Bull Trout (*Salvelinus confluentus*) Population and Habitat Surveys in the McKenzie and Middle Fork Willamette Basins, 1998

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INTRODUCTION

Prior to 1978, Dolly Varden (*Salvelinus malma*) was classified into an anadromous and interior form. Cavender (1978) classified the interior form as a distinct species, *Salvelinus confluentus*, the bull trout. Bull trout are large char weighing up to 18 kg and growing to over one meter in length (Goetz 1989). They are distinguished by a broad flat head, large downward curving maxillaries that extend beyond the eye, a well developed fleshy knob and a notch in the lower terminus of the snout, and light colored spots normally smaller than the pupil of the eye (Cavender 1978).

Bull trout are found throughout northwestern North America from lat. 41°N to lat. 60°N. In Oregon, bull trout were once distributed throughout 12 basins in the Klamath and Columbia River systems including the Clackamas, Santiam, McKenzie and Middle Fork Willamette sub-basins west of the Cascades (Buchanan et al. 1997). However, it is believed bull trout have been extirpated from west of the Cascades with the exception of the McKenzie sub-basin.

Before 1963, bull trout in the McKenzie sub-basin were a contiguous population from the mouth to Tamolitch Falls. Following the construction of Cougar and Trail Bridge Reservoirs there are three isolated populations: 1) the mainstem McKenzie and tributaries from the mouth to Trail Bridge Reservoir. 2) the mainstem McKenzie and tributaries above Trail Bridge Reservoir to Tamolitch Falls. 3) South Fork McKenzie and tributaries above Cougar Reservoir. The study area includes the three aforementioned McKenzie populations, and the Middle Fork Willamette and tributaries above Hills Creek Reservoir.

We monitored bull trout populations in the McKenzie and Middle Fork Willamette basins using a combination of sampling techniques including: spawning surveys, standard pool counts, juvenile trapping, radio tracking, and presence/absence surveys (electrofishing and snorkeling).
In addition, we reintroduced bull trout fry from Anderson Creek (McKenzie basin) to the Middle Fork Willamette above Hills Creek Reservoir in an attempt to rehabilitate bull trout populations in the Middle Fork Willamette Basin. By monitoring population trends and determining life history characteristics of bull trout in McKenzie and Middle Fork Willamette basins we can make better informed management decisions that will help maintain long-term and sustainable bull trout populations in these systems.

**STATUS**

On June 10, 1998 the US Fish and Wildlife Service (USFWS) listed the Columbia River bull trout population segment (including the McKenzie sub-basin) as Threatened under the federal Endangered Species Act. Buchanan et al. (1997) listed the bull trout population in the Mainstem McKenzie as “of special concern”, the South Fork McKenzie population as “high risk” and the bull trout above Trail Bridge Reservoir as “high risk”. Bull trout in the Middle Fork Willamette are listed as “probably extinct”. 
ACTIONS

Mainstem McKenzie

Spawning Surveys

We began weekly spawning surveys of Anderson Creek on September 3 and continued through October 22. Surveys began at the mouth and concluded at a barrier falls 2.6 km upstream. We observed a total of 79 redds, similar to the 1997 count of 85 (Figure 1).

Figure 1. Bull trout redds counted in Anderson Creek in the USFS index area and total area counts by ODFW, 1989-1998.

No redds were observed in surveys above the barrier falls. Spawning activity peaked on September 25 with 31 redds and 51 fish observed (Figure 2). Spawning timing was similar to previous years (Figure 2).
Biweekly spawning surveys of Olallie Creek began on September 10 and continued through October 19. We observed a total of seven redds, two less than the 1997 total of nine. Of these, six were observed in North Fork of Olallie Creek within 100 m of the confluence with the South Fork.

**Juvenile Trapping**

We trapped juvenile bull trout migrating down Anderson Creek for the fifth consecutive year using a rotary screw downstream migrant trap. The 1998 total of 7,902 fry captured was a 21 percent increase over the number captured in 1997 and a 296 percent increase over the number captured in 1996 (Table 1).
Table 1. Number of bull trout fry and juveniles captured in the downstream migrant trap in Anderson Creek, 1994-1998.

<table>
<thead>
<tr>
<th>Date Captured</th>
<th>Number of fry</th>
<th>Estimated Capture*</th>
<th>Number &gt; 1+</th>
<th>Estimated Capture*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 15-May 26, 1994</td>
<td>1,808</td>
<td>3,185</td>
<td>129</td>
<td>242</td>
</tr>
<tr>
<td>Feb. 15-May 31, 1995</td>
<td>1,877</td>
<td>3,597</td>
<td>261</td>
<td>471</td>
</tr>
<tr>
<td>Feb. 19-May 31, 1996</td>
<td>1,995</td>
<td>3,420</td>
<td>179</td>
<td>330</td>
</tr>
<tr>
<td>Feb. 11-May 31, 1997</td>
<td>6,540</td>
<td>12,955</td>
<td>64</td>
<td>129</td>
</tr>
<tr>
<td>Feb. 10-June 11, 1998</td>
<td>7,902</td>
<td>13,892</td>
<td>151</td>
<td>272</td>
</tr>
</tbody>
</table>

estimated number of bull trout fry captured if the trap ran continuously

ODFW and USFS personnel continued to transfer a portion of the bull trout fry trapped in Anderson Creek to streams in the McKenzie and Willamette basins in an effort to rehabilitate bull trout populations. A total of 1,889 fry were transferred to Sweetwater Creek and 1,497 to the Middle Fork Willamette during 1998 (Table 2).

Table 2. Number of bull trout fry transferred from Anderson Creek to Sweetwater Cr., Olallie Cr., and the Middle Fork Willamette, 1993-1998.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sweetwater Cr.</th>
<th>Olallie Cr.</th>
<th>MF Willamette</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>308</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1994</td>
<td>507</td>
<td>245</td>
<td>0</td>
</tr>
<tr>
<td>1995</td>
<td>589</td>
<td>313</td>
<td>0</td>
</tr>
<tr>
<td>1996</td>
<td>894</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1997</td>
<td>1193</td>
<td>112</td>
<td>0</td>
</tr>
<tr>
<td>1998</td>
<td>1889</td>
<td>0</td>
<td>1497</td>
</tr>
<tr>
<td>Totals:</td>
<td>5380</td>
<td>670</td>
<td>1497</td>
</tr>
</tbody>
</table>

Standard Pool Counts

Standard pool counts began in the mainstem McKenzie on July 1 and continued biweekly to September 9, 1998. A total of seven pools were surveyed. The peak count of 30 fish occurred
on August 25 (Table 3). This count is higher than the peak count of 19 in 1997 and similar to counts in 1994-1996.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Bull Trout</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>32</td>
</tr>
<tr>
<td>1995</td>
<td>33</td>
</tr>
<tr>
<td>1996</td>
<td>36</td>
</tr>
<tr>
<td>1997</td>
<td>19</td>
</tr>
<tr>
<td>1998</td>
<td>30</td>
</tr>
</tbody>
</table>

**Radio Tracking**

In January of 1998 there were three bull trout with functioning transmitters overwintering in the mainstem McKenzie River. The three fish were widely distributed, and held their over-wintering positions (Leaburg Lake-082, 0.3 miles below Heaven’s Gate-104, and 2.0 km below Hendricks Bridge RK 36.3-063) until the end of April. In early May two of the fish began moving upstream while the third fish (063) held below Hendricks Bridge. 063 remained below Hendricks Bridge into August at which time the radio transmitter malfunctioned and we were unable to track the fish. It was assumed that it was dead because it had not moved since December 1997, however, we are uncertain of when the fish died.

The two remaining radio tagged bull trout moved steadily upstream during June and July and were located in Olallie pool on August 3, 1998. We located one of the radio tagged fish in Anderson Creek on August 31 (104) and observed (082) on a redd in Anderson Creek on September 22. Both fish were subsequently located in the mainstem McKenzie on October 6. On October 12 we radio tagged a bull trout in Anderson Creek (1623) and now have three radio tagged bull trout in the mainstem McKenzie. We located (082) and (104) on November 16 in same over-wintering positions that they held last year. This is the first time we recorded this specificity for over-wintering sites for bull trout in the McKenzie River.
**Presence/Absence**

We conducted presence/absence surveys to determine the range of bull trout in the mainstem McKenzie River and tributaries. On September 9 we surveyed Separation Creek from the confluence with Horse Creek upstream approximately 1 km. We dove all pools and runs in this section, but observed no bull trout. We did, however, observe three large redds appropriate in size for bull trout or chinook salmon.

**South Fork McKenzie**

**Spawning Surveys**

We conducted spawning surveys in Roaring River in cooperation with the USFS. On October 6 we observed 0 redds from Roaring River campground downstream to the confluence with the South Fork McKenzie River. USFS personnel observed six redds in Roaring River on October 19, five above the first bridge crossing over Roaring River. We conducted subsequent surveys on October 27 and November 3 to verify these redds and located five of the six flagged redds. Of the flagged redds observed, we only felt confident classifying two of them as bull trout redds. We also conducted a snorkel survey on October 7 in the South Fork McKenzie beginning approximately 2.8 km above the confluence of Elk Creek and the South Fork McKenzie upstream to a 15 foot barrier falls on the South Fork McKenzie. No redds or bull trout were observed.
Standard Pool Counts

We snorkeled nine standard pools biweekly in the South Fork McKenzie River from July 8 – September 15. The peak number of bull trout observed was 17 on August 18.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Bull Trout</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>17</td>
</tr>
<tr>
<td>1996</td>
<td>9</td>
</tr>
<tr>
<td>1997</td>
<td>10</td>
</tr>
<tr>
<td>1998</td>
<td>17</td>
</tr>
</tbody>
</table>

Bull trout were found mainly in two pools Dutch Oven and Big Hole. Fish concentrated heavily in Big Hole all summer and on September 02 15 of the 16 fish observed were in Big Hole. September 15 all the fish observed were in Big Hole (9). It is unclear why bull trout were concentrated in Big Hole during this time.

Radio Tracking

We radio tagged five bull trout in Cougar Reservoir, two on October 22 (1642, 1671) and three on November 13 (1612, 1633, 1653). All of the radio tagged fish, except one, have remained at the head of the reservoir at the inlet of the South Fork McKenzie. Radio tagged bull trout (1653) moved down the reservoir to the inlet of Walker Creek on November 17 and was later detected at the head of the reservoir on November 25.

Presence/Absence

We conducted presence/absence surveys to determine the range of bull trout in the South Fork McKenzie River and tributaries. We spot-shocked Augusta Creek on August 17 0.5 miles upstream of the confluence with the South Fork McKenzie to a point approximately 2.0 miles upstream. Fish species identified included: cutthroat trout, rainbow trout, chinook, and cottus sp. A second survey further upstream also detected no bull trout. In late August we spot-shocked
Roaring River in several locations over a two-day period. We recovered four bull trout while shocking from the mouth to a point 50 m upstream. We also found a single bull trout fry in a side channel 50 m upstream from the first bridge crossing Roaring River. In addition, we spot-shocked four bull trout fry from a side channel 0.7 miles above the first bridge crossing, the highest known observation of bull trout fry in Roaring River. We spot-shocked Elk Creek from the bridge crossing to the mouth, however, no bull trout were observed.

**Trail Bridge Reservoir**

**Spawning Surveys**

We conducted spawning surveys from the head of Trail Bridge Reservoir upstream to Kink Creek in cooperation with USFS personnel in September and October, 1998. A total of three bull trout redds were identified during the 1998 season before the release of 50 adult chinook salmon above Trail Bridge Reservoir on October 5. Because of the difficulty of distinguishing between bull trout and chinook redds, counts occurring after October 5 are considered unreliable.

Following a spawning survey above Trail Bridge Reservoir on September 30 we identified a possible hybrid brook trout x bull trout while diving at the head of the reservoir. On October 1 we captured the suspected hybrid using hook and line. Closer examination revealed a fish with tri-colored fins, worm-like vermiculations on the dorsal surface, and no blue halos around the orange spots typical of brook trout. After examination it was agreed that the fish should be tested to determine if it is a hybrid brook trout x bull trout.
Juvenile Transfer

We began to implement the Rehabilitation Plan (ODFW 1997) for the Middle Fork Willamette bull trout population by transferring fry from Anderson Creek to three locations in the Middle Fork Willamette Basin. A total of 1,499 fry were transferred during April-May, 1998. We transferred a majority (63%) of the fry to Iko Springs, the largest of the three release sites.

<table>
<thead>
<tr>
<th>Date</th>
<th>Iko</th>
<th>Shadow</th>
<th>Chuckle</th>
</tr>
</thead>
<tbody>
<tr>
<td>April-06-98</td>
<td>305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April-07-98</td>
<td>215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April-13-98</td>
<td></td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>April-15-98</td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>April-21-98</td>
<td>244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April-23-98</td>
<td>174</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-05-98</td>
<td></td>
<td></td>
<td>111</td>
</tr>
<tr>
<td>Total</td>
<td>938</td>
<td>150</td>
<td>411</td>
</tr>
</tbody>
</table>

Presence/Absence

We conducted presence/absence surveys to determine the range of bull trout in the Middle Fork Willamette Basin above Hills Creek Reservoir. The last documented siting of bull trout above Hills Creek Reservoir occurred in 1990. We focused our survey efforts on tributaries to the Middle Fork that historically held bull trout. On July 28 we spot-shocked two reaches of upper Swift Creek and a single reach in Bear Creek (Appendix A) and found no bull trout. We snorkel surveyed the Middle Fork Willamette from Sacandaga Campground to Youngs Flat on
August 5 and again observed no bull trout. We conducted a final snorkel survey on August 13 of a single reach in Staley, Davey, and South Fork Staley Creek (Appendix A) and observed no bull trout.
CONCLUSIONS

Mainstem McKenzie

Spawning surveys conducted in Anderson Creek since 1995 have yielded an average count of 81 redds. We observed 79 redds this year two below the average for the last four field seasons. These data indicate that the number of spawning adult bull trout in the mainstem McKenzie River has been consistent over the last four years and the adult spawning population appears to be stable.

Although redd counts have been consistent over the past four years the number of emergent bull trout fry captured in Anderson Creek has not. The 1998 count of 7,902 bull trout fry captured in the downstream migrant trap was 21% higher than the 1997 total of 6,540 fry and 296% higher than the 1996 count. It is unclear why similar redd counts in 1995-1998 produced so many fewer bull trout fry in 1995 and 1996 than in 1997 and 1998. USFS surveys found that the embeddedness of Anderson Creek decreased following the 1996 flood and this may have allowed for increased spawning success in Anderson Creek.

After decreasing in 1997, the peak count of bull trout observed in standard pools of the mainstem McKenzie returned to levels consistent with 1994-1996 counts. Distribution of bull trout in the standard pools was typical as more fish were observed in the lower pools in July and concentrated in Olallie pool in August before entering Anderson Creek.

Radio tagged bull trout in the mainstem McKenzie exhibited typical behavior. Fish began moving slowly upstream in May and reached Olallie Pool in August. Both radio tagged fish entered Anderson Creek for the second consecutive year and are presumed to have spawned. After spawning the bull trout moved quickly downstream to the exact same over-wintering areas
used the previous year. This is the first time we have recorded this specificity for over-wintering sites for bull trout in the McKenzie River.

Presence/Absence surveys in the tributaries to the mainstem McKenzie failed to increase the range of bull trout in the McKenzie basin. However, we observed three redds in Separation Creek of the appropriate size for bull trout or chinook salmon. We recommend further survey work in Separation Creek during the 1999 field season.

**South Fork McKenzie**

Redd counts in the South Fork McKenzie basin were low as in previous years. No bull trout redds were observed during the last two seasons in Roaring River. In 1998 USFS personnel observed six redds in Roaring River. Of the six redds observed by USFS personnel, our subsequent surveys classified two as bull trout redds. Clearly bull trout are spawning in Roaring River, but this is the only spawning tributary in the South Fork basin identified. With five newly radio tagged bull trout in the South Fork McKenzie we hope to identify other spawning and rearing areas in the South Fork McKenzie basin in 1999.

The peak count of 17 bull trout observed in standard pools in the South Fork McKenzie River was the highest count since 1995. Although bull trout use to concentrate in Dutch Oven, this year bull trout were heavily concentrated in Big Hole. It is unclear why bull trout were concentrated in Big Hole, especially in September, however this pool also held the highest concentration of adult chinook salmon. It is possible bull trout are targeting adult chinook salmon (eggs) and fry as a food source.

Presence/absence surveys failed to substantially increase the range of bull trout in the South Fork McKenzie Basin. We found bull trout fry 0.7 miles above the first bridge crossing Roaring River, the highest known observation of bull fry in Roaring River. Surveys in upper
Roaring River, Augusta, and Elk Creek failed to locate adult or juvenile bull trout. We expect that the five fish radio tagged in the South Fork McKenzie in October and November 1998 will help us fully determine the range of bull trout in the South Fork McKenzie Basin.

**Trail Bridge Reservoir**

Bull trout spawning surveys for the mainstem McKenzie above Trail Bridge Reservoir were consistent and low as in previous years. We observed only three redds prior to releasing 50 adult chinook salmon above Trail Bridge Reservoir on October 5. This low redd count combined with the discovery of a possible hybrid brook trout x bull trout in the reservoir does not bode well for the continued existence of bull trout in the mainstem McKenzie above Trail Bridge Reservoir. In addition, no bull trout redds have been observed in Sweetwater Creek and it is hoped that bull trout will begin spawning there in 1999.

**Middle Fork Willamette**

We began to implement the Rehabilitation Plan (ODFW 1997) for bull trout in the Middle Fork Willamette Basin. Our original goal was to relocate 25% of the bull trout fry (up to 2,000) captured migrating down Anderson Creek in the McKenzie Basin. We reintroduced a total of 1,499 fry to three cold water springs above Hills Creek Reservoir during April-May 1998. Transport was successful and the mortality rate associated with transfer was extremely low (< 1%). We attempted to monitor whether bull trout fry used the release sites for rearing, but monitoring proved difficult because of the complex habitat and small size of the fish. It is uncertain whether the reintroduced bull trout fry migrated to the Middle Fork Willamette to rear, are in the release sites and can not be detected, or did not survive relocation to the Middle Fork Willamette. We will continue to monitor the release sites and the Middle Fork Willamette for age 1+ bull trout this spring.
Presence/absence surveys failed to locate any bull trout in the Middle Fork Willamette Basin. We focused our survey efforts on tributaries to the Middle Fork that historically held bull trout (Swift and Staley Creek). Given the size of the area we were only able to survey a fraction of the habitat available to bull trout in the Middle Fork Willamette Basin. Future survey efforts should focus on Swift Creek, Middle Fork Willamette above Sacandaga Campground, and the head of Hills Creek Reservoir. If there is an extant population of bull trout in the Middle Fork Willamette Basin it is extremely low in number.
REFERENCES


