Bull Trout Distribution, Movements and Habitat Use in the Umatilla and John Day River Basins

2009 Annual Progress Report

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Abstract

The goal of the U.S. Fish and Wildlife Service's studies in the Umatilla and John Day basins is to provide information that can be used to develop recovery actions for bull trout (*Salvelinus confluentus*) listed as threatened under the Endangered Species Act. In 2009, we focused on gaining a better understanding of the seasonal distribution and movement of subadult bull trout in the two basins. In the Umatilla Basin, we targeted subadults in the lower Umatilla River for radio tagging, because our past trapping and telemetry efforts in the upper river had failed to include individuals that utilized the lower river. To maximize the likelihood of capturing subadults, we angled in cold water refuges in late summer, when any bull trout present in the lower river presumably would have been restricted to those refuges. We also continued to maintain a passive integrated transponder (PIT) tag detection array in the North Fork Umatilla River (UM1) near its mouth and another 15 km downstream in the Umatilla River (UM2). We caught no bull trout while angling, so no fish were radio tagged in the Umatilla Basin in 2009. Only one subadult was detected at UM1. It was detected in November after having been tagged upstream in the North Fork 102 d earlier in July. No PIT-tagged subadults were detected at UM2, but it was not fully functional for much of the year. Given the low abundance of bull trout in the basin, and the apparent rarity of subadults that undertake extensive downstream migrations, assessing the effects of human impacts in the lower Umatilla River on subadult movement and distribution will be difficult. In the John Day Basin, we operated a screw trap in the North Fork John Day River in spring and fall near the town of Dale, at river kilometers 104 and 97, respectively, to capture subadults for radio tagging. We also angled below the trap site in fall. We caught no bull trout in the screw trap in spring or while angling in fall. Four subadults were captured in the screw trap in November, and we radio tagged all of them. All had moved downstream below rkm 63 by 9 December. We could not determine their locations between 9 December and the end of the year because our scheduled telemetry flights were cancelled due to inclement weather.

Introduction

Bull trout (*Salvelinus confluentus*) were officially listed as a Threatened Species under the Endangered Species Act (ESA) in 1998. The U.S. Fish and Wildlife Service (FWS) subsequently issued a Draft Recovery Plan (U.S. Fish and Wildlife Service 2002) which included chapters for the John Day Recovery Unit (Chapter 9) and the Umatilla-Walla Walla Recovery Unit (Chapter 10). The two chapters were updated in 2004 (U.S. Fish and Wildlife Service 2004a. 2004b), and are the current guide for recovery actions in the Umatilla and John Day basins. The goal of bull trout recovery planning by the FWS is to describe courses of action necessary for the ultimate delisting of this species, and to ensure the long-term persistence of self-sustaining, complex interacting groups of bull trout distributed across the species' native range (U.S. Fish and Wildlife Service 2004a, 2004b).

Bull trout are native to the Umatilla and John Day basins, and they exhibit two different life history strategies in those systems. Fluvial bull trout spawn in headwater streams and juveniles rear in these streams for one to four years before migrating downstream as subadults to larger main stem areas, and possibly to the Columbia River, where they grow and mature, returning to the tributary stream to spawn (Fraley and Shepard 1989). Downstream migration of subadults generally occurs during the spring, although it can occur throughout the year (Hemmingsen et. al. 2001a, 2002). These migratory forms occur in areas where conditions allow for movement from upper watershed spawning streams to larger downstream waters that contain greater foraging opportunities (Dunham and Rieman 1999). Stream-resident bull trout also occur in the two basins, and they complete their entire life cycle in the tributary streams where they spawn and rear. Resident and migratory forms of bull trout may be found living together for portions of their life cycle, but it is unknown if they can give rise to one another (Rieman and McIntyre 1993). Bull trout size is variable depending on life history strategy. Resident adult bull trout tend to be smaller than fluvial adult bull trout (Goetz 1989). Under appropriate conditions, bull trout regularly live to 10 years, and under exceptional circumstances, reach ages in excess of 20 years. They normally reach sexual maturity in four to seven years (Fraley and Shepard 1989; McPhail and Baxter 1996).

When compared to other North American salmonids, bull trout have more specific habitat requirements. The habitat components that shape bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (U.S. Fish and Wildlife Service 1998). Throughout their lives, bull trout require complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Watson and Hillman 1997). Juveniles and adults frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). McPhail and Baxter (1996) reported that newly emerged fry are secretive and hide in gravel along stream edges and in side channels. They also reported that juveniles are found in pools, riffles, and runs where they maintain focal sites near the bottom, and that they are strongly associated with instream cover, particularly overhead cover. Bull trout have been observed over-wintering in deep beaver ponds or pools containing large woody debris (Jakober et al. 1998). Habitat degradation and fragmentation (Fraley and Shepard 1989), barriers to migration (Rieman and McIntyre 1995), and reduced instream flows have all contributed to the decline in bull trout populations in the Columbia River Basin.

In summary, bull trout need adequate stream flows and temperatures and the corresponding habitat for each of the different life history functions at specific times of the year in order to persist. Habitat conditions must be adequate to provide spawning, rearing, and migration opportunities, cover, forage, seasonal movement, and over-wintering refuges.

The goal of FWS studies in the Umatilla and John Day basins is to develop information and analyses to assist in assessing the relative merit of potential action strategies in making progress towards meeting the requirements outlined in the Umatilla-Walla Walla and John Day Recovery Unit chapters of the Draft Recovery Plan (U.S. Fish and Wildlife Service 2004a, 2004b) for the recovery and delisting of bull trout. Specifically, FWS studies were designed to address the following recovery plan objectives:

- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and

- Conserve genetic diversity and provide opportunity for genetic exchange.

The habitat objective should be accomplished through a series of steps designed to restore and maintain suitable habitat conditions for all bull trout life history stages and strategies. The first step should consist of defining the physical conditions that comprise suitable bull trout habitat. The second step should be application of these habitat "criteria" to current conditions to determine the extent of the relevant stream that currently provides suitable habitat. The third step should consist of determination of the changes required to improve habitat in areas indicated in the recovery plan that do not currently provide suitable conditions. The fourth step should consist of implementing changes to restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.

The genetic diversity objective should be accomplished by maintaining connectivity among local populations of bull trout to facilitate gene flow and genetic diversity. As the Recovery Plan discusses, connectivity consists of maintaining the fluvial component of each local population which includes providing conditions that allow fluvial adults to effectively move between spawning and wintering areas, and ensuring that movement of both fluvial adult and subadult bull trout can occur, at least seasonally, between local populations within each core area in the recovery unit. This includes establishing the physical conditions necessary for up- and down-stream fish passage, and providing a continuum of suitable physical habitat to ensure the persistence of fluvial life stages and provide the opportunity for genetic interchange between local populations within each core area.

The approach FWS used to plan studies in the two basins consisted of the following steps:

- Identify information needed to assess if criteria for recovery objectives are being achieved;

- To that end, design and implement studies to describe bull trout distribution, movement, and seasonal habitat use patterns;

- Use this information and results from these studies to assist in guiding actions that will make progress towards bull trout recovery.

We previously described what was known about the abundance, distribution, and migratory patterns of bull trout and potentially limiting physical conditions in the Umatilla Basin when we initiated our study there in 2004 (Anglin et al. 2008). To summarize, at that time, the only viable population of bull trout appeared to occur in the North Fork Umatilla River, and it appeared to be relatively small. Telemetry studies had shown fluvial adult bull trout did not migrate extensively, remaining within the upper Umatilla River and the North Fork to complete their life cycle (Sankovich et al. 2003, 2004; Oregon Department of Fish and Wildlife [ODFW], unpublished report). Little was known about the movement and seasonal distribution of subadults, but the available evidence suggested they also were not prone to undertake extensive migrations. Five bull trout had been captured in a ladder at Three Mile Falls Dam in the lower Umatilla River at river kilometer (rkm) 6 between 1995 and 2004. These fish were 254 to 330 mm in fork length (FL), indicating they were either subadults or first-time maturing adults when captured. Thus, assuming these fish originated in the Umatilla Basin, it appeared at least a small number of subadults produced there continued to migrate to and use the lower Umatilla and Columbia rivers. Although there were human impacts to the upper basin due to development, agriculture, and forest management, the major impacts occurred in the lower basin where there were six irrigation dams and diversions and sections of the river were sometimes dewatered seasonally. All but one of the diversion dams had ladders, but the ladders were designed for passage of salmon and steelhead, and it was not known if bull trout could negotiate them.

Between 2004 and 2009, the conditions in the Umatilla Basin that held the potential to negatively impact bull trout remained relatively unchanged. The population in the North Fork appeared to be small and stable or declining based on redd counts and mark-recapture abundance estimates (P.M.S., unpublished data; Budy et al. 2004, 2005, 2006, 2007, 2008). Because fluvial adult bull trout migrations had been studied previously and subadult migrations remained largely un-described, we chose to focus on the latter when we began our study in the basin. Through 2008, we used a combination of trapping, snorkeling, telemetry, and fixed passive integrated transponder (PIT) tag detection sites to determine the subadult population was small and individuals exiting the North Fork (i.e., individuals migrating as subadults for the first time) remained within the upper 40 km of the Umatilla River during their first summer in the Umatilla River. We also determined some of these subadults and older ones rearing in the upper Umatilla River undertook staged downstream migrations, for example, emigrating from the North Fork in spring and rearing in the Umatilla River for several months before again initiating downstream migration in fall. We observed no subadults utilizing the heavily impacted lower river. As a result, we were unable to describe the timing of use, seasonal distribution, and movement of subadults in the lower river and determine how subadults might be negatively affected by conditions there. Because of the small size of the subadult population, our sample size was small each year, and we potentially had not fully described the migratory behavior and distribution of subadult bull trout in the basin. Our objective in 2009, therefore, was to continue to study the subadults.

Bull trout in the John Day Basin inhabit the Middle Fork, North Fork, and upper John Day River drainages. When we initiated our study in the basin in 2005, we chose to focus on bull trout from the North Fork. Few migratory individuals remained in the Middle Fork system and those in the upper John Day River and its tributaries had been studied extensively by ODFW from 1997 to 2001.

The John Day River Recovery Unit Team identified seven local populations of bull trout in the North Fork John Day River Sub-basin: 1) upper North Fork John Day River (includes Crawfish, Baldy, Cunningham, Trail, Onion, and Crane Creeks and the main stem upstream from Granite Creek), 2) upper Granite Creek (includes Bull Run, Deep, and Boundary creeks), 3) Boulder Creek, 4) Clear/Lightning creeks above the Pete Mann ditch (includes Salmon Creek), 5) Clear Creek below the Pete Mann ditch (includes Lightning Creek below the ditch), 6) Desolation Creek (includes South Fork Desolation Creek below a barrier falls and North Fork Desolation Creek), and 7) South Fork Desolation Creek upstream from the barrier falls (U. S. Fish and Wildlife Service 2002). Leading up to our study, there were no reliable abundance estimates for these populations, but because much of the upper main stem flows through a wilderness area, local biologists suspected its bull trout population, in particular, was relatively healthy. Fluvial bull trout were believed to persist only among the upper North Fork John Day, upper Granite Creek, and Desolation Creek local populations (U. S. Fish and Wildlife Service 2002), and there was evidence indicating their abundance in the latter two local populations was extremely low (P. Howell, U. S. Forest Service [USFS], personal communication; P.M.S., unpublished data). Little information was available on the migratory patterns of these bull trout. Based on observations of two radio-tagged subadults and the incidental capture of fluvial adults by steelhead anglers, it was evident the overwintering area extended downstream into the lower North Fork and John Day River (Hemmingsen et al. 2001b; T. Unterwegner, ODFW retired, personal communication). The telemetry data also showed subadult migrations could be extensive, with one individual traveling at least 220 km between its winter and summer rearing sites (Hemmingsen et al. 2001b).

There are no dams on the North Fork John Day River and water withdrawals from it are limited to the lower 24 km, where several irrigation pumps are operated. In all but extreme drought years (e.g., 1977), the lower river has sufficient flow to provide fish passage during the irrigation season (T. Unterwegner, ODFW retired, personal communication). The Pete Mann Ditch is the only other significant water diversion in the sub-basin. It traverses a number of tributaries to Clear Creek and diverts varying portions of their flow into the Powder River Basin. Because fluvial bull trout are no longer present in the Clear Creek system, the Pete Mann Ditch currently has the potential to impact only resident bull trout and their localized movements.

The major factor limiting the distribution and movement of bull trout in the North Fork John Day River Sub-basin appears to be high summer stream temperatures (Columbia-Blue Mountain Resource Conservation and Development Area 2005). The high stream temperatures are attributed to a lack of streamside shade, increases in fine sediments, altered hydrologic patterns, losses of pool habitat, and low amounts of in-stream wood (Umatilla National Forest and Walla Walla National Forest 1997a and 1997b cited in Columbia-Blue Mountain Resource Conservation and Development Area 2005). These conditions are a product of past and, to a lesser extent, continuing forest management practices (e.g., logging and fire suppression), grazing, placer and dredge mining, and road construction (Columbia-Blue Mountain Resource Conservation and Development Area 2005). The lower sub-basin's semi-arid climate and loss of forest canopy due to extensive wildfires might also be important naturally-occurring contributing factors. The elevated stream temperatures presumably force bull trout to seek out and remain in colder headwater reaches of the main stem and its tributaries, or any coldwater refuges downstream, during summer. They might also form a thermal block to migration for individuals that fail to ascend the river system in a timely manner.

Although high summer stream temperatures have been proposed as the major factor limiting bull trout in the North Fork John Day River Sub-basin (Columbia-Blue Mountain Resource Conservation and Development Area 2005), a more detailed description of the migratory behavior of the sub-basin's bull trout is needed to support this contention and determine where thermal barriers or other factors might be restricting the movement and distribution of those fish. Information on both fluvial adult and subadult migrations was limited when we initiated work in the North Fork John Day River in 2005, but we elected to begin by studying the adults. While angling and operating an upstream migrant trap in the North Fork in 2005-07, we captured only eight large-bodied (>300 mm FL) char, three of which appeared to be brook trout (*Salvelinus fontinalis*) x bull trout hybrids rather than pure bull trout. We tagged seven of these fish, including the apparent hybrids. All remained in the upper 79 km of the 180 km-long North Fork throughout the lives of their two-year tags, and none appeared to encounter impediments to their movement. In 2008, we did not attempt to capture and tag fluvial adults. Instead, we simply conducted spawning ground surveys in the North Fork and its tributaries Baldy and Desolation creeks to assess adult abundance and distribution in those streams, as we had done the previous three years. Based on the results from those surveys and our efforts to capture fluvial adults for tagging, it became evident the abundance of fluvial adults was exceedingly low. In 2009, therefore, we changed our objective to describing the seasonal movement and distribution of subadults.

Umatilla River Basin

Methods

Radio Telemetry

To attempt to broaden our understanding of subadult distribution and movement, we specifically targeted subadults in the lower Umatilla River for tagging. We did this by angling in the lower river's cold water refuges in late summer (mid-August to mid-September), when bull trout would be limited to those areas. The cold water refuges were identified based on forward looking infrared imagery (FLIR) data presented in the Umatilla Basin Total Maximum Daily Load and Water Quality Management Plan (Oregon Department of Environmental Quality 2001). We focused our angling effort on an 8 km reach downstream of McKay Creek (rkm 81; Figure 1) and a 3 km reach downstream of Minnehaha Spring (rkm 16; Figure 1), where the FLIR data indicated temperatures remained below 21^{o}C and were as low as 14^{o}C.

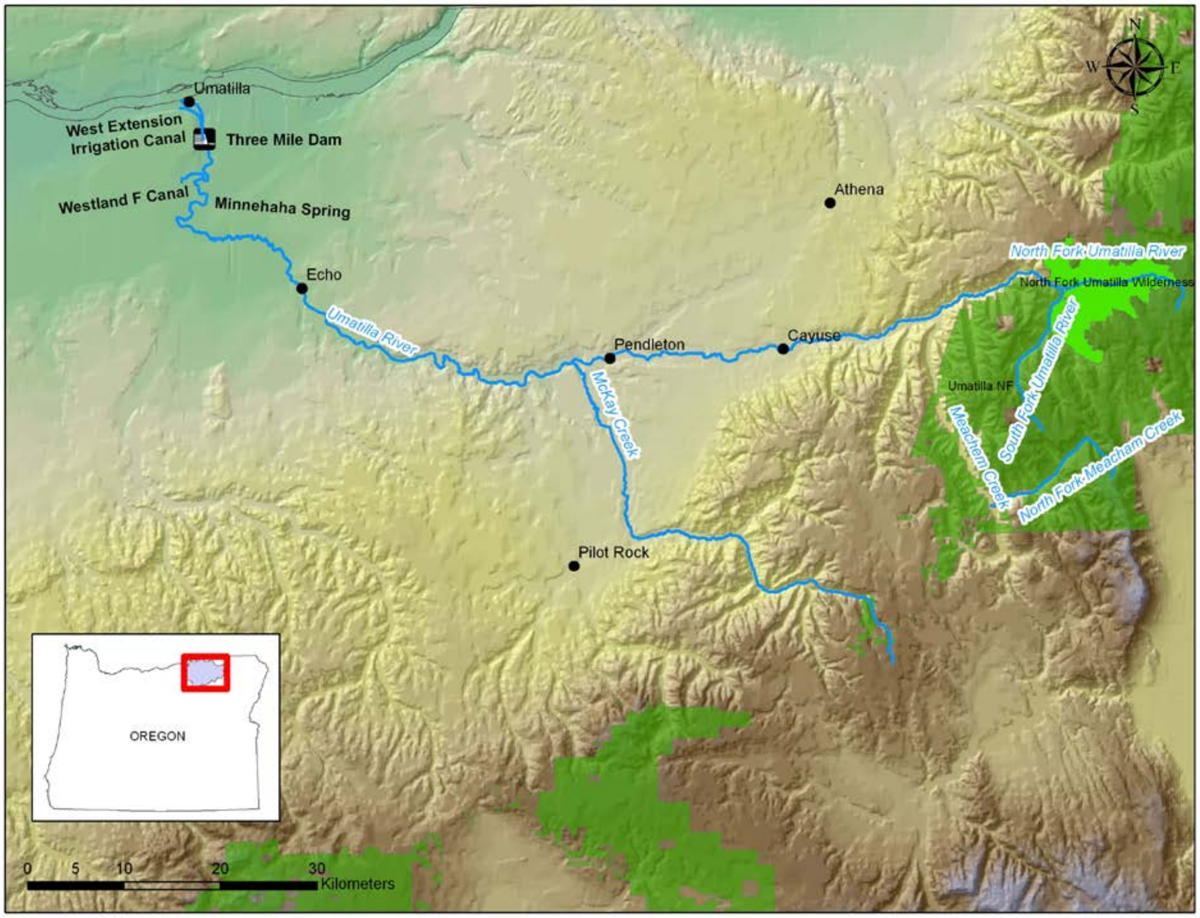

Figure 1. Map of the Umatilla River Basin showing the locations of the cold water refuges in the lower Umatilla River (downstream from McKay Creek and Minnehaha Springs) that were angled in summer 2009 in an attempt to capture subadult bull trout for radio tagging.

Because we captured no subadult bull trout while angling in the cold water refuges, we did not tag or track any fish in 2009 and, therefore, do not report here on the methods associated with those activities.

PIT Tag Detection Arrays

Bull trout movements were also monitored using two PIT tag detection arrays, one near the mouth of the North Fork (UM1) and another at rkm 129 on the Umatilla River (UM2), just upstream from the intake to the Imeques acclimation facility (Figures 2 and 3). The two arrays were brought on-line in October 2004 and August 2007, respectively. Each consisted of a full duplex interrogation system (Destron Fearing FS1001A), an antenna array custom built for this application, and a laptop computer equipped with Minimon software (Pacific States Marine Fisheries Commission). Power at the UM1 site was supplied with a combination of solar panels, batteries, and a generator. Remote data upload was accomplished using satellite communications (Figure 2). The UM2 site was powered through a hard wire connection. Data collected there were downloaded manually.

Figure 2. PIT tag detection array in the North Fork Umatilla River (UM1). On the left is the shed that houses the electronics, computer, and generator. Solar panels and satellite dish are visible on the roof. On the right the antenna array can be seen mounted to a bridge.

Figure 3. PIT tag detection array in the Umatilla River at rkm 128 (UM2).

The PIT tag detection arrays enabled passive monitoring of the movement of bull trout that were PIT tagged in the North Fork in summer 2003-08 as part of a population assessment study (Budy et al. 2004, 2005, 2006, 2007, 2008) and in the Umatilla River in 2005-07 and North Fork in 2009 as part of this study (Sankovich and Anglin 2006, 2007, 2008). Before 2009, the fish we PIT tagged were those captured in a screw trap near the mouth of the North Fork that were in excess of the number needed for radio tagging. Because the population assessment study ceased in 2008, we, in cooperation with personnel from Utah State University (USU), used methods similar to those used in that study to capture and PIT tag bull trout in the North Fork in 2009. We had only two days (28 and 29 July) to sample, so we focused on the reach of river between Coyote and Woodward creeks, where bull trout density was consistently highest during the population assessment study. The relatively efficient passive monitoring using PIT tag detection arrays together with the ongoing comprehensive tagging effort is an important part of our goal to better understand migratory bull trout life history, and the temporal and spatial aspects of their distribution and movements.

Routine inspection and maintenance of the PIT tag detection arrays were conducted to ensure reliable data collection and system operation. Antenna detection efficiency tests were conducted periodically to estimate the proportion of the antenna field that consistently detected a PIT tag that passed through the apparent field. Methods used to conduct efficiency tests were described in Anglin et al. (2008).

Results

Radio Telemetry

We caught no bull trout while angling in cold water refuges in the lower Umatilla River in August and September, so no fish were radio tagged in 2009. Visibility in the cold water refuge downstream from McKay Creek was poor due to McKay Creek being turbid and providing most of the flow. Bull trout, if present in that section of river, might have been difficult to capture by angling as a result. Conditions in the cold water refuge near Minnehaha Spring were suitable for angling.

PIT Tag Detection Arrays

The PIT tag detection array in the North Fork Umatilla River (UM1) was operational for all but 25 days (9 in January and 16 in July) in 2009. It detected only three bull trout that had been tagged and released in the North Fork (Table 1). One of these fish was fluvial adult sized (425 mm FL) when tagged in 2007. It had last been detected in 2008 (October) at UM2 and was detected at UM1 in July and August 2009 (Table 1). Another of these fish was juvenile or subadult sized (206 mm FL) when tagged in 2006, but was likely an adult when detected at UM1 in 2009 given the time elapsed since its tagging, and its detection history (e.g., pattern of movement; Table 1). The final bull trout presumably was a subadult, having been tagged at 144 mm FL in July 2009 and detected at UM1 102 d later in November. To date, only 49 (9%) of 530 bull trout that were subadult sized (<300 mm FL) at tagging in the North Fork in 2003-09 have been detected at UM1.

The UM2 PIT tag detection array was less than fully operational for much of 2009. Of the site's four antennas, two were operating from 2 January to 30 April, one was operating in May, two were operating from 1 June to 15 July, and none were operating from 16 July to 9 September. All four antennas were operating from 10 September though the remainder of the year. One bull trout was detected at UM2 in 2009. It was the 206 mm FL individual noted above. It passed UM2 in May, 21 d before being detected at UM1 (Table 1).

Discussion

Our description of subadult migrations in the Umatilla Basin has been limited primarily to the initial movements relatively small, presumably younger, individuals make upon exiting

Table 1. Tagging data, detection histories, and elapsed time from tagging to initial detection or between detections for bull trout PIT-tagged and released in the North Fork Umatilla River in 2003-09 and detected at PIT tag detection arrays in the North Fork Umatilla (UM1) and Umatilla (UM2) rivers in 2009.

		Length at	Date of detection		Elapsed
Tag ID	Date tagged	tagging (mm)	UM1	UM2	time (d)
3D9.1BF1B2D981	08/04/06	206	12/09/06		127
			08/12/07		246
				10/19/07	68
			10/04/08		350
				5/25/09	223
			6/15/09		21
			6/21/09		6
			8/1/09		41
3D9.1BF1B2A626	07/20/07	445		11/12/07	115
			07/14/08		244
			09/26/08		74
				10/24/08	28
			7/5/09		254
			8/3/09		29
3D9.1C2C6CA36E	7/29/09	144	11/8/09		102

the North Fork Umatilla River. We have not been able to adequately describe what these fish do prior to reaching maturity and returning to the North Fork to spawn. The limited information we have collected on larger (older) radio-tagged subadults (n=4) captured in the upper Umatilla River has shown they may remain at a single site from fall through early summer (Anglin et al. 2008) or begin to move downstream as stream temperatures decrease in the fall (Sankovich and Anglin 2007, 2008). We have not documented use of the lower Umatilla River by subadults, although there is evidence it occurs. For example, seven bull trout have been trapped in the ladder at Three Mile Falls Dam since in 1995. Assuming these fish originated in the Umatilla Basin, some, if not all, would have migrated downstream through the lower Umatilla River as subadults, given they ranged in fork length from 250 to 385 mm (from large subadult to small adult size) when captured at Three Mile Falls Dam. Our attempt in 2009 to sample subadults in the lower Umatilla River was unsuccessful. Describing the seasonal movement and distribution of subadult bull trout in the lower Umatilla River may not be possible at this time given the small size of the bull trout population in the North Fork Umatilla River and the apparently low frequency with which individuals from that population migrate downstream into the lower river. In the future, therefore, we will transition primarily to describing physical conditions in the Umatilla Basin, so that we can make inferences about how they might be impacting bull trout given what we have learned from this study and others relating to bull trout life history and habitat requirements.

Plans for 2010

In 2010, we will continue to operate UM1 and UM2, but will largely transition from describing the seasonal movement of subadult bull trout to collecting additional temperature data to fill in gaps in the existing temperature record in the basin. We will use the temperature data to conduct a patch analysis (FWS 2008) and identify potential bull trout patches. To fill in gaps in our understanding of fluvial bull trout movements, we will also tag any bull trout captured at Three Mile Falls Dam in the lower Umatilla River.

John Day Basin (North Fork John Day Sub-basin)

Methods

To capture subadult bull trout for radio tagging, we operated a screw trap in the North Fork John Day River at rkm 104 (Figure 4) from 19 June to 7 July. We had intended to begin operating the trap earlier in the spring, but were not issued a special use permit from the USFS in a timely manner. We also angled in the North Fork in fall below rkm 121 and operated a screw trap at rkm 97 (Figure 4) from 11 November to 1 December, when anchor and surface ice formed in the river. We selected trap sites that were in the middle section of the North Fork, far downstream from juvenile rearing areas, to increase the likelihood of capturing farther-migrating subadults that might use the John Day River.

We followed the methods described in Sankovich et al. (2003) and Anglin et al. (2008) to radio tag subadults. We used model NTC-3-2 tags (Lotek Wireless Fish and Wildlife Monitoring) that weighed 1.2 g in air, had a 9.5 s burst rate, and a warranty life of 96 d. Based on a length/weight relationship developed for bull trout in the North Fork Umatilla River (Budy et al. 2004), we estimated the model NTC-3-2 tags would suitable for bull trout as short as 164 mm FL at 3% of the host's weight. For the fish that were tagged, the tags actually were less than 1.2% of the host's weight. The tagged fish were allowed to recover from anesthesia before being released in a slow water section of river downstream from their capture site.

We tracked the radio-tagged fish by vehicle. During tracking, fish positions were recorded using a GPS unit. The coordinates were later entered into a mapping program (MAPTECH's Terrain Navigator) to determine the location, in river kilometers, of each individual.

Results

In the spring and early summer, the screw trap captured 139 Chinook salmon (*Oncorhynchus tshawytscha*) fry, 1 Chinook salmon smolt, 8 larval lamprey (*Lampetra tridentata*), 22 suckers (*Catastomus spp.*), 7 speckled dace (*Rhinichthys osculus*), 6 redside shiners (*Richardsonius balteatus*), 6 steelhead or rainbow trout (*O. mykiss*) fry, and 1 steelhead smolt. No bull trout were captured. In the fall, we caught no bull trout while angling, but caught four in the screw trap ranging in size from 203 to 300 mm fork length (Table 2). We radio tagged all of these fish. Among the fish incidentally captured were 2,186 Chinook salmon

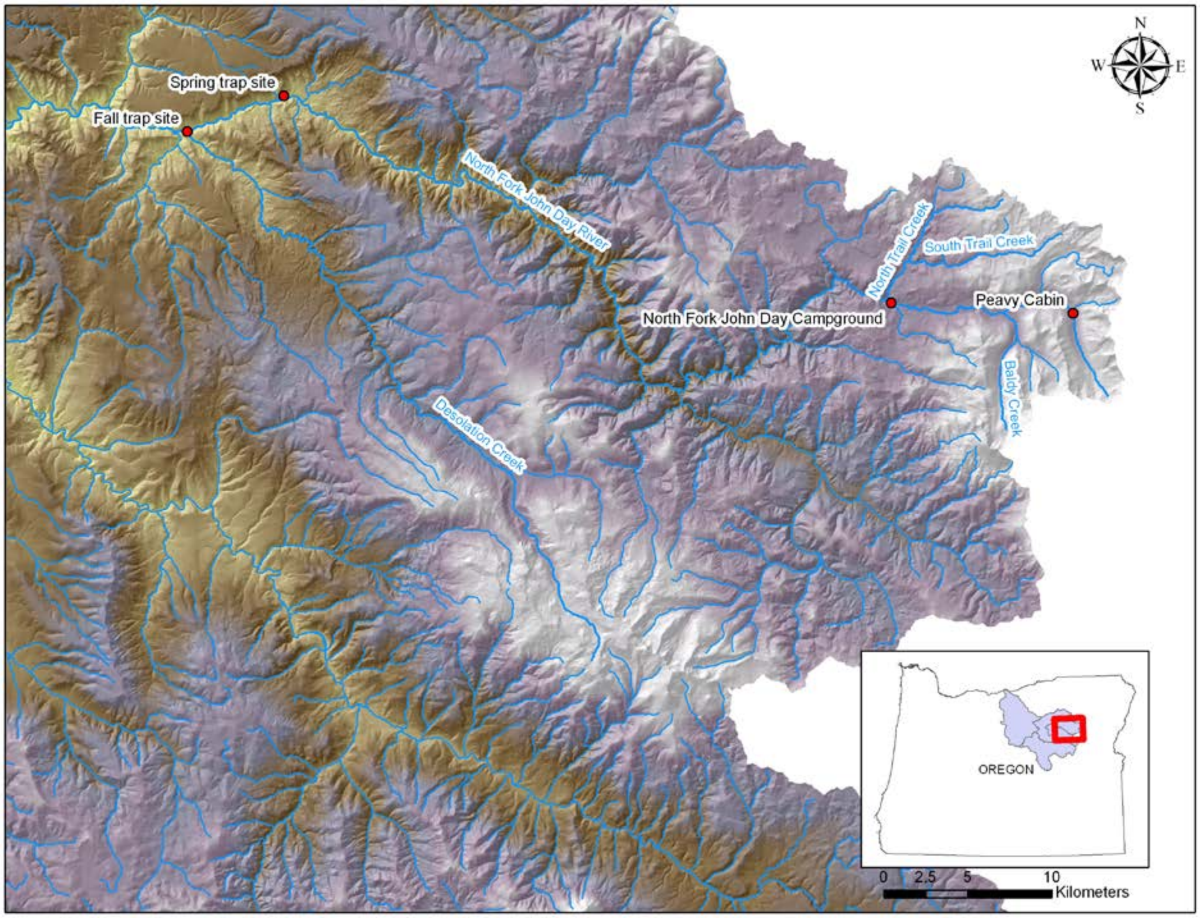

Figure 4. Map showing the location of the North Fork John Day River, screw trapping sites in it, and relevant tributaries and landmarks.

pre-smolts, 9 juvenile and 7 adult mountain whitefish (*Prosopium williamsoni*), 9 suckers, 7 larval lamprey, 4 dace, 2 juvenile steelhead or rainbow trout, 2 adult rainbow trout, and 1 adult smallmouth bass (*Micropterus dolomieu*).

During the initial telemetry survey along the North Fork John Day River Road on 13 November, we located two of the three tagged subadults (codes 17 and 18), which had moved approximately 6 and 18 km downstream from the trap site (rkm 97; Table 3). The other subadult (16) presumably had moved downstream of Potamus Creek (rkm 63), which was the farthest downstream we could track by road on the 72 km section of river between the trap site and the town of Monument. During the following survey along the same road on 20 November, one of the previously located subadults (18) had moved downstream another 16 km, while the other (17) remained at its previous location. We again failed to locate the subadult with tag code 16. On 8 December, after a week of sub-freezing weather that lead to the formation of substantial amounts of surface and anchor ice on and in the North Fork, we found none of the radio-tagged fish (including an additional one that had been released on the day of the previous survey) between the trap site and Potamus Creek. The last tracking event of the reporting period occurred on 21 December, when we tracked the North Fork from its mouth upstream to

Table 2. Date of tagging, radio tag code, fork length, weight, and capture and release site of bull trout captured in a screw trap in the North Fork John Day River in 2009.

Date	Radio tag code	FL (mm)	WT (g)	Capture/Release site (rkm)
11/11/09	16	225	112.3	97
11/11/09	17	250		97
11/11/09	18	300		97
11/20/09	19	203	84.3	97

Table 3. Locations of radio-tagged bull trout in the North Fork John Day River at release and during tracking events from 11 November to 21 December 2009. River kilometers are continuous from the mouth of the North Fork.

	Radio tag code			
Date	16	17	18	19
11/11/09	97.0	97.0	97.0	
11/13/09		77.5	91.5	
11/20/09		77.5	75.0	97.0
12/8/09				
12/21/09				

Monument, and the John Day River from Service Creek (rkm 251) to a point 16 km upstream from the mouth of the North Fork (rkm 312). Since none of the radio-tagged bull trout were found, they presumably were in the North Fork between Monument and Potamus Creek. We were unable to confirm this because all of our telemetry flights scheduled through the end of the year were cancelled due to poor weather.

Discussion

Since our trapping operation in spring-summer was restricted to a short time frame when the spring freshet was ebbing, it is difficult to infer anything from our having caught no bull trout. Downstream migration of subadult bull trout in spring typically peaks and diminishes before the period when we were able to operate the screw trap (see, for example Hemmingsen et al. 2001a, 2001b). In the future, to increase the likelihood of capturing subadults for radio tagging and gain a better understanding of their distribution and movements, we will install the trap earlier in the spring and operate it for a longer period of time. The special use permit we obtained from the USFS is valid through 2010, so the problem we confronted in 2009 should not be an issue in 2010.

There is little we can conclude about the movements and distribution of the subadults we radio tagged in fall, since their locations were not known at the end of the year. They appeared to have remained in the North Fork between Potamus Creek and the town of Monument. We operated the screw trap well below the spawning and early rearing areas in the sub-basin to increase the likelihood of capturing individuals that might migrate long distances and enter the John Day River, allowing us to increase our understanding of subadult distribution in the John Day River, and of any impediments to their movement there. Hemmingsen et al. (2001b) previously showed subadult bull trout from the North Fork John Day Sub-basin use the John Day River, so our preliminary results from 2009 do not add to the existing knowledge of subadult distribution.

Given the apparent low abundance of fluvial adult spawners in recent years in Baldy and Desolation creeks and the upper North Fork (Sankovich and Anglin 2006, 2007, 2008, 2009) where most, if not all, of the sub-basin's fluvial bull trout are produced (U.S. Fish and Wildlife Service 2004a), we did not anticipate capturing a large number of subadults in the screw trap. Although we caught only four, they provided evidence that at least some level of subadult production is occurring. Since the trap was located relatively far downstream from spawning and early rearing areas where only longer-distance migrating individuals would be captured, there presumably were many more subadults rearing upstream from the trap site.

Plans for 2010

In 2010, we will continue to track the fish radio tagged in 2009 and to study the seasonal distribution and movement of subadult bull trout. We will operate a screw trap in the North Fork in spring and perhaps in the fall (if we achieve a reasonable level of success during the spring trapping) to capture subadults for radio tagging. We will also radio tag any bull trout captured incidentally by personnel from ODFW operating screw traps and seining in the Middle Fork John Day and John Day rivers to expand our knowledge of the migratory patterns of bull trout in the John Day Basin.

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