ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: Minimizing Risks and Mitigation of Impacts to Bull Trout *Salvelinus confluentus* from Construction of Temperature Control Facilities at Cougar Reservoir, Oregon

PROJECT NUMBER: W66QKZ13186766

PROJECT PERIOD: October 2002 through September 2003

Prepared by: J. Vincent Tranquilli
Mark G. Wade
Chad K. Helms

Oregon Department of Fish and Wildlife
3406 Cherry Avenue NE
Salem, Oregon 97303

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CONTENTS

INTRODUCTION

Cougar Dam, operated by the U.S. Army Corps of Engineers (Corps), Willamette Basin Project, is located on the South Fork McKenzie River (RM 4.4), 42 miles east of Eugene, Oregon. The Corps is modifying the intake structure at Cougar Dam to allow release of water from various depths of the 1280-acre reservoir. This will enable the Corps to control the temperature of the water discharged below the dam, and reduce impacts of the project on the South Fork McKenzie River and mainstem McKenzie River downstream of the project. Construction of the temperature control facilities requires lowering the reservoir below minimum pool reducing the area to approximately 106 acres for at least two and possibly up to four summers beginning in 2002.

Bull trout *Salvelinus confluentus* are native to the McKenzie Basin and inhabit Cougar Reservoir and the South Fork McKenzie up to approximately the Three Sisters Wilderness boundary (RM 26.5). Ratliff and Howell (1992) classified the status of the South Fork McKenzie bull trout at moderate risk of extinction. More recently, Buchanan et al. (1997) classified this population at high risk of extinction. The Columbia River distinct population segment, which includes McKenzie River bull trout, was listed as threatened in June 1998 (63 FR 31647).

Because drafting the reservoir may adversely affect bull trout, the Corps funded this study to minimize impacts of construction on bull trout. To protect this population, we need to more fully understand the movement and habitat use of bull trout in the South Fork McKenzie watershed, and to develop an emergency action plan should environmental conditions become detrimental to the overall health of the population. Recommendations from this project will be made to the Environmental Coordination Committee in the event that actions to protect bull trout become necessary.

OBJECTIVE 1 - DETERMINE THE NUMBER OF BULL TROUT USING THE PROJECT AREA AND THEIR MIGRATION TIMING INTO AND OUT OF THE AREA

Juvenile Abundance and Migration Timing in Roaring River:

Roaring River is the only known spawning area for bull trout above Cougar Dam. To estimate the number of age 0 fry, and age 1 and older juvenile bull trout moving out of Roaring River, we fished a five-foot diameter rotary screw trap 170 m above the mouth of Roaring River from February 11 through August 6, 2003. We stopped sampling on August 6 so that we would not catch adult bull trout returning downstream after spawning, and because we removed some of the screening on the screw trap to increase generation of electricity used to power a video recorder and light (*See page 7,* Spawning Abundance). We differentiated fry from juveniles by length. Fork lengths of fry ranged from 29 to 57 mm and fork lengths of juveniles ranged from 71 to 156 mm in 2001-2003 (Figure 1). Juvenile bull trout captured in the screw trap were scanned for a passive integrated transponder (PIT tag). We anesthetized unmarked bull trout longer than 100 mm fork length, implanted a 23 mm half-duplex PIT tag in the body cavity

using a scalpel, and released them 200 m above the trap. We calculated trap efficiency by dividing the number of PIT-tagged fish recaptured by the number of PIT-tagged fish released. We did not include PIT-tagged fish released within seven days prior to the trap not operating in the efficiency calculation because these fish may have moved past the trap while it was not operating. The trap did not operate during three periods for a total of 16 days due to high water, debris, or mechanical problems. Point estimates of the number of fish passing the trap were calculated by dividing the number of unmarked fish caught by the estimated trap efficiency. Variance used to calculate 95% confidence intervals for the estimated number of fry, and age 1 and older juveniles were estimated by the one-sample bootstrap method, drawing 1,000 iterations with replacement from a binomial distribution of mark-recaptured fish (Efron and Tibshirani 1986; Thedinga et al. 1994).

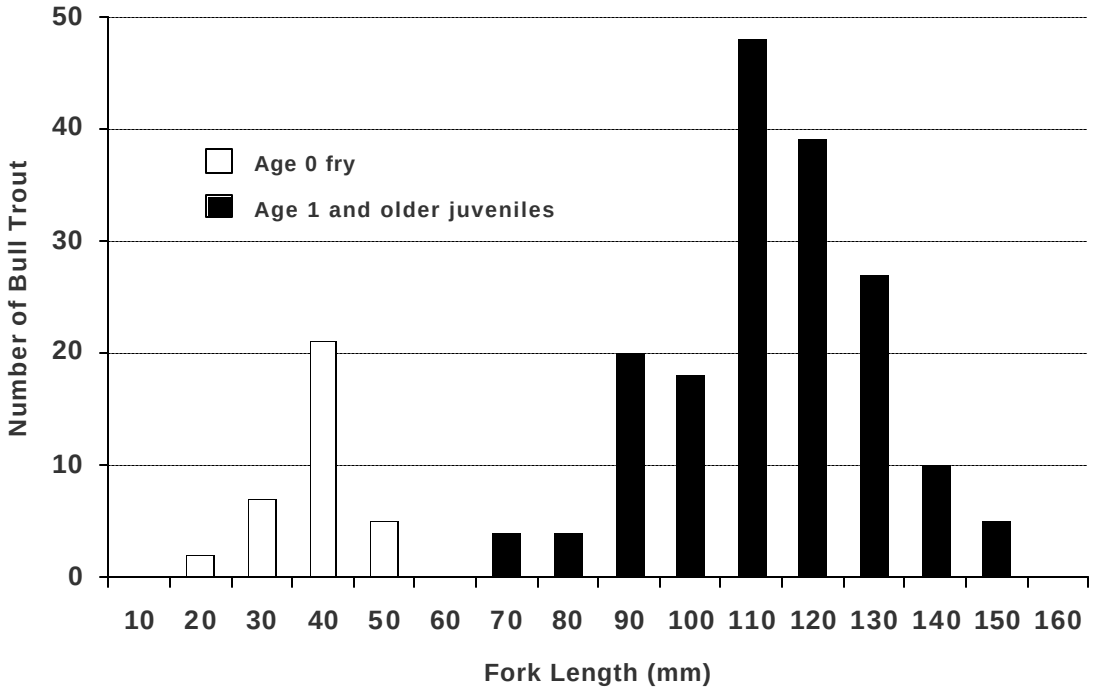

Figure 1. Fork lengths of age 0 fry, and age 1 and older juvenile bull trout captured in the Roaring River screw trap, 2001-2003.

We captured 69 juvenile bull trout at the Roaring River screw trap in 2003. Catch per day of age 1 and older juvenile bull trout was highest in August, although the trap operated only the first six days of the month (Figure 2). We estimate trap efficiency was 51% (n = 41) and 135 ± 46 (95% confidence interval) juvenile bull trout moved past the trap while it was fishing. The trap did not sample for 16 day, mostly in March, a time when few age 1 and older juveniles were migrating. We calculated the number of age 1 and older juvenile bull trout captured per day during the week prior to and the week after

the three periods the trap did not operate and used those values to estimate 141 age 1 and older juvenile bull trout moved past the screw trap in Roaring River in 2003.

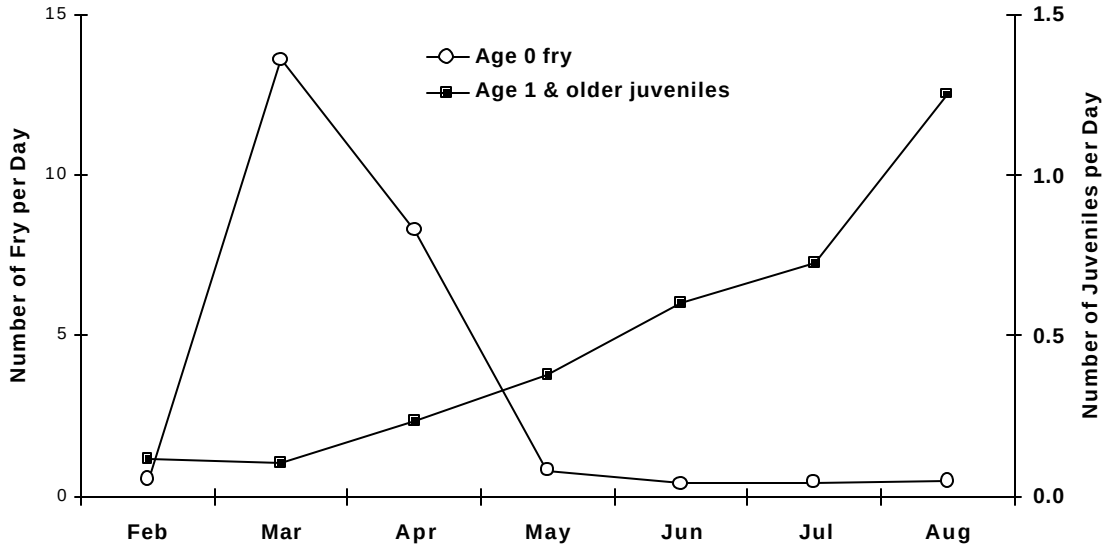

Figure 2. Catch of age 0 fry and age 1 and older juvenile bull trout per day at the Roaring River screw trap in 2003.

We captured 570 age 0 fry in 2003. Catch of bull trout fry peaked in March and April with the first fry captured on February 18, 2003, one week after we began trapping (Figure 2). If we assume trap efficiency for fry was 11% (Wade et al. 2002) then an estimated 5,211 ± 2,094 (95% CI) fry moved past the trap while the trap was fishing. Unfortunately the trap did not sample for 13 days in March, the apparent peak of fry migration. We calculated the number of bull trout fry captured per day during the week prior to and the week after the three periods the trap did not sample and used those values to estimate 7,666 bull trout fry moving past the screw trap in Roaring River in 2003.

Migration of Juvenile Bull Trout – We used PIT tags and three fixed interrogation sites to monitor migration of juvenile bull trout in South Fork McKenzie above Cougar Reservoir. We captured juvenile bull trout in the Roaring River screw trap, in minnow traps baited with salmon eggs and with dip nets while snorkeling at night, and PIT tagged those longer than 100 mm fork length. We operated three fixed interrogation sites. One in Roaring River from May 7 to October 15, 2002, in the South Fork McKenzie at Dutch Oven throughout the report period except from August 5 through August 25, and in the South Fork McKenzie near Smith Creek from May 1 through December 13, 2003 (Figure 3).

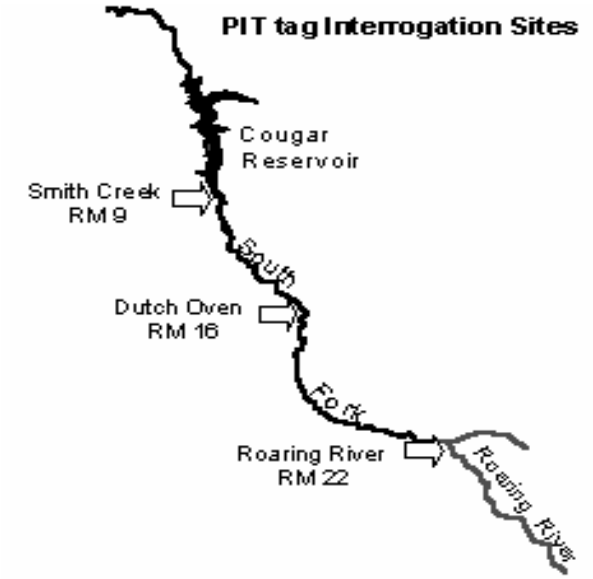

Figure 3. Location of PIT tag detectors in the South Fork McKenzie and Roaring River.

We believe many juvenile bull trout enter Cougar Reservoir in the fall. PIT-tagged juvenile bull trout were detected at Dutch Oven throughout 2003, but were only detected at Smith Creek in the fall of 2003 (Table 1). However, we know that the juvenile bull trout detected at Dutch Oven on February 16, 2003 entered the residual pool in the spring because we caught it in a trap net at the head of the residual pool on May 12. More data are needed to more fully assess when juveniles enter the residual pool.

Table 1. Tagging and detection history of juvenile bull trout detected at Dutch Oven and Smith Creek interrogation sites between October 1, 2002 and December 31, 2003. TD / DO = days between tagging and detection at Dutch Oven, DO / SC = days between detection at Dutch Oven and detection at Smith Creek.

Tagging		Date detected		Days	
Date	Fork length (mm)	Dutch Oven	Smith Creek	TD / DO	DO / SC
06/27/01	125	10/12/03	11/01/03	837	20
07/18/01	115	10/03/03	10/07/03	807	4
08/01/01	125	02/16/03		564	
08/29/01	143	12/21/02		479	
04/29/02	133		10/05/03		
05/03/02	126		10/05/03		
05/07/02	105	11/22/02		199	
07/03/02	127	06/08/03		340	
08/12/02	142	03/16/03		216	
10/09/02	105	04/11/03		184	
10/09/02	102	07/10/03		274	
05/30/03	115	07/14/03		45	
06/11/03	142		09/04/03		

Juveniles spent more time rearing above Dutch Oven after they were tagged than between Dutch Oven and Smith Creek. Time between capture at the Roaring River screw trap and detection at Dutch Oven ranged from 45 to 837 days (n = 7), while time from detection at Dutch Oven to detection at Smith Creek ranged from 4 to 20 days (n = 2). Habitat in the South Fork McKenzie from the confluence of Roaring River to Dutch Oven appears to be more complex than below Dutch Oven. The South Fork McKenzie above Dutch Oven has more multiple channels, large woody debris, backwaters and alcoves which provide good rearing habitat for small bull trout.

We assume bull trout less than 30 cm fork length move downstream, however two fish PIT tagged in the South Fork McKenzie were detected upstream in Roaring River during the spawning period (Table 2). The Vaki Riverwatcher recorded one fish moving upstream on August 24 and downstream on September 1. The other fish was detected on September 9 in Roaring River and five days later downstream at Dutch Oven (this fish is not included in Table 1).

Table 2. Tagging and detection history of two bull trout believed to be less than 30 cm fork length that moved upstream into Roaring River during the spawning period in 2003.

	Date	Length	Method	Location (river mile)
Fish 1	07/01/03	238	Dip net, snorkeling	S. Fork McKenzie (20.2)
	08/24/03		Vaki / PIT detector	Roaring River (22.4)
	09/01/03		Vaki / PIT detector	Roaring River (22.4)
Fish 2	10/02/02	127	Minnow trap	S. Fork McKenzie (21.2)
	09/09/03		PIT tag detector	Roaring River (22.4)
	09/14/03		PIT tag detector	Dutch Oven (16.4)

Adult Bull trout Migration Timing - We monitored the movements of bull trout longer than 30 cm fork length above Cougar Dam using radio telemetry and PIT tag detectors. We surgically implanted radio tags in the body cavity of 25 bull trout between May 2001 and October 2002. Bull trout were captured by angling, with a floating trap net set near the head of the residual pool, and in Roaring River at the weir with a dip net and with the screw trap. Radio tags were programmed to transmit for eight hours only on Wednesdays to prolong battery life. In October of 2002, we began to supplement data obtained from radio tags with PIT tags. We implanted 23-mm half-duplex PIT tags in the dorsal sinus using a scalpel. Previously, we implanted a PIT tag with the radio tag in the body cavity, but PIT tags were shed at a high rate in sexually mature bull trout. A total of 33 PIT-tagged bull trout, seven of which were also radio-tagged, were tracked at three fixed locations (Figure 3).

Radio tags allowed us to locate tagged fish each week (Figure 4). Two bull trout (151.354 and 755) died shortly after they spawned and returned to the residual pool in the fall of 2002. Three bull trout (151.213, 233 and 923) were captured and released below Cougar Dam in October 2002 (*See* Objective 4). We recaptured these fish and returned them to the residual pool in May 2003. Five bull trout (151.133, 324, 345, 594

and 942) over-wintered in the residual pool. Of these five, two moved through the residual pool to the dam in late October, two by early to mid December and the fifth in mid March. All eight radio-tagged bull trout moved out of the residual pool and above the Road 19 Bridge in mid May through early June. Two fish (151.133 and 324) returned to the residual pool in mid July and likely died. Three moved into Roaring River to spawn (151.213, 345 and 233) where one died (151.345). The other two returned to the residual pool by early October. Three other fish held in the river throughout the summer (151.942, 594 and 923). One of these fish died or was taken by a predator (151.942) and the other two (151.594 and 923) returned to the residual pool the same week that post-spawn fish returned.

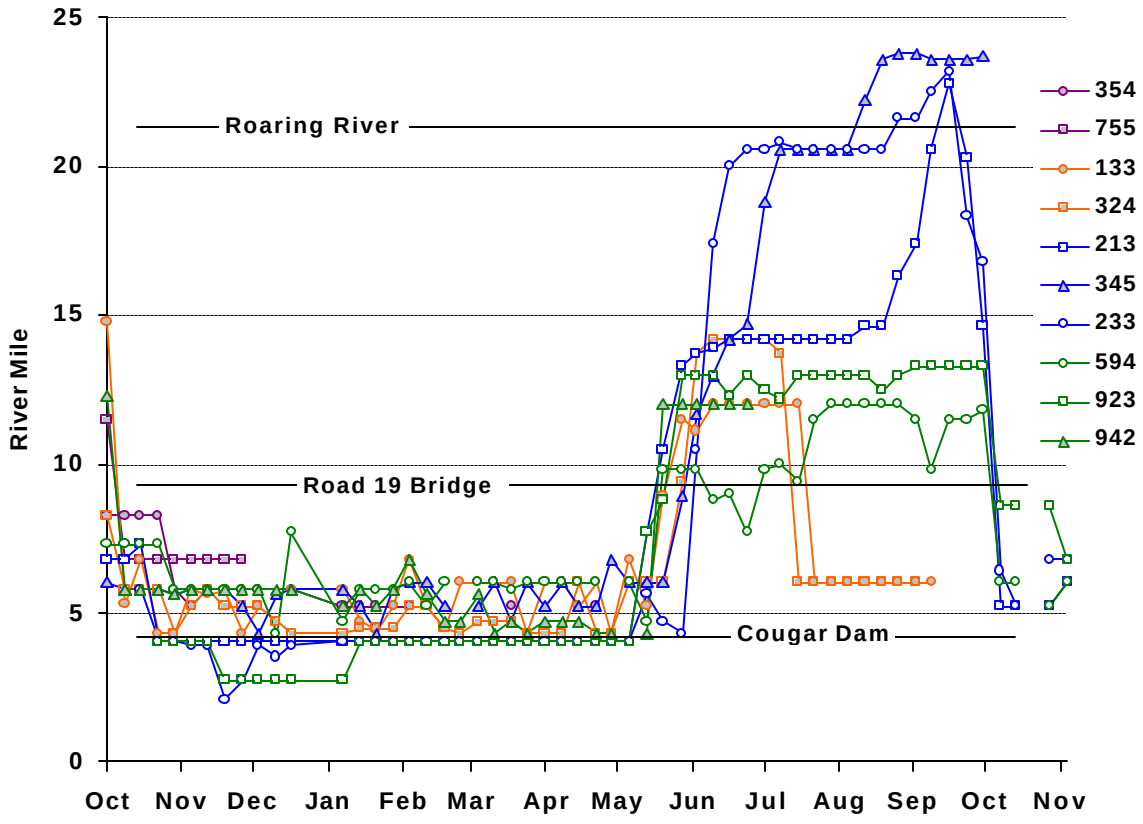

Figure 4. Locations of radio-tagged bull trout in the South Fork McKenzie River in 2003.

We detected 30 of the 33 PIT-tagged bull trout longer than 30 cm in the South Fork McKenzie above the residual pool in 2003. Two of the undetected fish were also radio-tagged and we located them in the South Fork McKenzie above the residual pool. The first PIT-tagged bull trout was detected moving upstream out of the reservoir at RM 10 on April 26, one week prior to the installation of the Smith Creek detector at RM 9.

Travel time of PIT-tagged fish migrating upstream from Smith Creek to the Roaring River weir averaged 89 days and ranged from 65 to 129 days (n = 9). Travel time for fish migrating downstream averaged 25 days and ranged from 6 to 56 days (n = 8).

About half of the 33 PIT-tagged fish were between 30 and 45 cm fork length when we tagged them. None of these fish entered Roaring River in 2003 indicating that these fish were likely immature. It appears that adfluvial bull trout above Cougar Dam mature at a fork length longer than 45 to 50 cm.

Spawning Abundance – We operated a Vaki Riverwatcher fish counter in Roaring River from July 30 through October 16. The counter recorded 47 fish moving upstream and 43 downstream. Prior to this year, the Vaki count included all fish moving through the weir longer than about 30 cm fork length and potentially counted the same fish more than one time. In 2003, we used a time-lapse video recorder with a light to identify species and a PIT tag detector to record the movements of PIT-tagged bull trout through the Vaki counter. We identified 28 bull trout, six chinook salmon, and one cutthroat trout by analyzing the videotapes. We identified three additional fish as bull trout based on PIT tag detections. We were unable to identify nine fish counted by the Vaki because the video, light and PIT tag detector did not always operate. However, based on their relative lengths and the date they moved upstream, the unidentified fish were likely bull trout (Figures 5 and 6).

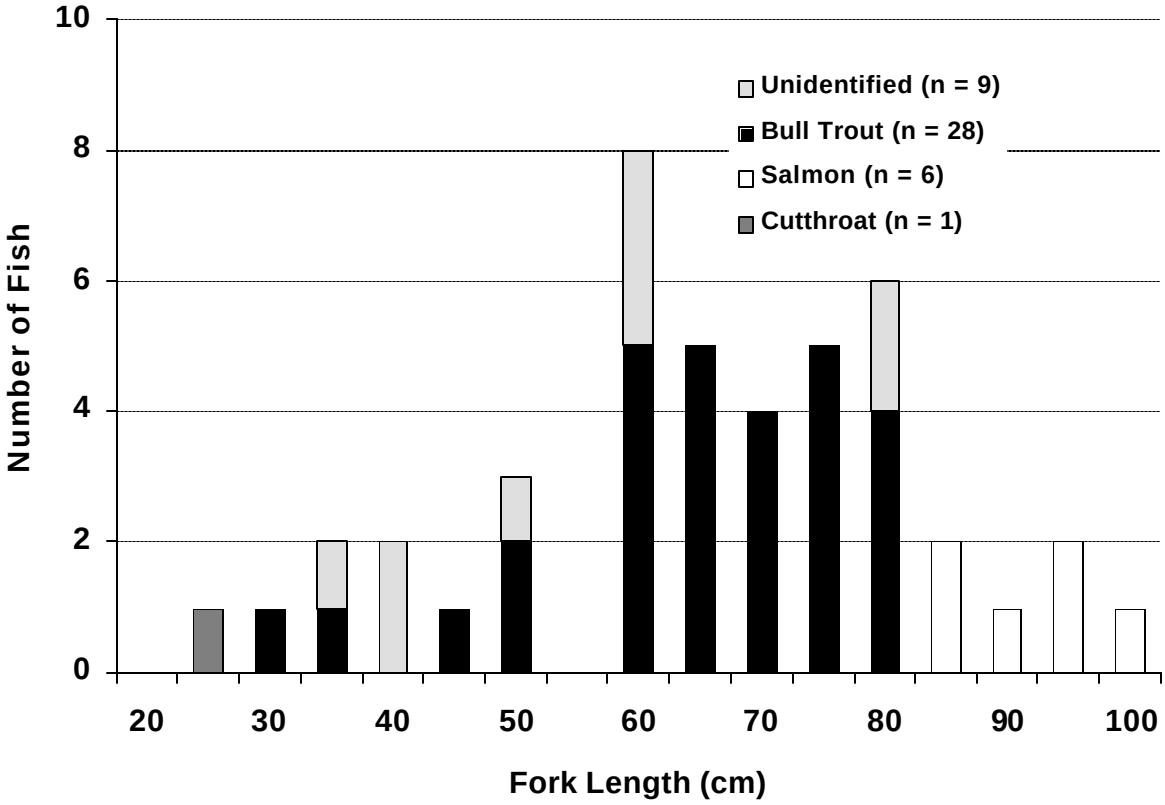

Figure 5. Estimated length of unidentified fish, bull trout, chinook salmon and cutthroat trout moving upstream through the Vaki Riverwatcher fish counter in 2003.

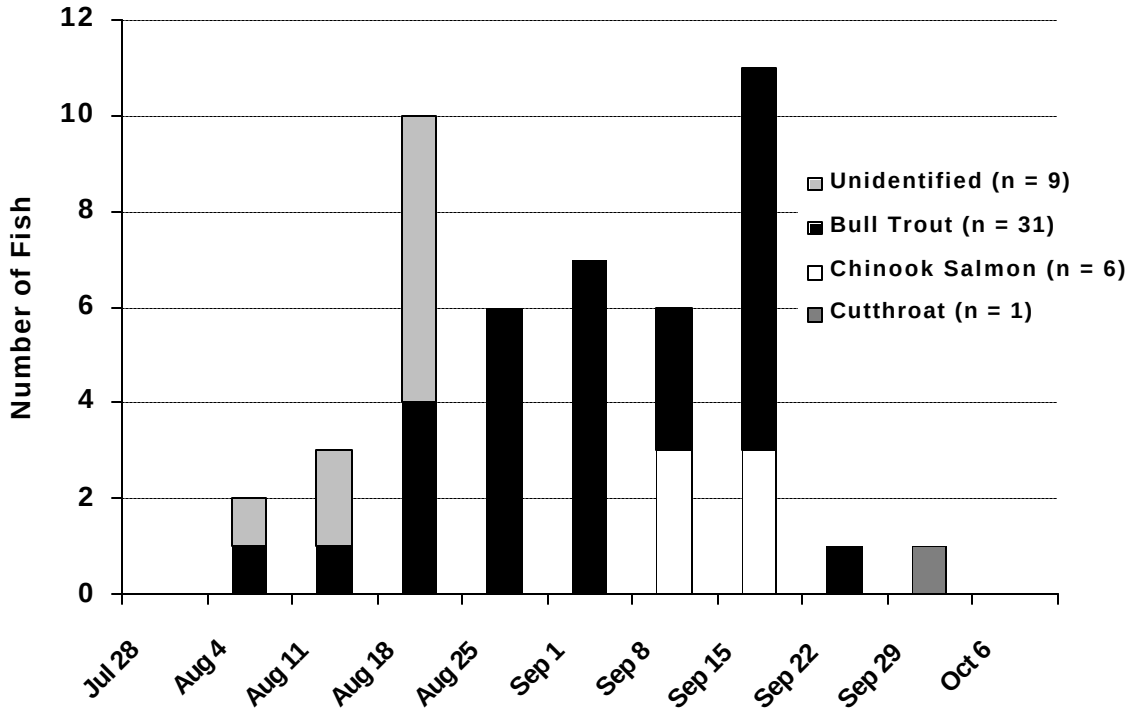

Figure 6. Number of unidentified fish, bull trout, chinook salmon and cutthroat trout moving upstream through the Vaki Riverwatcher fish counter in 2003.

Three of the 15 PIT-tagged bull trout longer than 30 cm detected at the Vaki weir moved up and down through the weir more than one time. Assuming all nine unidentified fish are bull trout, that unmarked fish moved up and down through the weir at the same rate as marked fish, and that PIT tag detection efficiency at the weir was 100 percent, then an estimated eight bull trout moved up through the weir more than one time [(27 + 3 + 9) x (3 / 15) = 7.8] and an estimated 31 unique bull trout longer than 30 cm moved up through the Roaring River weir in 2003.

Bull trout spent an average of 15 days above the Roaring River weir, with individuals ranging from 8 to 42 days. Of the three PIT-tagged fish that moved up and down through the weir more than one time, one fish moved up and down through the weir twice within ten minutes of its arrival. Another fish remained above the weir for 26 days, moved down and up again within 13 minutes, then spent five more days above the weir. The third fish remained above the weir for 8 days, moved downstream for 5 days, and then moved upstream for another 6 days.

Redd Surveys - We counted 27 redds in Roaring River from the mouth upstream 1.9 miles to an area believed to be impassible to bull trout. The number of redds counted in 2003 was similar to counts in recent years (Figure 7). Chinook salmon redds are indistinguishable from bull trout redds in Roaring River and may positively bias bull trout redd counts. In 2002, three chinook salmon were observed during redd surveys and the following spring 44 salmon fry were captured in the Roaring River screw trap, indicating

that chinook salmon spawned in Roaring River in 2002. In 2003, we observed six chinook salmon on the videotapes moving upstream through the weir. However, all six were males, therefore no chinook salmon spawned in Roaring River in 2003.

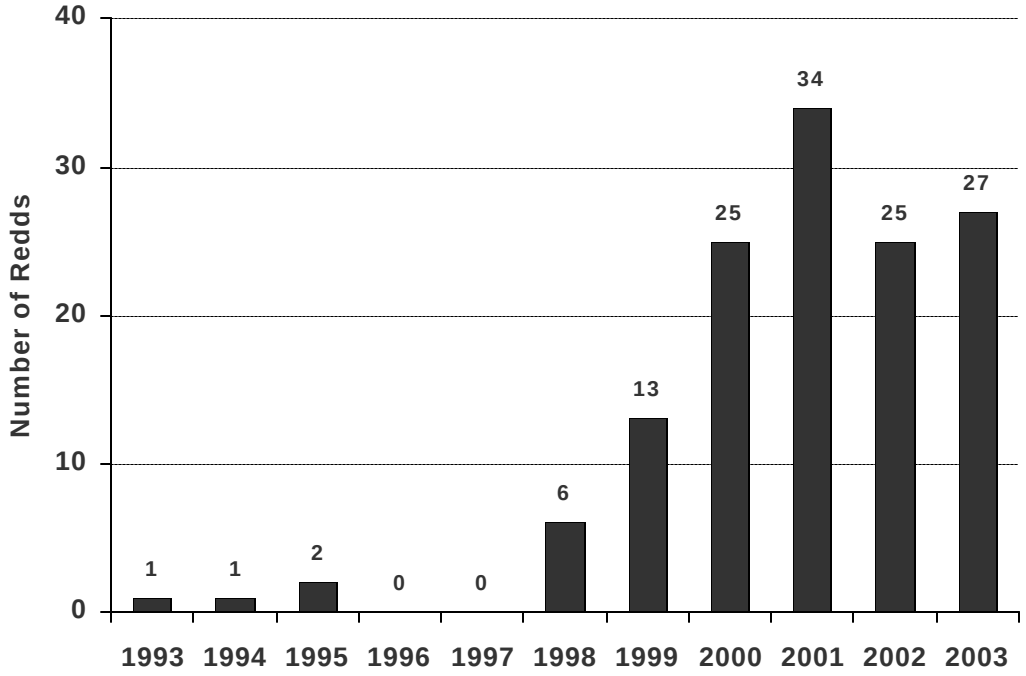

Figure 7. Redds counted in Roaring River, 1993 - 2003. Counts from 1993 to 1995 were from the mouth upstream to 650 feet above the Road 19 Bridge (D. Bickford, USFS, personal communication 2002). Counts from 1996 to present are believed to be complete counts.

OBJECTIVE 2 - DETERMINE HABITAT PREFERENCES OF BULL TROUT REARING IN COUGAR RESERVOIR DURING CONSTRUCTION COMPARED TO THOSE PRIOR TO CONSTRUCTION

We found radio-tagged bull trout distributed throughout Cougar Reservoir from late October through May (Figure 4). Fish appeared to be concentrated near the dam and at the head of the residual pool, areas where juvenile chinook congregate.

Both radio-tagged and PIT-tagged bull trout left the residual pool and moved up the South Fork McKenzie from late April through mid June. Mature fish left the residual pool during that time, as they did before drawdown, to migrate to Roaring River to spawn. However we do not know if immature fish left the residual pool because conditions were unsuitable due to the drawdown of the reservoir, or if this is a characteristic of their normal life history. After spending the summer in the South Fork McKenzie and Roaring River, bull trout returned to the residual pool from late September through early November.

OBJECTIVE 3 - DETERMINE THE SAFEST AND MOST EFFECTIVE MEANS OF PREVENTING BULL TROUT FROM MIGRATING INTO COUGAR RESERVOIR AND CAPTURING THOSE ALREADY RESIDING IN THE RESERVOIR

We identified and discussed trap nets, angling and screw traps as techniques for capturing bull trout so that they could be prevented from migrating to Cougar Reservoir or removed from reservoir in previous annual reports. During the report period we continued to refine our angling methods and identified areas where we can catch bull trout during the winter and spring.

OBJECTIVE 4 - EVALUATE OPTIONS FOR DISPOSITION OF FISH IF THEY ARE TO BE REMOVED FROM ABOVE COUGAR DAM

Representatives from the U.S. Army Corps of Engineers, U.S. Forest Service, U.S. Fish and Wildlife Service and ODFW met in August 2002 to discuss options and criteria for temporary removal of bull trout from above Cougar Dam should conditions warrant. Options included releasing fish into another water body and collecting them at a later time, or holding fish at a facility such as a hatchery, spawning channel, net pen or portable raceway. Subsequent to the meeting we completed a report entitled "Options for Temporary Relocation of Bull Trout Removed from above Cougar Dam" that describes and ranks options (APPENDIX A).

The group decided not to remove bull trout in the fall of 2002 pending results of spawning surveys and fish counts in Roaring River. By October 2002 the number of redds and fish counts were high enough that removal bull trout from above Cougar Dam was deemed unnecessary.

However, the group decided conditions may warrant removal of bull trout in the future and more information was needed to assess the viability of releasing fish in the South Fork McKenzie below Cougar Dam and collecting them at a later time. To determine the feasibility of this approach, we captured three bull trout in Cougar Reservoir and released them below the dam in October 2002 (Table 3). The fish remained in the South Fork McKenzie near Cougar Dam over the winter (Figure 8). We recapture all three by angling and released them into the residual pool in May 2003. 151.213 and 151.233 migrated upstream into Roaring River during the spawning period and 151.923, which was likely immature based on its length, migrated upstream to RM 13. All three fish returned to the residual pool in October 2003.

Table 3. Bull trout angled in Cougar Reservoir and released below Cougar Dam, October 2002

Radio frequency	Fork length (cm)	Date tagged	Date transferred	Comments
151.213	68.5	09/07/2001	10/16/2002	Female
151.233	73.0	10/16/2002	10/16/2002	
151.923	44.4	10/17/2002	10/17/2002	Immature

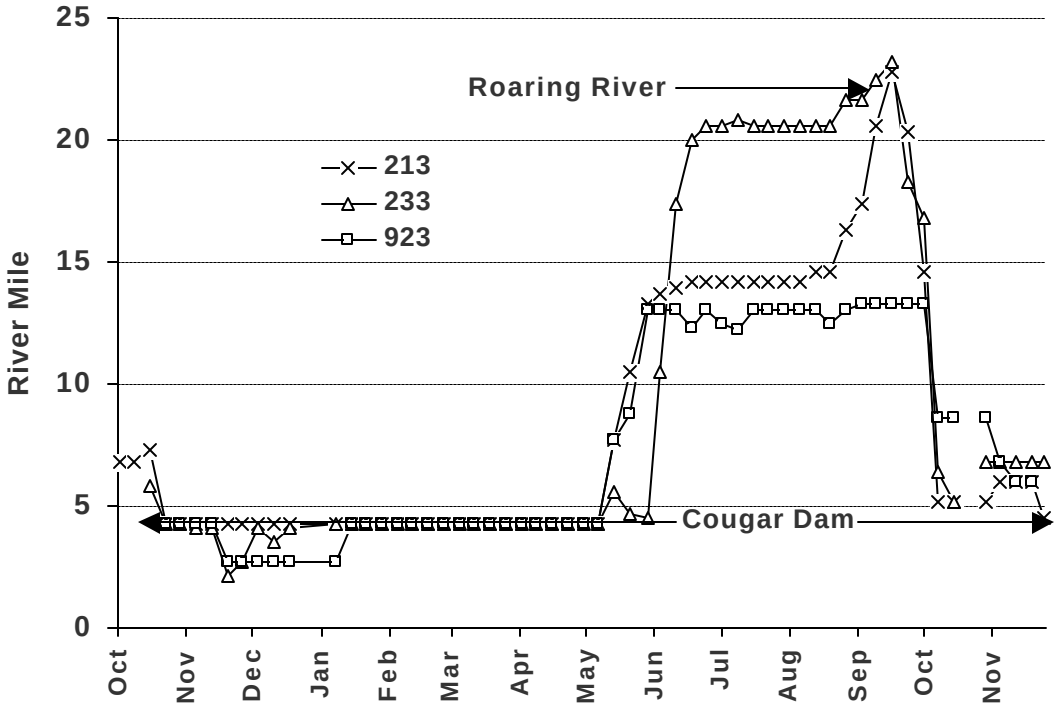

Figure 8. Locations of three radio-tagged bull trout captured in Cougar Reservoir and released below Cougar Dam in October 2002, and returned to the reservoir in May 2003.

OBJECTIVE 5 - MONITOR PASSAGE AND ESTIMATE MORTALITY OF BULL TROUT PASSING THROUGH THE DIVERSION TUNNEL

We angled below Cougar Dam in May 2003 and captured nine bull trout in addition to the three radio-tagged bull trout that we moved from Cougar Reservoir to below the dam in October 2002. These fish ranged from 29 to 69 cm fork length. Three had been PIT-tagged in Cougar Reservoir in October and December 2002 and therefore must have passed Cougar Dam through the diversion tunnel. We had PIT tagged only 11 sub-adult and adult bull trout above the dam when we captured the three PIT-tagged fish below the dam. We know the other eight fish remained in the residual pool because we subsequently detected them above Cougar Dam in 2003. We PIT-tagged five of the untagged fish captured below the dam and released them in Cougar Reservoir along with the three previously tagged fish. Four of these fish were longer than 50 cm fork length and they migrated up the South Fork McKenzie into Roaring River during the spawning period. The four less than 50 cm fork length were detected in the South Fork McKenzie above Cougar Reservoir at the Smith Creek PIT tag antenna shortly after they were released, and two were detected at Dutch Oven. We expect the smaller fish will spawn in Roaring River in the future as they mature. These data indicate that a significant portion of the adult and sub-adult bull trout passed through Cougar Dam in 2003, they survived passage through the diversion tunnel, and bull trout passing through the dam can be recaptured and returned above the dam to spawn.

We PIT-tagged and released a bull trout below the dam prior to the decision to transfer all bull trout to the residual pool. We detected this fish immediately below the dam throughout the summer and fall of 2003, but it was not recaptured despite numerous attempts. The fish was 66 cm fork length and likely mature, but it did not leave the area below Cougar Dam to spawn elsewhere in the McKenzie system suggesting that it originated above the dam.

We did not observe dead bull trout below Cougar Dam and did not detect the three PIT-tagged bull trout that passed through the diversion tunnel. We used combinations of five PIT tag antennas as we adjusted to different conditions below the dam (Figure 9).

This picture shows the downstream end of the original adult weir downstream bypass pipe with a helical PIT tag antenna wrapped around the outside. We did not believe fish moving downstream could readily find the upper entrance to the pipe so we blocked it and installed a larger bypass pipe that also had a helical antenna wrapped around it.

This picture shows the new bypass pipe that led into an 8-ft diameter screw trap. Another antenna spanned the top of the weir. The upper antenna conductor was supported by a cable and protected by a garden hose (visible in the top of this picture) while the bottom antenna conductor ran beneath the wooden walkway.

The PIT tag antenna spanning the top of the weir was never overtopped during high water.

After the bypass pipe washed out, we removed some of the weir panels on each side of the weir and installed wooden framed antennas around the perimeter of the openings.

Figure 9. PIT tag antennas used below Cougar, fall 2002 through spring 2003.

OBJECTIVE 6 - DETERMINE THE EFFECT OF CONSTRUCTION ON BULL TROUT AND SPRING CHINOOK SALMON IN THE S.F. MCKENZIE RIVER BELOW COUGAR DAM

The three bull trout captured in Cougar Reservoir and released below Cougar Dam in October 2002, and the nine other bull trout captured below the dam appeared healthy when we recaptured them and returned them to Cougar Reservoir in May 2003. Six of these fish migrated up the South Fork McKenzie and entered Roaring River during the spawning period. This suggests conditions below Cougar Dam were not detrimental to bull trout during the report period. Maximum daily temperature and dissolved oxygen were at acceptable levels while the bull trout were below the dam. Turbidity reached very high levels for a short period when the Rush Creek diversion failed releasing a large amount of sediment into the South Fork McKenzie. We were unable to determine the effects of the sediment on incubating spring chinook eggs.

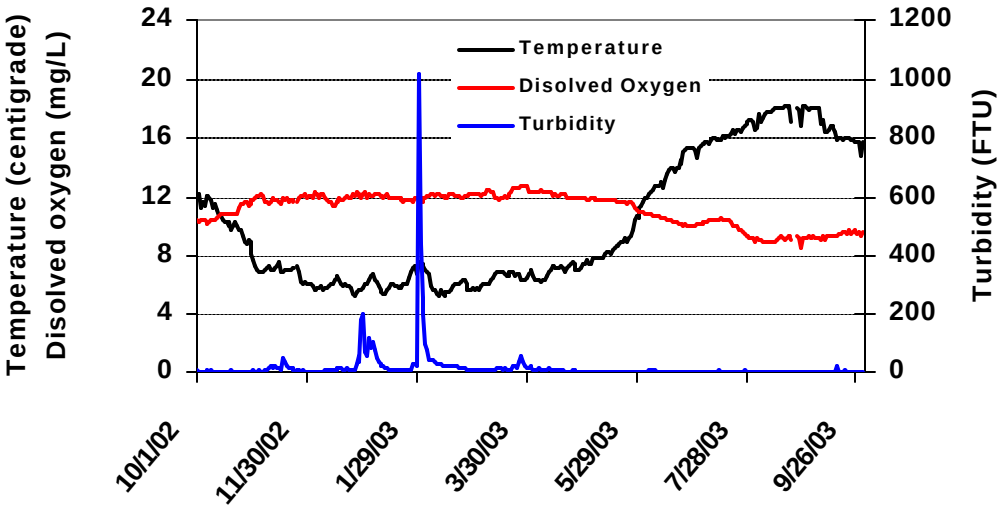

Figure 10. Maximum daily temperature, dissolved oxygen and turbidity measured by the USGS in the South Fork McKenzie River 0.6 miles downstream from Cougar Dam.

We observed a large number of adult chinook salmon in the South Fork McKenzie below Cougar Dam in 2003. We counted more redds below Cougar Dam in 2003 than in 2001 or 2002. In 2003, about half of the redds were within ¼ mile of the dam. Many redds in this area were superimposed and difficult to count. The increase in number of redds in the South Fork McKenzie below Cougar Dam since 2001 is probably due in part to a larger number of fish passing Leaburg Dam and in part to the response of spawning chinook salmon to warmer water temperatures during construction.

Table 4. Number of redds in the South Fork McKenzie below Cougar Dam.

		Number of redds		
Year	Reservoir drawdown	Below Rd 19 Bridge	Above Rd 19 Bridge	Total
2001	No	17	44	61
2002	Yes	24	60	88
2003	Yes	43	90	133

OBJECTIVE 7 - DETERMINE WHETHER CONSTRUCTION ACTIVITIES AT THE DAM OR WATER QUALITY CONDITIONS IMPACT BULL TROUT IN THE RESIDUAL POOL UPSTREAM OF COUGAR DAM DURING JUNE-OCTOBER

Radio-tagged and PIT-tagged bull trout left the residual pool and moved up the South Fork McKenzie from late April through mid June (Figures 4 and 11). We believe few if any adult or sub-adult bull trout remained in the residual pool after June and therefore they were not impacted by conditions in the reservoir during June through October. We detected 30 of 33 PIT-tagged sub-adult and adult bull trout above Cougar Dam, in the South Fork McKenzie in late spring and summer 2003. Two of the undetected fish were also radio-tagged and we located them in the South Fork McKenzie above the residual pool. Studies before construction began found mature bull trout migrated out of the reservoir in the spring (Taylor and Reasoner 2000). However, we do not know if immature fish left the residual pool because conditions were unsuitable due to the drawdown, or if they were following their normal migration pattern. After spending the summer in the South Fork McKenzie and Roaring River, adult and sub-adult bull trout returned to the residual pool from late September through early November.

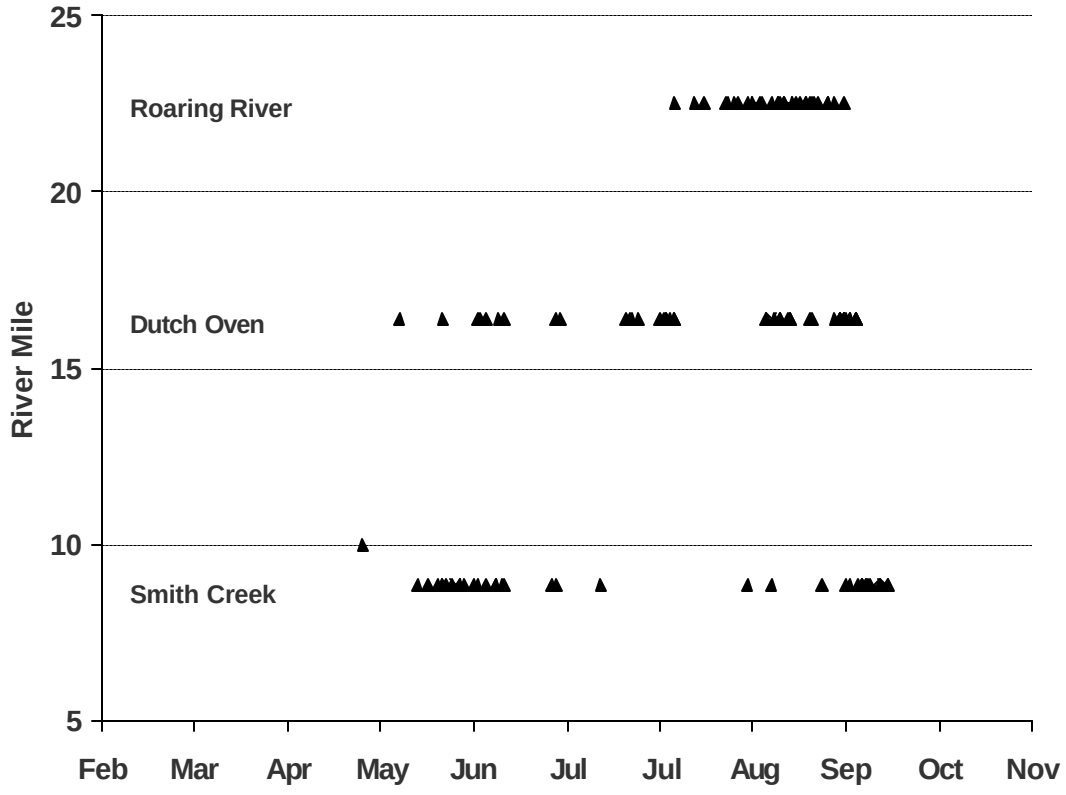

Figure 11. Detections of PIT tagged adult and sub-adult bull trout at three sites above Cougar Reservoir in 2003

OBJECTIVE 8 - CONDUCT POST-PROJECT MONITORING OF FISH RESPONSE TO WATER QUALITY CONDITIONS AND OPERATIONS OF THE COMPLETED WATER TEMPERATURE CONTROL FACILITIES

We will begin work on Objective 8 in FY 2005 when construction of the temperature control facility is completed.

OBJECTIVE 9 – DETERMINE THE MORTALITY OF JUVENILE CHINOOK SALMON PASSING THROUGH THE RESERVOIR (REGULATING) OUTLET AND PENSTOCKS

The penstock and regulating outlet were de-watered during the report period. We will continue work on this objective when the Temperature Control Facility is operational in FY 2005

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APPENDIX A

Options for Temporary Relocation of Bull Trout Removed from above Cougar Dam

Construction of temperature control facilities at Cougar Dam requires lowering the reservoir below minimum pool for two or three summers. The resulting changes to bull trout habitat such as size and depth of the residual pool, water temperature, turbidity and location of discharge from the reservoir may negatively impact the South Fork McKenzie bull trout population. If monitoring detects unusually high mortality, we may capture some of the bull trout and temporarily relocate them to increase survival and reduce adverse effects on the population. Monitoring has found only adult and sub-adult (12-18 inches long) bull trout in the residual pool and those are the life history stages we would temporarily remove to another location.

On August 29, 2002, Greg Taylor and Chuck Willis (USACE), Dave Bickford (USFS), Chris Allen (USFWS), Jeff Ziller, Vince Tranquilli, Chad Helms and Mark Wade (ODFW) met to discuss options and criteria for temporary removal of bull trout from above Cougar Dam. The group decided some of the options are not viable and those decisions are noted below. We also decided not to remove bull trout in 2002 pending results of spawning surveys and electronic fish counts in Roaring River (counts at the Vaki Riverwatcher and redd counts were high enough that we did not remove fish from the system).

This document identifies two approaches for temporarily relocating the fish; 1) releasing the fish into another waterbody and collecting them at a later time, or 2) holding the fish at a facility such as a hatchery, spawning channel, net pen or portable raceway. All options have potential risks that need to be weighed against alternative actions such as modifying the construction process, terminating the temperature control project or taking no action. The option selected will depend on the source of mortality (e.g. excessive migration out of the residual pool through the diversion tunnel or poor water quality in the residual pool and South Fork below the dam), the length of time the bull trout need to be removed from the South Fork McKenzie system and the time of year we capture them.

Criteria for Evaluating Options

Timing - There is a limited window of opportunity during September and early October to capture a significant number of adult bull trout. During this time adult bull trout can be readily captured in traps as they move downstream after spawning or by angling when they congregate at the head of the residual pool. Options for holding adult bull trout that are not available during this time period cannot be used.

Water Quality – Both release areas and holding facilities must provide appropriate water temperatures for bull trout throughout duration of relocation.

Space – Holding facilities must provide an area large enough to accommodate the number of fish relocated.

Disease – The removed fish should not be exposed to high levels of pathogens and the site should be in the Willamette system so that the risk of introducing new diseases into the system above the dam is decreased when the bull trout are returned the South Fork McKenzie.

Ability to Return Fish – All options for holding facilities allow all of the fish that are removed from above Cougar Dam to be returned. We do not know the proportion that can be recaptured and returned for the options where the fish are released into another waterbody. We would need to construct traps to catch the fish for several of the release options.

Ecological impacts – Release options must be areas where the bull trout will do no harm and preferably where fish that are not recaptured will contribute to an existing population.

Security – Holding facilities must have a reliable water supply and we should be able to monitor fish health and condition regularly. All options must not expose the fish to high levels of human and animal predation.

Options

Release into Another Waterbody

South Fork McKenzie below Cougar Dam (Preferred Option). This approach is the preferred option if we are relocating bull trout because a significant percentage of the population is passing through the dam and getting killed. If we are relocating fish because water quality in the residual pool is poor due to temperature or turbidity, then this approach may not work because water quality in the South Fork McKenzie below Cougar Dam would also likely be unsuitable. If bull trout pass through the dam without a substantial proportion being killed or only a small proportion of the population passes through the dam, then leaving the fish above the dam would be preferable. ODFW Fish Pathology does not have concerns about this option since adult spring Chinook are released above Cougar Dam.

An adult collection facility is being constructed below Cougar Dam. The primary purpose of this facility is to collect bull trout that pass through the dam, either during construction of the temperature control facility or after the facility is completed, so that they can be returned to spawn with the population above the dam. This facility could also be used to recapture bull trout if they were removed from above Cougar Dam and released into the South Fork McKenzie below the dam.

This approach assumes that fish released into the South Fork below the dam will not experience unusually high mortality, they will return to the South Fork at a later time and that the adult collection facility will be completed and function properly. In order to test the assumptions about the behavior of bull trout released below the dam, we implanted radio tags into three bull trout captured in Cougar Reservoir and released them below the dam in October 2002. We hope to learn where they go and if we will be able to recapture them in the new adult trapping facility. So far the fish have remained in the South Fork although two of the fish were located a mile or two downstream about a month after they were released. They have since moved upstream, and as of March 12, all three bull trout remain in the area below the dam. We believe these fish are alive because they appear to make small movements and are sometimes detected by the PIT tag antennas at the new adult weir.

Carmen-Smith Spawning Channel (Rejected). The Carmen-Smith spawning channel is located just below Trail Bridge Dam. Because the flows are relatively low and stable, it would be fairly easy to build a temporary trap at this site. The spawning channel was constructed as mitigation for spring chinook spawning habitat made inaccessible by EWEB hydroelectric facilities on the upper McKenzie River. The spawning channel is heavily used by spring chinook and the number may be increasing as progeny return from releases of surplus hatchery adults above Trail Bridge dam. A large number of spawning chinook is likely not compatible with releasing and recapturing bull trout from the South Fork McKenzie. This option was rejected because of unknown behavior of released bull trout and the potential to interfere with spawning by wild spring chinook, also a federal ESA listed species.

Leaburg Dam (Rejected). The McKenzie River below Leaburg Dam is the lower extent of the range of the mainstem McKenzie population. This area also supports large fisheries for anadromous fish, which may lead to inadvertent mortality of bull trout. Bull trout from the south fork could be released below Leaburg Dam and recaptured as they return past the dam, however this has several drawbacks. A large number of adult spring chinook return during the same period that bull trout pass the dam and their numbers would often preclude trapping. A new ladder is being constructed on the right bank that does not include trapping facilities. This option was rejected because of the number of wild spring chinook present and the uncertainty about trapping facilities.

Middle Fork Willamette (Rejected). Bull trout are native to the Middle Fork Willamette above Hills Creek Reservoir. However this population was extirpated or nearly extirpated by the early 1990s. Since then ODFW and the USFS have been working to reestablish a population of bull trout in this area including introducing fry from Anderson Creek. This option was rejected because there are no trapping facilities in this system and most sites that are suitable for constructing a trap are not near a road.

Trail Bridge Reservoir (Rejected). Trail Bridge Reservoir supports a population of bull trout. This population has likely been increasing since passage under Highway 126 into Sweetwater Creek was reestablished. When passage into Sweetwater

Creek was reestablished the population in Trail Bridge Reservoir was thought to be very small. To hasten use of Sweetwater Creek by bull trout, ODFW and the US Forest Service released a total of 6,377 bull trout fry from Anderson Creek into Sweetwater Creek between 1993 and 1999. Bull trout released into Trail Bridge would need to be differentially marked so that they could be separated at recapture from bull trout already present. Recapturing bull trout would require building at least one trap on either the McKenzie River above the reservoir or on Sweetwater Creek, depending on where the fish from Cougar population were released. If the released fish returned to both places, then two traps would need to be constructed. This option was rejected because it is likely that fish would only enter the streams and be trapped very close to spawning which could be very stressful for both the South Fork fish and Trail Bridge population. In addition, the fish transferred from the South Fork McKenzie may not stay in Trail Bridge Reservoir but exit through the dam and be lost to the project.

Holding Facilities. Facilities suitable for holding bull trout must have a dependable and ideally pathogen free water supply and must provide adequate security from human and animal predators. Keeping bull trout removed from above Cougar Dam in a holding facility of some type would provide the opportunity to return a high percentage of the fish to the South Fork McKenzie River.

Marion Forks Hatchery (Potential). Marion Forks Hatchery is located on the North Santiam system above Detroit Reservoir. This hatchery raises spring chinook and has circular ponds available from early November until July. Covers would need to be constructed for the ponds. The hatchery has two gravity fed water supplies, one of which, Horn Creek, is usually les than 45°F and relatively pathogen free.

Willamette Hatchery (Potential). Willamette Hatchery is located on Salmon Creek near Oakridge in the Middle Fork Willamette system. Circular ponds are available all year. Water is gravity fed from Salmon Creek; however, the temperature reaches 62°F or more in the summer. It may be possible to hold bull trout at this location during the fall, winter and spring months.

Carmen-Smith Spawning Channel (Rejected). A holding facility could be created at the head end of the Carmen-Smith spawning channel either by building weirs across a portion of the channel or constructing a holding pen. Water into the facility is from the McKenzie River and is controlled by a gate. This options was rejected because the site is in a remote location and there is no on site security. Fish held at this site would likely be subject to poaching.

Net Pens (Rejected). Net pens are commonly used for fish culture. ODFW has pontoons and walkways that could be used to support a net pen, but locking covers and netting would need to be purchased. Net pens need to be deployed in an area that has little current. Areas in the McKenzie system that support bull trout and are suitable for net pens include Trail Bridge, Clear Lake and Cougar reservoirs.

Clear Lake - There is a caretaker at the Clear Lake Lodge and this site may be worth investigating further if the fish are removed from above Cougar Dam and they cannot be released in the South Fork McKenzie or held at an ODFW hatchery.

Trail Bridge Reservoir – This reservoir is probably cold enough to hold bull trout in a net pen throughout the year, but there may be security problems.

Cougar Reservoir - Cougar Reservoir may be too warm during the summer to successfully hold bull trout and may be too turbid much of the remainder of the year.

Other ODFW Hatcheries (Rejected). There are two ODFW hatcheries on the McKenzie River that could hold bull trout but are a lower priority than Marion Forks or Oakridge hatcheries.

Leaburg Hatchery – Leaburg Hatchery has circular ponds available most of the year. Water is supplied from the McKenzie River and is not pathogen free. There are often disease problems at this hatchery. A well could be drilled to supply the bull trout pond or the water supply sterilized however these actions would expensive.

McKenzie Hatchery – McKenzie Hatchery has raceways available from early November through June. The majority of the water is supplied from the McKenzie River via the Leaburg Canal, although some water can be drawn from Cogswell Creek from late fall through the spring. Construction at Leaburg Dam is likely to dewater the hatchery from May through October of 2003. This facility offers no real advantage for holding bull trout over Leaburg Hatchery.

Portable Tank (Rejected). ODFW has used a portable raceway in the past and may still have one available. The portable raceway cost approximately $5,000. No specific location for a portable raceway has been identified. Security and a dependable water supply would be major considerations if this option were pursued. This option was rejected because there are too many unknowns.

Salmon Disease Lab (Rejected). The Salmon Disease Lab is located near Corvallis and operated by Oregon State University. It is supplied with constant 54°F well water. Although most fish at this facility cannot be released because of disease concerns, if bull trout were held in the outdoor tanks, releasing them would be acceptable. Although this option may be possible, personnel would need to be hired to care for the fish.