Project Completion Report
McKenzie and Middle Fork Willamette Bull Trout Monitoring Grant
Grant Number: 209-3069

1.

a) The McKenzie River and the Upper Middle Fork Willamette River (MFWR) provide habitat for two populations of ESA *threatened* Columbia River bull trout. The McKenzie River population is the stronghold for bull trout in the entire Willamette Basin and has become a donor population to the recently re-established bull trout population in the MFW. The McKenzie and MFWR Watersheds have been identified as high priority areas for restoration and monitoring. Several crucial population dynamics have been monitored to assure that both populations continue to thrive and exist. Because of the regional and national significance of this program, an extensive monitoring program has already been developed. OWEB funds were used to maintain this ongoing monitoring and evaluation program that is vitally important.

b) The Fisheries Departments of the McKenzie and Middle Fork Ranger Districts (USFS) along with the Oregon Department of Fish and Wildlife (ODFW) employs a highly qualified staff of experts who have been performing the newest and most up to date monitoring within the watershed for the past several years. By monitoring, data was gathered on bull trout population dynamics that include: population growth, adult and juvenile distribution, spawning success, out-planting success, and natural fry reproduction. Additional data was gathered on key habitat factors such as newly recruited spawning gravel, large wood movement and distribution, pool per mile ratios, increased habitat cover, and stream temperature. This data was gathered by spawning and snorkel surveys, physical stream surveys, minnow trapping, modified screw traps with retro fitted culverts and river spanning weirs, electronic tagging equipment, infrared fish counters, and under water digital video recorders. All of this information is used to access the condition and stream function of the Upper Middle Fork Willamette River and McKenzie River.

c) There have been no changes from the original proposal.

d) Fishery Biologists guided an interpretative hike of the Upper Middle Fork Willamette River, observing preferred bull trout habitat, bull trout redds, and log placement restoration efforts, to demonstrate the importance of in-stream wood and the habitat it creates in our streams. This interpretative hike was open to the general public. See the attached scanned newspaper article (attachment 1) and "Show and Shine" (attachment 2).

f) Our project was implemented well and has proved to be highly efficient and effective in monitoring bull trout. The USDA Willamette National Forest, Middle Fork Ranger District is currently working on completing strategic planning of aquatic projects that augment habitat located on the Upper Middle Fork Willamette River. These projects are outlined in the *USDA Upper Middle Fork Willamette River Watershed Action Plan, June 2009*, for the years 2009 thru 2013.

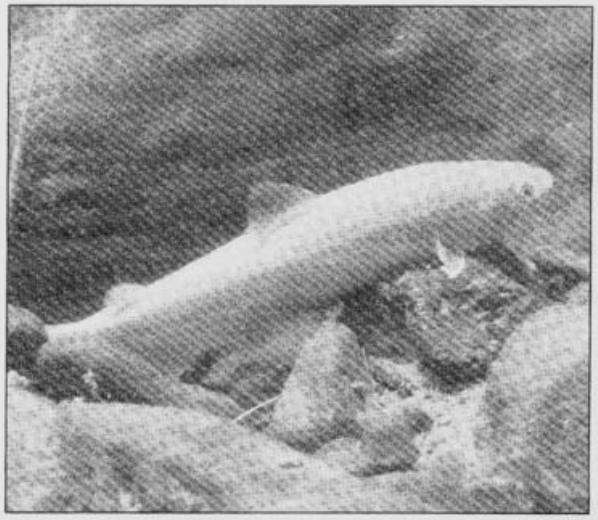
2.

b) Attached is the monitoring data from the ***USDA Forest Service Annual Monitoring Report*** (attachment 3). This data and all monitoring information is housed in the Fisheries Department, Middle Fork Ranger District, on the Willamette National Forest in Westfir, Oregon.

3. Accounting of all expenditures attached (attachment 4).

Attachment 1. Copy of newspaper article highlighting bull trout interpretive hike.

Oakridge DEAD MOUNTAIN ECHO
Thursday, September 16, 2010
Volume XXXVIII, Number 22 Hometown Newspaper of Farlane Vester Oak



Anglers catching a bull trout should use care when releashing them to ensure survival.
Photo by Brandy Langum U.S. Forest Service Fisheries Biologist

Forest Service offers free tour Friday

Bull trout making a return to the Willamette River

by Cheron Ferland
Forest Service Wildlife Biologist
Middle Fork Ranger District

Bull trout were once thought to be extirpated above Hills Creek Reservoir within the Middle Fork Willamette River. Efforts by Forest Service (FS) and Oregon Department of Fish and Wildlife (ODFW) as well as other cooperators such as OWEB, Middle Fork Willamette River Watershed Council, U.S. Army Corps of Engineers, and others over the past 12 years have resulted in a phoenix-like return of the cold-water loving salmonid. With reintroduction/transplanting efforts beginning in 1997, these still rare fish are once again establishing a hold on the Upper Middle Fork River of the Willamette National Forest, resulting in natural reproduction being documented for the first time in 2005. In addition to these reintroduction efforts, numerous habitat enhancement projects have been completed and are still ongoing. These include: Large woody debris placement into the main stem of the Middle Fork Willamette River and tributaries, placement of salmon carcasses into the river, providing key nutrients, mimicking the systems historic natural ecological processes, the removal of fish barrier culverts, and the creation of a new spawning and rearing channel constructed at Indigo Springs to provide access to historic high quality spawning habitat.

Another important part of the recovery process is monitoring. FS and ODFW biologists engage in several monitoring techniques including spawning surveys, pit-tagging, snorkel surveys, and trap-

to the Jarbidge River in northern Nevada, the Klamath Basin in Oregon, the McCloud River in California and north to Alberta, British Columbia, and possibly southeastern Alaska. Currently, bull trout have been eliminated from much of their historic habitat and are found only in a few upper tributary streams and several lake and reservoir systems in Oregon, Washington, Montana, Idaho, and small population in northern Nevada. They have been eliminated from the main stems of most large rivers and are now completely extinct in northern California.

Bull trout reach sexual maturity at between four and seven years of age and are known to live as long as 12 years. They spawn in the fall after temperatures drop below 48 degrees Fahrenheit in streams with cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Many spawning areas are associated with cold water springs or areas where stream flow is influenced by groundwater, which makes the Upper Middle Fork Willamette River ideal habitat for this fish.

Threats to bull trout are numerous. Due to their life history requirements, bull trout are more sensitive to increased water temperatures, poor water quality, angling or harvest and low flow conditions than many other salmonids. Past and continuing land management activities have degraded stream habitat, especially along larger river systems and stream areas located in valley bottoms, to the point where bull trout can no longer survive or reproduce successfully. Brook trout, introduced throughout much of the range of bull trout, easily hybridize with them, producing sterile offspring. Brook trout also

You will see signs alerting anglers to release bull trout.

Photos by Jon Hyde, U.S. Forest Service Fisheries Biologist

Bull trout returning to Willamette

.....from page 1

areas. Dams and other in-stream structures also affect bull trout by blocking migration routes, altering water temperatures and killing fish as they pass through and over dams, or are trapped in irrigation and other diversion structures.

Many of the actions intended to protect other declining salmonids may also help bull trout. Stream and habitat protection and restoration, reduction of siltation from roads and other erosion sites, and modification of land management practices to improve water quality and temperature are all important. In fact, there is an effort underway now on the Middle Fork Ranger District of the Willamette National Forest to "put to rest" many roads within the Upper Middle Fork Willamette River Watershed in order to accomplish these very objectives. Several state agencies have enacted regulations reducing or prohibiting bull trout harvest. Several states have also drafted or have adopted conservation plans to help bull trout populations recover.

If you'd like to learn more about the Upper Middle Fork Willamette River bull trout, and perhaps actually meet one, there is a free tour for the public being offered by the FS on Friday, September 17th. This will be an all-day tour taking participants to several of the key cold springs on the river and demonstrating some of the monitoring methods that are used for bull trout. Pre-registration is required by calling 541-782-2283.

Attachment 2. Show and Shine (attached PDF file)

Attachment 3. Monitoring Data.

USDA Forest Service, Willamette National Forest, Middle Fork and McKenzie River Ranger Districts Bull Trout Monitoring Report, 2009 and 2010

Introduction

This Bull Trout Monitoring Report summarizes and highlights monitoring, accomplishments in 2009 and 2010. It is our goal to be a proactive partner to a variety of interested parties; state, federal and private interests, whose goals and missions are aligned with ours to restore and strengthen not only our native fish populations, but the habitat they are found in and depend on. The fisheries department believes strongly in restoration, habitat improvement and success for our streams, rivers, watershed, and forest; dedicating ourselves daily to the strategic planning and goals of the bull trout monitoring program summarized in this report.

The bull trout monitoring program and accomplishments on the Middle Fork and McKenzie River Ranger Districts are completed with the scientific knowledge, assistance, support, and funding from multiple federal, state, and private entities, these include the, U.S. Fish and Wildlife Service (USFWS), Oregon Watershed Enhancement Board (OWEB), Middle Fork Willamette Watershed Council (MFWWC), Oregon Department of Fish and Wildlife (ODFW), Oregon Chapter of Trout Unlimited (TU), U.S. Army Corp of Engineer (USACE), Weyerhaeuser Challenge Cost Share (CCS), PAYCO, Capital Investment Project (CIP) and Joint Venture (JV).

MONITORING SUMMARY

Bull Trout (*Salvelinus confluentus*) Monitoring and Reintroduction

Introduction

This year marks the thirteenth year of the Willamette bull trout reintroduction and recovery program. Beginning in 1997 through 2005, a total of 10,408 bull trout fry were collected and transported from the Anderson Creek population located on McKenzie River and released into designated sites of adequate forage opportunities, suitable rearing habitat, and cold water temperatures in the Upper Middle Fork Willamette River (MFWR) upstream of Hills Creek Dam. Fry transfers were discontinued in 2006 to evaluate both the donor and recipient populations. The following year (2007) a captive rearing program started; transferring fry from Anderson Creek directly to the Leaburg McKenzie Hatchery for a growth period of 8-10 months, with an expected increase in survival rate. Since 2007, over 1,000 juveniles have been out-planted into the MFWR.

Objectives for Bull Trout Monitoring:

1. Estimate the distribution, abundance, and timing of bull trout spawning in the MFWR and McKenzie River sub-basins.
2. Estimate abundance of out-migrating fry and juveniles in Anderson Creek, the source for fry transfers to the MFWR. Capture and utilize up to 25% of the total fry production in Anderson Creek for reintroduction into the MFWR.
3. Estimate the number of naturally produced bull trout fry and juveniles rearing in spring-fed tributaries and adjacent areas in the MFWR.
4. Monitor emigration and dispersal of bull trout fry and juveniles from spring-fed tributaries in the MFWR. emigration is out of an area and immigration is into an area
5. Monitor adult bull trout population and movements including spawning distribution in the MFWR above Hills Creek Reservoir.
6. Monitor the survival and life history characteristics of captivity-reared bull trout juveniles released into Swift/Bear creek.
7. Collect tissue samples of juvenile and adult bull trout from the MFWR and McKenzie River for genetic analysis.
8. Monitor temperature regimes throughout the MFWR Watershed.

Methods

PIT Antenna Monitoring

Half Duplex Passive Integrated Transponder (PIT) tag technology is used to monitor movement of bull trout in the MFWR upstream of Hills Creek Dam and in the McKenzie River sub-basin. Beginning in 2004, adults (fish > 300mm fork length) and juveniles (fish >100mm fork length) have been captured by various methods (trapping, netting, hook and line) and PIT tagged (Texas Instruments, Inc., half duplex, 23mm) for tracking.

Half Duplex PIT antenna arrays (Oregon RFID) are seasonally (June-November) constructed in 14 locations in 2010. However, two antennas are installed and operated year round in bull trout release sites: Swift and Echo Creek. Six antennas are installed in known spawning tributaries: Iko, Indigo and Chuckle springs in the MFWR sub-basin and in the McKenzie River below Trail Bridge Dam, Sweetwater Creek, and Roaring River in the McKenzie River sub-basin. Six antennas are installed in the main-stem MFWR: at forest road 2143 (RM 256), the confluences with Iko (RM 258), Indigo (RM 259), and Chuckle springs (RM 260), below Hills Creek Dam (RM 231), and upstream of Hills Creek Reservoir at Snow Creek (RM 240). Antennas at the spring sites are paired to provide directionality.

Juvenile Monitoring and Iko springs Population Estimate

Several tributaries and side channels in the upper MFWR basin were examined for bull trout presence by minnow trapping selected locations. Traps were set in the Swift Creek side channel, Echo Creek, Found Creek, Chuckle Springs, Indigo Springs and two MFWR side channels. Minnow traps were baited with salmon eggs. Merstic data was taken on all fish caught and untagged juveniles over 115mm fork length (FL) were PIT tagged before release.

A mark/re-sight (mark and night snorkel re-sight) population estimate was conducted in Iko Springs from 21-25 June, 2010 using the Chapman modified (1951) Lincoln-Peterson method to

estimate Iko Springs population, based on a model with three assumptions: **1)** The population is closed, **2)** all animals are equally likely to be captured, and **3)** marks are not lost or overlooked (Pollock et, al 1990). The upper and lower segments were divided throughout the study and given separate population estimates. A channel spanning seine net was placed at the mouth of Iko Springs to block passage and an additional block net was placed at the midpoint of the survey, dividing Iko Springs into upper and lower reach segments. Minnow traps were set on consecutive nights in both segments. All captured bull trout were marked with upper caudal fin clips. Night snorkeling re-sight surveys were then conducted at least 24 hours after initial trapping; all fish observed clipped and unclipped were counted.

Swift/Bear Creek Captive Reared Juvenile Monitoring

In an effort to examine the success of captive reared bull trout translocation 816 minnow traps were set in Swift Creek from the mouth upstream and into a large reach of Bear Creek from July 13 to August 11. USFS and ODFW crews working upstream, set minnow traps in desirable habitat pockets. Desirable habitat was determined by individuals based on presumed rearing habitat, and where traps would stabilize. All traps were marked with GPS coordinates and plotted. Bull trout captured were scanned for PIT tags, examined for *VI* markers, sampled for genetics and merstic data was taken. Untagged bull trout (>115 mm fork length) were PIT tagged before release.

Anderson Creek Juvenile Out-migrating Abundance and Capture for Reintroduction

A 5-foot rotary screw trap is used in the lower portion of Anderson Creek to estimate abundance of out-migrating juveniles and capture fry for reintroduction in the MFWR. It is run 2 days per week from February to the end of August. The trap is checked daily when in use and fry are either transferred to ODFW's Leaburg Hatchery or released back into Anderson Creek downstream of the trap site. Up to 87.5% of the 2-day trap catch per week were transferred to Leaburg Hatchery for captive rearing. No more than 25% of total estimated fry production in Anderson Creek are transferred annually.

Spawning Distribution and Abundance

To estimate the number of adults spawning in the upper MFWR, monitoring efforts included: snorkel surveys, redd counts, trapping, and PIT antenna interrogation. Tagged adults were tracked at PIT tag antenna sites. A 5-foot rotary screw trap and river spanning weir was installed downstream of known spawning grounds in an effort to trap all spawned-out adults returning to Hills Creek Reservoir. Captured bull trout were scanned for PIT tags, merstic data was taken, and fish were released downstream of the trap. All brook trout were intentionally removed from the system.

Redd counts were conducted weekly in the MFWR from Sacandaga Campground (RM 256) upstream to the Tumblebug Creek (RM 261) confluence and spawning tributaries from August 25 to October 28, and bi- weekly if possible in an attempt to identify redds with fish present. Counts in the MFWR included bull trout and Chinook redds as both species are present and spawning grounds overlap. All redds in Iko, Indigo and Chuckle springs were assumed to be

constructed by bull trout, and bull trout redds in the MFWR were confirmed only if fish were observed on the redd. Swift Creek was surveyed once at the end of the season. All redds were marked with GPS coordinates.

To estimate the number of adults spawning in the McKenzie River sub-basin, monitoring efforts included redd counts, trapping, and PIT antenna interrogation. Tagged adults were tracked at PIT tag antenna sites. Two 5-foot rotary screw traps and river spanning weirs were installed downstream of known spawning grounds in the McKenzie River above Trail Bridge Dam and Roaring River in an effort to trap all spawned-out adults. Captured bull trout were scanned for PIT tags, merstic data was taken, and fish were released downstream of the trap. All brook trout were intentionally removed from the system.

Redd counts were conducted every two weeks (September through November) in all known spawning streams – Anderson Creek, Olallie Creek, Sweetwater Creek, McKenzie River above Trail Bridge, Roaring River and the Carmen-Smith spawning channel. All redds in these streams were assumed to be constructed by bull trout (except for the Carmen-Smith spawning channel where bull trout were seen building redds), since Chinook are not known to spawn in these areas. GPS coordinates are taken at each redd.

Results and Discussion

Juvenile Monitoring and Iko Springs Population Estimate

Table 1. Minnow trapping sites in 2010

Site	Date	Trap Number	Bull Trout Captured	Cutthroat Captured
Swift Creek Side Channel	2/2/2010	79	7	57
Echo Creek	3/9/2010	30	0	17
Found Creek	3/25/2010	196	0	232
Chuckle Springs	4/13/2010	59	8	17
Gravel Augmented Side Channel (MFW, RM 257.5)	5/26/2010	98	11	57
MFW (Chuckle Springs Confluence Upstream to RM 261)	8/10/2010	40	1	41
Indigo Springs	8/24/2010	90	0	4

Captivity Reared Juvenile Bull Trout Reintroduction and Monitoring

The captivity reared bull trout from the 2009 late release group (n=155) were tagged and released in April 2010 in Swift and Echo creeks. Mean length was 202 mm FL upon release.

The Echo Creek antenna was installed to monitor these fish. Two fish from this group were captured at the FSRD 2143 rotary screw trap in October 2010, likely migrating to Hills Creek Reservoir. A substantial increase in size was documented, fork lengths increased from 227mm and 228mm to 279mm and 280mm.

In addition, a total of 450, untagged 70mm captivity reared bull trout were released in the upper MFWR tributaries and side channels in August 2010. A substantial portion of these (n =350) were released in Swift and Bear creek or their tributaries. New locations this year included Happy Creek (a tributary to Bear Creek), and upper Swift Creek at the Forest Service Road (FS Road) 2143 crossing. Of the remaining fish (n=100), 50 were released in Echo Creek and 50 were released in the MFWR at a small side channel located upstream of Chuckle Springs.

Minnow traps were set in Swift and Bear creeks from July 13 –August 11. A total of 61 juvenile bull trout were caught in 816 traps. Forty-nine bull trout were caught in Swift Creek and twelve in Bear Creek. VI marks showed that 38 of these fish were from the 2009 release groups, two were from 2008 and one was from 2007. While no definite results can be conveyed without a more specific study design, results did show overall low numbers of bull trout in the lower reaches of Swift Creek and an increasing trend of bull trout presence in upper reaches of Swift Creek (closer to release sites). Percentages of total cutthroat caught decreased as the total number of bull trout increased (Figure 2).

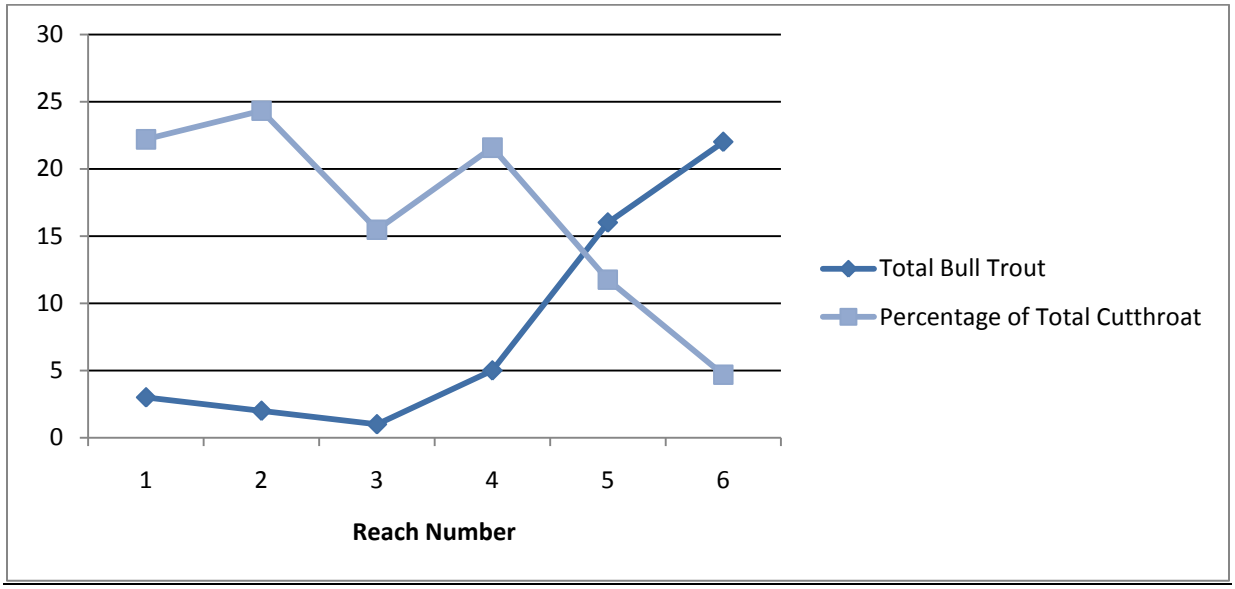


Figure 1. Actual number of bull trout caught in minnow traps in each reach trapped in Swift Creek and percentage of total cutthroat caught in minnow traps in each reach.

Anderson Creek Juvenile Outmigration and Capture for Reintroduction

A total of 1,694 and 1,153 bull trout fry were captured in the Anderson Creek trap in 2009 and 2010, respectively. A total of 173 and 202 bull trout juveniles (ages 1+ and 2+) were captured in 2009 and 2010, respectively. The graphs below show the total estimated out-migration after extrapolating the 2-day per week catch to a 7-day week, based on 60% trap efficiency.

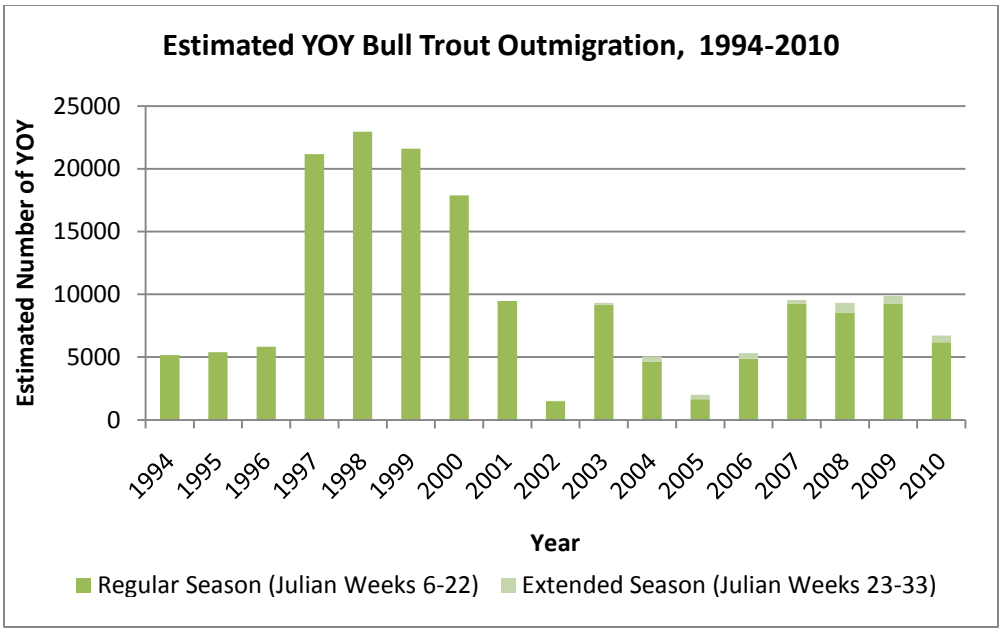


Figure 2. Estimated abundance of out-migrating bull trout fry, 1994-2010.

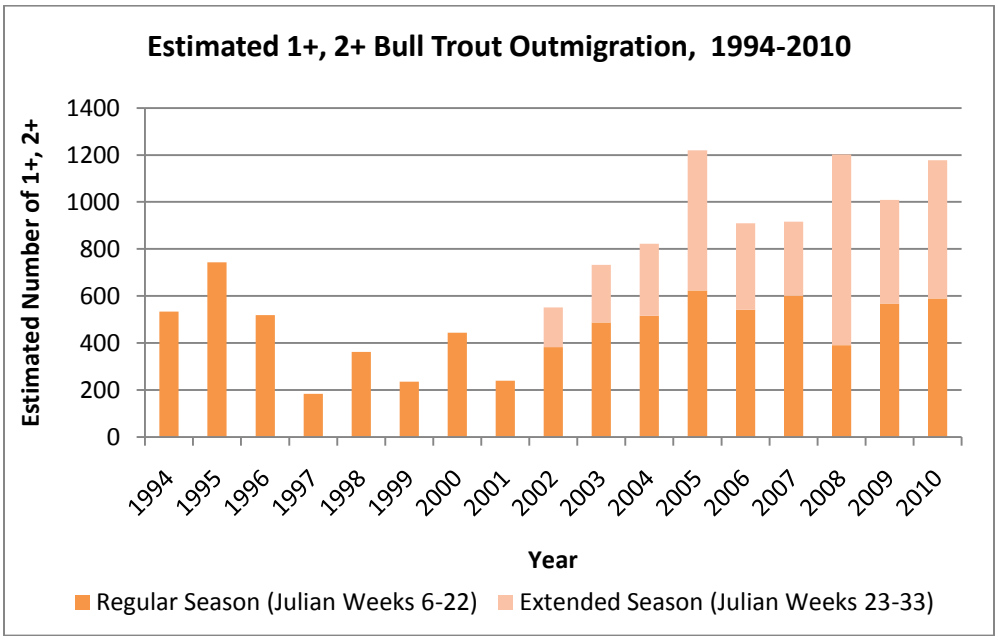


Figure 3. Estimated abundance of out-migrating bull trout juveniles (age 1+ and 2+), 1994-2010.

Spawning Distribution and Abundance - MFWR

A total of 11 bull trout redds were observed in all known spawning grounds, ten of these were located in Iko Springs. The first redd was observed on September 8th with two bull trout present. Two more redds had fish present at the time of the first observation but seven (all located in Iko Springs) were never observed with bull trout on the redds. The last redd in Iko Springs was identified on September 27. A total of 27 redds were observed in the MFWR. Out of these, a pair of bull trout were observed on one redd. Chinook were seen on 18 redds and eight redds

were observed with no fish present. The pair of bull trout spawning in the MFWR was located at the confluence with Iko Springs. No redds were observed in Chuckle and Indigo springs, or Swift and Bear creeks.

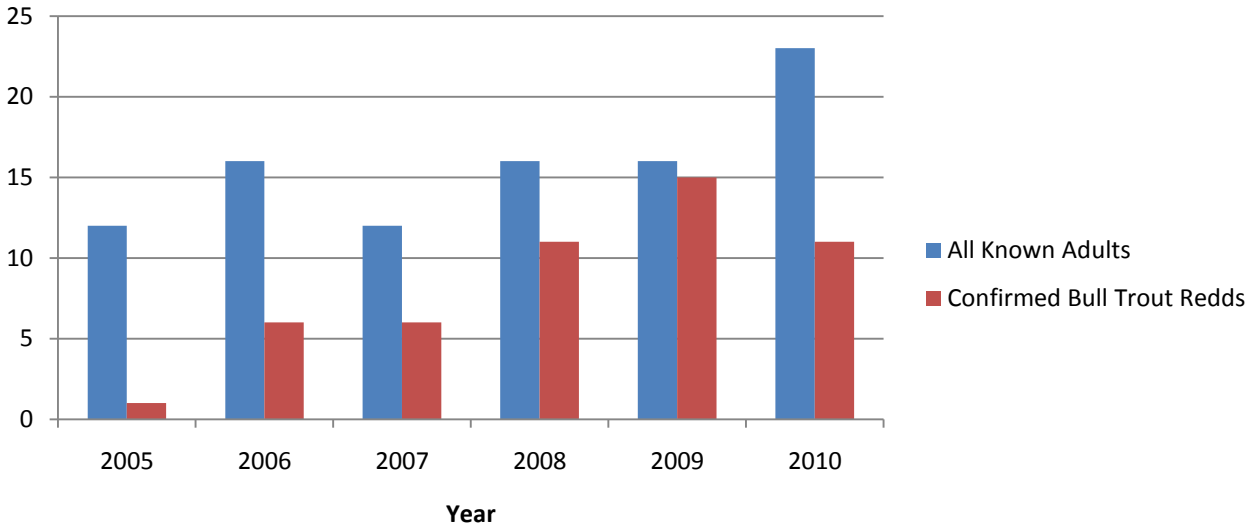


Figure 3. Known adults compared to confirmed redds

The rotary screw trap at FS Road 2143 caught 17 adult and 20 juvenile bull trout. Eight adults were female, eight were male and one was unknown sex. Ten adults had tags and seven were newly tagged in the trap: three females, three males, and one unknown. The first adult bull trout caught in the trap was a female, captured on September 17. Of the 20 juveniles, four had PIT tags, eleven were newly tagged and five were too small to tag.

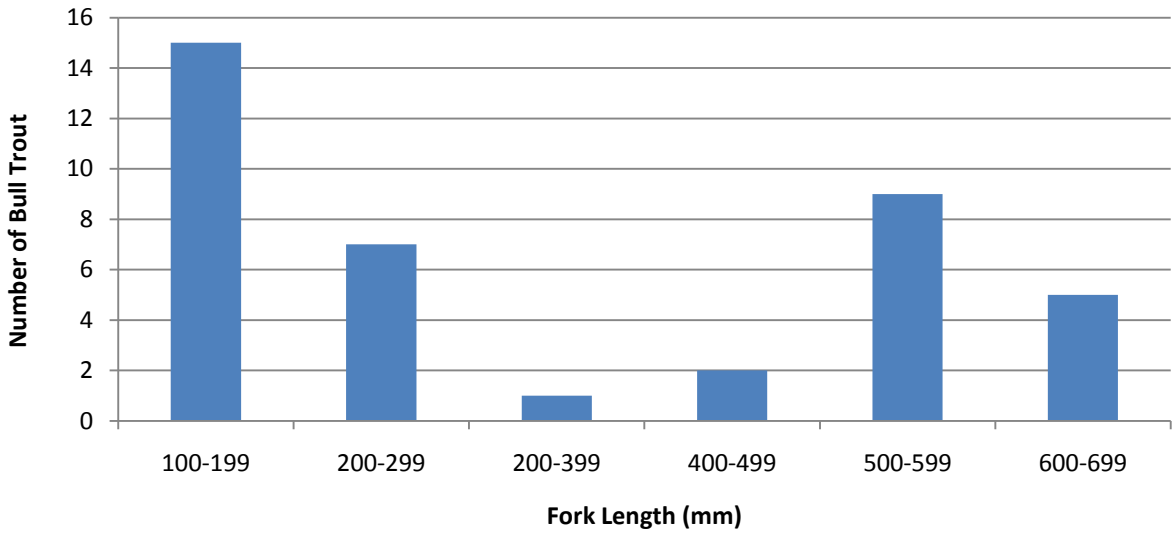


Figure 4. Length Frequency Histogram of Bull Trout Caught in Rotary Screw Trap at FR 2143.

A total of 23 adults were recorded in the MFWR in 2010: 11 female, nine male and three unknown. In addition to the 17 adults caught in the screw trap, seven more adults were recorded on the FR 2143 antenna. These adults did not enter the screw trap but all were recorded on the FS Road 2143 and Snow Creek antenna sites migrating up-river, and later downstream. Sexes of

these seven bull trout included: three female, one male and two unknown. We classified adult bull trout as those measuring ≥ 400 mm fork lengths, or demonstrating spawning characteristics (expelling milt).

We confirmed 11 bull trout redds and 11 female bull trout, however, this may not fully represent the population. There is some uncertainty with eight redds of unknown species as well as three unsexed individuals present in the spawning grounds. Untagged adult females may exist that were able to elude the trap and weir. To identify redd species origin; habitat and interstitial spaces will be snorkeled for bull trout fry in the spring during the time of fry emergence. In previous years redds have been located in Iko, Chuckle and Indigo springs and in the main channel of the MFWR. PIT tag detections showed that some bull trout migrated upstream of Iko Springs and entered Chuckle and Indigo springs but no redds were observed. Seven PIT tagged adults were detected in Iko Springs, one detected in Chuckle Springs, two in Indigo Springs and, two in Swift Creek (some bull trout were detected in more than one creek). Five adults were detected at FS Road 2143 antenna and were never detected again upstream.

Spawning Distribution and Abundance – McKenzie River Sub-basin

Figure 5 shows the number of redds for all bull trout spawning streams in the McKenzie River sub-basin. A total of 225 and 161 redds were counted in 2009 and 2010, respectively. In 2009, we counted a record number of total redds, followed by a large decline in 2010, particularly in Anderson Creek and Sweetwater Creek. The cause of decline is unknown at this time.

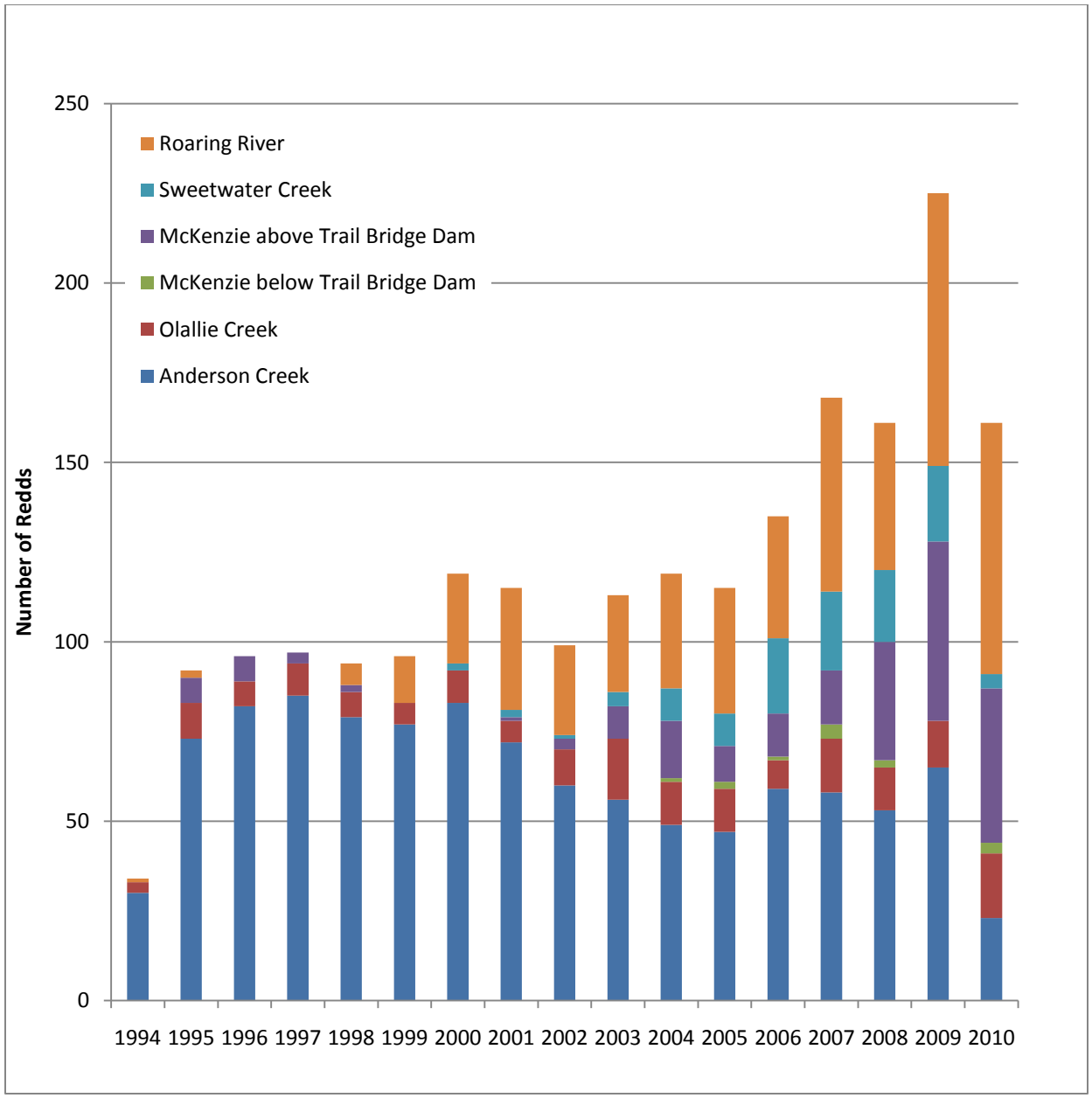


Figure 5. Number of bull trout redds counted for all known spawning streams in the McKenzie River sub-basin, 1994-2010.

Conclusion

We accomplished our goals by gaining information, and continued to perform research to meet study objectives established for bull trout monitoring in the Middle Fork Willamette River and McKenzie River in 2009 and 2010. We met our objectives for monitoring the bull trout population by estimating abundance and distribution of spawning adults. We continue to work toward completing objectives for estimating population and distribution of naturally occurring juvenile bull trout and continue to monitor the survival and life history of captive reared juveniles released in Swift and Bear creeks.

Adult abundance in the MFWR continues to increase gradually each year and in 2010 the known spawning population consisted of more adults than previous years. Adult movements were observed in multiple tributaries but redds were only observed in Iko Springs. Redd counts were unconfirmed in the main-stem MFWR due to Chinook salmon spawning presence and our research suggests that Iko Springs is the only area where consistent bull trout spawning occurs.

Naturally produced fry and juvenile bull trout were observed in Iko, Indigo, and Chuckle springs. Study objectives are focused primarily on juvenile and adult life stages while sub-adult activities are largely unknown. Current research suggests that adult bull trout overwinter in Hills Creek Reservoir but sub-adults may reside there for multiple years. Factors in Hills Creek Reservoir that may be detrimental to bull trout include: fishing pressure, blue-green algae presence with associated oxygen level deprivations, temperature fluctuation, and foraging or habitat limitations. Hills Creek Reservoir remains an unknown factor in the status of MFWR bull trout and needs more research.

Swift and Bear creek continue to be the main recipient for trans-located juveniles, but in 2010, bull trout were out-planted in numerous tributaries and side channels as well. The impact of captive reared juveniles to the population remains to be seen, but our research suggests low survival rates and/or retention in Swift and Bear creek.

As the thirteenth year of the bull trout reintroduction and monitoring program comes to a close, our data shows the abundance of mature bull trout continues to increase each year, however, the known 2010 population of 23 adults remains questionable. Fry transfers produced spawning adults, first observed in 2004 and it can be assumed that documented offspring from these adults now constitute part of a 'naturally' occurring spawning adult population. More research is needed to determine the success of the hatchery rearing and juvenile out-planting program that started in 2007. In the fall of 2011 we should see adults from that generation returning to the cold water springs to spawn. In addition, more research is needed to determine what constitutes a healthy population of bull trout in the MFWR, how many individuals are needed, and how to achieve genetic diversity.