FISHERIES DIVISION
Federal Aid Job Progress Report
Montana Statewide Fisheries Management
Federal Aid Project Number: F-113
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Project Title: Montana Statewide Fisheries Management

Job Title: Bitterroot River Drainage Fisheries Management

ABSTRACT

Results from sampling of the Bitterroot River in 2015 and 2016 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. .

Fish population monitoring on the Bitterroot National Forest (BNF) indicates that population trends vary throughout the drainage. Westslope Cutthroat Trout populations are stable and Bull Trout populations are stable to declining. Radio telemetry study of Bull Trout in Skalkaho and Daly Creeks indicates that some resident fish migrate several miles during the spawning period. Also, redd counts for Bull Trout should be undertaken during mid September to early October for maximum effectiveness. In Sleeping Child Creek, Brown Trout distribution has expanded upstream since sampling began in the 1980's. A comparison of eDNA and standard sampling techniques in BNF streams to detect Bull Trout indicated that they are equally effective in streams that have been well sampled by both means.

Lake Como has been stocked with Rainbow Trout, Westslope Cutthroat Trout and Kokanee in recent years. The average size of Rainbow Trout captured in gill nets has not changed much in recent years, but the size of Kokanee has increased. Since Kokanee have not been stocked since 2010 it is possible that some reproduction is occurring.

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.

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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 2011-2016 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 fish that we encountered that could be caught by 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 2015 and 2016, we concentrated on sites that in the past 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 a 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.

Radio transmitters were implanted in Bull Trout during July, 2016 to assess pre-spawning and spawning movements. Fish were located at least 2 times per week and redd counts

were done at 2 sites on Daly Creek during September and October, 2016. All redds were counted each day of sampling.

Lake Como Reservoir was sampled with gillnets, set overnight. Sampling has occurred at full pool in May or low pool in October/November. Floating experimental nets are used.

Northern pikeminnow, Longnose and Largescale Sucker and Yellow Perch were removed from Hieronymus Pond during the spring of 2015 and 2016. 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.

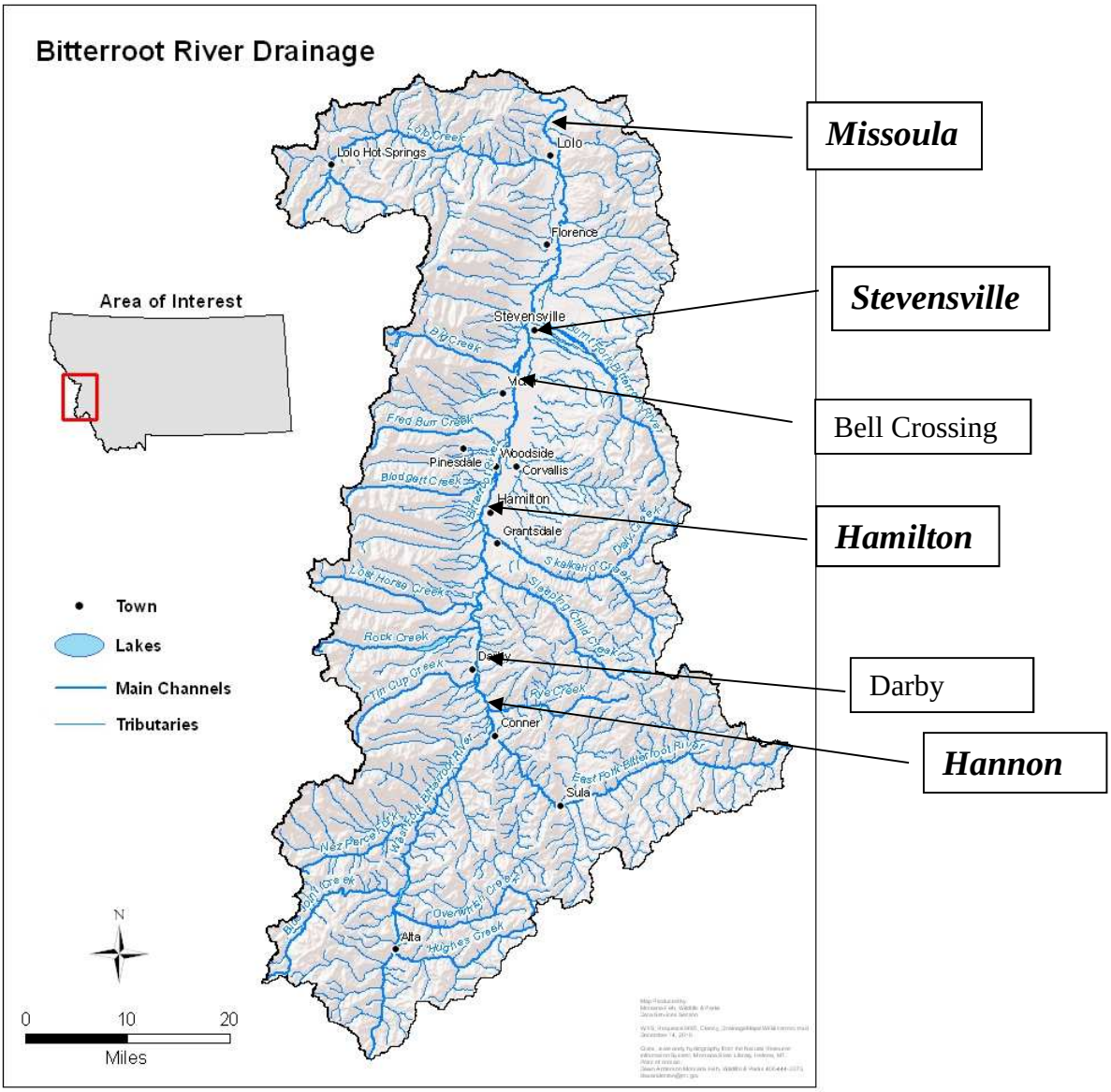

Figure 1. Map of study areas with study sections labeled. The bolded, italicized reaches are sampled during routine population estimates and single pass sampling for all species

RESULTS AND DISCUSSION

Bitterroot River Trout Populations

We monitor 1 or 2 long term sections of the Bitterroot River and/ or West Fork Bitterroot during early Fall each year. Another crew has been monitoring trout populations on the Missoula section each. This report discusses the trends in Rainbow and Brown Trout, 12 inches and longer and Westslope Cutthroat, 10" and longer. During 2015, the Conner section of the West Fork Bitterroot River and Bell Crossing section of the Bitterroot River were sampled. In 2016 the Darby section of the Bitterroot River was sampled.

The Rainbow Trout populations in the upper river declined in the mid-1990's and stabilized 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). The number of larger Westslope Cutthroat on the Conner section was the highest since data collection began (Figure 8).

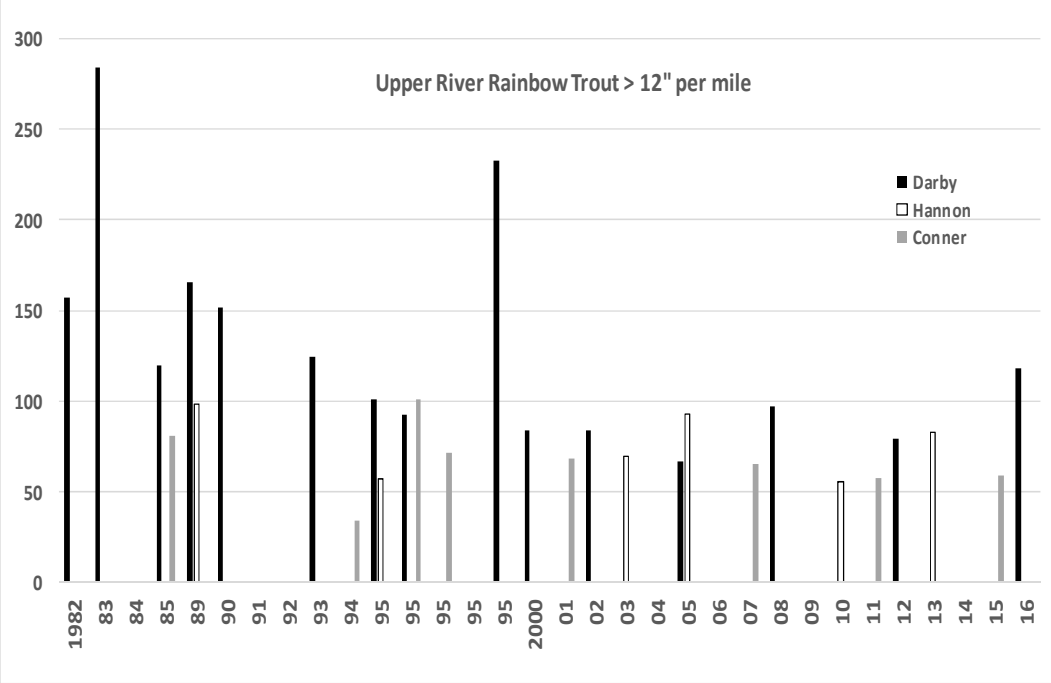

Figure 2. Population trends of Rainbow Trout in the Conner, Hannon and Darby sections

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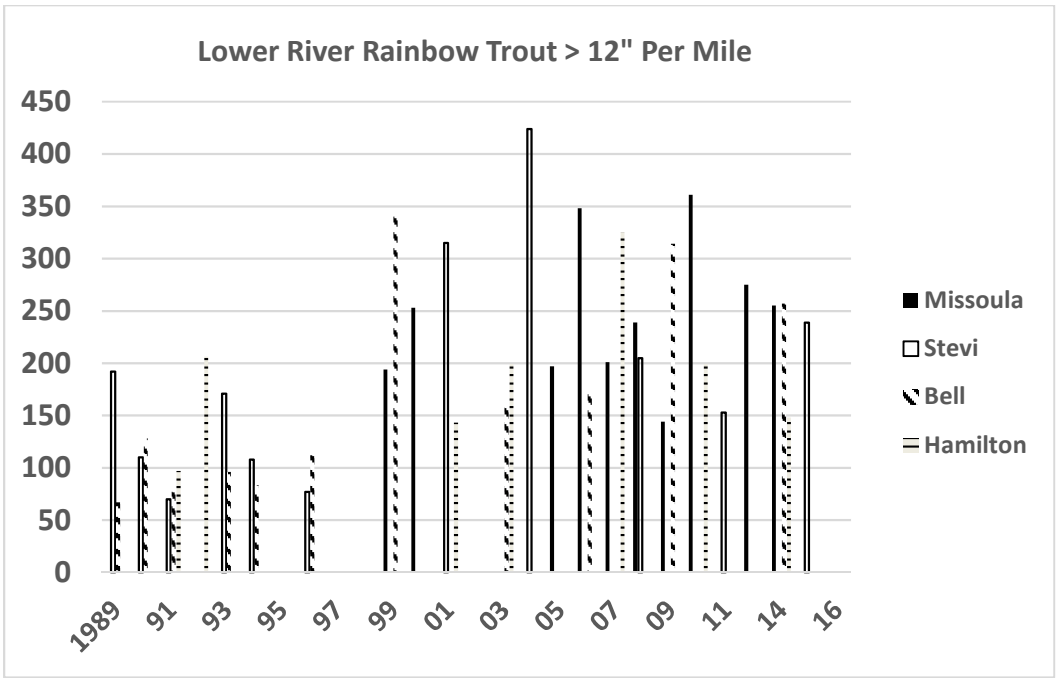

Figure 3. Population trends of Rainbow Trout in the Hamilton, Bell Crossing, Stevensville and Missoula Sections.

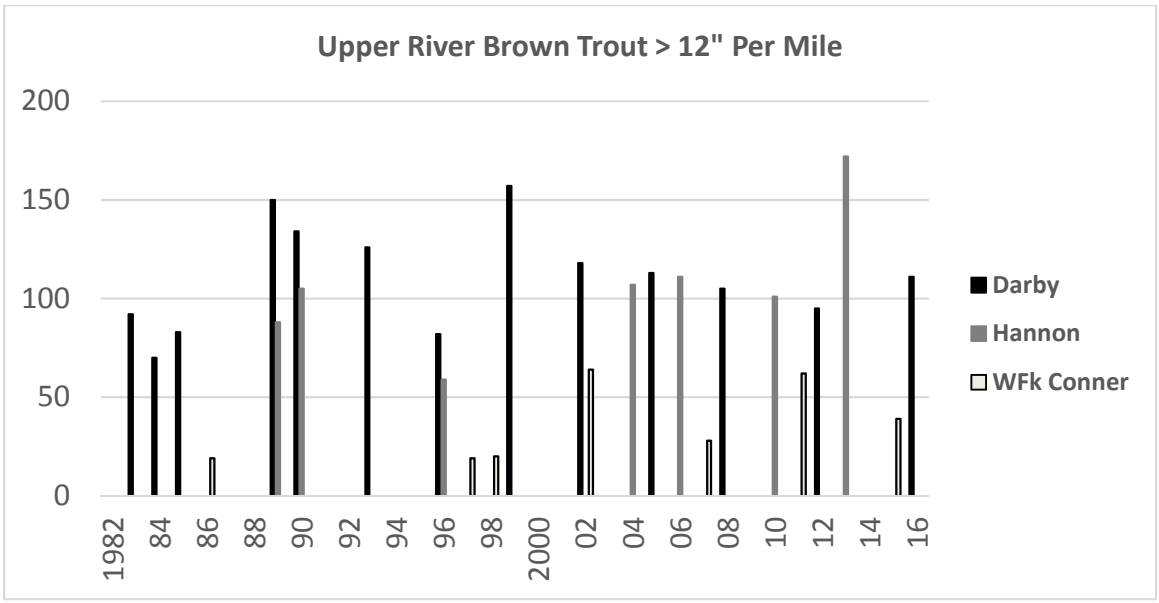

Figure 4. Population trends of Brown Trout in the Conner, Hannon and Darby sections.

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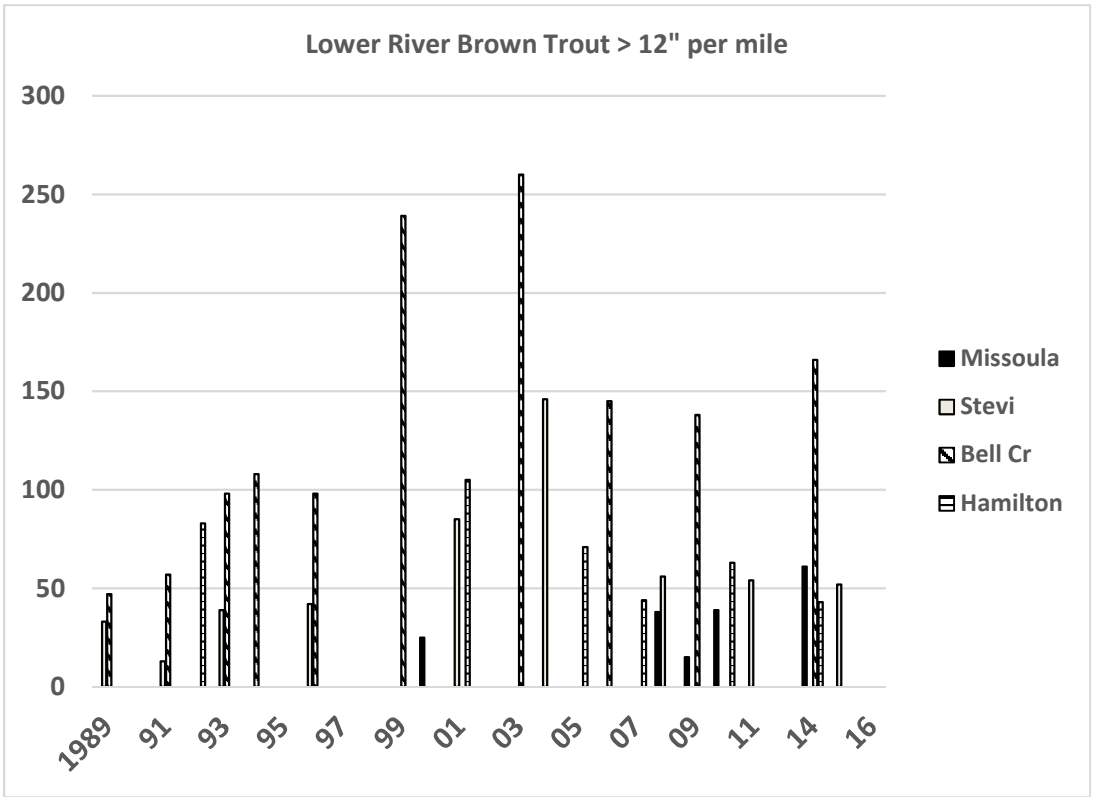

Figure 5. Population trends of Brown Trout in the Hamilton, Bell Crossing, Stevensville and Missoula sections.

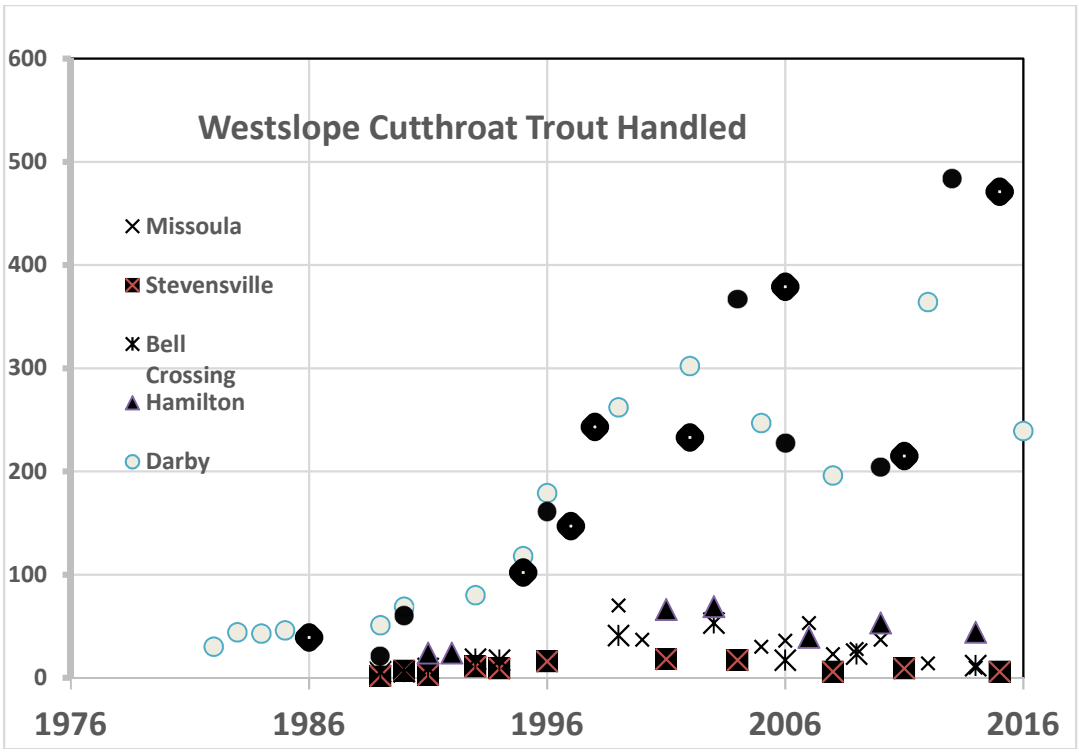

Figure 6. Number of Westslope Cutthroat handled during electrofishing in the study section of the Bitterroot River during the years indicated.

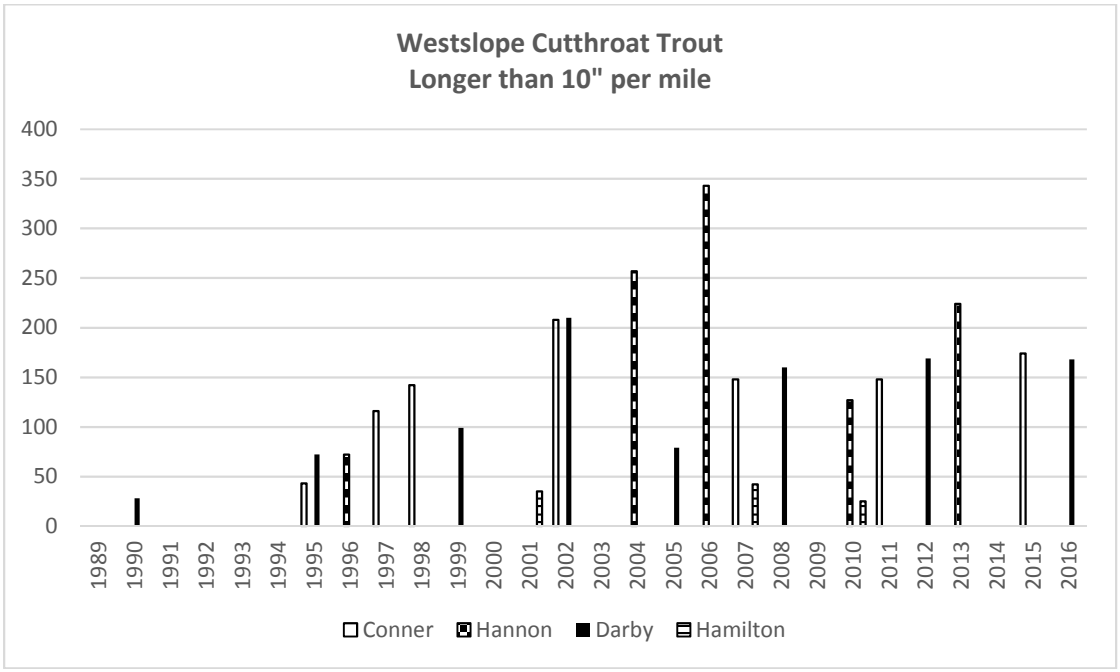

Figure 7. Population trends of Westslope Cutthroat in the Conner, Hannon, Darby and Hamilton sections.

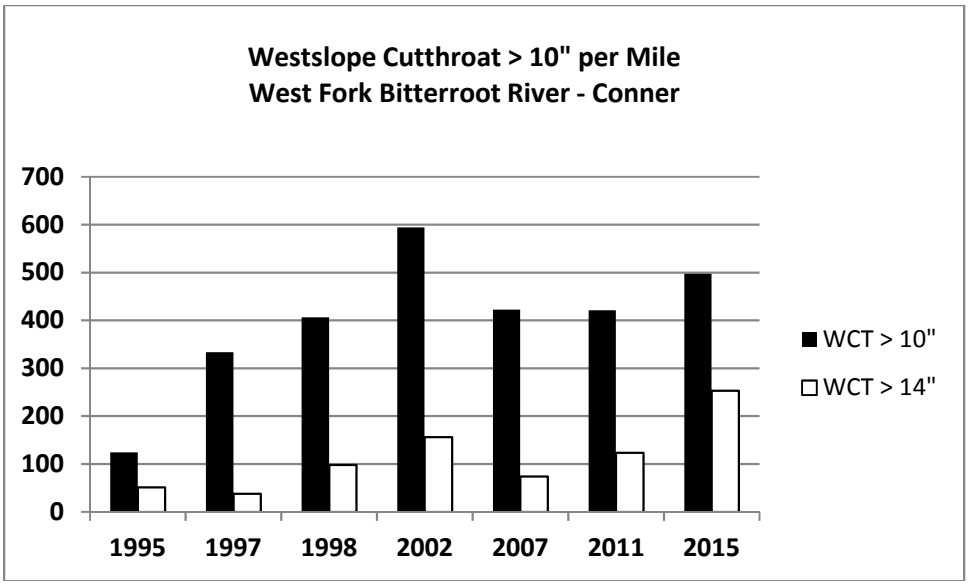

Figure 8. Population estimates of Westslope Cutthroat Trout in the Conner Section of the West Fork Bitterroot River during the years indicated.

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.

Data indicate that Mountain Whitefish is the most common species captured (Figure 9).

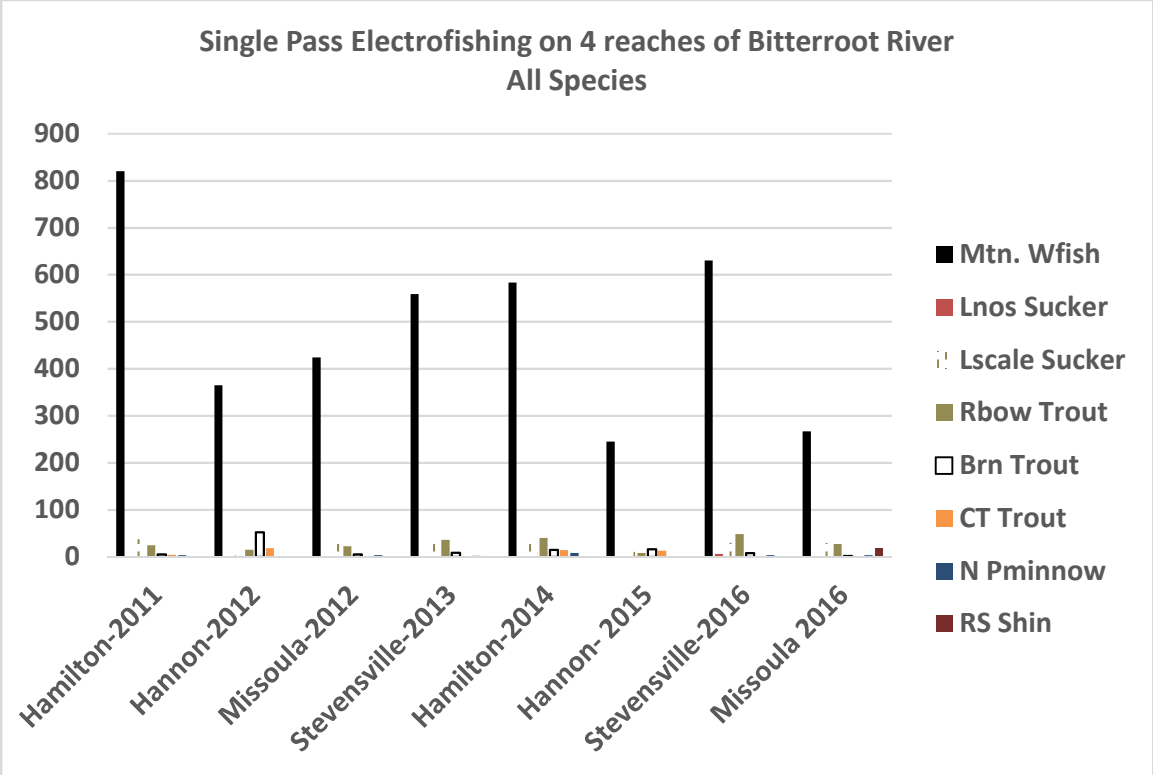

Figure 9. Relative abundance of species captured in single pass electrofishing at 4 sites in the Bitterroot River.

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 2015 and 2016, indicate that on the sections we sampled, Westslope Cutthroat Trout are fairly balanced between positive and negative trends (Figure 10). 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).

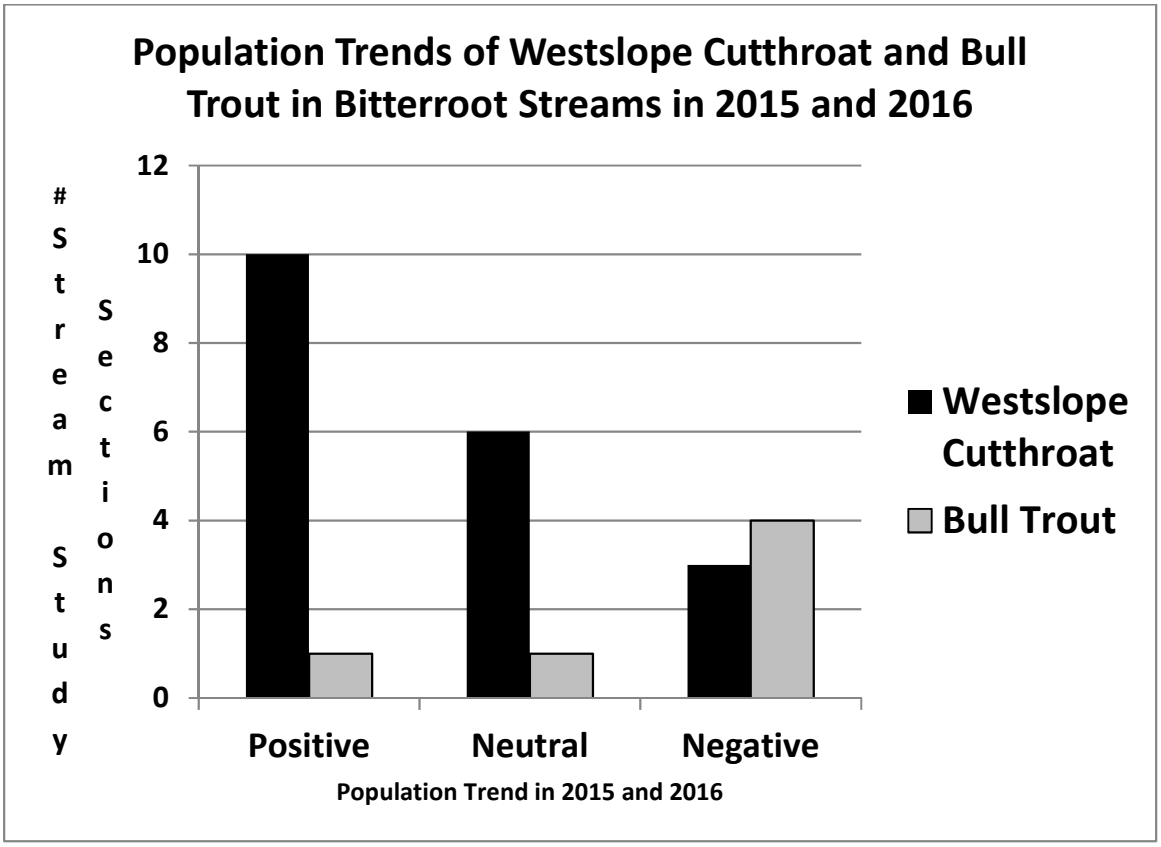

Figure 10. Overall trends for Westslope Cutthroat and Bull Trout in the study sections on the Bitterroot National Forest and adjacent streams sampled in 2015 and 2016.

Bull Trout Radio Telemetry

During early July of 2016, we implanted radio transmitters in 25 Bull Trout in Skalkaho an Daly Creeks (Figure 11). We were attempting to understand the patterns of movement during the spawning period of Bull Trout.

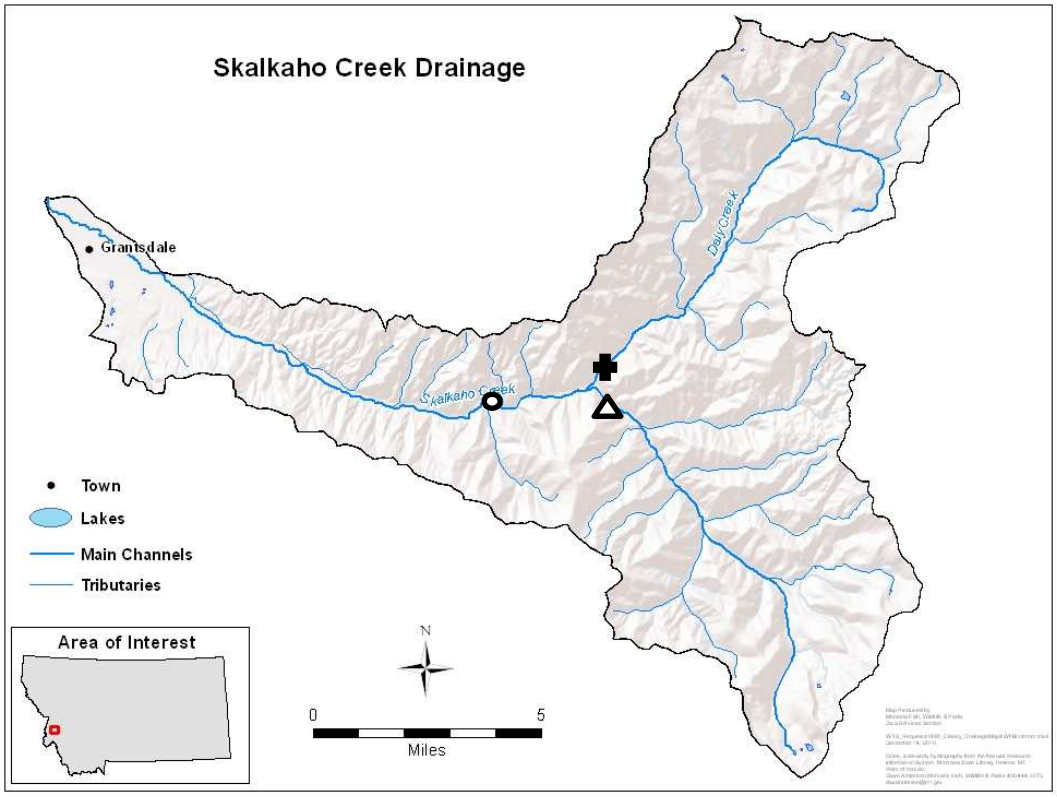

Figure 11. Location of sites where radio transmitters were implacnted in Bull Trout in Skalkaho and Daly Creeks in July, 2016.

Migration was defined as a fish moving at least ½ mile. Eleven of the 25 fish migrated, and the smallest size was about 240 mm (Figure 12). Fish from lower Skalkaho Creek and Daly Creek migrated upstream in Daly Creek, and fish from South Fork Skalkaho migrated within South Fork Skalkaho, presumably for spawning (Figure 13). It appears that Daly Creek is a significant spawning stream for Bull Trout. The highest proporation of Bull Trout that migrated were from Lower Skalkaho. They migrated as far as 4.0 miles upstream into Daly Creek (Figure 14). Only 2 of the fish from Daly Creek migrated upstream in Daly Creek (Figure 15). Four of the fish in South Fork Skalkaho migrated a relatively short distance (Figure 16). The tributary streams in this area are small. We did not observe any fish moving into tributaries to spawn.

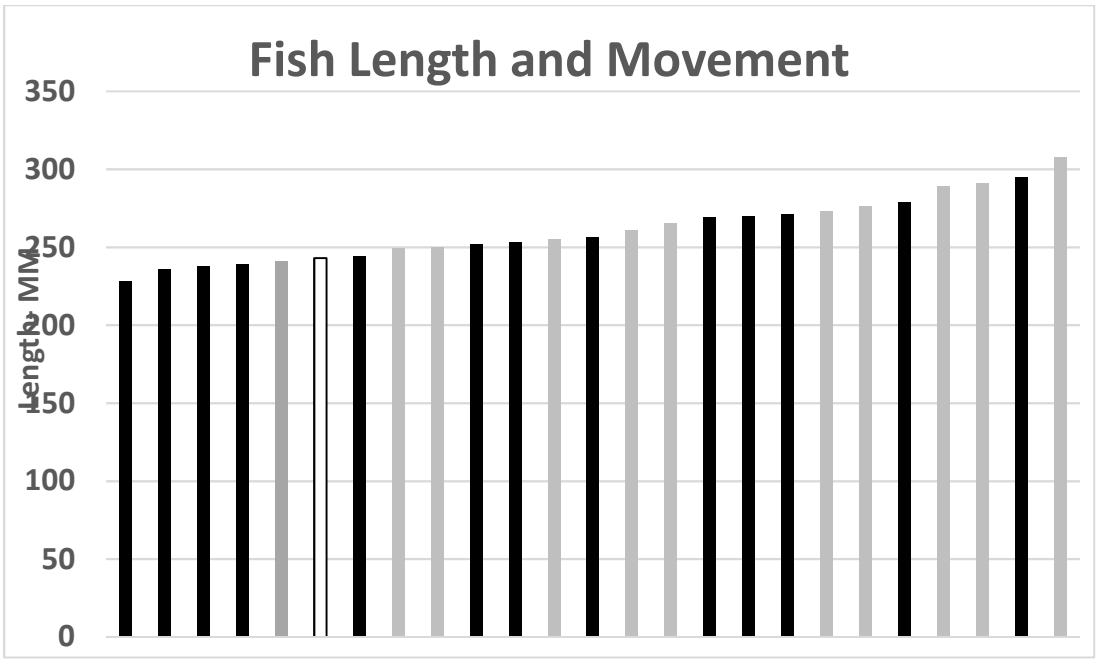

Figure 12. Length of Bull Trout and migratory status. (Black-no migration, Gray-migrated, White-lost fish)

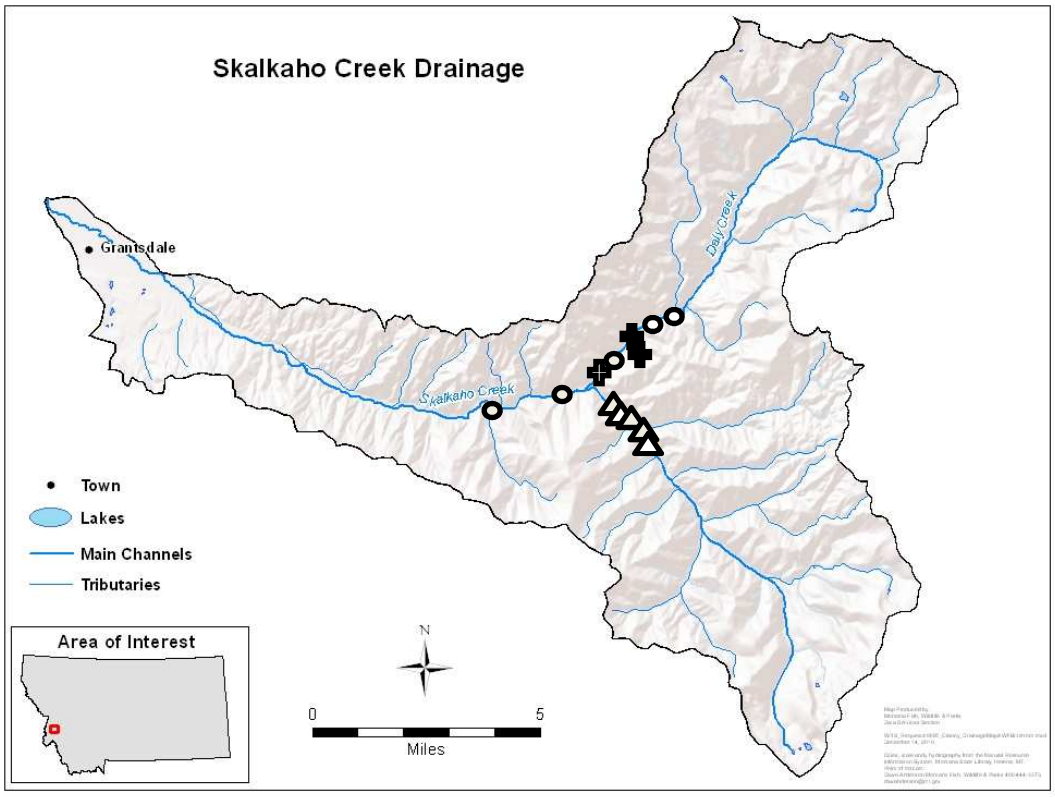

Figure 13. Upstream migration exent by fish from each site.

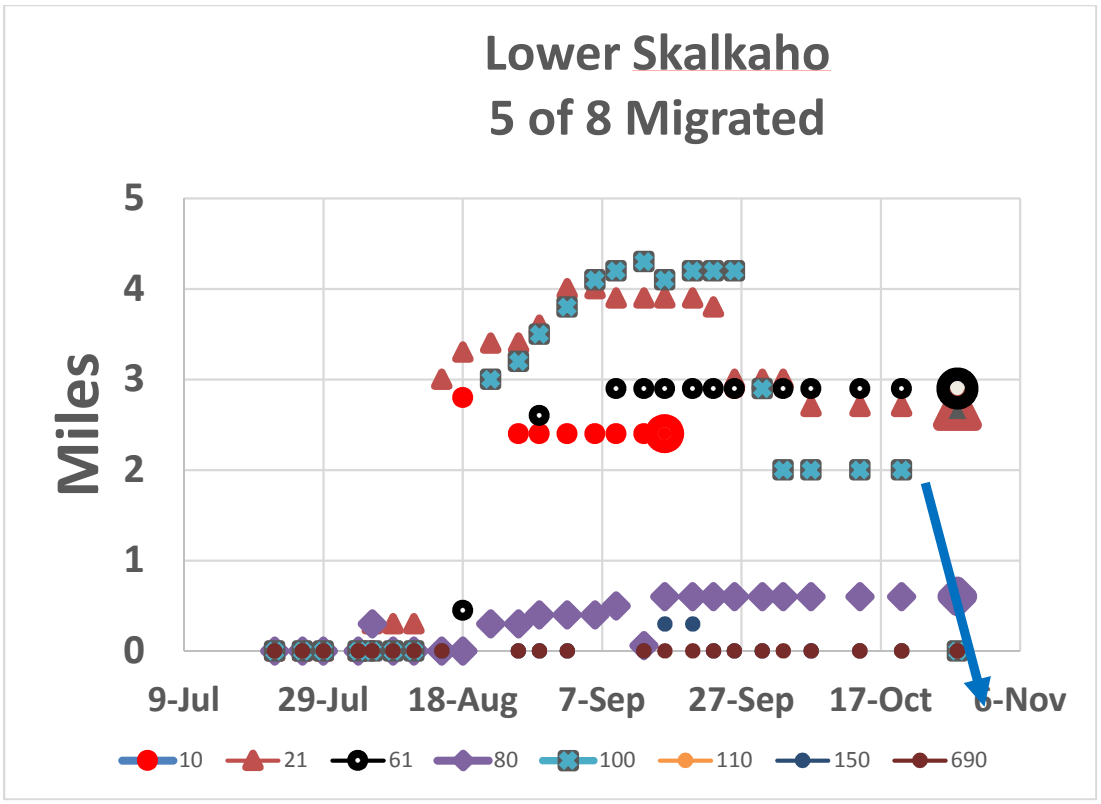

Figure 14. Migration status and miles migrated of fish from Lower Skalkaho Creek.

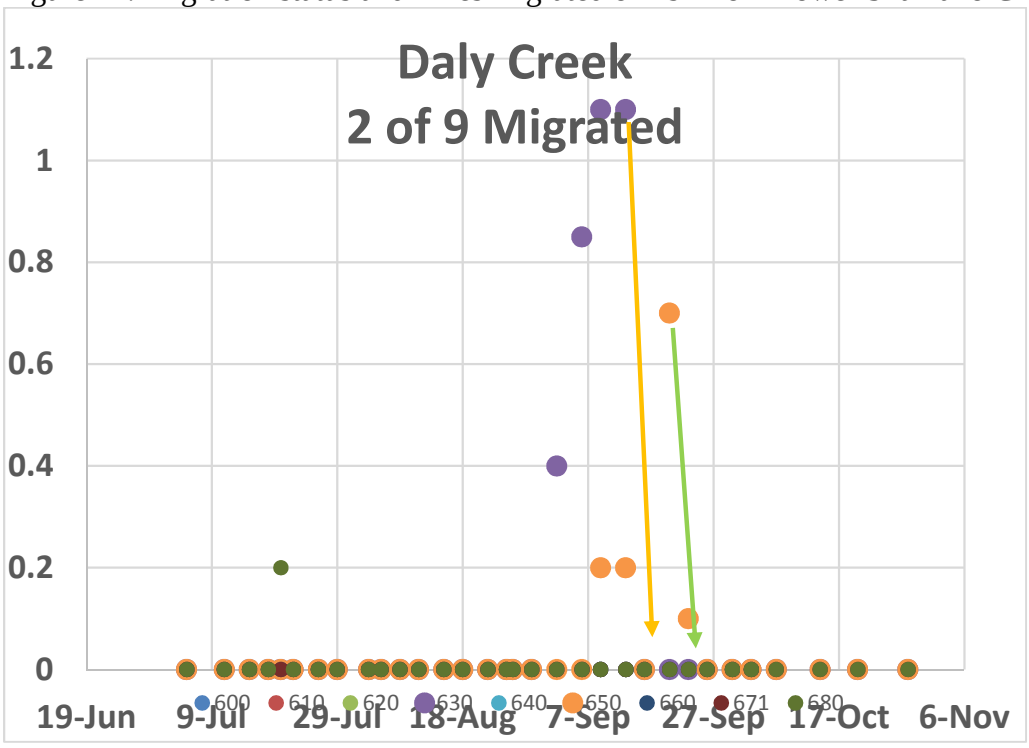

Figure 15. Migration status and miles migrated of fish from Daly Creek.

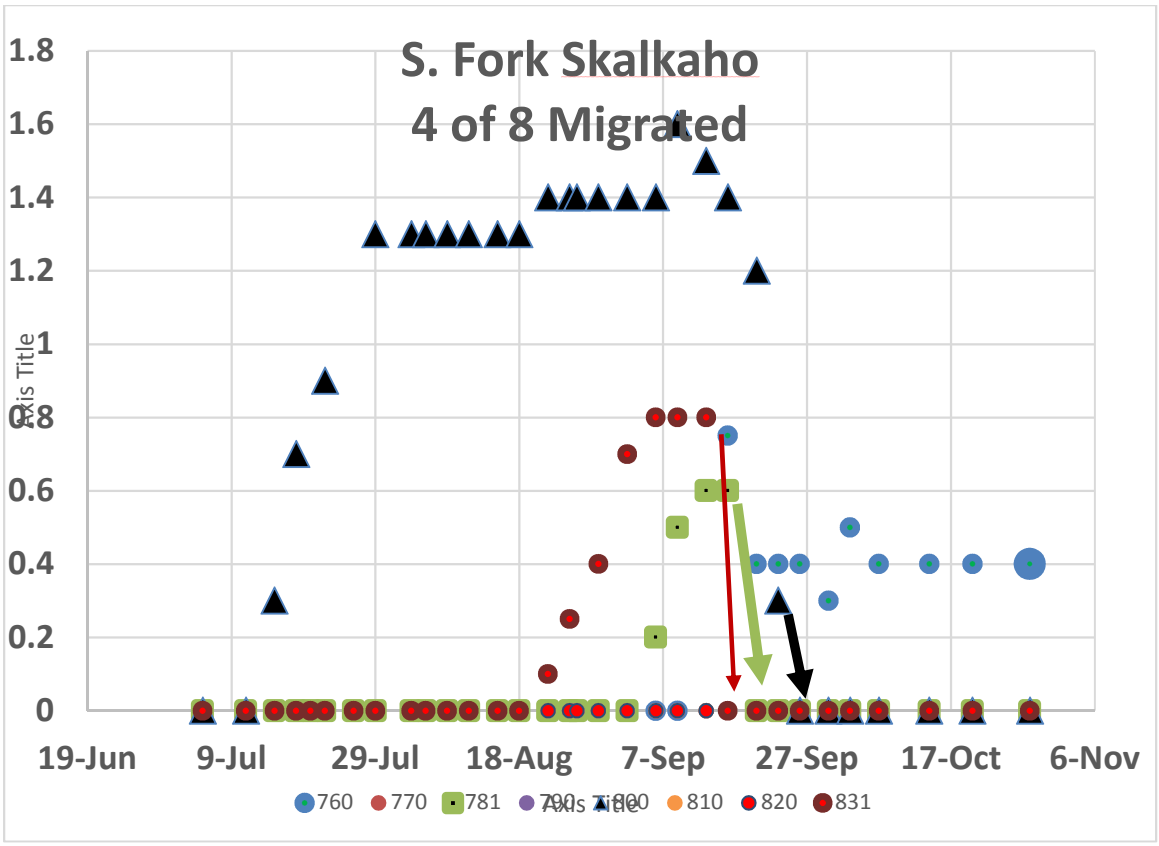

Figure 16. Migration status and miles migrated of fish from South Fork Skalkaho Creek.

Redd Counts were assessed several times on two reaches of Daly Creek (Figure 17). Some similarities were observed in the 2 reaches. Bull Trout were actively seen on redds between September 10 and 25 and the peak of redd counts was in late September and diminished after that. All visible redds were counted each time and are only approximate due to superimpostion and aging which caused difficulty in seeing older redds.

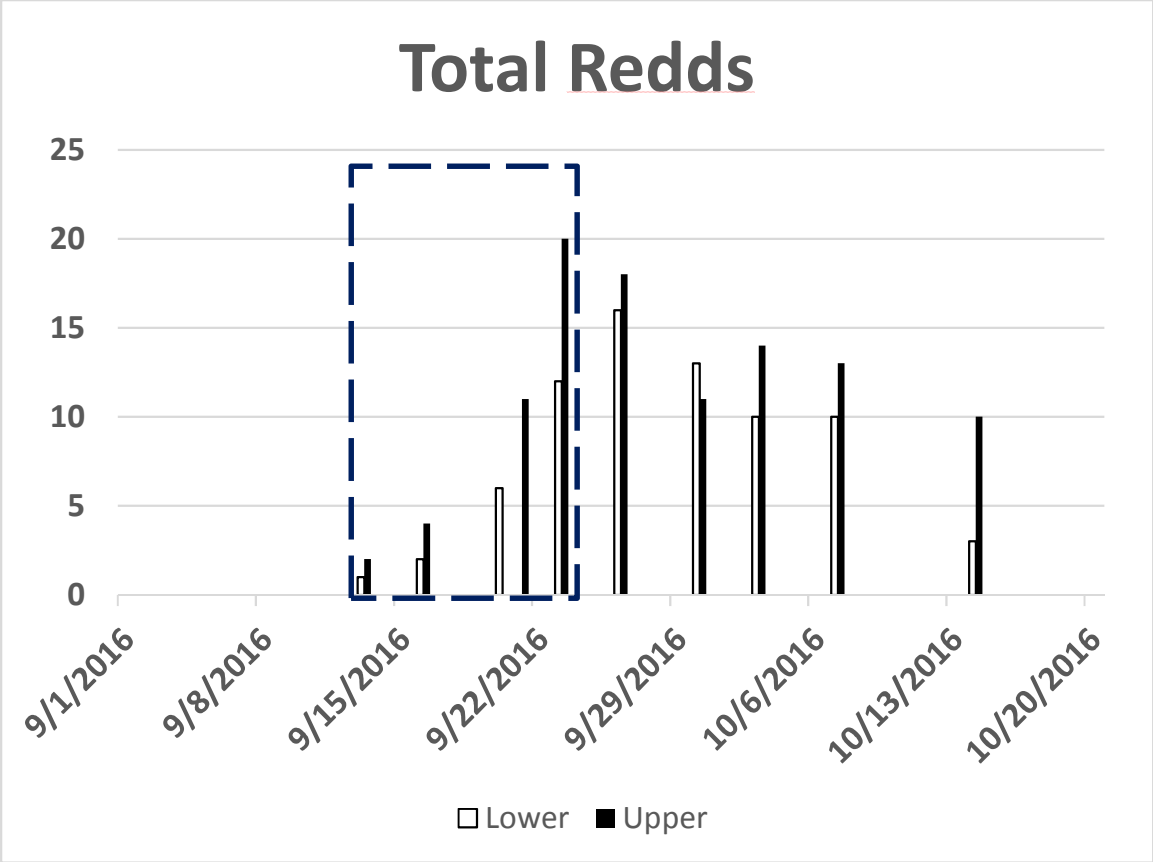

Figure 17. Redd Counts at Lower and Upper Daly Creek during September and October, 2016.

Sleeping Child Creek Brown Trout range expansion.

Since population estimates were first collected in Sleeping Child Creek in the m-1980's, the upper drainage has been inhabited by a native fishery, including Bull and Westslope Cutthroat Trout. During the 1980's and 1990's and through 2010 no obvious change occurred (Figures 18-20). However, since 2010 Brown Trout have expanded their range in upper Sleeping Chld Creek (Figure 21). By 2016 Brown Trout represent about ½ of the fish at the long term monitoring site near Sleeping Child Hot Springs (Figure 22). Brown Trout replacement of Bull Trout has been documented in several streams in western Montana (Al-Chockhachy et al, 2016)

Figures 18-22. Relative abundance of fish captured in electrofishing sections of Sleeping Child Creek during the decades indicated. Red=Westslope Cutthroat, Green = Bull Trout, Orange = Brook Trout and Black = Brown Trout.

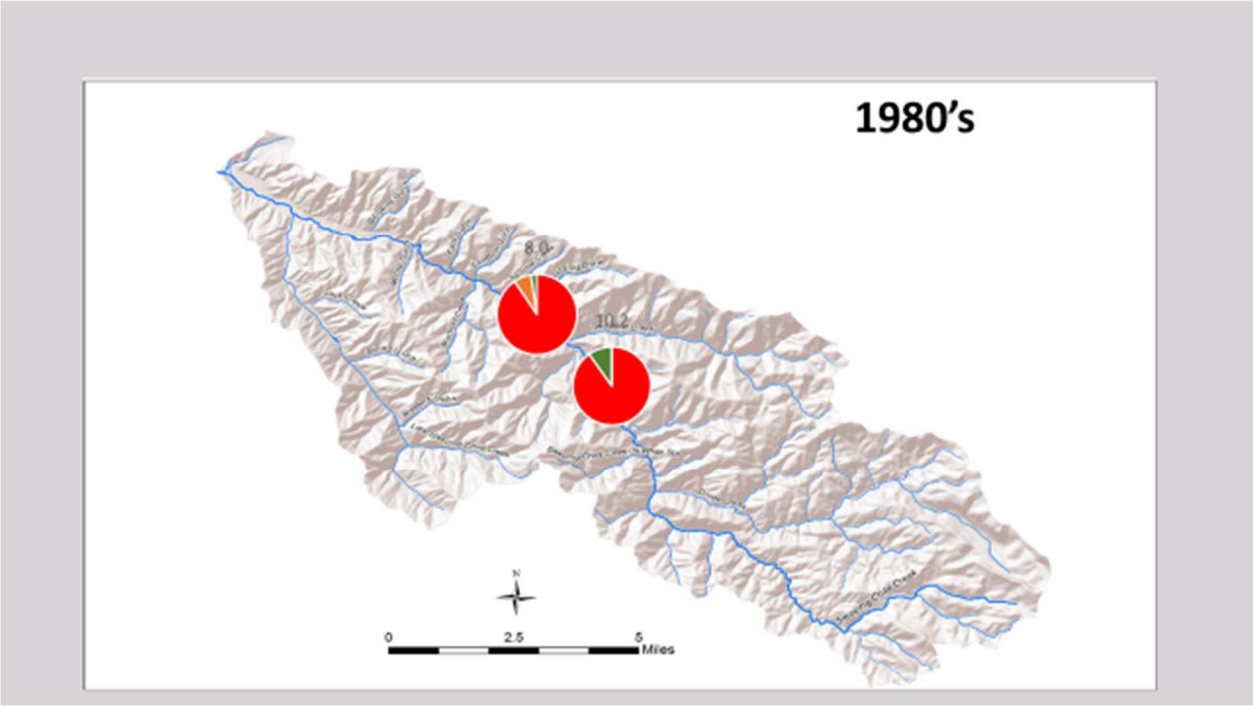

Figure 18. Relative abundance of species at fish sampling sites during the 1980's.

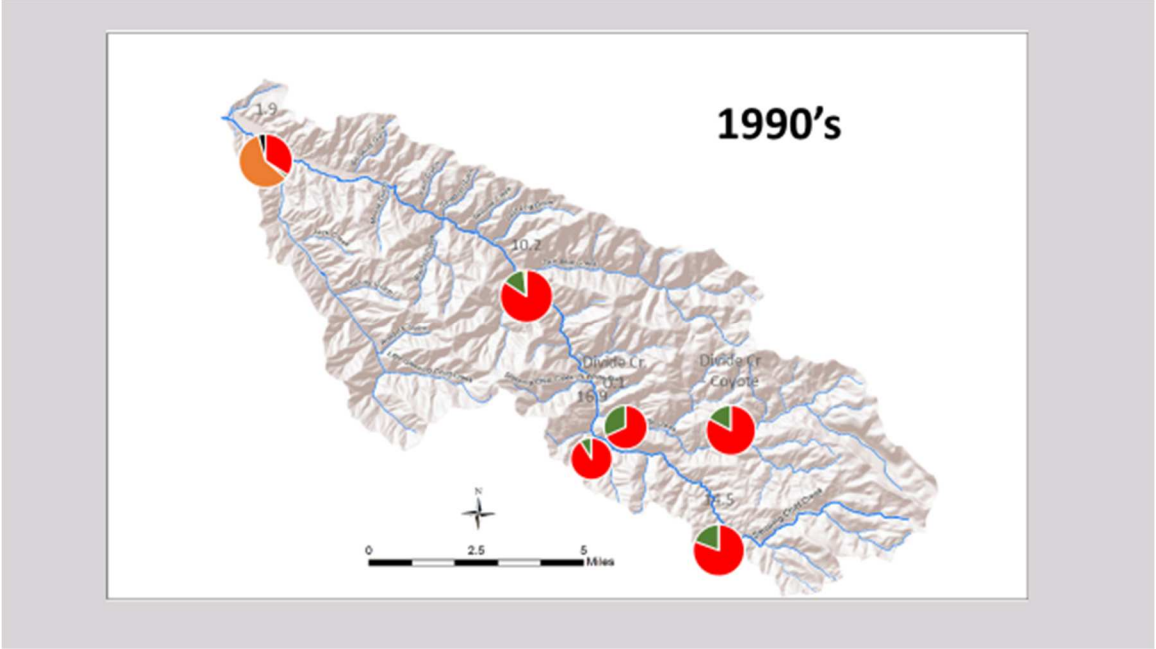

Figure 19. Relative abundance of species at fish sampling sites during the 1990's.

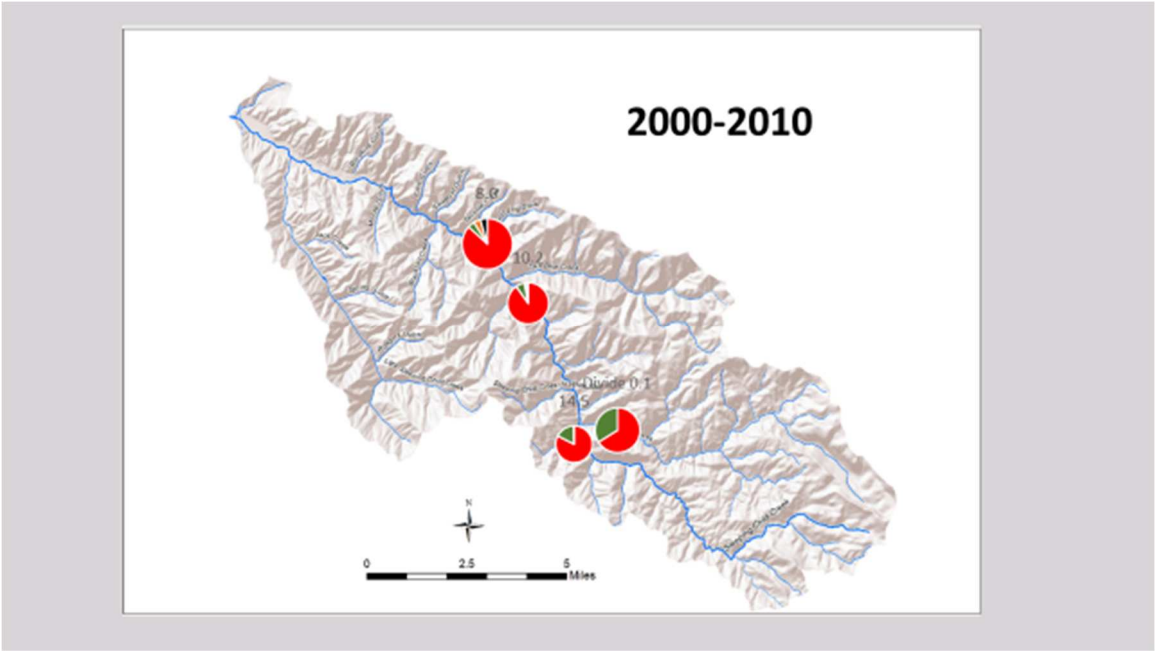

Figure 20. Relative abundance of species at fish sampling sites between year 2000 and 2010..

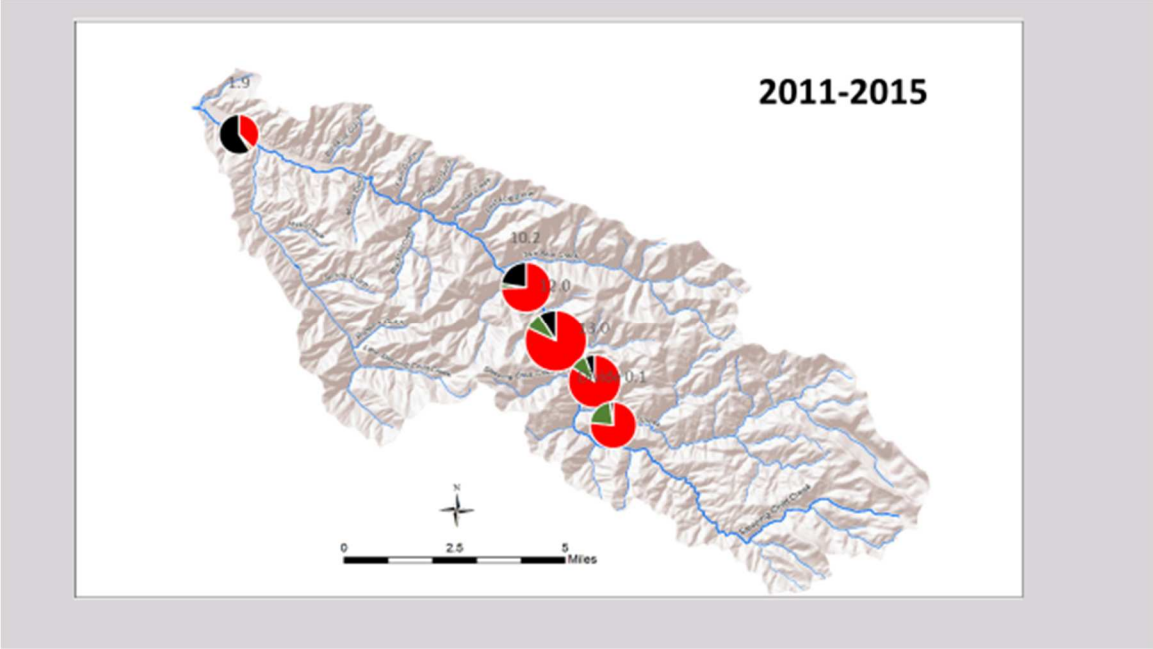

Figure 21. Relative abundance of species at fish sampling sites between year 2011 and 2015.

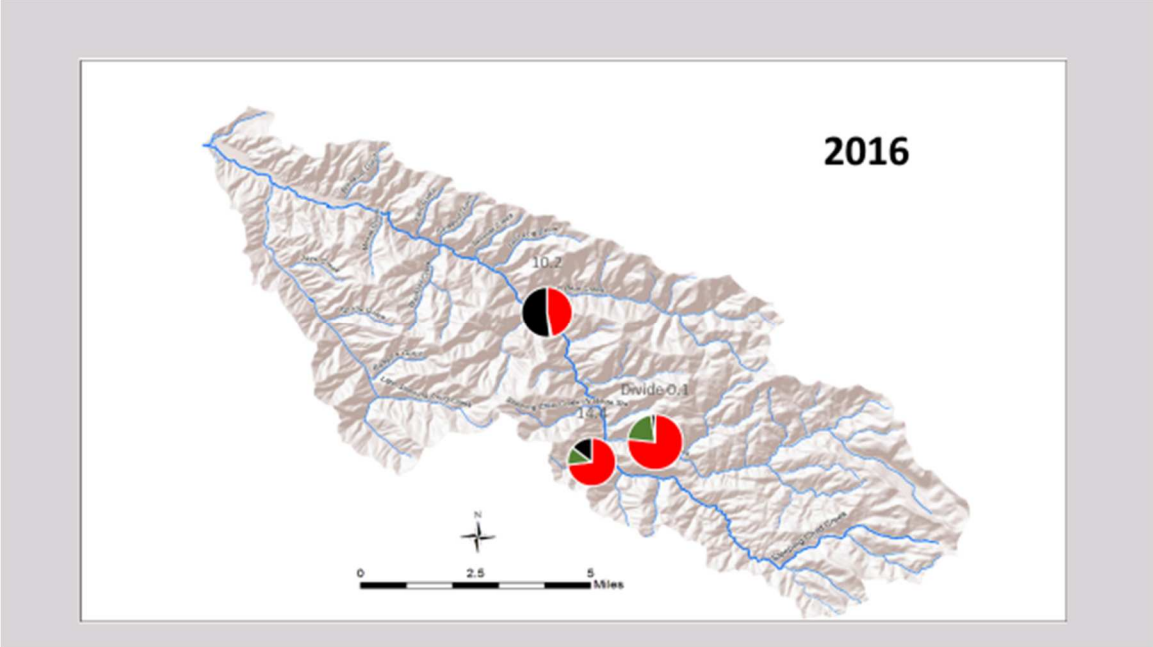

Figure 22. Relative abundance of species at fish sampling sites in 2016.

Field Fish Surveys vs. eDNA Surveys

We compared the ability of standard electrofishing and snorkeling techniques and eDNA sampling to detect Bull Trout presence in streams in the Bitterroot Valley. Most of the streams had been sampled at multiple locations and multiple years by electrofishing or snorkeling. The eDNA sampling was completed in 2015 and 2016 at multiple sites within each stream. So, each stream had been fairly thoroughly sampled using all techniques. The data indicate that both standard field sampling and eDNA sampling were equally effective in detecting presence of Bull Trout (Figure 23). In the few stream reaches where disagreement occurred, it was likely due to small sample size or differences in location of sampling.

Each type of sampling has advantages and disadvantages (Evans et al. 2017, Uhlibarri et al. 2017). Continued refinement of the eDNA sampling techniques may allow for less traditional sampling in future years.

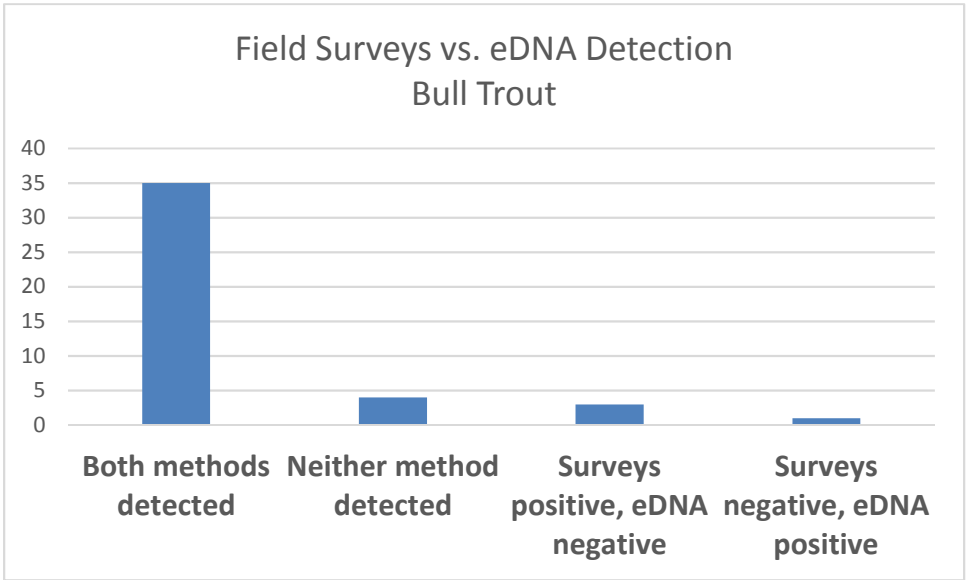

Figure 23. Detection of Bull Trout presence in streams in the Bitterroot Drainage using field surveys (electrofishing or snorkeling) and eDNA analysis.

Lake Como

Overnight gillnets were set in Lake Como during spring, 2015 and fall of 2016. We have returned to netting during the fall to avoid recreationists. We also appear to capture more fish per net in the fall. The size of Rainbow Trout has been consistent over the years, but the size of Kokanee has been increasing (Figure 24). Since Kokanee have not been stocked since 2010 they may be reproducing the Lake Como.

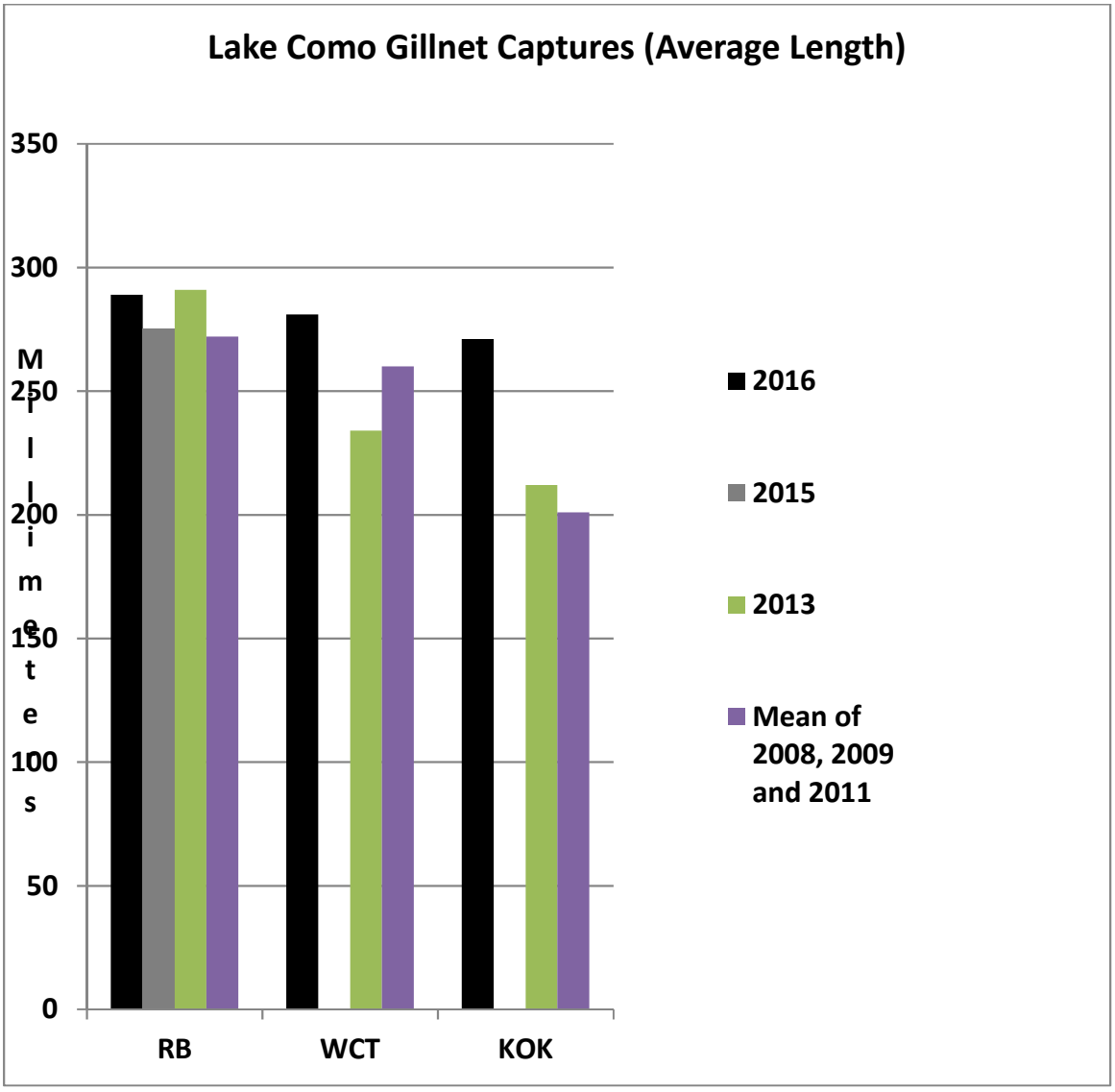

Figure 24. Mean length of salmonids captured in gill nets in Lake Como during the years indicated.

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 25). 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 26). 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.

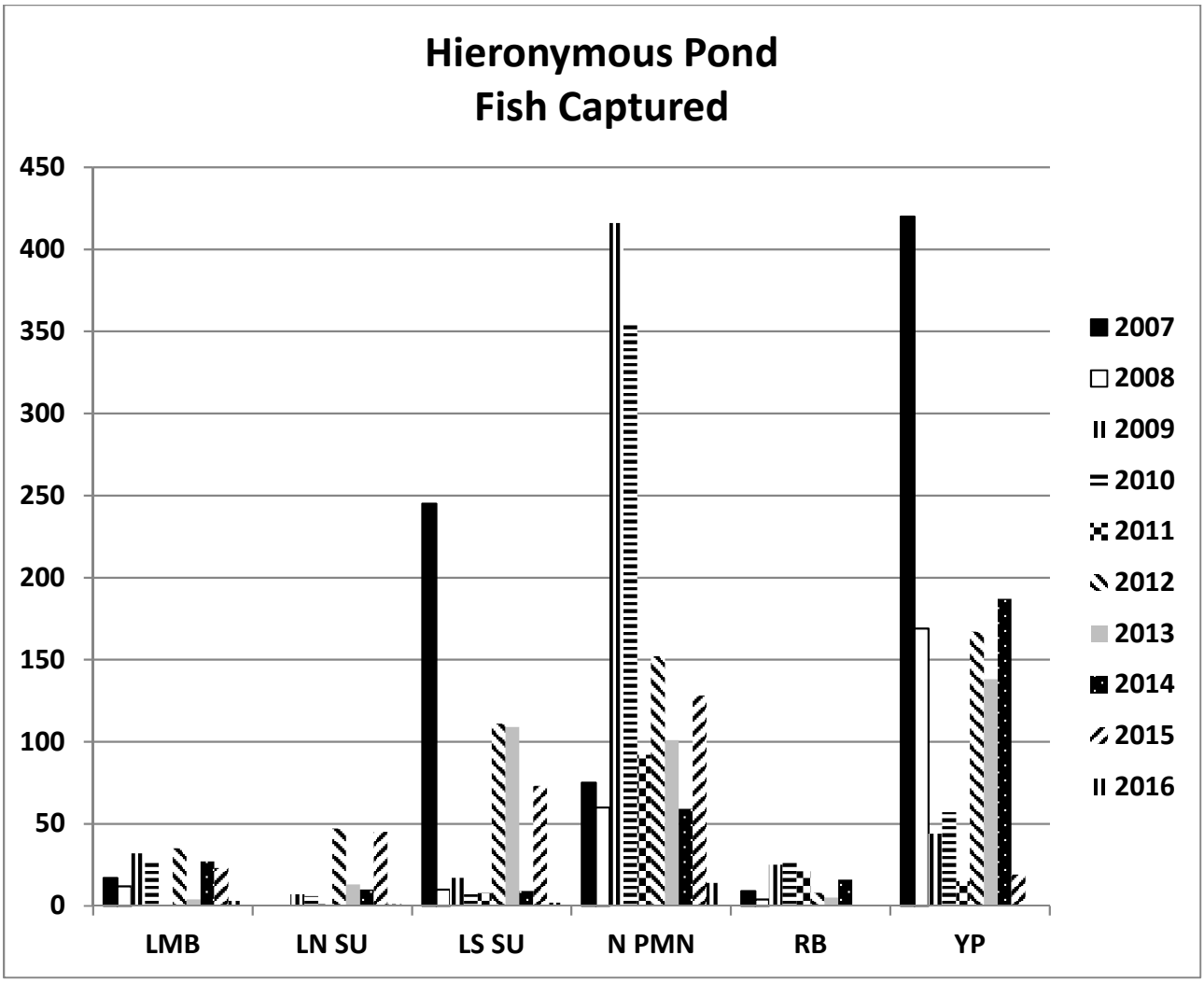

Figure 25. The number of fish of each species captured during electrofishing in Hieronymous Pond during the year indicated.

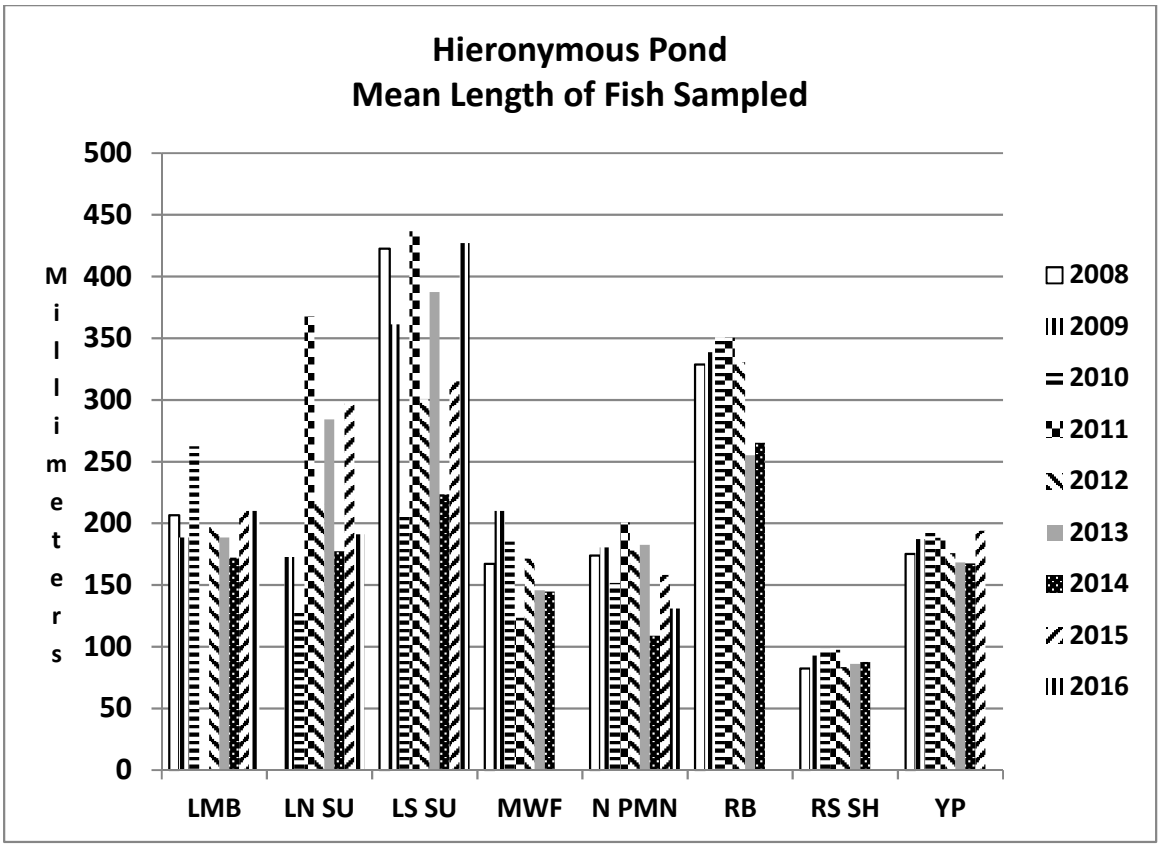

Figure 26. Mean length of fish of each species captured during electrofishing during the year indicated.

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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
		Radio Telemetry

Lake Como
Hieronymus Pond