	48.9	52.1	46.3	48.9	52.1	53.5	56.7	61.1
30	45.6	46.7	47.6				47.7	49.7	52.8	46.2	48.6	51.0	46.2	48.6	51.0	53.4	57.0	61.6
31	45.8	46.9	48.5				48.2	50.3	53.5				49.2	52.3	55.0			

Thermograph was compromised and Onset was unable to retrieve data from 8/18/2011-1/9/2012.

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters in 2012.

Burleigh FAS Bridge 2012 continued

2012	July			August			September			October			November			December		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	54.2	57.0	61.7	54.8	57.9	61.8	52.4	53.9	56.6	50.2	52.2	55.7	50.0	50.8	52.4	49.5	50.0	51.2
2	54.0	57.2	61.3	54.2	57.2	60.9	50.7	53.3	57.1	51.1	52.7	55.6	49.6	50.7	52.4	48.9	50.0	51.1
3	54.5	57.3	62.0	54.4	55.9	57.8	50.5	53.1	57.1	49.8	50.5	51.6	48.9	50.3	52.6	48.3	48.8	49.9
4	52.7	56.2	60.5	53.1	56.4	60.4	50.8	52.9	56.6	50.0	50.5	51.8	50.0	50.8	52.0	48.4	49.4	50.6
5	52.8	54.3	56.0	53.3	56.9	61.2	50.4	53.0	57.2	48.9	50.1	51.8	50.0	51.0	52.7	48.2	49.7	51.3
6	52.5	56.1	60.1	53.9	57.0	60.7	51.4	52.6	55.0	48.0	50.0	53.0	49.5	50.7	52.1	48.3	48.9	49.7
7	53.5	56.5	60.9	54.6	57.6	61.4	50.8	53.2	57.1	49.5	51.2	54.1	49.8	51.1	52.6	48.3	48.7	49.7
8	53.7	56.5	61.4	53.7	57.0	60.9	50.4	53.0	57.2	49.6	50.5	50.8	47.8	49.0	49.7	46.1	47.5	48.8
9	53.4	57.0	61.8	54.8	57.4	61.0	50.9	53.2	57.2	49.4	50.6	53.4	47.3	48.2	49.1	46.3	47.2	49.1
10	54.0	56.9	60.4	54.9	56.3	58.8	51.6	53.3	56.7	49.3	51.0	54.1	46.7	47.3	48.7	47.6	48.2	49.3
11	53.8	56.7	60.9	54.7	56.5	60.1	50.2	52.1	55.3	49.5	50.4	52.4	46.4	47.7	49.4	47.3	48.4	49.6
12	53.7	57.0	61.7	54.2	57.0	60.9	49.7	51.8	55.4	49.2	51.0	54.4	47.4	48.8	50.5	48.7	49.2	49.7
13	53.9	55.9	59.4	54.1	56.9	60.9	49.9	52.3	56.4	50.0	51.1	53.5	48.7	49.3	50.9	48.0	48.5	49.8
14	54.5	55.7	57.9	53.6	56.4	60.4	50.4	52.5	56.3	49.9	51.5	54.0	48.1	49.2	50.6	47.9	48.8	50.1
15	54.4	56.5	60.9	52.6	54.5	55.9	50.9	52.6	55.8	50.8	51.8	53.0	48.1	49.0	51.0	47.4	48.2	49.6
16	53.3	56.4	61.2	51.9	54.7	58.8	50.9	52.5	55.6	49.3	51.0	52.3	48.4	49.6	51.2	47.5	48.2	49.6
17	54.3	56.6	59.6	51.9	54.9	59.0	50.0	52.3	56.0	48.9	49.6	51.0	48.5	49.5	51.6	47.5	48.6	50.1
18	53.7	56.8	60.8	51.9	54.7	58.8	50.4	52.6	56.7	48.6	50.1	52.9	48.6	49.5	51.2	47.4	48.0	48.9
19	53.4	56.4	61.2	51.6	54.6	58.9	50.3	52.4	55.8	49.3	50.8	52.7	48.2	49.3	51.1	47.1	47.9	49.2
20	54.0	55.6	59.8	52.1	54.8	59.1	50.5	52.5	55.8	49.8	51.1	52.7	49.5	50.2	51.2	47.6	48.5	50.1
21	53.6	56.9	61.4	52.2	54.9	58.9	50.5	52.6	56.4	49.5	50.4	52.0	48.6	49.9	50.8	48.4	49.0	50.4
22	53.5	56.5	61.0	53.0	55.2	58.8	50.5	52.7	56.4	49.1	49.9	51.1	47.7	48.2	48.9	47.3	48.0	49.2
23	54.0	56.2	60.3	51.9	54.5	58.5	50.8	52.6	55.4	47.5	49.2	50.5	48.0	49.0	50.4	47.3	47.9	49.4
24	53.3	55.9	60.0	51.9	53.8	57.1	50.5	52.5	55.8	47.7	49.1	51.3	49.2	49.6	50.3	46.5	46.9	47.5
25	52.4	56.0	60.0	50.5	53.3	57.3	50.6	52.3	55.2	48.0	48.3	48.6	48.7	49.1	50.4	46.5	47.1	48.1
26	53.7	57.2	61.6	50.8	53.5	57.3	51.0	52.3	55.3	48.1	49.0	50.6	47.4	48.4	50.1	47.0	47.7	49.1
27	54.4	56.7	59.7	52.2	54.6	58.9	50.7	52.5	56.0	48.5	49.3	50.6	47.8	48.6	50.1	47.4	48.1	49.4
28	54.6	58.1	62.0	52.2	54.7	58.8	50.6	52.5	56.1	48.8	50.3	52.3	48.4	49.1	50.7	47.2	48.3	49.3
29	54.7	58.1	62.1	52.0	54.2	57.7	50.7	52.5	55.8	49.9	50.8	52.8	49.0	49.7	51.1	47.0	48.0	49.7
30	54.6	58.0	62.4	51.1	53.6	57.9	50.7	52.3	54.9	50.0	51.0	53.1	49.4	49.9	50.8	46.9	48.2	49.7
31	54.5	58.0	61.7	51.4	53.5	56.9				50.0	51.0	52.6				46.5	47.8	49.3

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters retrieved in 2012.

Hruska FAS 47.1133;109.50539																		
2012	January			February			March			April			May			June		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1				40.4	42.3	44.2	39.3	42.0	43.9	47.1	49.4	52.2	46.8	49.3	52.1	51.2	56.1	60.0
2				41.9	43.0	44.1	39.4	41.9	44.6	44.4	47.9	51.7	44.8	48.6	52.1	52.8	56.9	61.0
3				39.3	41.6	43.5	40.4	43.1	45.2	43.2	48.7	53.3	45.3	48.9	51.5	52.2	57.6	62.9
4				38.9	41.8	44.2	39.3	43.6	48.0	45.4	50.3	54.9	47.0	51.8	56.6	54.2	59.1	63.9
5				39.4	42.0	44.1	37.7	39.8	42.9	45.5	47.3	50.8	49.0	50.7	53.2	57.3	61.4	66.2
6				41.2	41.8	42.7	36.7	38.2	39.9	42.6	44.1	46.8	46.1	48.3	50.9	55.3	59.4	62.8
7				39.5	40.7	42.0	36.7	39.7	42.8	41.0	46.1	51.2	44.9	50.4	55.9	52.6	58.3	63.9
8				37.5	40.5	43.1	38.8	42.5	46.3	42.2	47.5	52.3	47.7	53.6	59.1	54.7	59.4	64.5
9				40.6	42.6	44.3	41.4	44.4	47.6	44.0	48.6	53.0	50.6	55.9	60.6	53.8	56.2	59.0
10	39.5	42.9	44.2	39.2	41.1	43.3	39.5	43.4	47.1	44.2	48.4	52.6	49.1	51.7	56.7	50.1	51.4	54.1
11	36.0	37.5	39.3	36.0	39.0	41.9	40.3	44.3	48.1	45.3	50.4	55.1	45.4	51.1	56.8	50.0	54.7	60.2
12	37.0	39.3	41.3	38.7	42.1	44.8	41.1	44.3	46.6	47.5	49.4	52.6	47.7	53.7	59.2	48.7	53.5	57.1
13	40.2	41.0	41.8	42.6	43.8	44.8	42.7	45.6	48.6	44.7	49.5	54.2	49.6	55.5	60.9	46.7	49.4	51.8
14	39.9	41.6	43.4	40.5	42.5	44.1	42.2	44.4	46.2	45.6	50.4	54.5	51.1	56.7	61.8	43.7	49.1	54.6
15	38.2	40.2	42.1	37.8	40.7	43.1	43.5	46.1	48.6	45.0	47.1	50.7	51.9	58.0	63.6	45.1	49.3	53.4
16	36.6	37.3	38.2	38.6	41.5	43.8	44.3	46.2	47.6	43.4	47.1	51.0	54.0	58.6	62.5	43.7	48.9	53.4
17	35.0	36.7	37.9	41.6	43.5	45.9	44.3	47.6	50.9	46.9	50.2	54.0	53.8	57.3	60.1	46.5	49.5	52.6
18	32.8	33.5	36.6	39.7	42.2	44.4	44.8	47.6	49.9	46.9	49.1	51.4	51.8	54.5	56.4	43.7	49.1	54.8
19	32.3	34.4	36.3	40.9	43.1	44.9	38.1	40.2	46.6	45.0	49.0	52.7	48.5	53.0	56.7	44.5	47.5	50.1
20	34.6	37.0	40.6	40.4	41.9	43.0	38.2	40.8	43.5	46.2	49.2	52.0	49.7	55.7	61.1	43.7	46.2	49.2
21	40.7	42.9	44.5	40.2	42.5	43.8	40.9	45.2	49.7	47.4	51.9	56.3	53.3	58.1	62.9	43.1	49.2	55.4
22	40.4	41.6	43.5	39.2	42.4	43.7	43.6	47.4	51.9	47.6	54.0	59.9	53.7	56.8	58.7	46.5	50.4	54.0
23	38.7	40.7	42.3	37.3	39.5	41.6	43.8	47.0	50.6	50.0	55.6	60.0	50.0	54.0	57.7	47.0	52.4	57.9
24	37.8	40.1	41.6	39.2	41.9	44.9	43.7	46.0	49.2	51.4	56.2	60.0	49.9	52.2	55.1	49.8	54.6	59.0
25	41.3	42.2	44.2	39.0	41.4	43.2	42.8	46.9	51.1	51.8	56.6	60.6	47.5	50.5	52.6	50.1	55.3	59.9
26	40.2	41.7	43.7	36.2	39.2	41.9	44.5	48.1	51.5	52.7	55.5	57.9	47.5	48.6	50.1	51.8	55.5	59.6
27	38.2	40.1	41.3	37.9	40.9	43.9	44.3	47.5	50.8	44.1	49.2	55.4	44.6	46.8	48.1	45.3	50.7	55.1
28	38.6	40.8	43.2	37.1	40.7	43.5	44.0	47.1	49.4	40.9	42.2	43.9	42.8	46.2	50.2	44.8	51.2	57.1
29	42.5	42.9	43.6	38.3	41.4	43.9	43.9	46.8	49.4	42.2	46.8	51.9	45.7	51.0	55.6	47.3	52.9	57.6
30	41.5	42.1	42.8				44.8	48.6	51.9	45.5	48.3	50.9	49.2	52.7	55.9	47.3	53.2	58.7
31	40.6	42.1	43.8				46.4	50.1	53.4				50.0	53.6	56.4			

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters retrieved in 2012.

Hruska FAS 47.1133;109.50539																		
2012	July			August			Sept			Oct			Nov			Dec		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1	48.7	53.9	58.5	49.0	53.7	58.2	45.9	49.1	53.4	39.7	44.0	47.3	38.0	39.7	41.1	45.6	46.6	47.8
2	48.1	53.8	59.0	47.6	52.3	55.9	42.3	47.4	51.8	42.3	45.3	48.4	38.3	40.1	41.1	45.5	46.6	47.8
3	49.2	54.2	58.5	47.6	50.1	53.2	41.4	46.8	51.2	39.2	40.9	45.1	36.0	38.8	40.9	42.8	43.9	46.0
4	46.5	52.3	57.1	45.1	50.4	55.7	41.7	45.7	48.7	38.3	39.6	41.1	38.6	40.0	41.4	42.1	43.9	45.9
5	46.5	48.9	53.2	46.2	51.9	57.1	40.6	45.9	50.9	37.2	38.5	39.7	38.3	43.7	51.2	43.4	45.8	47.6
6	45.1	51.2	57.3	47.3	52.1	55.7	43.1	46.0	47.8	34.0	37.7	40.3	45.4	47.9	49.5	41.8	42.9	43.9
7	47.6	52.3	56.8	48.7	53.6	57.6	41.7	46.7	51.8	37.5	40.6	43.7	48.0	49.1	50.3	41.6	42.6	43.5
8	47.8	53.3	57.3	47.0	52.5	57.1	40.9	46.4	51.2	38.9	40.1	42.0	42.4	44.7	47.9	37.5	40.0	43.2
9	47.3	53.8	59.9	49.2	53.5	57.3	41.7	47.0	51.5	37.5	39.7	42.8	40.5	41.8	42.8	35.3	37.5	40.2
10	48.4	53.7	58.2	48.4	51.3	53.7	43.4	47.3	50.4	36.6	40.4	43.9	37.4	38.7	40.4	40.0	41.1	42.2
11	48.4	54.0	58.7	47.8	51.3	55.7	41.1	44.6	47.0	38.0	39.7	42.3	36.5	38.9	41.3	39.2	41.3	43.8
12	48.4	54.6	60.2	47.3	52.5	57.1	38.6	43.1	47.3	36.0	39.9	43.7	39.0	41.6	44.5	43.6	44.3	45.4
13	49.0	53.2	55.9	47.8	52.8	57.3	38.9	44.2	49.2	38.6	41.1	42.8	43.3	44.8	46.7	41.9	42.8	44.4
14	49.5	51.7	53.7	46.7	51.9	55.9	40.6	44.9	48.1	38.6	41.5	43.4	42.0	44.3	46.1	40.9	42.6	44.2
15	49.5	53.8	59.0	46.2	48.7	52.9	41.1	45.0	47.6	41.1	42.5	43.9	42.8	44.6	45.9	41.0	42.1	44.1
16	47.6	53.3	58.7	43.1	48.2	53.7	41.7	45.3	48.4	39.2	41.3	42.5	42.5	44.9	47.0	39.6	40.9	42.3
17	49.2	53.9	57.9	43.7	49.3	54.3	39.7	44.4	48.4	36.0	37.5	39.2	43.9	45.7	47.1	39.8	41.9	43.9
18	48.7	54.5	59.9	43.9	49.6	54.6	40.0	45.1	49.2	34.6	37.7	40.9	44.4	45.6	47.2	39.9	40.7	42.2
19	48.4	54.2	59.0	43.9	49.7	54.0	40.6	45.0	48.1	37.2	39.4	41.4	42.4	44.6	46.1	38.1	39.4	40.6
20	49.0	51.8	55.4	44.8	50.3	54.8	40.3	44.7	48.1	40.0	41.0	42.3	45.3	46.6	47.9	39.2	40.8	42.8
21	49.2	54.6	60.2	44.8	50.0	54.0	40.3	45.1	49.2	37.2	39.0	41.1	45.5	46.9	47.9	42.0	43.1	44.5
22	48.1	54.1	59.0	47.0	51.4	55.1	40.6	45.5	49.2	36.3	37.8	38.9	40.9	42.5	45.4	40.2	41.2	43.5
23	49.5	54.0	58.7	44.5	49.7	54.0	41.7	45.5	48.7	34.6	36.5	38.0	40.0	42.5	45.4	38.8	39.9	41.4
24	47.6	52.6	57.6	44.2	48.2	51.2	40.6	44.7	47.8	33.5	35.4	37.8	44.7	45.6	46.8	36.5	37.6	39.9
25	46.2	52.1	57.1	41.1	46.6	51.2	40.6	44.5	47.3	33.5	34.1	36.6	43.8	44.5	45.3	35.8	37.1	38.6
26	47.0	52.2	57.6	41.7	46.9	51.2	41.7	44.4	47.0	32.9	34.9	37.2	41.2	42.7	44.3	37.2	38.4	39.9
27	48.4	51.4	54.6	44.8	50.0	55.1	40.6	44.6	48.1	34.6	36.1	37.5	40.3	42.3	43.9	38.7	39.9	41.6
28	48.4	53.5	58.7	45.6	50.9	55.4	40.9	45.1	48.4	36.0	38.2	40.6	41.9	43.9	46.0	39.8	41.4	43.3
29	49.0	53.9	58.2	45.3	49.9	53.4	40.9	44.6	47.3	38.3	40.1	42.0	44.2	45.7	47.3	37.8	39.7	41.4
30	48.4	53.4	56.8	42.8	48.3	52.9	41.1	44.5	47.6	38.3	40.3	42.3	45.0	46.2	47.2	40.5	41.5	43.4
31	48.7	53.7	58.2	43.1	47.9	52.0				39.2	40.7	42.0				36.7	39.4	42.3

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters retrieved in 2012.

North Fork Musselshell River																		
2012	May			June			July			August			Sept.			Oct.		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1				47.9	52.3	56.9	53.8	57.7	63.1	57.9	63.5	69.6	55.8	58.6	63.0			
2				47.4	53.0	59.3	54.0	58.4	64.7	55.5	62.0	67.9	51.5	56.4	61.2			
3				47.1	52.7	58.9	54.0	59.3	65.6	56.4	60.9	65.2	49.7	55.0	60.1			
4				49.2	56.2	64.1	52.6	58.4	65.0	54.0	60.9	69.0	50.6	55.1	59.4			
5				52.7	57.7	62.9	52.2	55.1	59.1	53.5	61.4	68.9	48.6	54.0	59.2			
6				48.4	53.4	58.4	52.7	57.5	62.7	55.4	60.6	64.5	51.5	55.0	58.9			
7				46.2	53.9	62.5	53.6	58.5	64.8	55.8	61.8	67.9	48.6	54.1	59.7			
8				50.2	56.3	63.0	54.3	60.4	67.6	54.5	61.6	68.2	48.3	54.0	60.0			
9				48.5	52.0	55.8	54.4	60.8	68.3	57.8	63.3	68.4	49.0	54.2	59.0			
10				45.4	48.0	50.4	55.1	60.5	67.0	57.6	60.6	64.8	52.4	55.9	59.6			
11				46.0	51.5	58.8	55.1	60.4	66.9	57.6	62.3	67.9	48.9	52.2	55.6			
12				46.8	53.7	59.9	54.7	60.9	68.4	56.0	62.7	69.2						
13				50.1	54.5	58.7	55.4	59.0	62.3	56.7	63.0	69.1						
14				47.0	54.5	62.6	57.2	59.5	62.4	55.4	61.7	67.2						
15				48.5	55.0	61.5	57.2	60.8	65.7	55.7	58.0	62.9						
16				47.4	54.9	61.9	56.0	60.0	64.6	54.5	59.9	66.9						
17				51.1	56.4	63.0	56.3	61.0	67.2	53.8	60.9	67.8						
18				48.8	55.8	63.6	56.3	61.9	68.9	53.1	60.5	67.4						
19	43.9	49.4	54.2	48.2	54.0	60.6	55.7	61.0	66.6	53.0	59.5	64.5						
20	43.9	50.7	57.3	48.2	54.1	60.6	56.9	60.5	66.0	55.7	61.6	67.7						
21	48.5	53.7	59.2	47.9	56.6	66.0	56.6	62.1	69.1	55.4	61.4	66.8						
22	50.6	53.0	55.5	51.6	57.1	62.4	56.7	61.7	67.6	57.0	62.2	67.2						
23	45.1	50.3	56.0	52.9	60.5	68.6	57.1	61.0	66.1	54.2	60.5	66.5						
24	44.2	50.0	56.8	56.8	63.6	71.5	57.6	61.4	67.1	54.3	58.3	62.2						
25	42.5	44.6	49.7	53.7	61.7	68.6	55.3	61.1	67.8	48.0	54.7	61.8						
26	41.3	43.2	45.4	51.6	58.4	65.5	56.6	61.7	67.5	49.8	55.5	61.2						
27	42.3	46.2	51.7	47.8	55.5	63.3	56.6	61.3	67.5	54.0	59.2	65.2						
28	41.9	44.8	48.5	48.5	57.2	66.6	57.0	62.7	69.9	53.9	60.1	66.9						
29	43.3	49.3	54.6	51.5	57.3	63.0	57.5	62.2	66.7	54.6	59.3	63.3						
30	44.8	49.0	53.1	52.1	57.7	64.1	56.4	62.8	69.8	51.4	57.0	62.6						
31	44.3	49.9	54.7				57.3	63.4	69.9	51.9	56.2	60.2						

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters retrieved in 2012.

South Fork Musselshell River																		
2012	May			June			July			August			Sept.			Oct.		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1				48.4	51.7	56.9	60.6	65.6	71.7	63.3	69.7	76.2	59.6	63.5	70.8			
2				48.7	52.9	56.8	59.5	65.9	73.6	61.7	67.5	73.1	55.8	61.5	68.0			
3				48.1	52.2	56.4	62.1	67.0	72.5	61.1	65.2	69.9	52.9	59.4	66.4			
4				49.3	54.8	60.9	58.1	64.5	71.7	57.4	64.6	72.4	53.3	58.9	65.4			
5				52.9	56.8	60.8	58.7	60.6	64.6	58.8	66.4	73.5	51.5	58.2	65.5			
6				47.9	52.2	55.9	55.4	61.9	69.9	62.0	66.0	68.7	54.6	58.8	64.6			
7				45.8	51.8	58.4	58.5	63.7	70.2	60.8	67.0	73.6	51.4	58.6	66.8			
8				49.6	55.0	60.4	59.5	65.8	73.3	60.5	67.2	73.2	51.8	59.2	67.5			
9				49.2	51.4	56.4	60.3	68.1	77.2	63.8	68.8	73.3	53.8	59.5	66.3			
10				45.0	47.1	49.2	62.4	68.3	74.7	63.2	65.7	68.9	56.9	60.6	65.7			
11				44.7	50.1	56.6	61.7	67.7	74.1	60.6	65.6	71.0	52.6	56.2	61.2			
12				48.9	54.7	60.6	60.7	68.0	76.4	59.9	66.5	73.2						
13				52.9	56.8	61.5	61.9	66.3	70.8	61.5	67.4	72.8						
14				50.4	56.4	62.8	62.7	65.9	69.7	60.8	66.4	72.1						
15				51.7	56.5	61.5	61.9	66.9	73.5	59.1	61.5	65.0						
16				51.1	56.6	62.2	61.3	66.7	73.1	55.8	62.3	69.9						
17				54.8	59.7	65.9	61.8	67.6	74.8	57.7	64.7	71.2						
18				53.7	58.8	65.2	61.7	68.8	76.7	57.6	64.6	71.2						
19	42.3	46.6	50.3	52.0	56.5	61.0	62.0	68.3	74.2	57.7	63.7	68.8						
20	43.0	48.7	55.1	51.4	55.0	59.0	62.5	67.1	73.0	60.6	65.6	71.2						
21	47.9	51.7	54.9	50.9	58.0	66.2	61.6	68.9	76.5	59.7	65.1	70.5						
22	49.2	51.6	53.5	55.6	59.2	63.0	62.9	69.7	76.6	61.2	65.8	70.7						
23	43.9	48.0	52.8	56.0	62.5	70.4	62.8	68.1	72.9	59.1	64.6	70.3						
24	43.2	45.9	48.4	61.1	66.6	74.0	61.8	67.0	73.2	57.7	62.0	66.4						
25	41.9	42.9	45.8	59.3	65.4	71.0	58.8	66.1	73.0	52.3	58.8	65.6						
26	39.3	40.4	41.8	59.2	63.6	69.1	60.7	67.5	74.2	53.7	59.4	65.7						
27	38.3	41.8	45.4	52.9	59.1	65.5	61.4	67.1	73.6	58.6	64.5	72.4						
28	40.1	42.5	46.3	53.4	60.9	69.5	60.7	67.8	76.8	59.7	66.1	73.7						
29	42.3	47.1	52.2	57.9	63.8	70.2	62.5	69.6	77.6	60.6	64.9	70.0						
30	46.2	48.5	50.6	58.0	65.2	73.4	62.3	69.3	77.0	55.8	62.9	71.1						
31	44.9	48.8	53.0				62.7	69.5	76.7	56.0	62.0	67.8						

Appendix 3 continued. Minimum, mean and maximum water temperatures (ºF) from Lewistown Area Waters retrieved in 2012.

Musselshell River @ CMR																		
2012	May			June			July			August			Sept.			Oct.		
Date	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
1				62.5	66.2	69.8	74.1	78.3	82.9	73.7	77.9	81.9	70.7	72.8	75.3	55.8	59.4	62.3
2				65.1	68.4	71.3	72.5	77.2	82.9	73.1	76.5	80.0	67.2	70.8	74.1	57.1	59.4	61.7
3				65.4	69.1	73.1	75.0	78.7	82.9	69.8	72.2	75.9	63.7	68.4	72.5	53.0	55.0	60.0
4				68.7	72.3	76.5	71.3	75.8	81.0	66.9	71.2	76.5	63.1	66.2	69.2	50.4	51.7	53.0
5				71.0	73.8	77.5	69.8	72.2	76.2	69.5	73.5	78.4	59.4	63.9	68.4	47.9	49.4	51.3
6				69.2	71.6	73.7	67.5	72.9	79.7	71.6	75.7	80.3	63.4	64.9	66.6	44.6	47.6	50.4
7				66.9	70.5	73.7	72.5	76.9	81.6	73.7	77.2	81.3	60.8	64.6	69.2	47.4	49.9	52.7
8				67.5	71.0	74.7	73.7	77.8	82.2	72.5	77.4	82.9	61.7	65.6	69.8	50.2	51.4	52.4
9				66.3	68.3	71.9	73.1	78.1	84.2	75.0	78.1	82.6	63.7	66.9	70.7	47.9	49.1	50.4
10				61.1	63.1	66.9	76.5	80.6	84.2	74.1	76.7	79.7	64.9	67.5	70.1	45.4	48.7	51.8
11				58.3	61.7	66.0	75.6	79.5	84.2	72.2	74.5	76.5	62.0	64.1	67.5	46.0	47.6	49.9
12				61.7	66.9	72.5	75.0	80.5	86.6	71.3	75.3	80.3	57.1	60.7	63.7			
13				67.5	70.4	73.1	77.2	80.7	83.6	71.6	75.3	80.0	55.5	60.0	64.6			
14				65.1	69.0	72.8	75.6	77.0	79.0	71.0	74.3	77.8	58.5	61.2	63.7			
15				66.3	68.5	70.7	74.4	78.1	83.2	68.4	70.8	75.6	58.5	60.8	62.8			
16				64.6	68.4	71.9	74.7	79.3	84.6	63.1	67.6	72.2	60.0	61.3	63.4			
17				68.1	70.3	72.5	75.3	79.8	85.2	65.4	69.5	73.7	57.7	61.0	64.3			
18				66.9	70.7	74.7	76.2	81.4	87.2	66.9	71.5	76.5	57.1	61.7	66.3			
19				68.9	70.9	73.1	78.1	82.9	87.6	67.8	71.7	75.9	60.0	63.0	66.3			
20				64.9	67.1	68.9	77.8	79.9	83.6	68.7	72.0	75.9	59.7	62.5	64.6			
21				64.6	68.8	73.1	75.9	80.4	86.2	67.5	72.5	77.8	58.5	61.7	64.6			
22	67.5	69.6	72.8	68.4	70.6	72.2	77.5	81.9	86.2	71.6	74.5	78.1	58.3	62.1	65.1			
23	63.1	65.8	68.1	68.1	71.9	76.2	78.7	82.3	86.2	69.2	73.9	78.7	58.3	61.8	65.4			
24	59.7	61.8	64.9	71.0	74.0	78.4	77.8	80.6	83.9	68.9	71.5	74.7	57.7	60.3	62.8			
25	56.0	58.5	60.0	73.1	76.5	80.0	74.1	77.5	80.3	62.5	67.5	71.9	56.9	59.9	61.7			
26	53.5	55.0	58.3	74.7	78.4	83.6	73.1	77.1	82.2	62.5	67.4	71.9	57.7	59.8	61.7			
27	50.4	52.0	53.5	69.8	73.3	76.5	75.0	77.3	80.0	64.9	69.4	74.7	57.7	60.1	62.8			
28	48.5	50.4	53.0	67.8	73.2	78.4	73.1	78.0	83.9	68.1	72.5	77.8	57.4	60.8	64.3			
29	49.9	54.6	59.7	70.7	75.4	80.3	73.7	78.8	83.9	69.8	73.4	76.5	57.4	60.6	63.4			
30	56.3	59.4	62.3	72.5	77.3	82.6	74.7	79.2	84.2	67.2	71.3	75.3	58.0	60.7	63.1			
31	60.0	63.0	66.3				74.1	78.8	83.6	66.6	71.1	75.3						

Appendix 4– Mean daily flow in Lewistown area waters 2012.

Big Spring Creek (Hatchery) Discharge (*2012*)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	141.4	141.0	141.1	145.2	196.5	151.7	145.8	142.9	141.3	141.1	140.8	140.8
2	141.0	141.1	140.9	144.2	183.0	151.3	146.4	142.6	141.1	141.2	140.8	140.8
3	141.1	141.0	141.1	143.3	169.0	152.0	145.9	145.5	141.1	140.9	140.8	140.8
4	141.1	141.1	141.4	142.1	163.5	149.1	145.0	144.4	141.0	140.9	140.8	140.9
5	140.9	141.1	149.5	140.8	163.5	148.3	144.2	143.7	140.9	141.0	140.8	140.8
6	141.0	141.2	145.3	140.9	156.7	147.4	144.3	146.3	141.0	140.9	140.8	140.8
7	141.0	141.1	141.8	140.8	152.8	148.3	144.1	147.2	141.0	141.0	141.0	140.8
8	141.0	141.0	141.4	140.8	151.6	148.9	143.8	141.8	141.0	140.8	140.8	140.9
9	141.2	141.0	144.6	140.8	150.2	148.7	143.6	141.0	141.2	140.8	140.8	140.8
10	141.9	141.1	147.4	140.8	152.6	151.9	143.0	140.9	141.6	140.9	140.8	141.1
11	141.7	140.9	146.8	140.8	150.8	159.3	142.9	141.2	141.5	140.9	140.8	141.0
12	141.9	141.1	143.7	142.0	147.1	161.5	143.6	141.5	141.4	141.1	140.9	141.1
13	141.8	141.0	143.5	142.5	146.0	154.8	143.7	141.8	141.3	141.0	141.0	141.0
14	141.5	141.1	143.3	141.3	144.8	152.9	144.2	142.1	141.3	141.1	141.1	141.0
15	141.7	141.0	142.3	141.2	144.0	152.8	145.4	141.5	141.4	141.0	140.9	141.0
16	141.4	141.1	142.8	141.2	143.9	153.2	144.4	141.8	141.6	141.1	140.9	140.9
17	141.3	141.0	143.3	141.1	144.2	152.8	143.5	141.8	141.4	141.1	140.9	140.8
18	141.3	141.1	143.2	141.3	146.3	151.8	143.3	141.9	141.3	141.1	140.9	140.8
19	141.6	141.0	143.1	141.6	145.4	152.2	143.0	142.1	141.4	141.0	141.0	140.8
20	141.5	141.1	141.9	141.3	144.0	156.7	144.0	142.0	141.4	141.0	140.8	140.8
21	141.3	141.0	142.3	141.0	143.8	153.8	144.8	141.6	141.3	141.0	140.8	140.8
22	141.0	142.7	142.7	141.0	146.6	151.0	144.3	141.5	141.2	141.3	140.8	140.8
23	141.1	142.1	144.0	140.8	144.7	150.2	144.3	141.6	141.3	140.9	140.8	140.8
24	141.0	141.3	143.6	140.8	144.0	149.1	145.0	141.3	141.3	141.0	140.8	140.8
25	141.1	141.2	143.6	140.8	143.4	149.0	144.3	141.4	141.3	140.9	140.8	140.8
26	141.0	141.4	145.2	140.8	144.4	148.2	144.9	141.7	141.4	141.1	140.8	140.8
27	141.1	141.1	147.4	142.2	149.5	147.4	146.3	141.7	141.0	140.9	140.8	140.8
28	140.9	141.1	145.4	148.3	153.4	147.4	144.7	141.7	141.0	141.0	140.9	140.8
29	141.1	141.1	144.9	151.7	157.2	145.9	144.4	141.4	141.0	140.9	140.8	140.8
30	141.4		144.0	170.3	157.2	146.8	145.9	141.6	141.0	140.9	140.8	140.9
31	141.3		145.6		153.0		144.3	141.5		140.9		140.8

Appendix 4– Mean daily flow in Lewistown area waters 2012.

Big Spring Creek (Ash Street) Discharge (*2012*)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	184.5	176.0	165.3	201.7	368.5	235.9	180.3	178.1	139.6	139.6	152.5	152.5
2	182.4	165.3	163.2	193.1	347.1	238.0	186.7	178.1	139.6	139.6	152.5	152.5
3	171.7	158.9	165.3	184.5	310.7	240.1	182.4	180.3	139.6	148.2	152.5	152.5
4	169.6	163.2	191.0	182.4	293.6	227.3	178.1	176.0	139.6	146.1	152.5	152.5
5	176.0	165.3	441.2	182.4	293.6	223.0	176.0	173.9	139.6	146.1	152.5	150.3
6	176.0	167.4	293.6	195.2	282.9	214.5	176.0	173.9	139.6	143.9	152.5	150.3
7	165.3	165.3	197.4	186.7	263.7	208.1	176.0	169.6	139.6	143.9	152.5	150.3
8	167.4	158.9	186.7	186.7	253.0	208.1	173.9	169.6	139.6	152.5	152.5	150.3
9	163.2	167.4	325.7	186.7	244.4	208.1	173.9	169.6	139.6	148.2	152.5	146.1
10	171.7	165.3	285.1	186.7	250.8	250.8	171.7	169.6	139.6	146.1	152.5	148.2
11	167.4	156.7	255.1	186.7	244.4	297.9	169.6	171.7	139.6	146.1	152.5	150.3
12	171.7	163.2	223.0	242.3	235.9	242.3	167.4	167.4	139.6	143.9	152.5	150.3
13	169.6	165.3	208.1	223.0	225.2	225.2	163.2	161.0	139.6	143.9	152.5	152.5
14	169.6	167.4	205.9	203.8	218.8	218.8	165.3	165.3	139.6	143.9	152.5	152.5
15	167.4	158.9	197.4	197.4	214.5	208.1	165.3	169.6	139.6	143.9	152.5	150.3
16	161.0	158.9	201.7	193.1	212.3	203.8	165.3	165.3	139.6	143.9	152.5	148.2
17	158.9	165.3	201.7	188.8	218.8	205.9	165.3	163.2	139.6	143.9	152.5	148.2
18	158.9	165.3	210.2	195.2	225.2	203.8	163.2	152.5	137.5	143.9	152.5	146.1
19	161.0	165.3	201.7	197.4	218.8	201.7	158.9	150.3	137.5	143.9	154.6	143.9
20	165.3	163.2	186.7	191.0	212.3	233.7	156.7	148.2	137.5	143.9	154.6	146.1
21	165.3	163.2	186.7	184.5	218.8	220.9	156.7	150.3	137.5	143.9	156.7	146.1
22	165.3	282.9	195.2	182.4	227.3	203.8	154.6	150.3	137.5	143.9	156.7	146.1
23	165.3	218.8	208.1	180.3	216.6	199.5	152.5	148.2	137.5	143.9	154.6	146.1
24	165.3	182.4	208.1	180.3	208.1	197.4	150.3	146.1	139.6	143.9	158.9	146.1
25	167.4	171.7	208.1	178.1	203.8	195.2	186.7	148.2	139.6	143.9	152.5	146.1
26	169.6	167.4	225.2	178.1	205.9	193.1	195.2	143.9	139.6	143.9	152.5	146.1
27	167.4	167.4	229.5	240.1	242.3	186.7	193.1	143.9	139.6	143.9	152.5	146.1
28	163.2	165.3	216.6	308.6	285.1	184.5	191.0	141.8	139.6	143.9	156.7	146.1
29	178.1	165.3	205.9	342.8	285.1	182.4	191.0	141.8	139.6	143.9	152.5	146.1
30	203.8		193.1	368.5	278.6	182.4	186.7	139.6	139.6	148.2	152.5	146.1
31	182.4		199.5		248.7		180.3	139.6		148.2		146.1

Appendix 4– Mean daily flow in Lewistown area waters 2012.

Big Spring Creek (Mill Ditch) Discharge (*2012*)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	85.4	92.4	82.9	113.1	113.1	149.3	125.3	147.4	120.7	126.2	56.7	26.6
2	86.1	89.3	82.6	106.7	106.7	145.7	99.6	145.9	120.4	126.0	44.8	26.4
3	87.5	84.8	82.5	101.0	101.0	150.8	71.4	149.8	121.1	131.8	35.9	25.8
4	87.7	84.1	93.8	98.3	98.3	139.0	69.5	147.1	120.6	133.3	36.9	25.6
5	88.2	83.8	178.1	96.6	96.6	133.1	69.1	144.6	140.2	133.4	36.0	25.6
6	87.5	84.6	189.9	101.8	101.8	127.6	69.1	142.5	149.8	133.1	35.5	25.5
7	83.7	83.5	108.2	100.8	100.8	123.3	68.9	141.4	147.3	132.8	31.0	25.7
8	84.6	81.1	95.0	99.1	99.1	122.5	67.0	139.6	128.6	135.7	28.3	25.2
9	86.0	82.8	118.8	99.8	99.8	123.5	66.2	137.8	128.3	132.7	28.7	24.2
10	86.6	83.0	165.6	101.4	101.4	131.5	104.7	139.2	128.0	119.6	27.7	24.9
11	82.0	78.3	148.2	102.4	102.4	186.9	127.3	141.7	128.0	116.9	27.7	24.8
12	83.2	82.3	129.3	114.6	114.6	158.6	124.6	140.0	128.8	114.9	28.0	25.1
13	85.3	81.7	113.1	136.2	136.2	142.5	122.9	137.2	130.9	113.9	27.9	24.9
14	84.9	82.5	114.5	117.9	117.9	132.4	125.1	134.3	123.9	113.6	27.7	24.8
15	84.7	79.8	104.4	108.6	108.6	123.4	125.7	137.3	124.4	114.1	27.8	24.6
16	80.3	80.1	104.5	106.1	106.1	119.2	125.2	135.4	124.8	84.4	27.8	24.4
17	79.0	80.9	108.6	103.0	103.0	118.9	126.7	132.6	125.1	36.7	27.8	24.6
18	77.0	81.4	112.9	102.2	102.2	117.7	125.2	125.8	124.8	38.4	27.8	24.1
19	77.5	80.6	113.7	106.7	106.7	115.8	122.6	118.7	124.8	40.3	27.6	23.7
20	80.8	81.1	96.2	102.6	102.6	146.5	123.5	118.2	125.1	40.4	27.5	23.9
21	84.1	81.2	93.7	98.7	98.7	163.7	125.1	117.8	125.2	41.4	27.7	24.0
22	84.1	114.8	97.6	96.9	96.9	148.7	122.8	117.7	125.1	43.4	27.2	23.8
23	83.7	120.5	110.0	95.2	95.2	142.5	120.5	116.5	124.8	45.3	27.0	23.3
24	82.8	95.1	113.2	94.3	94.3	139.4	120.9	116.2	125.6	46.6	26.9	22.7
25	84.7	89.6	109.9	94.1	94.1	137.3	121.6	116.5	126.5	47.1	27.1	22.4
26	84.8	83.2	118.2	93.0	93.0	134.0	154.5	115.6	127.4	47.4	26.9	22.6
27	85.4	84.3	133.6	111.2	111.2	128.0	159.7	114.4	128.0	49.0	26.8	22.8
28	82.9	82.3	119.3	186.2	186.2	126.4	154.9	113.5	127.1	50.3	26.6	22.8
29	87.5	82.9	112.8	185.8	185.8	125.4	154.0	111.4	127.0	51.7	26.7	22.8
30	101.6		108.0	222.9	163.1	124.1	155.3	110.6	126.4	53.0	26.9	22.9
31	101.2		111.5		227.0		150.1	112.0		54.6		22.5

Appendix 4– Mean daily flow in Lewistown area waters 2012.

Big Spring Creek (Reed and Bowles) Discharge (*2012*)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	69.7	86.1	72.7	103.4	367.2	257.7	199.3	189.7	127.2	159.2		
2	72.3	82.6	70.1	99.6	365.9	255.6	210.3	188.8	128.0	159.1		
3	75.0	75.4	69.8	93.1	327.2	265.5	195.9	197.5	128.2	165.0		
4	75.1	72.1	88.2	131.9	306.4	249.6	185.5	193.0	128.6	167.7		
5	75.6	70.0	218.1	196.3	303.0	239.4	175.2	192.5	129.6	166.6		
6	75.0	68.4	236.1	206.9	294.9	234.9	157.6	193.2	130.7	159.8		
7	68.0	66.3	126.2	206.9	278.6	229.0	156.9	192.9	130.1	158.3		
8	68.1	63.2	110.9	204.5	268.1	225.7	154.2	188.7	131.7	160.9		
9	73.7	70.8	125.4	206.1	260.6	227.2	150.4	189.2	140.9	168.4		
10	75.3	66.7	193.6	208.6	267.1	246.9	144.8	194.6	146.2	167.1		
11	67.7	62.0	165.1	208.8	268.7	310.0	139.3	198.6	154.0	166.4		
12	65.1	64.4	138.5	223.1	254.3	275.6	131.9	196.2	153.7			
13	71.0	70.0	112.4	248.2	246.0	248.0	129.4	184.1	150.1			
14	70.4	68.6	112.6	228.0	255.1	240.8	140.1	181.7	149.8			
15	70.9	64.8	98.8	216.2	231.7	227.8	139.1	184.2	149.4			
16	62.6	65.2	95.8	213.1	229.6	221.2	142.6	184.3	149.0			
17	58.0	70.0	98.0	209.4	230.5	218.8	149.0	181.3	149.3			
18	55.1	64.0	104.1	206.3	247.4	219.6	144.1	174.2	148.9			
19	54.3	66.6	106.1	211.6	242.5	219.5	133.1	163.2	148.5			
20	55.1	64.0	86.6	208.8	235.2	240.7	134.7	167.5	148.9			
21	60.4	68.2	84.2	199.3	229.2	246.8	139.2	166.9	151.8			
22	63.3	130.9	89.9	195.1	252.3	223.8	138.2	166.9	155.0			
23	65.6	140.1	103.7	192.7	242.7	217.8	138.4	166.9	155.2			
24	65.0	93.5	111.4	192.0	232.0	211.6	140.4	167.0	156.9			
25	68.3	86.5	104.4	191.6	226.2	210.5	141.0	165.5	158.3			
26	68.7	71.6	113.3	189.9	229.5	208.2	181.2	153.9	157.9			
27	69.3	74.3	134.8	219.3	266.9	203.2	197.0	127.9	159.0			
28	67.1	75.6	116.9	329.0	304.5	201.2	199.4	130.4	159.9			
29	73.6	73.2	106.7	325.8	304.6	199.3	200.0	126.2	159.7			
30	96.0		100.0	344.3	296.9	197.3	201.3	121.8	159.4			
31	97.8		101.4		275.3		194.3	122.3				