Evaluate Bull Trout Movements in the Tucannon And Lower Snake Rivers

Project Number 2002-006-00

2005 Annual Report
(January 1, 2005 - December 31, 2005)

Field Investigators:

Micheal P. Faler
United States Fish and Wildlife Service
Idaho Fishery Resource Office
P.O. Box 18
Ahsahka, ID 83520
(208) 476-7242

Glen Mendel and Carl Fulton
Washington Department of Fish and Wildlife
Fish Management Division
529 W. Main Street
Dayton, WA 99328
(509) 382-1005

October 18, 2006

Abstract

We sampled and released 194 bull trout (*Salvelinus confluentus*) from the Tucannon River in 2005. Passive Integrated Transponder (PIT) tags were inserted in 105 of these individuals, and we detected existing PIT tags in an additional 67 bull trout. Twenty-one of these fish were also surgically implanted with radio-tags, and we monitored their movements throughout the year. Fourteen bull trout sampled at the Tucannon Hatchery weir were not interrogated for PIT tags.

During 2005, we monitored the movements and migration of eight bull trout that were tagged in 2004, and 21 bull trout that were tagged in 2005. The general movements of these fish were typical of the movements we observed in this population from radio-telemetry work in 2002-2004. Bull trout began their upstream migration in late April through June, and continued on to the spawning areas in the upper reaches of the Tucannon River and it's tributaries in July and August. The first post spawn outmigrant was sampled in late September, and was followed by downstream movements typical of post spawn activity throughout October. By late November and early December, radio tagged bull trout were relatively stationary, and were distributed from rm 36 at the Tucannon Hatchery downstream to rm 1.8, near the confluence of the Tucannon and Snake Rivers.

Two bull trout outmigrated into the reservoir influenced area of the lower Tucannon and Snake rivers in January. One of these fish had been tagged during 2004, and the other was tagged in the lower Tucannon River in January, 2005. Both of these fish stayed in the reservoir influenced area until March, when they began their return back to the Tucannon River. These two fish are the first documented occurrences of bull trout from the Tucannon River embarking on a seasonal migration to and from Lower Monumental Pool. As in previous years, we did not collect data associated with objectives 2, 3, or 4 of this study, because we were unable to monitor migratory movement of radio-tagged bull trout into the vicinity of the hydropower dams on the main stem Snake River.

Acknowledgements

This study was funded by the U.S. Department of Energy, Bonneville Power Administration (BPA), Project number 2002-006-00, Contract numbers 00009774 and 00012207. Tracy Hauser of the Bonneville Power Administration served as Fish and Wildlife Project Manager for the project during 2005.

The authors would specifically like to thank Doug Maxey, Mike Sutterfield, Dave Clark, and Mike Manky of the Washington Department of Fish and Wildlife Tucannon Fish Hatchery for operation of the Tucannon trap and assistance with this study. We would also like to acknowledge Carrie Bretz, Frank Mullins, Stuart Rosenberger, Holly Smith, and R. J. Hemingway of the Idaho Fishery Resource Office for their assistance with field sampling, and Derek Gloyn of the Washington Department of Fish and Wildlife Dayton Fish Management Office for his assistance with field sampling, radio tracking, and fixed telemetry receiver monitoring.

Table of Contents

List of Tables

List of Figures

List of Figures (continued)

Introduction

The ESA (Threatened) listing of the Columbia River Distinct Population Segment of bull trout identified one of the major threats to the species as fragmentation resulting from dams on over wintering habitats of migratory subpopulations (Federal Register, 1998). At the time of listing, it appeared that a migratory subgroup in the Tucannon River may have utilized the mainstem Snake River for adult rearing on a seasonal basis (Underwood et al., 1995). The occurrence of bull trout in the hydropower system had been verified by a few incidental observations during sampling in Lower Monumental Pool (Buchanan et al. 1997 citing Ward), and in the adult passage facilities at Lower Monumental and Little Goose dams in the early 1990s (Kleist, in litt. 1993). Prior to 2001, documentation of fish movement past the adult fish counting windows at Lower Monumental Dam and Little Goose Dam occurred during spring, summer, and fall, but was suspended during winter months (November through March). The FCRPS Biological Opinion (USFWS 2000) required the U. S. Army Corps of Engineers (USACE) to provide data detailing the movement of bull trout past the adult fish counting stations at Lower Monumental and Little Goose Dams. This requirement prompted USACE to extend the collection of adult fish passage data into the winter months (i.e., November through March).

Time-lapse video counting did not document the presence of bull trout at Lower Monumental and Little Goose dams during the winter of 2003/2004 (Richards, pers. comm., 2004). However, bull trout have been observed at the fish viewing windows during spring and summer at both hydroelectric facilities since records were kept in 2001 (Anglea, et. al., 2004). Additionally, bull trout have been found in the adult/juvenile separator at the juvenile fish facility at Little Goose Dam in 2004 and 2005, and bull trout have also been caught incidentally during spring chinook recreational fisheries in the tailrace of Little Goose dam. The origin of these fish is unclear.

It remains unconfirmed if bull trout from the Tucannon River frequently utilize the main stem Snake River for rearing and foraging as observed in large rivers in other Columbia Basin subpopulations (Elle 1995; Faler and Bair 1992; Kelly Ringell and DeLaVergne 2000 and 2001; Schriever and Schiff; 2003; Theisfeld et al. 1996; Underwood et al. 1995). If bull trout originating from the Tucannon River migrate into the mainstem Snake River, it is also unknown if they attempt to pass the existing hydro facilities on a regular basis, or if the fishways are suitable for bull trout passage.

The potential for bull trout movements throughout the migratory corridor is high, but from the standpoint of future delisting and requirements set forth in the FCRPS Biological Opinion (USFWS 2000), the determination of temporal and spatial distribution in the mainstem is crucial in developing recovery actions, estimating “take”, and successful consultation on system improvement actions. This project was designed to help meet Reasonable and Prudent Measures, and Conservation Recommendations associated with the Lower Snake River dams in the FCRPS Biological Opinion, and to increase understanding of bull trout movements within the Tucannon River drainage.

Rieman and McIntyre (1993) describe unimpeded migratory corridors as important habitats to the persistence and interaction of local populations. They also indicate that disruption and/or modification of migratory corridors can increase stress, reduce growth and survival, and potentially result in the loss of migratory life-history types in a subpopulation. With these factors in mind, the primary question to be answered is: Does the existing hydropower system on the Lower Snake River limit the capabilities of Tucannon River bull trout to complete their migratory behavior, or are the current hydropower operations compatible with recovery and conservation of the species? The secondary goal of the project is to examine the movements and spatial/temporal distribution of migratory bull trout within the Tucannon River and to determine the proportion of migratory fish that leave the Tucannon River to overwinter. The bull trout stock status in the Tucannon River is considered healthy by the Washington Department of Fish and Wildlife (WDFW 1998), but little is known about their migrations in the Tucannon and Snake river subbasins. Martin et al. (1992) and Underwood et al. (1995) studied the interactions of bull trout, steelhead, and Chinook salmon in the Tucannon River during the early 1990's. As part of this larger study, there were 16 bull trout radio-tagged and tracked from July through November 1992. The authors indicated that 2 fish may have entered the main stem Snake River by the last week of October, but they were unable to verify these movements (Underwood et al. 1995).

The objectives of this study are to:

1. Determine the spatial distribution, migration timing, and movements of adult migratory bull trout in the Tucannon and Snake rivers.

2. Determine bull trout use and passage efficiency in fishways at Lower Snake River dams.

3. Estimate frequency of bull trout fall back at Lower Snake River dams.

4. Determine if bull trout losses result from movements out of Lower Monumental Pool.

The primary assumption associated with the study is that the movements of radio-tagged bull trout are not different from the movements of other bull trout in the subgroup. This assumption is critical to the project as a whole. The use of long life transmitters and tagging well before spawning or major migrations should reduce the effects of tagging on fish behavior. Martin et al. (1995) found that surgically implanted dummy transmitters did not affect fish survival, growth, or gonad development in rainbow trout held in captivity. Radio transmitters have been used in other bull trout studies in recent years with good success (Elle 1995, Faler and Bair 1992, Kelly Ringel and DeLaVergne 2000/2001, Schriever and Schiff 2003, Underwood et al. 1995). Objectives 1, 2 and 4 have critical assumptions, in part, associated with each of those objectives. In order to determine distribution in the Snake River (Objective 1) and passage efficiency (Objective 2), we must assume that a portion of our group of radio-tagged bull trout will enter the Snake River and at least attempt to pass through a fish ladder in the Lower Snake River.

Likewise, in order to estimate the extent of losses in Objective 4, there must be some movement (upstream or downstream) of radio-tagged bull trout out of Lower Monumental Pool and we also assume that radio transmission will be adequate to track bull trout movements throughout the reservoirs.

Study Area

The Tucannon subbasin encompasses the entire Tucannon watershed and all tributaries (approximately 502 square miles). The stream system originates in the Wenaha-Tucannon Wilderness Area, in the northeast portion of the Blue Mountains at an elevation of 6,234 feet (at Diamond Peak) and terminates at the Snake River (rm 62) at about 540 feet elevation (Figure 1). Dryland agriculture and livestock grazing are the dominant land uses in mid-elevation upland areas, while forestry, recreation and grazing are the primary land uses at higher elevations. The subbasin is characterized by deep v-shaped valleys in headwater areas gradually widening into comparatively broad valley bottoms on the lower mainstem of the Tucannon River and Pataha Creek. The topography is the result of folding and faulting of extensive deposits of Columbia River basalts. Highly erodible loess soils on the plateau tops support extensive acreages of dryland farming. There is generally a large difference in elevation between the valley bottom of the drainage network and the surrounding plateaus. Intermittent and/or ephemeral streams are present throughout the watershed. Under typical conditions these streams do not convey much water, but during thunderstorms or rain-on–snow events they are capable of carrying immense debris torrents into the Tucannon River. The sediment moving capacity of these small streams is easily seen in the extensive alluvial fans deposited at their mouths. Habitat conditions in the Tucannon subbasin range from generally fair to good in the Tucannon drainage to generally poor in the Pataha drainage.

Salmonid bearing streams in the subbasin include Bear Creek, Sheep Creek, Cold Creek, Panjab Creek, Turkey Creek, Meadow Creek, Little Tucannon River, Hixon Creek, Cummings Creek, Tumalum Creek, Pataha Creek, and the main stem Tucannon River. Summer steelhead/rainbow, spring Chinook, fall Chinook, resident rainbow trout, and bull trout are currently present. Summer steelhead/rainbow are presumed to be present in Kellogg and Smith Hollow Creeks. Coho were historically present, and in recent years, coho salmon have again begun using the lower reaches of the main stem Tucannon River. It is likely that the coho recently found in the Tucannon watershed originated from stray individuals from nearby tribal hatchery reintroduction efforts in the Snake or Columbia basins.

The Tucannon River enters the Snake River at rm 62.5 (rk 100.6) in Lake Herbert G. West, which is delineated by Lower Monumental and Little Goose dams on the downstream and upstream ends, respectively. Lyons Ferry Hatchery occurs a few miles downstream of the Tucannon mouth, at the confluence of the Snake and Palouse rivers. This portion of the Snake River is primarily a migration corridor for anadromous salmonids. Spring Chinook and summer steelhead use the Snake River to migrate to and from the ocean and/or between tributary streams, while fall Chinook use the Snake River

for spawning, rearing and migration. Sockeye salmon migrate through this corridor to and from spawning grounds in Idaho's Salmon River basin.

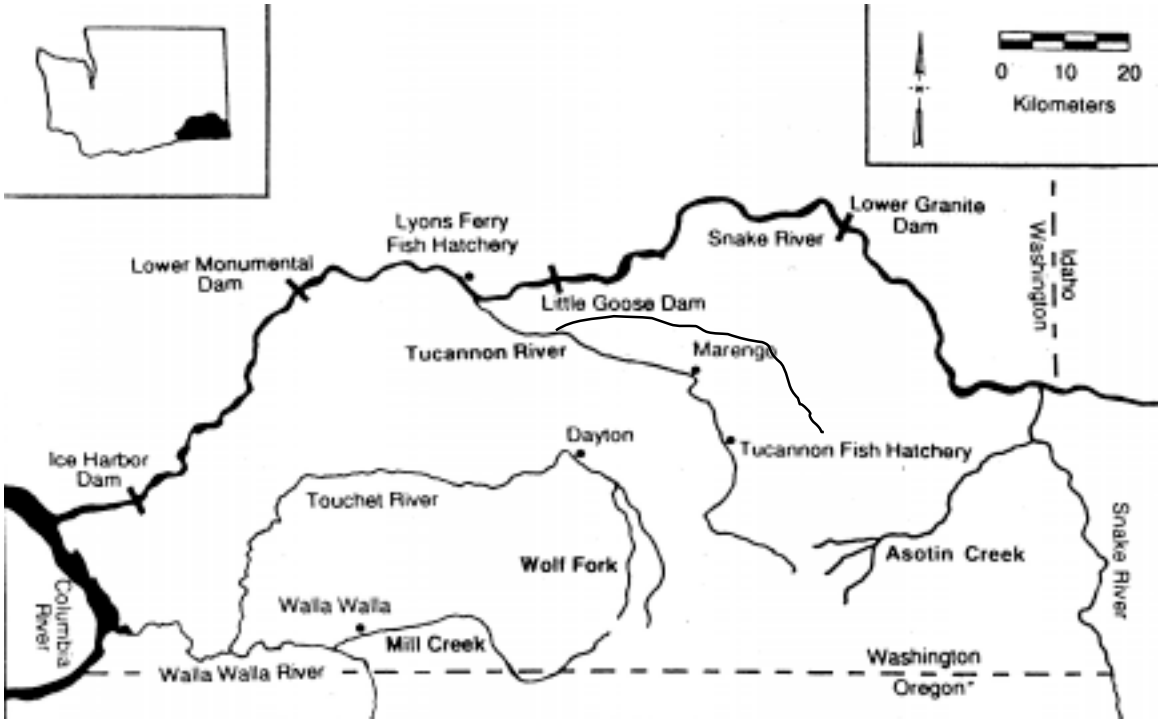

Figure 1. Map of Southeast Washington showing the location of the Tucannon River in relation to the four Lower Snake River dams.

Methods and Materials:

The approach of the study is to use radio-telemetry to monitor the movements of adult bull trout as they move within the Tucannon River basin, and as they emigrate to the Snake River to rear throughout the winter. In order to capture bull trout, we angled in the fall and winter with lead-head jigs and spoons equipped with barbless hooks. This method proved successful for capturing bull trout in September through December, and allowed us to capture and tag fish in the lower reaches of the river. Fish of appropriate size ($\geq$ 50 times transmitter weight in air) were surgically implanted with 294 day life expectancy radio-tags. Surgical procedures generally followed those used by Faler et al. (1988), Faler and Bair (1992), Kelly Ringel and DeLaVergne (2000/2001), and Schriever and Schiff (2003).

Radio-tags used during 2005 were obtained from Lotek Engineering. In contrast to previous years, we solely utilized Lotek model NTC-6-2 3V micro coded fish transmitters which weighed 4.5 g in air, had a 294 day life expectancy with a 7 second burst rate, and were suitable for fish as small as 225 g. All radio-tags implanted during

2005 operated on RF frequency 149.380 MHz and were individually micro-coded for easy separation of individual fish.

Radio-tagged fish locations were monitored at least weekly in the Tucannon River from shore or aircraft. Individual fish locations were recorded by GPS coordinates during flights, and proximity to landmarks and/or road miles while tracking on ground. We continued to use the four fixed telemetry stations operated since 2003 to monitor bull trout movements (Figure 2). The lowermost station, at rm 1.6, was operated to identify the timing of movements out of the Tucannon subbasin and into the mainstem Snake River. The station at rm 10.0 was established to determine if operation of the WDFW Snake River Laboratory steelhead weir impeded the downstream migratory movements of bull trout attempting to pass that location, as well as to provide an additional monitoring station in the lower river to increase the efficiency of detecting bull trout movements in the lower Tucannon subbasin. The two remaining fixed stations at the Tucannon Hatchery weir and Camp Wooten (rm 36.8 and 43.0) were operated to record timing of fish movement into and out of the upper Tucannon River.

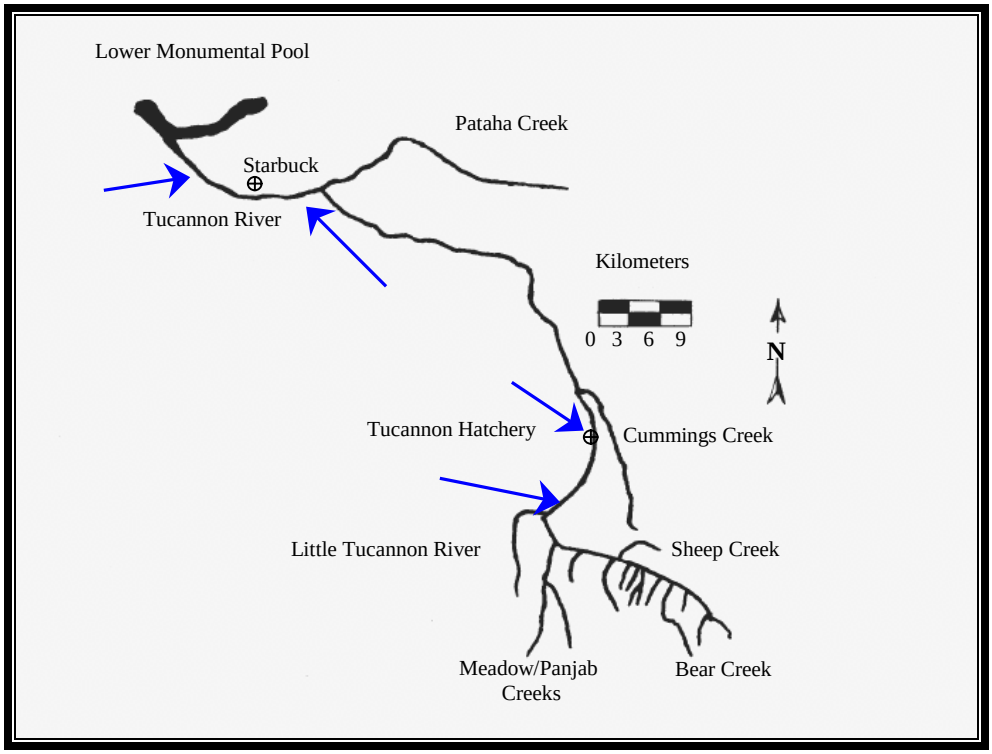

Figure 2. Fixed telemetry data logger stations (indicated by arrows) in the Tucannon subbasin, 2005.

Results and Discussion

This section includes several facets of work, some of which were initiated during the 2004 reporting cycle, but culminated in the 2005 reporting cycle. The data are organized both chronologically and by task for fish tagged in: 1) the spring and fall of 2004, 2) the fall and winter of 2005.

Migration and Distribution (fish tagged in 2004)

Tag movements and visual observation of live fish indicate that eight of the 25 bull trout (32%) tagged in 2004 survived and carried their radio tags through the winter into 2005 (codes 43, 92, 94, 95, 96, 97, 100, and 111). These fish were implanted with Lotek coded tags which transmit a unique code on radio frequency 149.380 Mhz. Of the 25 bull trout radio-tagged in 2004, 16 were tagged in the spring near the Tucannon Fish Hatchery weir (codes 15, 16, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, and 50), and nine were tagged in the fall at various locations ranging from near the Highway 12 bridge (rm 14.3) to the Tucannon Fish Hatchery weir at rm 36.8 (codes 92, 93, 94, 95, 96, 97, 99, 100, and 111).

Survival of fall tagged fish was decidedly higher than those tagged in the spring. Of the 16 fish tagged in the spring of 2004, one individual (6.3%) survived the winter and continued migratory movements into 2005, whereas seven of the nine fish (77.8%) tagged in the fall of 2004 survived the winter, retained their tags, and continued migratory movements into 2005. On June 22, 2005, the last known location of a bull trout tagged in spring of 2004 that survived the winter (code 43) was at rm 45.7, slightly more than a mile upstream of Cow Camp bridge. At this point, we could no longer track the movements of this fish, likely because the radio-tag battery had expired. This fish was tagged with a Lotek MCFT-3BM radio tag, with a life expectancy of 334 days, and on June 22, 2005, this tag had been transmitting a signal for 381 days.

Movements and distribution of the eight survivors from 2004, were similar to those observed in radio-tagged bull trout from previous years (Faler et al. 2003, Faler et al.2004, Faler et al. 2005). From January – April, 2005, these fish were distributed from the Tucannon Hatchery down to and including the reservoir influence zone at the confluence of the Tucannon and Snake rivers (Figure 3). One of these fish (code 111) was first detected in the reservoir influence zone on January 24, and remained in the area until March 9 (Figure 4). During May and June, this group of eight fish began to move upstream toward the spawning grounds in the upper reaches of the Tucannon River (Figure 4). Batteries in the radio-tags these fish were carrying began to fail during May and June, and as a result, we were unable to track this group of fish into July.

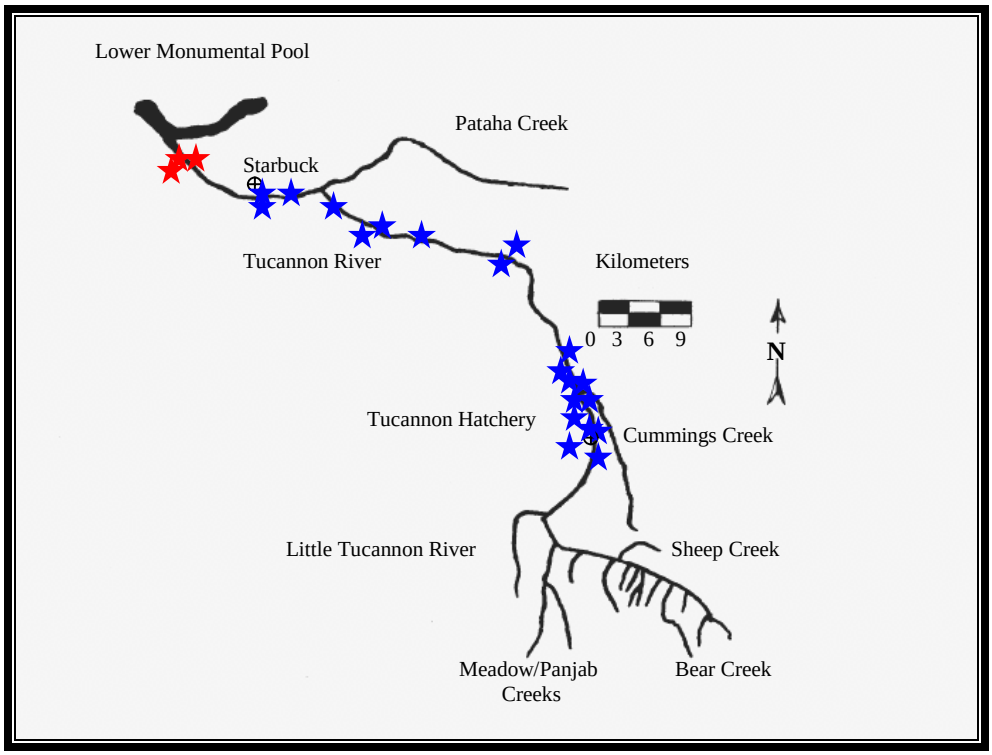

Figure 3. Distribution of eight radio-tagged bull trout from January through April, 2005, that were tagged in 2004. A star may represent a single fish location, multiple locations for an individual fish, or the location of two or more fish. A red star indicates fish locations within the reservoir influence zone of Lower Monumental Pool. (Codes 43, 92, 94, 95, 96, 97, 100, 111).

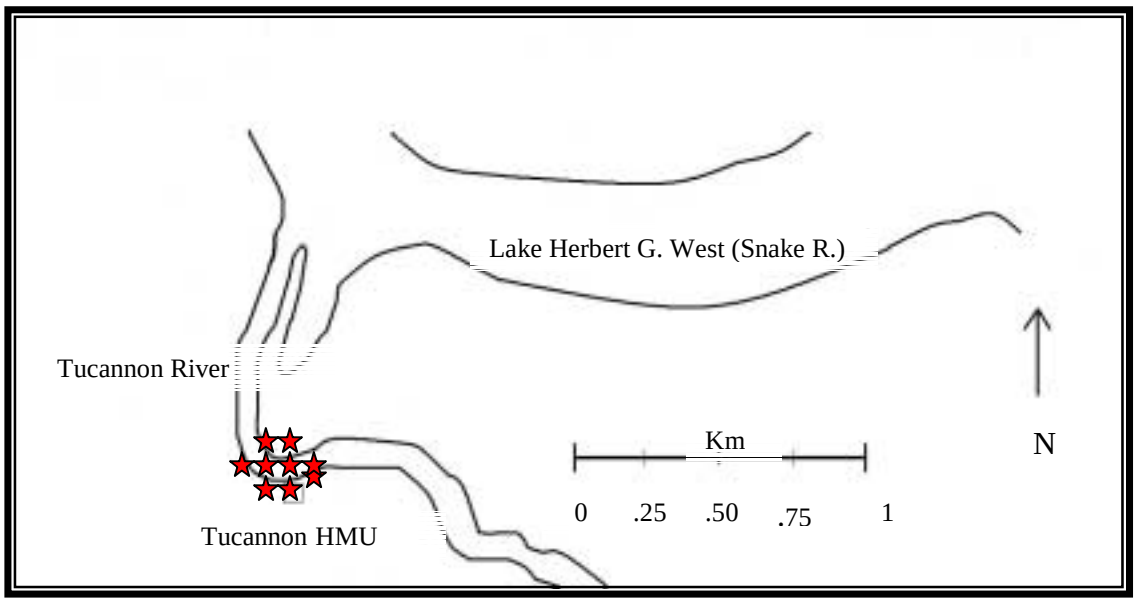

Figure 4. Distribution of code 111 (red stars) in the reservoir influence zone of the Tucannon River, January – March, 2005. Each star represents a single location.

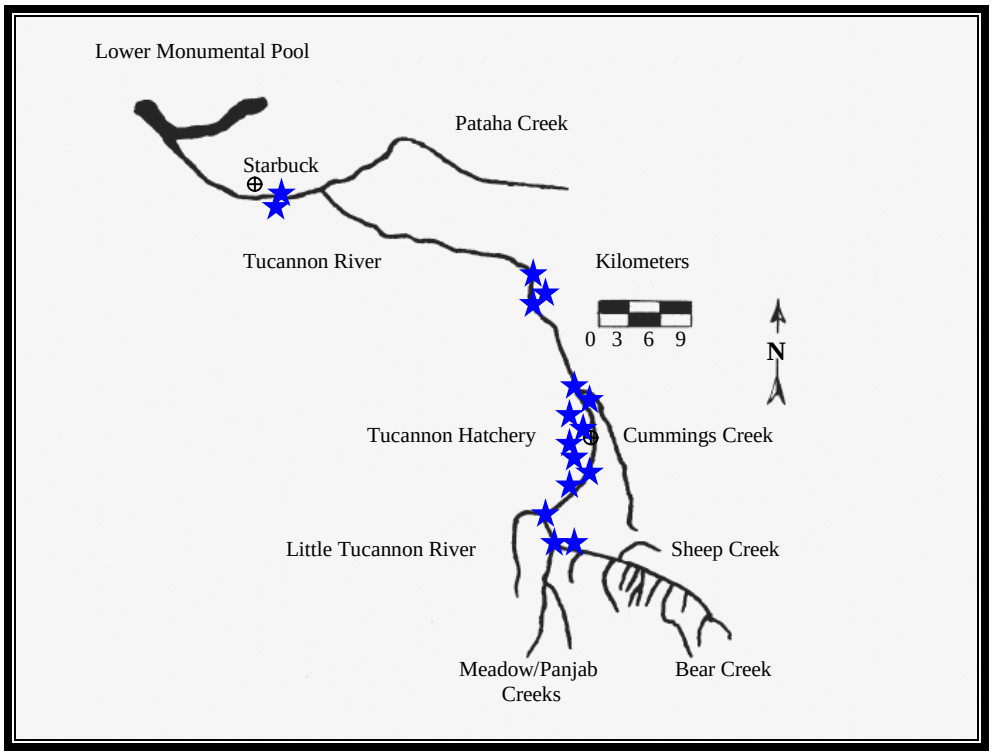

Figure 5. Distribution of seven radio-tagged bull trout during May and June, 2005, which were tagged in 2004. A star may represent a single fish location, multiple locations for an individual fish, or the location of two or more fish. (Codes 43, 92, 94, 95, 97, 100, 111).

Tag Verification (fish tagged in 2004)

Eighteen of the 25 radio tags implanted into bull trout in 2004 remained in the field at the end of 2005 (codes 15, 37, 39, 40, 41, 43, 44, 48, 50, 92, 93, 94, 95, 96, 97, 99, 100, 111). None of these tags continued to display movement to indicate that they are still carried by live bull trout. The status of these unrecovered tags fall into one of four categories: 1) the battery life of the tag expired and we were no longer able to locate the tag ; 2) the tag remains in known spawning areas within remote parts of the Wenaha-Tucannon Wilderness which has difficult terrain, no roads, and few trails, making tag recovery extremely difficult, so no attempts to recover the tags were made in 2005; 3) the tag remains in a location which requires access to private property for a recovery attempt, and access was not granted by the landowner; or 4) recovery attempts have been unsuccessful because the tag was found to be buried deeply under streambed substrate or within in-stream debris jams and could not be retrieved.

Winter sampling and tagging (2005)

Four bull trout were sampled and radio-tagged in the lower Tucannon River during January, 2005, and these fish ranged in size from 250 - 483 mm fork length. Two were caught by angling at rm 10.4, one was captured at the WDFW steelhead weir at rm 10.3, and the other was captured at the WDFW screw trap at rm 1.8. The fish captured at the steelhead weir was a PIT-tag recapture; the remaining 3 were equipped with new PIT tags.

The intent of the winter sampling approach was to focus efforts in the lower river reaches to increase the number of radio-tagged fish in close proximity to Lower Monumental Pool. We hoped this would increase our chances of tagging a fish that would later migrate into the Snake River and influence of the hydropower system.

Spring Sampling and Tagging (2005)

One hundred sixty five bull trout were captured at the Tucannon Hatchery weir in 2005 (Table 1). None of these bull trout were implanted with radio-tags. Fork length (mm) and/or weight (g) was recorded for 156 (94.5%) individuals, and 142 (86%) were scanned for PIT tags. Eight bull trout (4.8%) were radio-tag recaptures, and 63 (38.2%) individuals were PIT-tag recaptures. New PIT tags were implanted in 79 (73%) bull trout. All bull trout captured in the Tucannon Fish Hatchery trap between March 21 and July 21 were enumerated and released.

Table 1. Bull trout trapping data at the Tucannon Hatchery weir, 1998 - 2005.

Year	Number of Bull Trout Captured	Capture Dates
1998	82	4/1 – 8/29
1999	39	5/20 – 7/12
2000	41	4/17 – 8/29
2001	39	5/12 – 6/27
2002*	208	5/17–7/31
2003*	261	3/14 – 7/24
2004*	283	4/15 – 9/14
2005*	165	3/21 – 7/21

*Gaps between trap pickets were reduced prior to the 2002 trapping season.

Fall Sampling and Tagging (2005)

A total of 25 bull trout were captured between September 29 and November 17, 2005. We surgically implanted radio tags into 17 of these individuals. Twenty-two (88%) of the 25 fish were equipped with new PIT tags, the remaining three had been PIT tagged previously. Size range of bull trout captured during the fall of 2005 ranged from 220 –

560 mm fork length. The intent of the fall sampling approach was to capture and radio-tag fish that had survived the spawning season and initiated downstream migration, thereby increasing the possibility that radio-tagged bull trout would retain their tags throughout the winter, and potentially enter the Snake River.

All fish were captured by angling with jigs and spoons equipped with barbless hooks. Angling effort encompassed the section of river from the Tucannon Hatchery adult weir (rm 36.8) downstream to the Highway 261 bridge (rm 1.7). The overall condition of post spawn bull trout during the fall of 2005 was excellent. We did not see any incidence of *Saprolegnia* fungal infections as was observed in the fall of 2003 (Faler et. al., 2004).

Migration and Distribution (Fish Tagged in 2005)

Two of the four bull trout that were radio-tagged in January, 2005 ceased movements within 2 weeks of tagging. We assume these fish either died or lost their tags. The remaining two fish stayed in the lower reaches of the Tucannon River through April, 2005 (Figure 6).

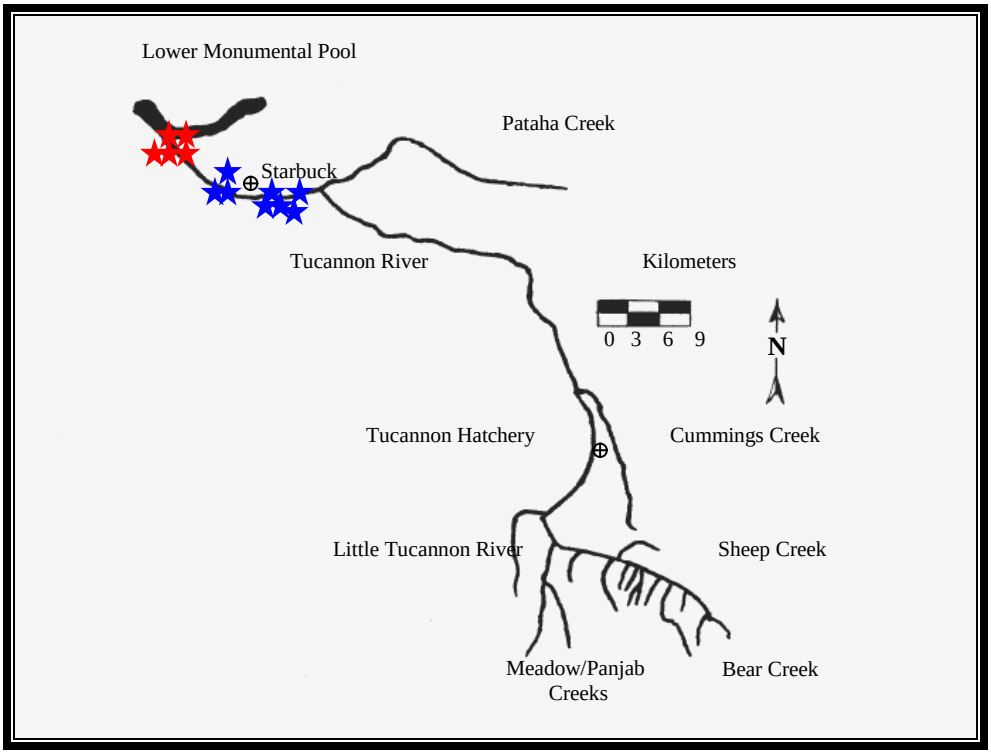

Figure 6. Distribution of two radio-tagged bull trout during Jan- April 2005, which were tagged in January, 2005. A star may represent a single fish location, multiple locations for an individual fish, or the location of both fish. A red star indicates locations in the reservoir influence zone of Lower Monumental Pool. (Codes 103 and 104).

One of these fish (code 103) entered the reservoir influence zone, and was first detected there on February 14. It remained in the area until early March (Figure 7).

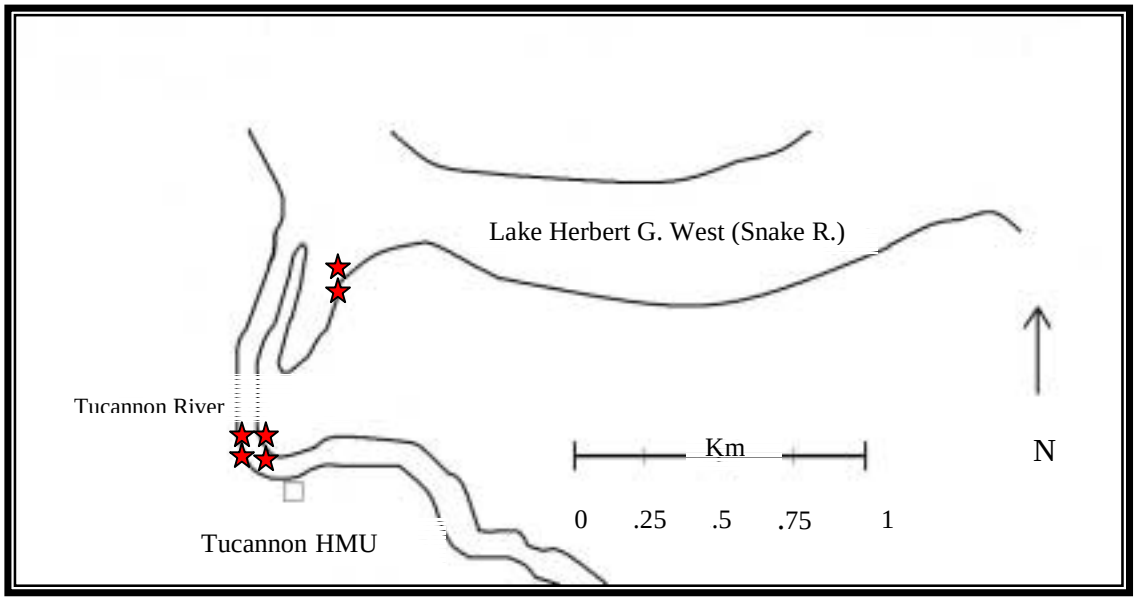

Figure 7. Distribution of code 103 (red stars) in the reservoir influence zone of the Tucannon River, January – March, 2005. Each star represents a single fish location.

During March, both fish began to move upstream, on their seasonal migration to the spawning and rearing areas in the upper Tucannon River basin (Figure 8). In mid June, code 104 stopped moving near rm 14, and we believe this fish either died or expelled its tag as described in Faler et al (2004). Code 103 was located continuously during July, August and September at rm 42.5 near the entrance to Camp Wooten (Figure 9). It is highly likely that this tag was no longer carried by a fish during this time because of the lack of movement observed. The battery in this tag expired in early October. We were unable to verify the status of either fish before the tags ceased transmitting. It is important to note that there were no efforts to tag spring upstream migrants in 2005. As a result, there were no active transmitters in tagged fish during the spawning season, and we did not have the capability to monitor movements of radio-tagged bull trout during late summer and early fall. Movements during the spawning season have been well document in previous annual reports (Faler et al 2003, 2004, 2005).

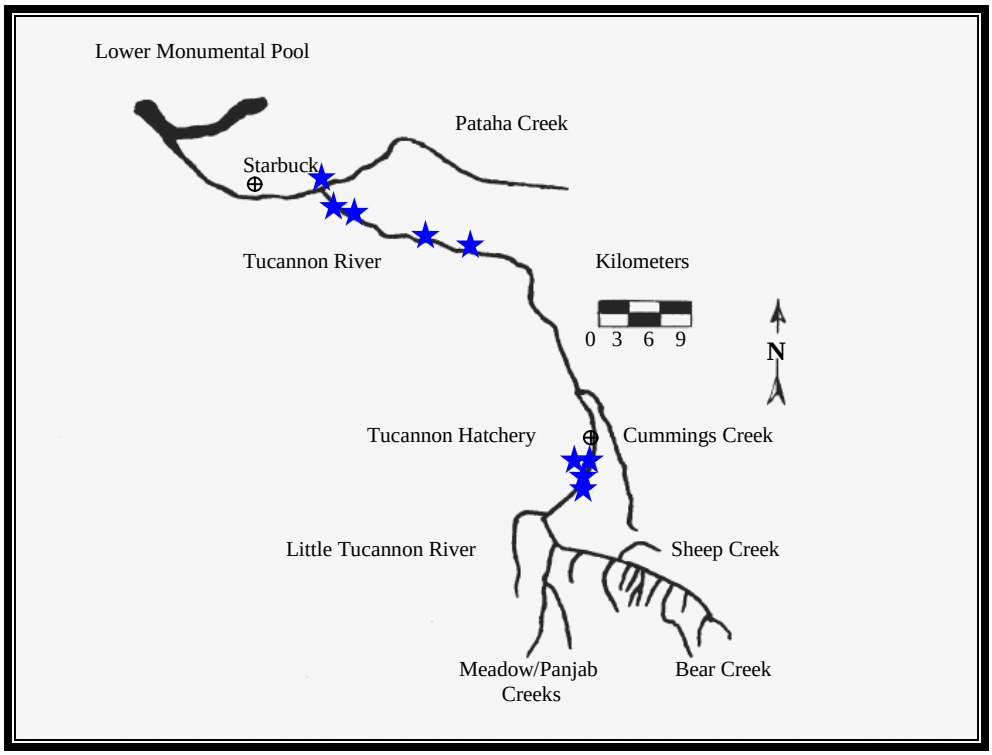

Figure 8. Distribution of two radio-tagged bull trout during May and June, 2005, which were tagged in January, 2005. A star may represent a single fish location, multiple locations for an individual fish, or the location of two or more fish. (Codes 103 and 104).

Fall sampling and tagging began on September 29, and because it was so late in the month, we included the initial capture location of one radio-tagged bull trout (code 107) on September 29 in the distribution map for October and November. During the fall, the sample group of radio-tagged fish increased with time as successful hook and line capture of bull trout yielded increasing numbers of individuals which were then radio-tagged and released. The following results and distribution maps are based on a radio-tagged population starting with one individual in early October, 11 by the end of October, and 18 by the end of November. No fish were tagged in December.

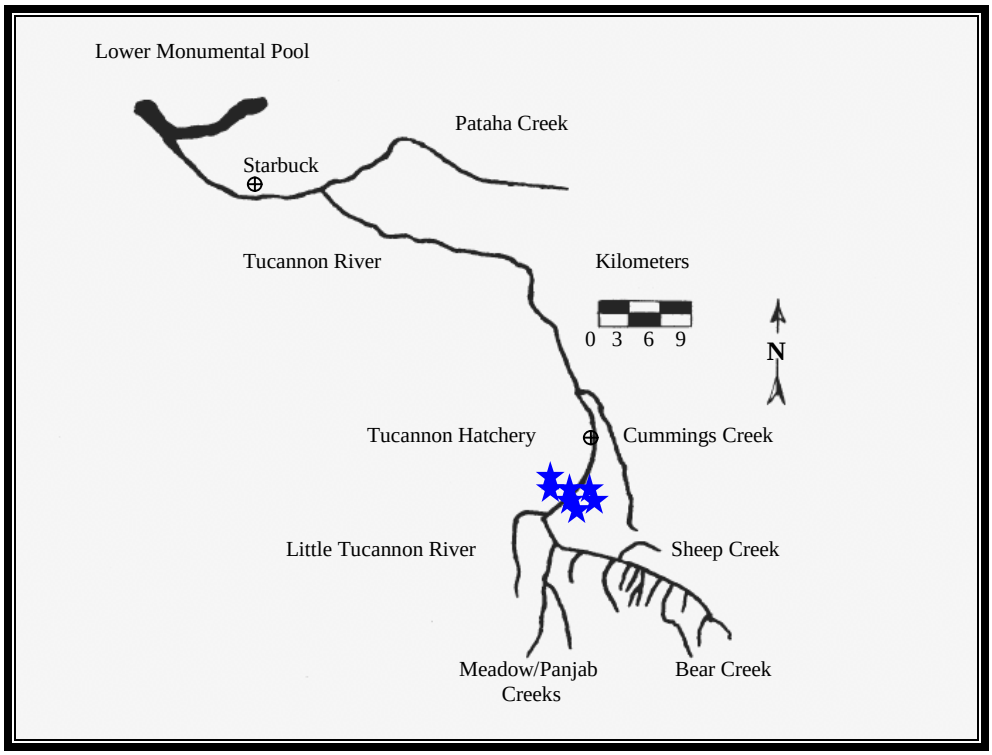

Figure 9. Distribution of a radio-tagged bull trout (code 103) during July, August, and September, 2005. Each star represents a single fish location.

Post spawning movements in October exhibited a general downstream migration (Figure 10), and were similar to the movements observed in the Tucannon River by Faler et al. (2003, 2004, and 2005) and Underwood et al. (1995). These observations are also typical of post spawning movements observed in other migratory populations (Elle 1995; Faler and Bair 1992; Kelly Ringel and DeLaVergne 2000/2001, Schriever and Schiff 2003, Theisfeld et al. 1996).

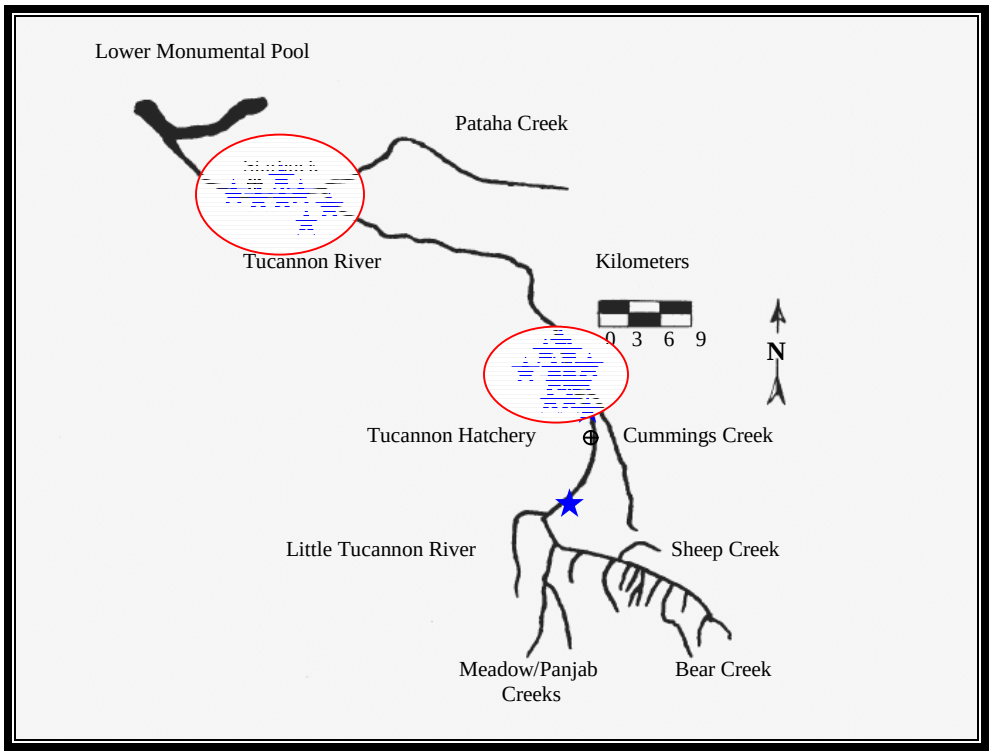

Figure 10. Distribution of 16 radio-tagged bull trout during October and November, 2005, which were tagged in 2005. A star may represent a single fish location, multiple locations for an individual fish, or the location of two or more fish. Red ovals indicate 2 segregated groups of fish. (Codes 98, 102, 105, 106, 107, 108, 109, 110, 113, 114, 115, 116, 117, 118, 120, 121).

By mid November, it appeared that there were two segregated groups of radio-tagged bull trout: 1) those that congregated near the Tucannon Fish Hatchery and Wooten Wildlife area (nine fish), and 2) those that migrated to the lower river near Starbuck (seven fish).

Movements stabilized in late November, and through December, we observed little change in the overall distribution of radio-tagged bull trout (Figure 11). However, one bull trout (code 106), moved very close to the reservoir influence zone in the Lower Tucannon River, but was not observed entering it during 2005.

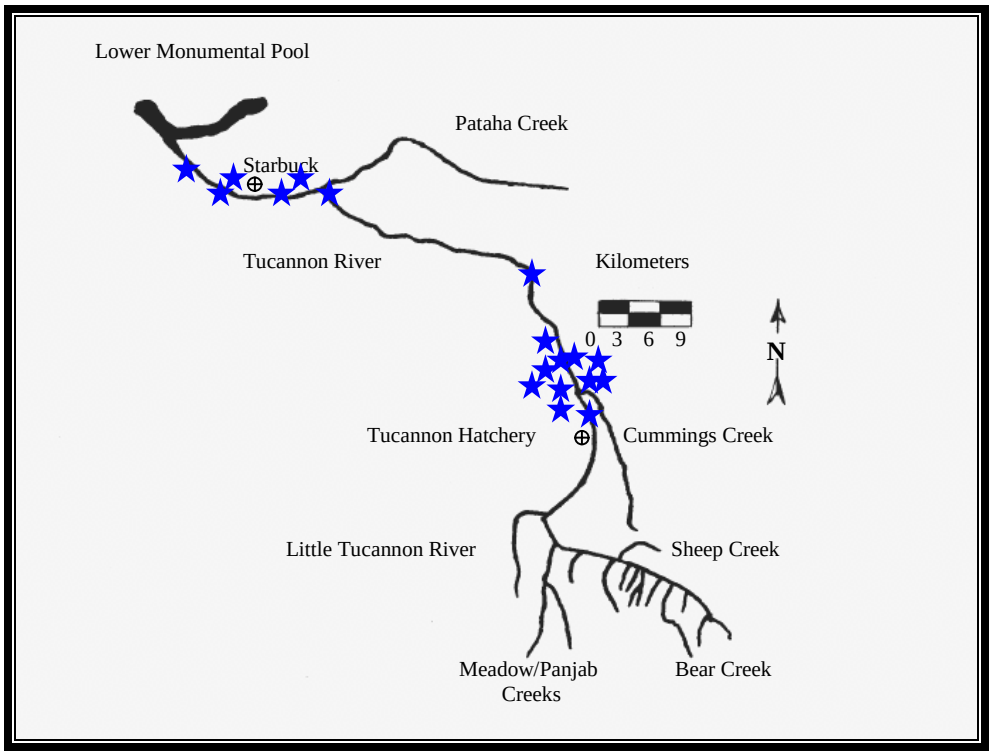

Figure 11. Distribution of 17 radio-tagged bull trout during December, 2005, that were tagged in 2005. A single star may represent a single fish location, multiple locations for an individual fish, or the location of two or more fish. (Codes 98, 102, 105, 106, 107, 108, 109, 110, 113, 114, 115, 116, 117, 118, 119, 120, 121).

Summary and Conclusions

Bull Trout Movements and Distribution

As in past years, bull trout generally moved to the basin headwaters during summer, and distributed themselves from the Tucannon Hatchery downstream to the lower river reaches during winter. The 2005 reporting year provides the first documented occurrence of bull trout from the Tucannon River conducting a seasonal migration to and from the impounded waters of Lower Monumental Pool. Two separate individuals, one that was tagged in December, 2004, and another that was tagged in January, 2005, moved into the reservoir influenced area, and returned to the Tucannon River in early spring.

Due to the poor post spawn survival of radio-tagged fish in past years, we chose not to radio tag fish during the spring migration. As a result, we had only two radio-tagged fish at large in the basin during the 2005 spawning migration. Data suggests that neither one of them survived the spawning migration.

We tagged several post-spawn out-migrants in late September and October, and by mid November, bull trout movements slowed. By this time bull trout radio-tags were

distributed from Camp Wooten to Starbuck. Although movements and activity associated with this group slowed during November, it did not cease. As a result, we had no reason to suspect mortality or tag loss on any of these fish at the end of December.

A basic assumption of radio tagging bull trout to monitor their movements is that the implanted transmitters and the tagging process does not affect their movements or behavior and that these tagged fish represent the movements of untagged fish. We have documented high rates of tag loss since the inception of this study. Most of the tag loss we observed this year appeared either shortly after tagging, or during the spawning migrations. In past years, it seemed to occur primarily during, or shortly after, spawning. We are uncertain whether the observed high rates of tag loss indicates high rates of mortality associated with the presence of the radio-tag, or whether our observations from radio tagged fish are representative of mortality rates for untagged bull trout. That uncertainty continues to concern us because it affects our confidence that radio telemetry enables us to accurately document and interpret the movements of bull trout. Therefore, we have changed the size of radio tags that we use, and captured and radio tagged bull trout during the post spawning season in the lower reaches of the Tucannon River (from the Tucannon Fish Hatchery downstream to the fixed telemetry receiver station located at rm 1.7). These changes were an attempt to maximize the sample size of radio tagged bull trout during fall and winter in an attempt to document fall and winter movements and entry into the Snake River by bull trout from the Tucannon River. When we consider the high rate of post-spawn tag loss that this project has observed with large, older adults, modifying the approach to focus on out-migrating sub adults and small adults in the lower reaches of the Tucannon River seems a reasonable means of increasing the possibility that radio-tagged fish will retain their tags throughout the winter, and potentially migrate into the mainstem Snake River. We observed a much higher rate of survival and/or tag retention in fish tagged in the fall of 2005, vs. spring tagging from past years during the upstream spawning migrations.

New Activities Planned for 2006

WDFW will continue to integrate all radio tracking information into a single tracking summary for each fish to improve interpretation and understanding of fish movements.

The 2006 winter and spring (January through March) sampling season will conclude the tagging efforts associated with this contract. Our efforts in 2006 will continue to focus on the younger cohorts (sub adults and small adults) in order to increase the number of radio tagged fish retaining their tags through the winter. We will also continue the use of Lotek nano-tags because of their performance in the main stem and the ability to surgically implant them in sub adult sized fish. We will target as many bull trout as can be captured through March 2006. No fish will be tagged in the spring during the upstream spawning migration.

In 2005, the U.S. Army Corps of Engineers funded Biomark to design and install two stream width PIT tag antenna array systems in the Lower Tucannon River. They also

supplied funding to the U.S. Fish and Wildlife Service to increase the PIT-tagging efforts in the Tucannon River Basin. The intent of these efforts is to enhance the probability of qualifying and quantifying the use of the main stem Snake River by migratory bull trout from the Tucannon River. The PIT-tag array project complements our radio telemetry study because the antenna arrays will detect any PIT tagged bull trout passing through. This added layer of data collection will further define the temporal and spatial distribution of bull trout in lower Tucannon subbasin and entry into the main stem Snake River.

We will continue to track radio-tagged bull trout through summer and fall 2006. All tagging and tracking data from 2006 will be summarized and included in the final project report. The final report will also contain summaries of our major findings from all years of this project. The final report will be completed in the fall of 2006.

Summary of Major Expenditures

- Helicopter time, Oct. 2004, Jan. 2005 ($3,752)

References

Anglea, S., R. Richmond, R. Brown, and J. Newell. 2004. Summary of Bull Trout Studies in the Lower Snake River and McNary Reservoir. Prepared for the U. S. Army Corps of Engineers Walla Walla District, Batelle Pacific Northwest Division. Richland, Washington.

Buchanan, D., M Hanson, and R.M. Hooten. 1997. 1996 Status of Oregon's Bull Trout. Oregon Department of Fish and Wildlife, Portland, Oregon.

Corps of Engineers. 1997. 1997 Annual Fish Passage Report, Columbia and Snake Rivers for Salmon, Steelhead and Shad. North Pacific Division, U.S. Army Corps of Engineers, Portland and Walla Walla Districts.

Elle, S. 1995. Federal Aid to Fish Restoration. Job Performance Report. Grant F-73-R17. Project 6, Bull Trout Investigations. Subproject 1, Rapid River bull trout movement and mortality studies, and Subproject 2, Bull Trout aging studies. IDFG 95-33. Idaho Fish and Game. Boise, Idaho.

Faler, M.P., L.M. Miller, and K.I. Welke. 1988. Effects of Variation in Flow on Distributions of Northern Squawfish in the Columbia River below McNary Dam. North American Journal of Fisheries Management 8:30-35.

Faler, M.P. and T. B. Bair. 1992. Migration and Distribution of Adfluvial Bull Trout in Swift Reservoir, North Fork Lewis River and Tributaries. Gifford Pinchot National Forest, Wind River Ranger District, Unpublished Report.

Faler, M.P., G. Mendel, and C. Fulton. 2003. Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers. Project No. 2002-006-00, 20 electronic pages, (BPA Report DOE/BP-00009774-1).

Faler, M.P., G. Mendel, and C. Fulton. 2004. Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers. Project No. 2002-006-00, 31 electronic pages, (BPA Report DOE/BP-00009774-2).

Faler, M.P., G. Mendel, and C. Fulton. 2005. Evaluate Bull Trout Movements in the Tucannon and Lower Snake Rivers. Project No. 2002-006-00, 32 electronic pages, (BPA Report DOE/BP-00009774-3).

Federal Register. 1998. Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. Vol. 63, No. 111. FR Doc. 98-15319. June 10, 1998.

Hubert, W.A. 1983. Passive Capture Techniques, in, Fisheries Techniques. Special Publication of the American Fisheries Society. Southern Printing Company, Inc., Blacksburg, VA. L.A. Nielson and D. L. Johnson, ed.

Kelly Ringel, B. and J. DeLaVergne. 2000 Progress Report. Wenatchee River Basin Bull Trout Telemetry Study. U. S. Fish and Wildlife Service, Leavenworth, Washington.

Kelly Ringel, B. and J. DeLaVergne. 2001 Progress Report. Wenatchee River Basin Bull Trout Telemetry Study. U. S. Fish and Wildlife Service, Leavenworth, Washington.

Kleist, T. (Washington Department of Wildlife) 1993. Memorandum to Eric Anderson (WDW) summarizing fish passage at Snake River dams.

Martin, S.W., M.A. Shuck, K.D. Underwood and A.T. Scholz. 1992. Investigations of Bull Trout (*Salvelinus confluentus*), Steelhead Trout (*Oncorhynchus mykiss*), and Spring Chinook Salmon (*O. tshawytscha*) Interactions in Southeast Washington Streams. U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife. Project No. 90-53, Contract No. DE-BI79-91BP17758. 206 pp.

Martin, S. W., J. A. Long, and T. N. Pearsons. 1995. Comparison of survival, gonad development, and growth between rainbow trout with and without surgically implanted dummy radio tags. NAJFM 15: 494-498.

Mendel, G., C. Fulton, and R. Weldert. 2003. An Investigation Into the Migratory Behavior of Bull Trout (*Salvelinus confluentus*) in the Touchet River Basin. Washington Department of Fish and Wildlife.

Rieman, B.E. and J.D. McIntyre. 1993. Demographic and Habitat Requirements for Conservation of Bull Trout. USDA Forest Service, Intermountain Research Station. General Technical Report INT-302.

Schriever, E. and D. Schiff. 2003. Bull Trout Life History Investigations in the North Fork Clearwater River Basin: Regional Fisheries Management Investigations; North Fork Clearwater River Bull Trout. U. S. Army Corps of Engineers, Walla Walla District, Contract No. DACW68-96-D0003, Delivery Order 0022.

Theisfeld, S.L., A.M. Stuart, D.E. Ratliff, and B.D. Lampman. 1996. Migration Patterns of Adult Bull Trout in the Metolius River and Lake Billy Chinook, Oregon. Oregon Department of Fish and Wildlife Information Report 96-1. Portland, Oregon.

Tobin, J. H. 1994. Construction and performance of a portable resistance board weir for counting migrating adult salmon in rivers. U. S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Technical Report Number 22, Kenai, Alaska.

Underwood, K.D., S.W. Martin, M.L. Shuck, and A.T. Scholz. 1995. Investigations of Bull Trout (*Salvelinus confluentus*), Steelhead Trout (*Oncorhynchus mykiss*), and Spring Chinook Salmon (*O. tshawytscha*) Interactions in Southeast Washington Streams--1992 Final Report. U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife. Project No. 90-53, Contract No. DE-BI79-91BP17758. 173 pp.

USFWS. 2000. Biological Opinion, Effects to listed species from operations of the Federal Columbia River Power System. Consultation Conducted by: U.S. Fish and Wildlife Service. December 20, 2000.

Washington Department of Fish and Wildlife (WDFW). 1998. Washington State Salmonid Stock Inventory - Bull Trout and Dolly Varden. Olympia, WA.