FISHERIES DIVISION
Federal Aid Job Progress Report
Montana Statewide Fisheries Management
Federal Aid Project Number: F-113
July 1, 2013 – June 30, 2015

Project Title: Montana Statewide Fisheries Management

Job Title: Bitterroot River Drainage Fisheries Management

ABSTRACT

Results from sampling of the Bitterroot River in 2013 and 2014 indicate trout populations are stable. The number of rainbow trout has stabilized in the upper river, at a lower level than in the past. We believe the decline was due to whirling disease. In the lower river, rainbow trout numbers are higher than in the past. The number of brown trout remains stable throughout the river and westslope cutthroat are in higher numbers than before catch and release was instituted. Electrofishing surveys of all species in the Bitterroot River indicate that mountain whitefish are the most abundant species collected.

Some mortality of fish has been observed in the upper river near Darby during midsummer. We have found that westslope cutthroat trout are the most common species. We suspect that angler induced handling mortality during peak water temperatures
is the primary cause. Releases of Painted Rocks Reservoir Water augments the streamflows of the Bitterroot, however, the cold water released from the dam does not significantly cool the main Bitterroot River due to inherent warming in the West Fork Bitterroot River and mixing with the warmer water from the East Fork Bitterroot River.

Fish population monitoring on the Bitterroot National Forest indicates that population trends vary throughout the drainage. Westslope cutthroat trout populations are stable and bull trout populations are stable to declining. Data indicate that most of the populations of westslope cutthroat upstream of Painted Rocks Reservoir are pure strain. We have found only 2 locations where introgression has occurred.

Lake Como has been stocked with rainbow trout, westslope cutthroat trout and kokanee in recent years. Gillnet samples from the fall capture more fish per net than from the spring.

Hieronymus Pond is located in Hamilton and has been managed as a fishing resource for local children. Stocking of rainbow trout and removal of yellow perch, longnose and largescale suckers and northern pikeminnows has been pursued to increase the size of desirable fish for the public. These removals appear to have allowed rainbow trout and yellow perch to increase in average size, but in recent years the average size has decreased.

TABLE OF CONTENTS

BACKGROUND

The Bitterroot River flows in a northerly direction from the confluence of the East and West Forks near Conner, Montana. The river flows 84 miles through irrigated crop and pastureland to its confluence with the Clark Fork River near Missoula, Montana. Five major diversions and numerous smaller canals remove substantial quantities of water from the river during the irrigation season (Spoon 1987). In addition, many of the tributaries, which originate on the Bitterroot National Forest (BNF) are diverted for irrigation during the summer months and contribute little streamflow to the river during that time. Therefore, many tributaries and the mainstem of the Bitterroot River are chronically dewatered during the irrigation season. Streamflow characteristics vary along the Bitterroot River, with the most critically dewatered reach between Hamilton and Stevensville (Spoon 1987). To help alleviate the mainstem dewatering, the MFWP annually supervises the release of 15,000 acre-feet of water from Painted Rocks Reservoir on the West Fork of the Bitterroot River and 3,000 acre-feet of water from Lake Como. The most dewatered reach of the river, north of Hamilton is the target for the Painted Rocks water. Urbanization and associated development of the floodplain is increasing in the Bitterroot Valley (Javorsky 1994).

The Bitterroot River is an important sport fishery for anglers in western Montana. Pressure estimates from the statewide survey indicate that the Bitterroot River routinely exceeds 100,000 angler days per year. Due to the high fishing pressure, fishing regulations became more restrictive in the 1980's and 1990's. The population estimates on the Bitterroot River focus on trout. Due to the length of the study sections and the large number of fish required to calculate population estimates, the other species of fish are not censused. It has been evident during electrofishing that several other species are fish are present in the river, therefore, beginning in spring, 2011; we began to sample all of the species in the river on a limited basis.

Streams within the BNF support widespread populations of native westslope cutthroat and bull trout. Due to the importance of streams within the BNF we have also monitored fish populations there. Within Montana, the BNF is the headwaters of the Bitterroot River.

Lake Como is a local reservoir that supports a moderate amount of angling pressure. It suffers from significant drawdown each summer. Hieronymous Pond is a small pond in Hamilton that supports moderate fishing pressure, mostly from families. It is stocked annually with rainbow trout.

METHODS

Fish population estimates on the Bitterroot River were collected on several reaches over the past 30 years. Study reaches were selected based on historical data, streamflow patterns and fishing

regulations. The reaches are 2.2-5.1 miles in length. The long term study reaches are illustrated in Figure 1. Electrofishing was conducted from a 14-foot long aluminum drift boat fitted with a boom shocking system. The system was powered by a 5000-watt generator and current was modified through a Coffelt Mark XXII or Smith Root VVP 15B electrofishing unit. Smooth direct current was used to capture fish. The Peterson mark-recapture method using log likelihood was used to calculate population estimates as modified through the Montana Fish, Wildlife and Parks Fisheries Analysis + program. Several mark and recapture runs were required to obtain sufficient sample size to estimate fish populations in some reaches. While these methods are broadly accepted and can be accurate (Peterson and Cederholm 1984, Rosenberger and Dunham 2005) mark-recapture population estimates are not always accurate (Cone et. al. 1988, Nordwall 1999). In large rivers it can be difficult to detect trends in fish populations (Russell et al 2012). In recent years, most of the fish collections downstream of Hamilton have occurred at night to facilitate handling of more fish. The population estimates were collected during September and October each year. Brown trout may be migrating by October, therefore, their estimates may be inflated.

During the spring of 2011-2014 we electrofished four, 2 mile long reaches of the Bitterroot River to assess the status of as many species as we could capture (Figure 1). We used the same boat and technique as described above, and we netted all of the fish that we encountered that were capable of capture with 2 netters. All fish were measured and weighed.

We monitored fish populations in some streams on the BNF. Background work that went into selection of the study sites is described in previous reports (Clancy 1993, 1996). During 2013 and 2014, we concentrated on sites that in the past that supported the more robust populations of bull trout.

Fish were captured by electrofishing using smooth direct current. On larger streams a bank electrofishing unit is used powered by a 4500 watt generator and current is controlled through a Smith Root Model VVP 15B unit. On smaller streams fish are captured using either a Coffelt Mark 10 or Smith Root LR-24 backpack electrofisher. We estimated trout populations on monitoring reaches using a mark-recapture technique. Monitoring sections are usually 1000 feet long. On the marking run, fish are released as close to their capture site as possible and approximately one week is allowed between mark and recapture. Population estimates are calculated using the Montana Department of Fish Wildlife and Parks Fisheries Analysis + program.

Lake Como Reservoir was sampled intensively with gillnets. Lake Como was sampled most years between 2006 and 2012. Some sampling took place during spring and some during fall. The methods and some results are summarized in Berg, 2009

Northern pikeminnow, longnose and largescale sucker and yellow perch were removed from Hieronymus Pond during the spring of 2013 and 2014. Each time out, a drift boat with a boom shocker was rowed around the edge of the pond and fish were captured, measured and removed. Generally, two passes were made each day.

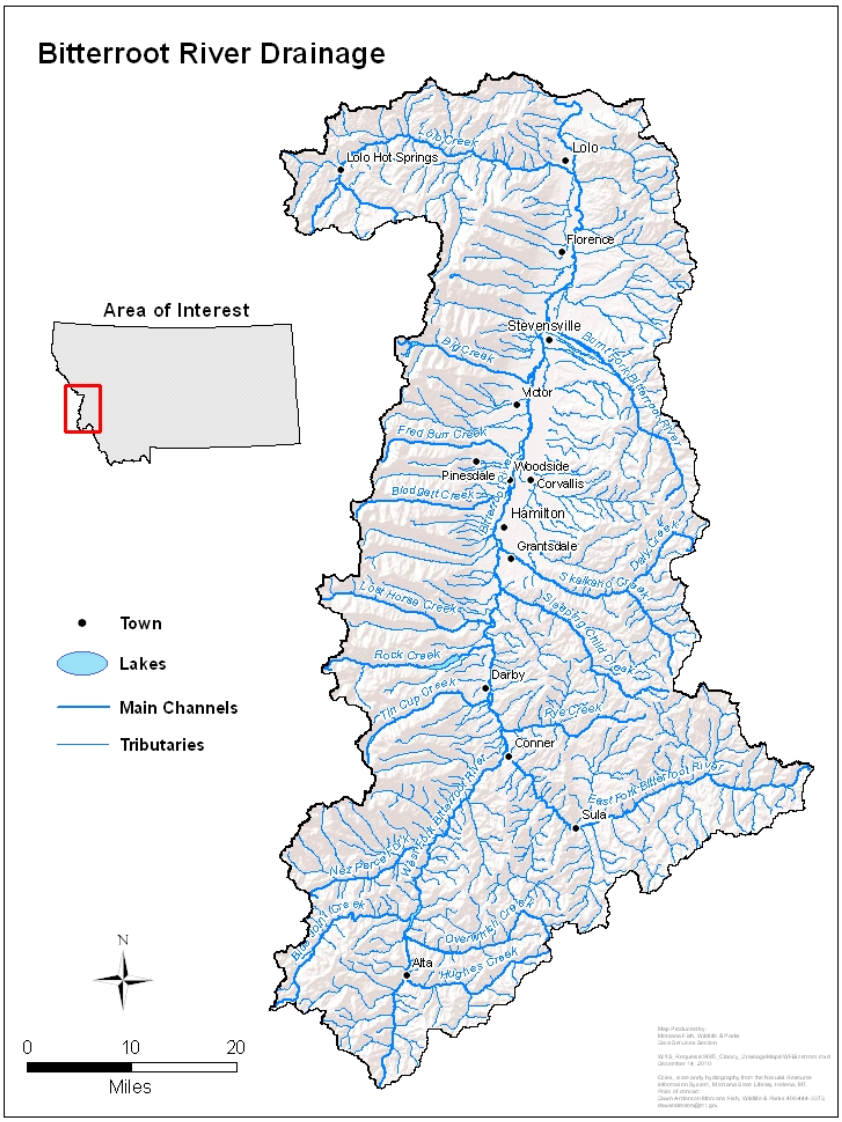

Figure 1. Map of study areas with study sections labeled. The bolded, italicized reaches are sampled during routine population estimates and single pass sampling for all species.

RESULTS AND DISCUSSION

Bitterroot River Trout Populations

We generally monitor 1 or 2 long term sections of the Bitterroot River and/ or West Fork Bitterroot during early Fall each year. In recent years, another crew has been monitoring trout

populations on the Missoula section each spring. This report discusses the trends in rainbow and brown trout, 12 inches and longer and westslope cutthroat, 10" and longer. During 2013, the Hannon Memorial and Missoula sections were sampled and in 2014 the Hamilton, Bell Crossing and Missoula sections were sampled.

The rainbow trout populations in the upper river declined in the mid-1990's and appeared to stabilize since then (Figure 2). This decline in the upper river may be due to whirling disease which was detected at high infection rates and is visible in some fish. The population of rainbow trout in the lower river has been increasing or stable in the past few years (Figure 3).

Brown Trout population estimates have historically indicated a relatively stable population and recent estimates have indicated a mixed trend (Figures 4 and 5). Overall, the population appears to be stable.

Westslope cutthroat population estimates indicate that populations have increased significantly since the early 1990's when catch and release regulations were instituted. The upper Bitterroot River showed significant increases in fish while the lower river was not as responsive (Figure 6). This is probably due to the fact that the upper river has more stable spawning tributaries and cooler summer water temperatures as well as more stable streamflows in spawning tributaries. The populations in the upper river peaked in the early 2000's and since dropped and stabilized (Figure 7).

Figure 2. Population trends of rainbow trout in the Conner, Hannon and Darby sections.

Figure 3. Population trends of rainbow trout in the Hamilton, Bell Crossing, Stevensville and Missoula sections.

Figure 4. Population trends of brown trout in the Conner, Hannon and Darby sections.

.

Figure 5. Population trends of brown trout in the Hamilton, Bell Crossing, Stevensville and Missoula sections.

Figure 6. Number of westslope cutthroat handled during electrofishing in the study section of the Bitterroot River during the years indicated.

Figure 7. Population trends of westslope cutthroat in the Conner, Hannon, Darby and Hamilton sections.

Bitterroot River Single Pass

Beginning in 2011, we began to sample 2.0 mile reaches of the Bitterroot River for all species of fish. These single pass samples give us an indication of the relative proportions and sizes of some species of fish. While electrofishing is selective for various sizes and species of fish, this data does allow us to compare data over time to get a general sense of the status of the population of the species and sizes.

The data indicate that the mountain whitefish is the most common species captured in our sampling (Figure 8).

Figure 8. Relative abundance of species captured in single pass electrofishing at 4 sites in the Bitterroot River.

Westslope Cutthroat Mortality in Upper Bitterroot River

Due to reports of fish mortality in the Upper Bitterroot River, we floated a 15 mile reach of the lower West Fork and Upper Bitterroot River during the Summers of 2012-2014 to locate any dead fish that we could find. The reach we floated was from the W. W. White (Highbank) FAS to the Wally Crawford FAS. During the floats in a raft, 1 or 2 viewers stood in the front of the raft while a third viewer rowed the raft. We tried to locate as many dead fish as we could find.

During 2012, we completed our initial floats (Figure 9). On July 27 and August 1 we floated the reach between Highbank and Wally Crawford. On those dates we found 42 dead fish, most of

which were westslope cutrhroat. On August 3 we floated from Victor Crossing to Stevensville, where the water is warmer and we found only 4 dead fish, all of which were suckers or northern pikeminnows.

During 2013, we floated 6 times, all from High Bank to Wally Crawford. A total of 38 dead fish were found (Figure 10). Twenty were westslope cutthoat trout and they constituted 71% of the trout mortality. This is a significantly higher percentage than the proportion of westslope cutthroat in the trout population in that reach. During 2014 water temperatures were cooler and mortality was low (Figure 11). Westslope cutthroat have a lower water temperature tolerance than rainbow trout (Bear et al 2007). The highest mortality of fish has been observed when maximum water temperature is at 19-20^{o}C (Figures 9 and 10). · Long term warming of streams could result in declining populations of westslope cutthroat (Williams et al. 2009).

Figure 9. Maximum dailly water temperture and the number of dead fish found during floats in 2012.

Figure 10. Maximum dailly water temperature and the number of dead fish found during floats in 2013 (1st number is all fish, 2nd number is westslope cutthroat)

Figure 11. Maximum dailly water temperature and the number of dead fish found during floats in 2014. 2013 (1st number is all fish, 2nd number is westslope cutthroat)

After 3 seasons of observing westslope cutthroat mortality, it is clear that westslope cutthroat have higher mortality than other species in relation to their proportion of the population (Figure 12).

Figure 12. The number of dead fish of each species found during floats.

Larger westslope cutthroat appeat to be more succeptible to mortality (Figure 13). It is not known if the larger fish were captured more often than the smaller fish, or were more vulnerable to release mortality. It is possible that larger fish were more evident to viewers than smaller fish.

Figure 13. Length of westslope cutthroat mortalities during 2012-2014.

Population estimates of westslope cutthroat on the Hannon Memorial and Darby study sections indicate differing trends between them (Figures 14 and 15). The Hannon Memorial population estimates indicate that the westslope cutthroat population is stable, while the Darby population estmates indicate that the population estimates of westslope cutthroat over 13 inches long are declining. It is unclear how much impact this mortality is having on the overall westslope cutthroat population.

Figure 14. Population trend of westlope cutthroat In the Hannon Memorial section during the years indicated.

Figure 15. Population trend of westlope cutthroat In the Darby section during the years indicated.

The temperature of water released below Painted Rocks Reservoir is very cold (Figure 16). However, by the time it reaches Conner, the water has warmed significantly. This fact and the mixing of West Fork Bitterroot water with warmer East Fork Bitterroot water negates using Painted Rocks releases to significantly cool the upper Bitterroot River. However, the cooler water from the West Fork Bitterroot River does moderate the warmer water from the East Fork Bitterroot River.

Figure 16. Maximum water temperature at sites indicated in 2013.

Bitterroot National Forest

Each year, trout populations are assessed on long term study sites on the Bitterroot National Forest and adjacent streams supporting native and non-native trout. The trout, are enumerated through mark-recapture population estimates. Each population estimate is compared to data collected in past years to assess the trend in trout populations. Since 1989, population estimates have been collected on 137 study sections. Between 1 and 26 years of data have been collected on each section. The average number of years that data has been collected on each study section is 4.8.

The data collected in 2013 and 2014, indicate that on the sections we sampled, westslope cutthroat trout are fairly balanced between positive and negative trends (Figure 17). A 10% differnce between the most recent population estimate and the historic mean was used to assess whether a population trend was occurring. Bull trout trends are mostly negative. This data is consistent with data from past years that indicate that westslope cutthroat are stable and bull trout are declining on some reaches of the Bitteroot National Forest (Clancy 2009, 2011, 2013).

Figure 17. Overall trends for westslope cutthroat and bull trout in the study sections on the Bitterroot National Forest and adjacent streams sampled in 2013 and 2014. A 10% difference between the most recent population estimate and the long term mean was used to assess the trend.

Genetic Testing – West Fork Bitterroot upstream of Painted Rocks Dam

We have intensified our genetic sampling of westslope cutthroat from the West Fork Bitterroot River drainage upstream of Painted Rocks Dam. Genetic samples from the past have indicated that nearly all of the streams support pure strain fish. In the past few years, with the help of the Bitteroot National Forest biologists and a University of Montana graduate student, we have collected samples from all of the major streams and most of the smaller streams.

The University of Montana Conservation Genetic Laboratory used SNPS to analyze these fish. The data collected indicated that all of the sites were pure strain westslope cutthroat trout, with the exception of 2 sites (Figure 18). The sites that supported introgressed fish are Chicken Creek and Upper Overhwich Creek (indicated by open circles in figure). Chicken Creek samples indicate a minor amount of introgression with rainbow trout, while a sample upstream of Overwhich Falls indicated introgression with Yellowstone cutthroat trout. Removal of fish from Overhwich Creek may be a logical project to undertake. We spent one day surveying Overwich Creek upstream of the falls. It supports a small population of introgressed westslope cutthroat/Yellowstone cutthroat trout. The stream is relatively small and appears to be a good candidate for fish removal.

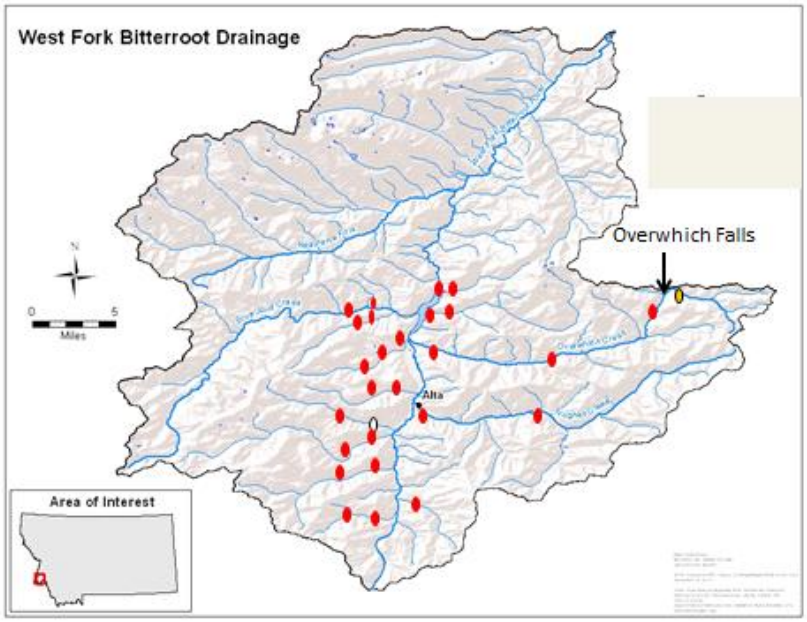

Figure 18. Location where genetic samples from westslope cutthroat trout have been collected. Open dots are introgressed.

Lake Como

During 2008, 2009 and 2011 intensive gillnetting of Lake Como was undertaken. Each year, 24 overnight gillnet sets collected a large number of fish. In 2013, we set 2 nets in Lake Como during October. The data indicate that the gillnets in October of 2013 caught more fish per net in most cases (Figure 19)

Figure 19. Number of fish captured per net in Lake Como.

The average size of fish of each species and relative proportion of rainbow and westslope cutthroat was similar to the size and proportion of fish caught in the previous years (Figure 20). During fall, the reservoir is much lower and recreational use is not as high as during May. Fall may be a better time to set nets for monitoring purposes.

Figure 20. Mean length of rainbow trout, westslope cutthroat trout and Kokanee from gill nets in lake Como.

Hieronymous Pond

Fish removal from Hieronymus Pond has occurred each Spring since 2008. The removal of fish is an effort to decrease competition among fish (Flick and Webster 1992). Removal of some fish has been undertaken each Spring. The primary goal of the fish removals is to increase the growth of yellow perch and stocked rainbow trout in Hieronymous Pond. The standard removal effort each day is to electrofish the edge of the pond twice and to remove yellow perch. Northern pikeminnows, largescale and longnose suckers are removed and released into the adjacent Corvallis Canal. All other fish are returned to Hieronymous Pond.

During the first few years, the number of fish removed was greater than the later years (Figure 21). The average size of fish has declined in recent years. Yellow perch, for example, were removed in large numbers in 2007 and 2008. By 2009-2011 the numbers declined, but average size increased (Figure 22). In recent years, the average size of yellow perch has decreased as their numbers increased in samples.

In general, it appears that the large number of fish removed in the early years did lead to an increase in the average size of yellow perch and possibly rainbow trout. Due ot the high number of species of fish in Hieronymous Pond, predicting the results of management actions such as fish removals is difficult. However, if larger fish are a management goal, a larger number of fish should be removed from the pond.

Figure 21. The number of fish of each species captured during electrofishing in Hieronymous Pond during the year indicated.

Figure 22. Mean length of fish of each species captured during electrofishing during the year indicated.

LITERATURE CITED

Bear, E.A. T. McMahon and A. Zale. 2007. Comparative Thermal Requirements of Westslope Cutthroat Trout and Rainbow Trout: Implications for Species Interactions and Development of Thermal Protection Standards. Trans. Am. Fish. Soc. 136, (4): 1113-1121

Berg, R.K. 2009. Fish population surveys of Browns Lake, Nevada Reservoir, Coopers Lake, Lake Como and Painted Rocks Reservoir since 2003. Montana Fish Wildlife and Parks. Federal Aid Project Numbers F-113-R1 & F-113-R2.

Clancy, C.G. 1993. Statewide Fisheries Investigations. Bitterroot Forest Inventory. Project F-46-R-4. Montana Fish, Wildlife and Parks, Helena.

Clancy, C.G. 1996. Statewide Fisheries Investigations. Bitterroot Forest Inventory. Project F-46-R-4. Montana Fish, Wildlife and Parks, Helena

Clancy, C.G. 2009. Montana Statewide Fisheries Management. Bitterroot River Drainage. Federal Aid Project No. E-113.

Clancy, C.G. 2011. Montana Statewide Fisheries Management. Bitterroot River Drainage. Federal Aid Project E-113.

Clancy, C.G. 2013. Montana Statewide Fisheries Management. Bitterroot River Drainage. Federal Aid Project E-113.

Cone, R.S., D.S. Robson and C.C. Krueger. 1988. Failure of Statistical Tests to Detect Assumption Violations in the Mark-Recapture Population Estimation of Brook Trout in Adirondack Ponds . North American Journal of Fisheries Management 8 (4):489-496.

Flick, W.A. and D.A. Webster. 1992. Standing Crops of Brook Trout in Adirondack Waters before and after Removal of Non-trout Species. North American Journal of Fisheries Management 12(4): 783-796.

Javorsky, L. 1994. The Bitterroot River floodplain: An historical analysis. Montana Department of Fish, Wildlife and Parks.

Nordwall, F. 1999. Movements of Brown Trout in a Small Stream: Effects of Electrofishing and Consequences for Population Estimates. North American Journal of Fisheries Management 19(2):462-469.

Peterson, N.P. and C.J. Cederholm. 1984. A Comparison of the Removal and Mark-Recapture Methods of Population Estimation for Juvenile Coho Salmon in a Small Stream. North American Journal of Fisheries Management 4(1):99-102.

Rosenberger, A. E. and J.B. Dunham. 2005. Validation of Abundance Estimates from Mark-Recapture and Removal Techniques for Rainbow Trout Captured by Electrofishing in Small Streams. North American Journal of Fisheries Management Volume 25(4):1395 – 1410.

Russell R.E, D.A. Schmetterling, C. S. Guy, B. B. Shepard, R. McFarland and D.Skaar.2012. Evaluating a Fish Monitoring Protocol Using State-Space Hierarchical Models. The Open Fish Science Journal (5) 1-8

Spoon, R.L. 1987. Evaluation of management of water releases for Painted Rocks Reservoir, Bitterroot River, Montana. Final Report. Montana Department of Fish, Wildlife and Parks. Bonneville Power Administration, contract report. Project 83-463, contract number DE-A179-83BP13076.

Williams,J. E., A. L. Haak, H. M. Neville and W. T. Colyer .2009 Potential Consequences of Climate Change to Persistence of Cutthroat Trout Populations. North American Journal of Fisheries Management. Volume 29(3): 533-548.

Prepared by: Christopher G. Clancy and Leslie G. Nyce. June 2015.

Stream	Code Number	Key Words
Bitterroot River drainage	2-03-8865	Trout populations
		Whirling Disease
		Fishing regulations
		Westslope cutthroat
		Water Temperature
		Rainbow trout
		Brown trout
		Bull trout
		Bitterroot River
		Bitterroot National Forest
		Lake Como
		Hieronymus Pond