

RECLAMATION

Managing Water in the West

Boise and Deadwood River Bull Trout (*Salvelinus confluentus*) Monitoring Activities

Technical Report for Idaho Department of Fish and Game Permit No. F-02-07-09



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DEADWOOD RIVER BULL TROUT MONITORING ACTIVITIES 2009

Introduction

The purpose of this report is to summarize the 2009 annual monitoring activities carried out by the U. S Bureau of Reclamation (Reclamation) which occurred under Idaho Department of Fish and Game (IDFG) Scientific Collection Permit No. F-10-99 in the Deadwood River Basin.

Since the listing of the Columbia River and Klamath River distinct population segment of bull trout (*Salvelinus confluentus*) as threatened under the Endangered Species Act in 1998, serious consideration has been given to range-wide population size and recovery efforts. Section 7 of the Endangered Species Act (ESA) requires that any actions that may be implemented by a federal government entity that could affect federally listed species must be consulted upon through the federal regulatory agencies: the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS).

Reclamation consulted under Section 7 of the ESA with the FWS and NMFS on Operations and Routine Maintenance of twelve Reclamation projects in the Snake River Basin above Brownlee Reservoir. The FWS completed a non-jeopardy Biological Opinion (BiOp) in March 2005. The BiOp contains a 30 year incidental take statement and corresponding reasonable and prudent measures (RPM) that outline non discretionary actions to minimize take of bull trout in the Boise project area. Facilities in the Boise Projects with adfluvial forms of bull trout present include Arrowrock and Anderson Ranch reservoirs on the Boise River system, as well as Deadwood Reservoir on the Payette River system. Reclamation developed a monitoring and implementation plan that outlines the field activities and data collection necessary to addresses the RPMs, associated terms and conditions, monitoring, and reporting requirements for the BiOp. The monitoring and implementation plan was submitted to the FWS in March, 2006 (USBR 2006).

Reclamation's field and data collection activities are currently concentrated on the Deadwood River and Reservoir and are covered by IDFG Scientific Collection Permit No. F-10-99. This technical report describes the results of Reclamation's 2009 field activities and data collection work. This report is formatted in four chapters: 1) general introduction and study area; 2) reservoir summary; 3) river summary; and 4) redd surveys.

STUDY AREA

The Deadwood River basin is located in Central Idaho. The Deadwood River is a major tributary to the South Fork Payette (Figure 2). The river is approximately 70 km long from headwaters (2124 meters above seas level) to mouth (1135 meters above sea level). Deadwood Dam, located at rkm 36 was constructed in 1929 and is the only dam on the Deadwood River. Deadwood Reservoir has a capacity of 153,992 acre feet with a maximum pool elevation of 1,628 meters and drains 282 km² while the river below the dam drains an additional 332 km².

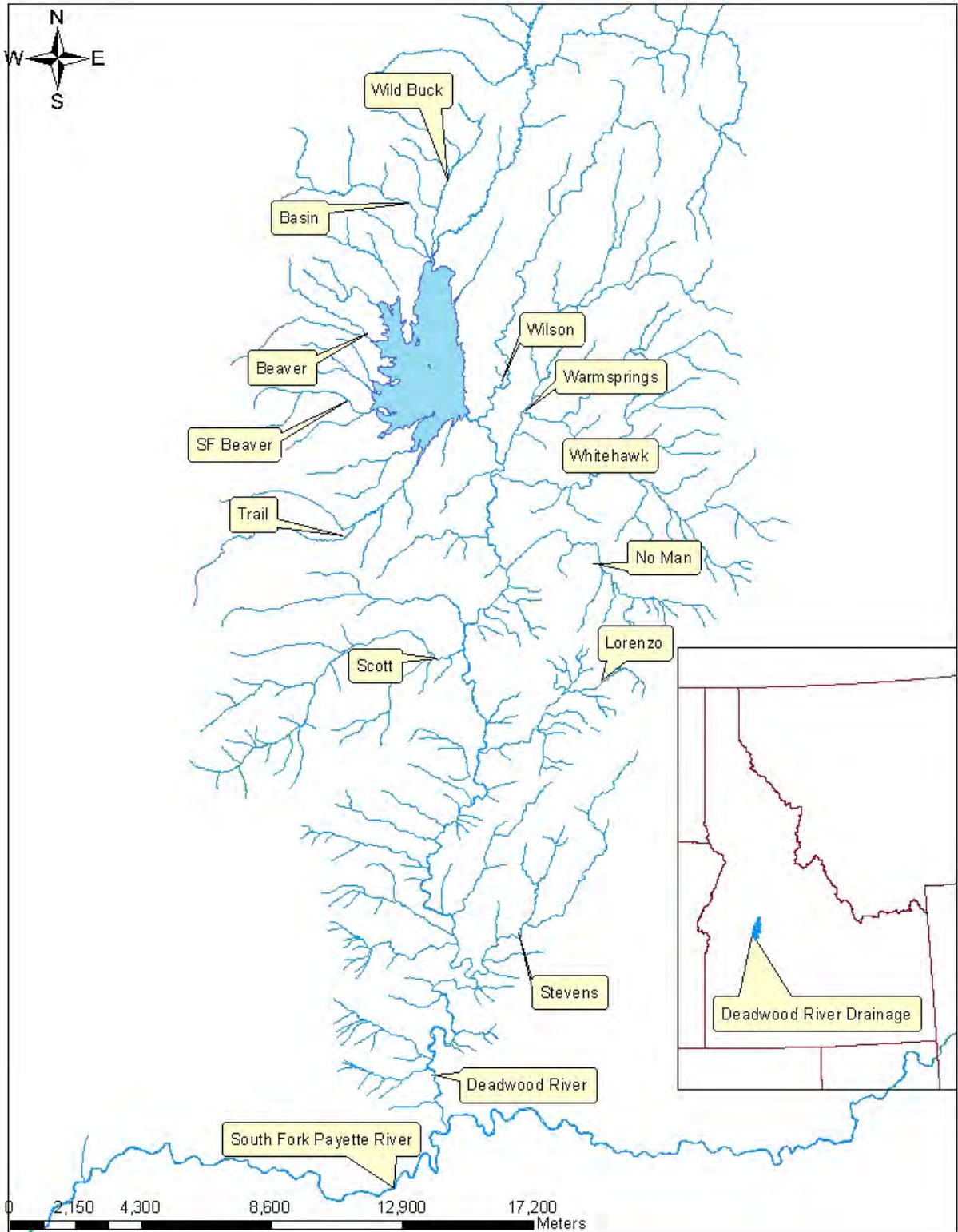


Figure 1: Deadwood River drainage study area showing main tributaries, Deadwood River, Idaho.

FYKE NETTING AND RADIO TAGGING OF BULL TROUT (*Salvelinus confluentus*) IN DEADWOOD RESERVOIR, Valley County, IDAHO

INTRODUCTION

The FWS identified in the 2005 BiOp that operations at Deadwood Dam cause take of bull trout. Term and condition 3.e, requires Reclamation to minimize entrainment of bull trout due to operations. Understanding bull trout movement and use of the reservoir is the first step in meeting this RPM. The reporting requirements of the 2005 BiOp also direct Reclamation to monitor bull trout take. Reclamation combined its entrainment and mortality tracking efforts to comply with these requirements. In 2009 seven bull trout were captured in Deadwood Reservoir using fyke nets and five of those fish were tagged with radio transmitters. One bull trout was a recapture from past years. One bull trout was also captured in a fyke net but not tagged due to a bait hook in its stomach. Fyke netting occurred from mid June to mid August. At the beginning of the reporting period four bull trout were still being tracked from previous years tagging. Confirmed mortalities of fish tagged in the reservoir during this reporting period included four bull trout, one that was tagged in 2006, two that were tagged in 2008 and one that was tagged in 2009. No tagged bull trout were entrained in 2009. Five bull trout were still being tracked in the reservoir as of October 2009.

STUDY AREA

All of the work discussed in this chapter occurred in Deadwood Reservoir located on the mainstem Deadwood River which flows into the South Fork Payette River in Central Idaho (Figure 1). Deadwood Reservoir stores water from the mainstem Deadwood River as well as several smaller tributaries.

METHODS

Sampling

Fish were collected using fyke nets, gill nets, minnow traps, and hook and line sampling from mid June through mid October. Fyke nets were only set at the mouth of Trail Creek in 2009 because of limited time and past success. Fyke nets were set for 24 hour intervals four days per week. Fyke nets measured 1.22 m x 1.22 m x 0.91 m with 30.48 m x 1.22 m lead lines with 4 fykes per net and were designed to sink (Figure 2. All the fyke nets were treated with an algaecide to prevent decay). Gill nets were set for up to one hour intervals at multiple locations in the reservoir. All of the gill nets had lead core bottom lines that followed the bottom of the reservoir and foam core top lines to maintain the vertical orientation in the water. Gill nets measured 100 meters long and 6 meters high with a range of mesh sizes. Gill nets were set using 8 kg weights to anchor the bottom line and 20 cm diameter buoys on the top line for marking location and retrieval.

In 2009 Reclamation experimented with different equipment and timing in an attempt to capture more bull trout and other species for the associated isotope and gut content studies. Minnow traps and gill nets were deployed when time allowed as well as extending the fyke netting time frame into the summer and fall while decreasing the

spatial distribution of fyke netting. With the changes in sampling methods, timing and distribution comparing catch rates or species composition to past years is difficult and will be left out of this report.

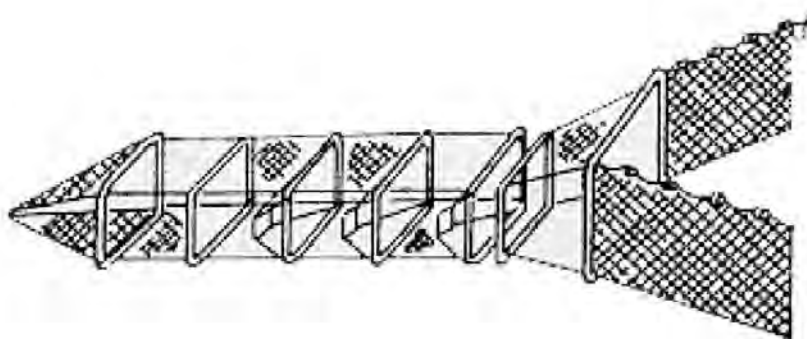


Figure 2. Fyke net used for capturing bull trout

Handling

Captured fish were placed in a live well and the following information and/or samples were collected. All fish captured were identified to species and enumerated. Up to the first ten fish of each species captured each month had muscle plugs taken from just below their dorsal fin for an associated isotope project. Total length (TL) was recorded for all game species. Gastric lavage was also conducted on all bull trout and up to ten fish of each other species per month. Additional procedures for examining captured bull trout included placing fish in an anesthetic bath containing tricaine methanesulfonate (MS-222; 100 mg/L) buffered with sodium bicarbonate. When a bull trout was considered anesthetized (could not right itself) it was measured (TL and fork length FL; mm) and weighed (g). While anesthetized Scale samples and fin clips were taken, and the fish was scanned for Passive Integrated Transponder (PIT) tags (Biomark Incorporated, Boise, ID). All healthy looking bull trout were implanted with radio transmitters (Lotek Wireless, Ontario Canada) and PIT tags. Scale samples were collected to provide age and growth information, fin clips allow a genetic analysis to determine natal origin, and PIT tags allow each fish to be uniquely identified if recaptured.

Telemetry

Radio tags were implanted using a modified shielded needle technique described by Ross and Kleiner 1982. Bull trout were placed ventral side up in a V-shaped surgery cradle. The gills were bathed in anesthetic solution using a turkey baster throughout the surgery. A small incision (1.0 cm to 2.0 cm) was made parallel to the linea alba, a fibrous structure that runs down the midline of the abdomen composed mostly of collagen connective tissue and a sterilized transmitter was inserted into the peritoneal cavity or the space within the abdomen that contains the intestines, the stomach, and the liver. The antenna exit hole was created using a 12 or 14 gauge 7.6 cm (3.0 in.)-long surgical needle inserted through the body wall below the pelvic girdle onto a 0.4-cm x 15-cm (0.15-in. x 6.0-in) long steel needle guide. The antenna exited the body approximately 1.5 cm to 2.0 cm (0.6 in. x 0.8 in) posterior to the pelvic girdle and slightly to the side of the mid-ventral line. The incision was closed with chromic cat cut sutures. The surgical wound was sterilized with betadine and surgical glue was then applied to the incision after sutures were in place. Bull trout were held and monitored in live wells until full recovery (minimum 15 minutes), and then released into Deadwood Reservoir near their point of

capture. Visible infirmity or injuries such as descaling, frayed fins, hook scars, or dermal lacerations were noted for all bull trout captured.

Radio tagged fish were tracked monthly throughout the year by helicopter (when weather and mechanical conditions allowed) and at least once a month on the ground during the summer. A remote tracking station set up on the dam has monitored for entrainment of radio tagged bull trout at Deadwood Dam continuously since 2006. Additionally during one 36 hour period bull trout were tracked at four hour intervals to characterize diurnal movement. When a radio tagged fish was located the following data was recorded at that location: time, GPS location, pressure (water depth), temperature of the fish and general comments. For each survey day the following data were also recorded: general weather, surface ice cover for the reservoir and river, reservoir pool elevation, general comments, and if surface ice was present pictures were taken.

Migration reporting in previous reports included timing and water temperature correlations, however, with the focus of work shifting to the river these data will not be available in this report. Average temperatures and migration timing available from 2006 through 2008 is available but not as accurate and comparable as past years. Because of the lack of accuracy temperature and timing analysis will not be done in this report for the 2009 reservoir tracking data.

Deposition of Specimens

All live specimens were returned to their approximate sampling location. Any incidental mortalities and requested voucher specimens were delivered as directed by Idaho Department of Fish and Game. Fin clips, scale samples, and muscle plugs were collected from all sampled bull trout. Muscle plugs were also collected from up to 10 individuals of each species in the reservoir. If a fish (excluding bull trout) was too small to take a muscle plug the whole fish was sacrificed and frozen. At Deadwood up to ten individuals of the smaller species, sculpin (*Cottus* spp) and dace (*Rhinichthys* spp.), per month (June-October) in the reservoir were frozen. Muscle plugs were collected from up to ten individuals from the larger species; whitefish, (*Prosopium williamsoni*) cutthroat trout, kokanee (*Oncorhynchus nerka kennerlyi*), and rainbow trout per month (June-October) in the reservoir. Muscle plugs and fish samples are being used in an associated isotope study and stored at The Rocky Mountain Research Station Labs in Boise, ID. Digital images of the scale samples are being taken and multiple readers will assign ages to each scale. Scale samples are being housed at Reclamation's Snake River Area Office in Boise, ID. Fin clips have been sent to the Abernathy Fish Technology Center (FWS) in Abernathy, Washington for genetic analysis allowing possible assignment to natal streams in the drainage. The collection of fin clips, scale samples, and muscle plugs were non lethal and occurred while the bull trout were anesthetized.

RESULTS

A total of 719 fish, representing eight species, were captured using multiple sampling methods (Table 1). Seven new bull trout and four recaptures combined for eleven bull trout sampling events, representing 1.5% of the total fish captured. Sculpin

were the least abundant fish sampled representing less than 1% of the total catch. The most abundant fish captured were dace comprising 50% of all fish captured. The second most abundant fish captured was the Mountain Whitefish, comprising 20% of all fish captured. Also noteworthy were Kokanee, comprising 12% of the total fish captured. Data from all species captured using all sampling methods in Deadwood Reservoir in 2009 are summarized in Table 1.

All bull trout captured in the reservoir in 2009 were captured in fyke nets at the mouth of Trail Creek. Bull trout ranged from 285 mm to 500 mm in total length and 200 g to 1164 g in weight (Table 2). One bull trout was recaptured from 2006 and two were recaptured from 2009. One bull trout tagged in 2009 was recaptured twice. Four radio tagged bull trout from the reservoir population died or expelled their tags during the 2009 field season.

Table 1: Number of fish sampled (total count), catch per unit effort (CPUE), and % of total catch for all 2009 sampling efforts, Deadwood Reservoir.

All Methods	Total Hours	1382.33	
Species	Total Count	CPUE	% Total
Bull Trout (<i>Salvelinus confluentus</i>)	11	0.01	1.53
Cutthroat Trout (<i>Oncorhynchus clarki lewisi</i>)	25	0.02	3.48
Kokanee (<i>Oncorhynchus nerka kennerlyi</i>)	84	0.06	11.68
Rainbow Trout (<i>Oncorhynchus mykiss</i>)	46	0.03	6.40
Redside Shiner (<i>Richardsonius balteatus</i>)	38	0.03	5.29
Sculpin <i>Cottus</i> spps.	5	0.00	0.70
Dace <i>Rhinichthys</i> spps.	362	0.26	50.35
Mountain Whitefish (<i>Prosopium williamsoni</i>)	148	0.11	20.58
Total	719	0.52	

Tracking in Deadwood Reservoir was limited in 2009 due to helicopter maintenance issues and more time and energy being spent on activities in the Deadwood River below Deadwood Dam. Average temperatures and migration timing are not as accurate as in past years due to infrequent tracking and will not be analyzed in this report.

It was possible to determine that all radio tagged fish still alive during the spawning period in 2009 were tracked up Trail Creek. Mortality or tag expulsion was verified on two fish and presumed on another two in 2009. The tag from fish #12 was found on the shore of Trail Creek just below the high water mark of the reservoir. The tag for fish #26 stopped moving in mid summer near the island straight out from Beaver Creek. The tag was recovered once water levels dropped. Fish #18 was tracked moving into Trail Creek during the spawning run and the tag was still in Trail Creek during a November flight. It is assumed that all adfluvial bull trout should have moved downstream in October and this fish is either sick, dead or has expelled its tag. Tag number 24 did not move during the entire summer and that fish is assumed to be dead or has expelled its tag. No mortalities in 2009 can be directly attributed to handling or tagging procedures.

Table 2: Date of capture, sampling location, length (total length; TL and fork length; FL), weight, and notes for all bull trout handled by Reclamation staff in Deadwood Reservoir, 2009.

Date	Location	Tag ID	TL	FL	Weight(g)	Notes
7/1/2009	Trail Creek Mouth	13	420	400	730	
7/1/2009	Trail Creek Mouth	11	432	410	840	
7/1/2009	Trail Creek Mouth	18	500		1300	Recapture
7/2/2009	Trail Creek Mouth	18	500		1164	Recapture
7/7/2009	Trail Creek Mouth	8	342	326	406	
7/7/2009	Trail Creek Mouth	12	394	373	554	
8/4/2009	Trail Creek Mouth	1	285	268	200	
8/12/2009	Trail Creek Mouth	12	394	375	572	Recapture
8/12/2009	Trail Creek Mouth	Not Tagged	396	378	530	Bait hook in stomach
8/12/2009	Trail Creek Mouth	11	428	410	738	Recapture
8/19/2009	Trail Creek Mouth	12	391	372	588	Recapture

The average life expectancy of a tagged bull trout in Deadwood Reservoir is approximately 225 days (14 to 1164 days). Mortality rates (number of fish tagged in one year that died in that same year) for 2006-2009 were 37.5%, 78%, 34% and 20% respectively (Table 4). The majority of confirmed mortalities during the entire study, based on where radio tags were found, occurred in the transition zone of the reservoir (n=11) presumably as fish were migrating to or back down from spawning. Tag recovery rates were next highest in the spawning tributaries (n=7) while only three tags have been recovered in the reservoir). The remainder of the radio tags have not been recovered.

DISCUSSION

All bull trout captured in Deadwood Reservoir in 2009 were captured in the Trail Creek arm of the reservoir, but throughout the season were tracked throughout the reservoir. All fyke nets were set within 30 m of the transition zone of Trail Creek. Mortality rates were lower in 2009 compared to past years. Weirs had been operated by IDFG on the mainstem Deadwood River and selected tributaries since the mid 1980's; however, no weirs were operated in 2009. The absence of weirs could have changed bull trout migration timing and mortality rates but with limited tracking and a small sample size this is unknown.

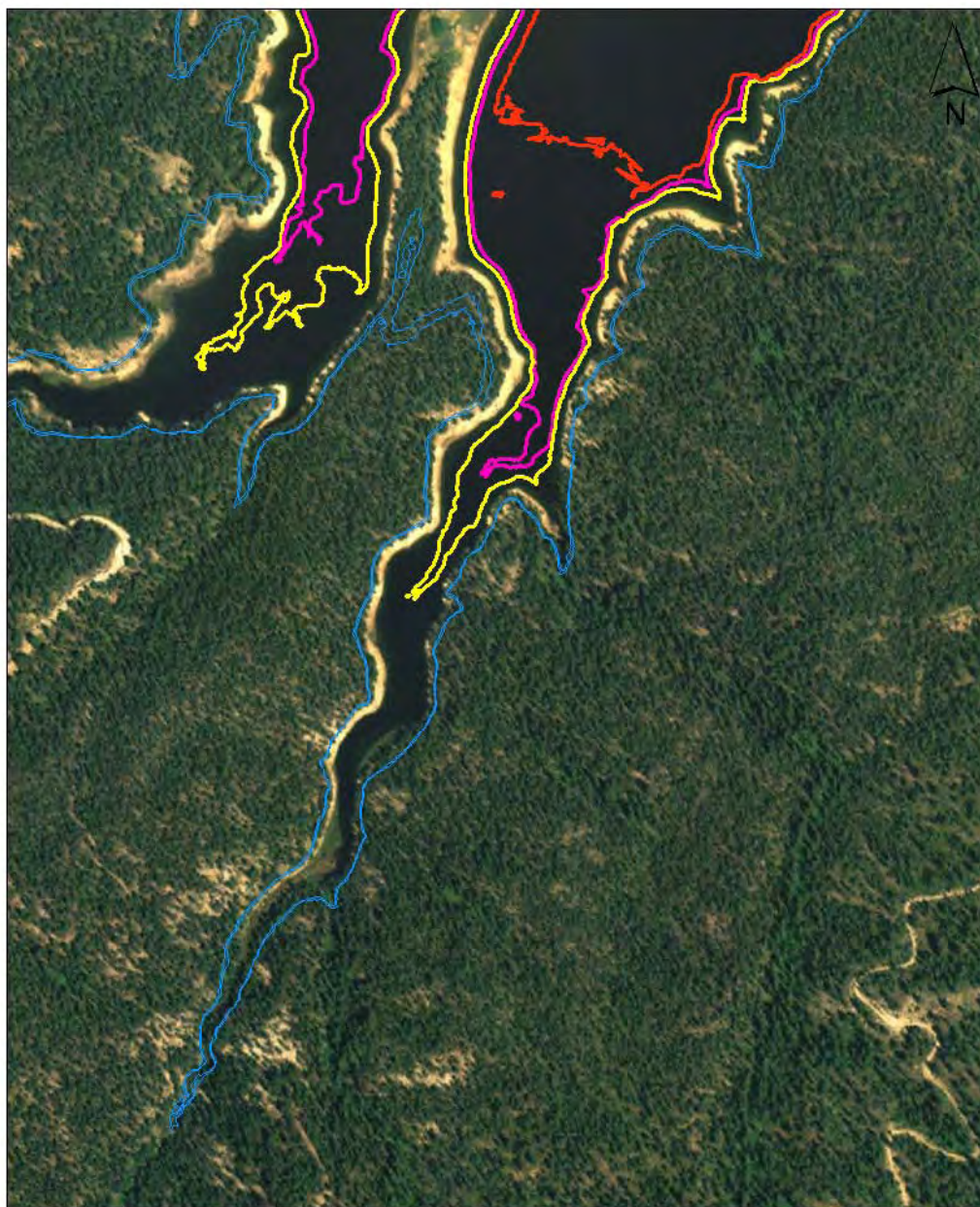
Because of changes in sampling methodologies and locations catch per unit effort and percent composition summaries from 2009 are not comparable to past years. The use of minnow traps in 2009 increased the proportion of smaller fish being captured in the reservoir. Using fyke nets throughout the summer and into the fall also changed the species composition from past years, mainly by capturing kokanee migrating upstream in the fall. Extending the time frame fyke nets were used (for an associated isotope study) could have also decreased the catch per unit effort for bull trout compared to past years..

Mortality rates for radio tagged bull trout were lower in 2009; a few explanations could explain the difference. The majority of bull trout mortalities in past years have occurred in the transition zones. The timing of bull trout movement through these transition zones in past years could have been hindered by the IDFG weirs. Having no man made barriers to migration in 2009 may have allowed for higher survival rates.

Reservoir elevations at the end of irrigation season (September) varies between years. Adfluvial bull trout in Deadwood Reservoir sometimes migrate up to spawn and always migrate down from spawning in September and October. The water levels during this time effects the distance they have to travel through tributaries as they run through the dewatered areas of the reservoir. These areas are known as reservoir drawdown zones (RDZs). Tributaries running through RDZs typically; have little to no cover, are shallow, and sometimes form extremely shallow deltas. The distance fish had to migrate through the RDZs in 2009 was similar to 2006 and less than 2007 or 2008 (Table 3). For example a fish migrating up and down Trail Creek in 2006 or would have had a 0.41 mile swim through the RDZ while a fish in 2007 would have had a 0.74 mile swim (Figure 3).

Table 3. Distances fish had to travel through Reservoir Drawdown Zones (streams or rivers that run through the dewatered area of the reservoir) since 2006.

Reservoir Drawdown Zone Distances (km)				
Water Year	Deadwood	Trail	Beaver	SF Beaver
2006	1.61	0.66	0.40	0.24
2007	2.37	1.19	0.74	0.50
2008	1.83	0.80	0.47	0.34
2009	1.61	0.66	0.40	0.24



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Figure 3: Deadwood Reservoir full pool (blue) and water levels at the end of irrigation season in 2006 (yellow), 2007 (red), 2008 (pink) and 2009 (yellow). The distance to migrate through the transition zone to or from the mouth of Trail Creek (bottom left) changes based on end of irrigation season pool elevation. Other tributaries show a similar pattern.

MONITORING BULL TROUT MOVEMENT BELOW DEADWOOD RESERVOIR USING RADIO TELEMETRY

ABSTRACT

The FWS 2005 BiOp identified operations at Deadwood Dam that cause harm and harassment to bull trout. Bull trout captured and tagged below Deadwood Dam could help address the terms and conditions associated with Deadwood Dam. The terms and conditions discuss possible harm and harassment associated with low winter stream flows, low summer temperatures, the lack of biologically significant ramping rates, and disruption of migratory cues below the dam as well as entrainment over or through the dam. Since September of 2007 twenty two bull trout have been collected from the stilling basin below the dam and implanted with radio tags. Eight fish were tagged in 2009. Individual fish have been tracked up to 20 miles downstream, but no fish have ever been tracked moving into the South Fork of the Payette. In 2009 three bull trout were tracked into Wilson Creek and spawning was verified.

INTRODUCTION

Sampling below the dam for bull trout has been attempted every year since 2004. Hook and line sampling was conducted in the river below the dam in the spring of 2004. One crew spent a week sampling the upper 2 miles below the dam while another crew sampled the lower 9 miles up from the confluence of the South Fork Payette. A spring electroshocking and hook and line sampling effort was conducted during the spring of 2005 in the upper 2 miles below the dam. Weirs were also installed and run on Wilson and Warm Springs creeks from mid June through mid September 2005. During a maintenance project in 2006 when the dam was cut back to only 5cfs a more extensive sampling effort was conducted. One crew spent a week sampling the stilling basin and the upper 2 miles below the dam using gill nets, backpack electroshockers as well as hook and line sampling. Another crew used electro-fishing equipment to sample two 1 ½ mile sections of the river near Stevens and Julie creeks.

Because no bull trout were captured in any of these sampling efforts no sampling was planned below the dam in 2007. Fishing during his lunch hour a Reclamation Electrician caught two bull trout within a week directly below the dam in the fall of 2007. An informal sampling effort followed involving setting one fyke net in the tailwater of the stilling basin and several hours of angling over a period of three weeks. Due to time constraints with weir operations in the reservoir, the fyke net below the dam was only periodically set for 24 hour periods. The fyke net was a sinking 1.22 m x 1.22 m x 0.91 m net with a 30.48 m x 1.22 m lead line (Figure 2). The net had a lead core bottom line that followed the bottom of the river and a foam core top line to maintain the vertical orientation in the water. The net was secured to the bridge at the upstream end and the lead line was stretched downstream and anchored with an 8 kg weight. A similar time frame was used for hook and line sampling and fyke net deployment in the fall of 2008 as well as additional hook and line sampling in the spring of 2008. Sampling in the river below the dam was mainly restricted to the stilling basin in 2008 because of time limitations and logistics. Some angling was done during tracking efforts as the fish

migrated downstream to try to recapture fish for growth information and tag replacement.

STUDY AREA

All of the work discussed in this chapter occurred on the lower Deadwood River and its tributaries between the dam and the South Fork of the Payette River (Figure 1).

METHODS

Sampling

Sampling efforts in 2009 focused on fyke netting in order to maximize efficiency and complete other necessary work. A pulley system was set up in a backwater area of the stilling basin below the spillway to allow for fyke nets to be deployed with up to 900 cfs discharge from the dam as long as no spill occurred. Hook and line sampling was also used before the pulley system was developed and when time allowed thereafter. Fyke nets were set out on a weekly basis when possible in 2009 in an attempt to determine the timing of possible entrainment. Hook and line sampling as well as minnow fykes were used on sections of the lower 9 miles of the Deadwood River above its confluence with the South Fork of the Payette River.

Handling

Captured fish were placed in a live well and the following information and/or samples were collected. All fish captured were identified to species and enumerated. Gastric lavage was also conducted on all bull trout and up to thirty fish of each other species. Additional procedures for examining trapped bull trout included placing fish in an anesthetic bath containing tricaine methanesulfonate (MS-222; 100 mg/L) buffered with sodium bicarbonate. When a bull trout was considered anesthetized (could not right itself) it was measured (TL and fork length FL; mm) and weighed (g). Scale samples and fin clips were taken, and the fish was scanned for Passive Integrated Transponder (PIT) tags (Biomark Incorporated, Boise, ID). All bull trout over 52.5g were implanted with radio transmitters, some of which contained temperature and depth sensors. Radio tags were manufactured by Lotek Wireless and included multiple sizes and data capabilities.

Surgical procedures for bull trout were similar to those described in Chapter 2. Bull trout were placed ventral side up in a V-shaped surgery cradle. The gills were bathed in anesthetic solution using a turkey baster throughout the surgery. The surgical methodology used was a modified shielded needle technique (Ross and Kleiner 1982). A small incision (1.0 cm to 2.0 cm) was made parallel to the linea alba, a fibrous structure that runs down the midline of the abdomen, composed mostly of collagen connective tissue, and a sterilized transmitter was inserted into the peritoneal cavity or the space within the abdomen that contains the intestines, the stomach, and the liver. The antenna exit hole was created using a 12 or 14 gauge 7.6 cm (3.0 in.)-long surgical needle inserted through the body wall below the pelvic girdle onto a 0.4-cm x 15-cm (0.15-in. x 6.0-in) long steel needle guide. The antenna exited the body approximately 1.5 cm to 2.0 cm (0.6 in. x 0.8 in) posterior to the pelvic girdle and slightly to the side of the mid-ventral

line. The incision was closed using absorbable surgical sutures. Surgical glue was then applied to the incision after sutures were in place. Bull trout were held and monitored in live wells until full recovery (minimum 15 minutes), and then released back into the Deadwood River near their point of capture. Visible infirmity or injuries such as descaling, frayed fins, or dermal lacerations were noted for all bull trout captured.

Telemetry

The movement of radio tagged fish was monitored using; a remote station set up on the dam, helicopter, and on foot. Once fish were noted to have left the stilling basin and were no longer detected by the remote station ground tracking was initiated. Ground tracking surveys covered a two mile distance downstream of the dam. If radio tagged fish were detected in tributaries, survey reaches were expanded to include the newly inhabited area. Due to snow ground tracking was not possible after October 30, 2009. Aerial tracking by helicopter was planned but has not been completed due to weather, and mechanical issues. For each survey day the following data was recorded: general weather, surface ice cover for the reservoir and river, reservoir pool elevation, general comments, and if surface ice was present pictures were taken. For fish that were ground tracked below the stilling basin photos were taken of their approximate location.

Deposition of Specimens

All live specimens were returned to their approximate sampling location. Any incidental mortalities and requested voucher specimens were delivered as directed by Idaho Department of Fish and Game. Fin clips, scale samples, and muscle plugs were collected from all sampled bull trout. Muscle plugs were also collected from up to 30 individuals total of each species in the in the river. If fish were too small to take a muscle plug from whole fish were frozen. Up to thirty fish total of the smaller species in the river were frozen. Up to three individuals from the larger species; whitefish, cutthroat trout, kokanee, and rainbow trout per month (June-October) in the river were frozen. Muscle plugs and fish samples are being used in an associated isotope study. Digital images of the scale samples are being taken and multiple readers will assign ages to each scale. Fin clips have been sent to the Abernathy Labs (FWS) for genetic analysis allowing possible assignment to natal streams in the drainage. The collection of fin clips, scale samples, and muscle plugs were non lethal and occurred while the bull trout were anesthetized.

RESULTS

A total of 151 fish representing eight species were captured in the Deadwood River in 2009 (Table 4) Rainbow trout were the most abundant fish captured representing 51 percent of the total. Eight bull trout were captured using a fyke net and hook and line sampling in the stilling basin below Deadwood Dam in 2009 (Table 5). Five bull trout were recaptured, some individuals up to three times, leading to a total of 14 bull trout sampling events representing eleven percent of fish captured. Captured bull trout ranged from 202 to 435 mm TL and 66 to 686 g in weight. All eight bull trout were implanted with radio transmitters. Seven of these bull trout continue to be tracked by helicopter or ground surveys. Tracking activities are planned to be ongoing through the end of 2011.

Table 4. Number of fish sampled (total count), catch per unit effort (CPUE), and % of total catch for all 2009 sampling efforts, Deadwood River.

All Methods	Total hours	673.650	
Species	Total Count	CPUE	% of Total catch
Bull Trout (<i>Salvelinus confluentus</i>)	17	0.025	11.26
Cutthroat Trout (<i>Oncorhynchus clarki lewisi</i>)	0	0.000	0.00
Kokanee (<i>Oncorhynchus nerka kennerlyi</i>)	7	0.010	4.64
Rainbow Trout (<i>Oncorhynchus mykiss</i>)	77	0.114	50.99
Redside Shiner (<i>Richardsonius balteatus</i>)	2	0.003	1.32
Sculpin <i>Cottus spp.</i>	3	0.004	1.99
Dace <i>Rhinichthys spp.</i>	19	0.028	12.58
Mountain Whitefish (<i>Prosopium williamsoni</i>)	26	0.039	17.22
Total	151	0.224	

Table 5: Bull trout captured in the Deadwood River below the dam in 2009 including date of collection, sampling method, location, length (total length; TL and fork length; FL), weight, and notes.

Date	Sampling Method	Location	Tag ID	TL	FL	Weight	Notes
6/16/2009	Hook and Line	Stilling Basin	14	380	360	550	
7/8/2009	Hook and Line	Stilling Basin	9	350	320	492	
8/13/2009	Fyke Net	Stilling Basin	70	202	190	66	
8/19/2009	Fyke Net	Stilling Basin	9	360	346	460	Recapture
9/2/2009	Fyke Net	Stilling Basin	2	307	298	276	
9/2/2009	Fyke Net	Stilling Basin	3	314	301	328	
9/2/2009	Fyke Net	Stilling Basin	72	221	209	96	
9/10/2009	Fyke Net	Stilling Basin	3	312	302	312	Recapture
9/10/2009	Fyke Net	Stilling Basin	9	365	350	488	Recapture
9/10/2009	Fyke Net	Stilling Basin	78	292	283	220	
9/11/2009	Fyke Net	Stilling Basin	17	433	411	582	Old tag scar
9/22/2009	Fyke Net	Stilling Basin	9	365	350	470	Recapture
9/24/2009	Fyke Net	Stilling Basin	72	227	218	110	Recapture
10/7/2009	Hook and Line	Stilling Basin	17	435	418	686	Recapture
10/7/2009	Fyke Net	Stilling Basin	70	253	240	150	Recapture
10/7/2009	Fyke Net	Stilling Basin	72	231	225	122	Recapture

As of October 2009 no bull trout tagged in 2009 had moved more than a quarter mile below Deadwood Dam. Four bull trout left the stilling basin in late September and three of those fish moved into Wilson Creek. Two of the fish that moved into Wilson Creek were documented spawning together. Spawning in Wilson Creek was much later compared to documented spawning in Trail Creek (the main spawning tributary to Deadwood Reservoir). There was one confirmed mortality or tag expulsion during spawning in Wilson Creek (12.5%).

Fin clips from all bull trout captured in the stilling basin since 2007 have been sent to Abernathy Labs for genetic analysis. Samples from 2009 have not been analyzed yet but all 13 samples from 2007 and 2008 that amplified are more closely related to bull trout from tributaries above the dam than they are bull trout from tributaries below the dam (Table 5).

DISCUSSION

Small resident bull trout have been electroshocked in two separate tributaries to the Deadwood River below the dam (Warm Springs and Scott creeks) but, 2007 was the first year bull trout were captured by Reclamation biologists in the mainstem river itself. All bull trout collected since 2007 have been captured in the stilling basin directly below the dam, despite efforts to capture fish at different downstream locations.

Bull trout captured below the dam since 2007 (n=22), on average, were smaller (312 mm, 308 g vs. 422 mm, 774 g) than their counterparts captured in the reservoir (n=35). All of the bull trout captured in the stilling basin looked healthy. The genetic information from fish captured in 2007 and 2008 shows these fish are more closely related to the population above the dam suggesting the fish were entrained. Genetic information has not been analyzed for fish collected in 2009.

Mortality rates from fish tagged below Deadwood Reservoir could be misleading because confirming mortalities is nearly impossible in the majority of the rugged lower Deadwood River canyon. Fish captured below the dam were also smaller on average than fish captured in the reservoir so smaller, shorter battery life tags were used further complicating mortality confirmation. We are currently tracking seven fish.

Bull trout captured in the stilling basin have been tracked moving up to 20 miles downriver in the mainstem Deadwood River in previous years (Figure 4). After two years of tracking bull trout in the river below Deadwood Dam no fish had ever been tracked moving into any of the tributaries. Three bull trout were tracked moving up into Wilson Creek in the fall of 2009. Two of these fish (#2 and #9) were observed spawning together on October 7. Fish spawning in tributaries to the reservoir usually move back into the reservoir by the first week in October. This late season spawning could be due to disrupted migratory cues and/or confusion because individual fish had been entrained and could not return to their natal streams. Reclamation plans to continue tracking and tagging efforts in 2010.

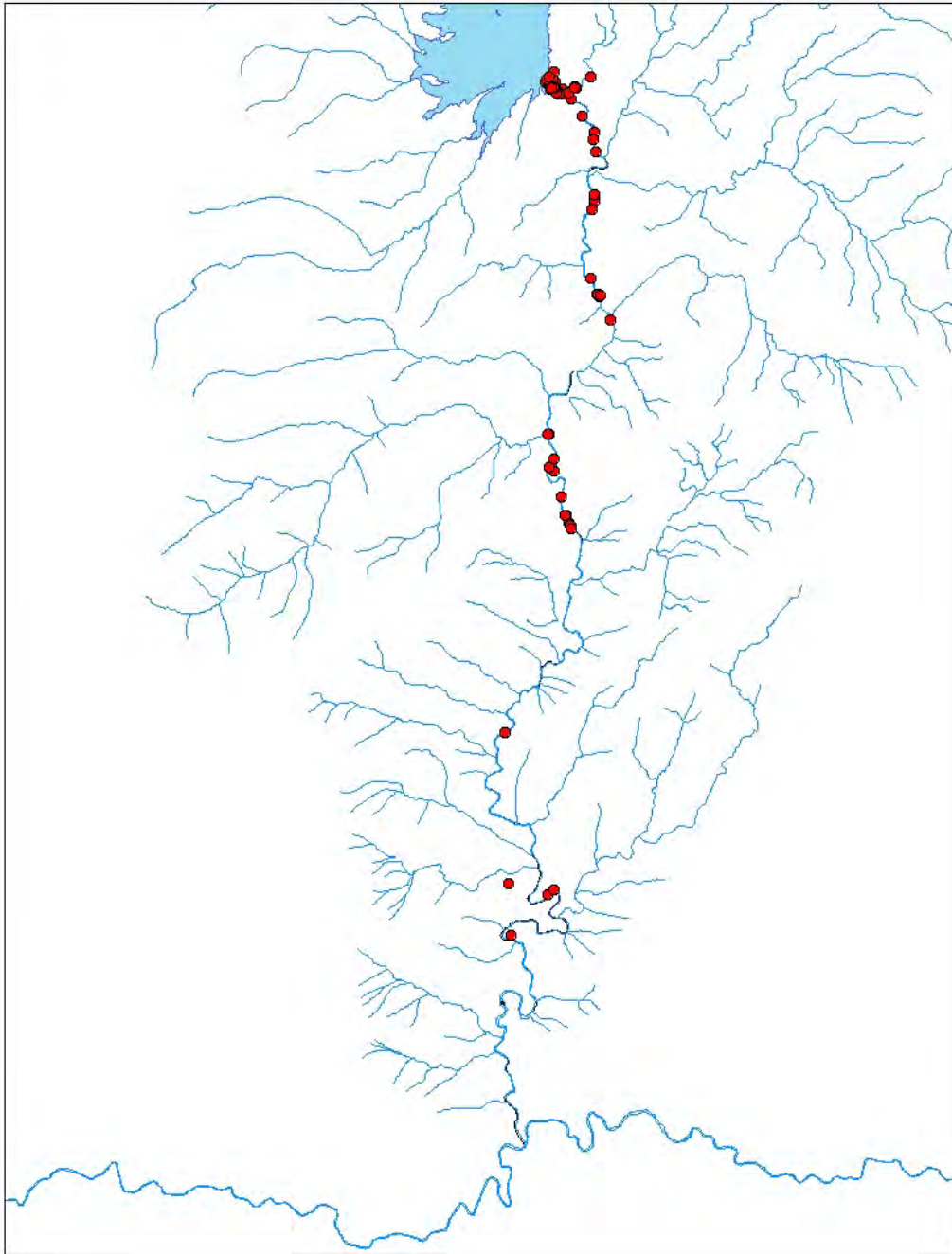


Figure 4: Radio tagged bull trout locations in the Deadwood River below Deadwood Dam between October 6, 2007 and October 30, 2009.

BULL TROUT REDD SURVEY IN SCOTT CREEK, IDAHO

ABSTRACT

Reclamation biologists surveys 1.7 miles of Scott Creek for bull trout redds in the fall of 2009. No definite redds or bull trout were seen but a few probable redds were identified.

INTRODUCTION

Past electro-fishing surveys conducted by Reclamation and the USFS have shown that Scott Creek has a healthy population of resident juvenile bull trout. All of the bull trout captured in the mainstem Deadwood River that have undergone genetic analysis (N=13) have been shown to be more closely related to bull trout from tributaries to the reservoir instead of the river below the dam. It is unknown if there is a migratory component to the Scott Creek population that has not been detected during surveys. In an attempt to identify fluvial bull trout using Scott Creek redd counts were conducted in a selected reach

STUDY AREA

The study area includes the mainstem of Scott Creek. Scott Creek drains into the Deadwood River at river kilometer 25 and covers an area of 17 square miles (Figure 1).

METHODS

Redd counts have not been previously conducted on Scott Creek therefore survey reaches and timing were selected prior to conducting the surveys. A survey reach was identified using patch boundary criteria establish by Rieman and McIntyre 1995 and juvenile bull trout distribution based on past electro-fishing. Timing of the survey was chosen to occur after bull trout were assumed to be completed spawning. During the survey two Reclamation biologists walked slowly upstream from a predetermined location, looked for bull trout and documented all gravel disturbances. All disturbances in the gravel were investigated and an attempt was made to determine if they were redds or not. Photographs and GPS coordinates were taken at each probable redd identified.

RESULTS

Reclamation biologists walked 1.7 miles of Scott Creek moving upstream from the approximate location where the 1600 meter topographic line crosses Scott Creek, October 7, 2009. Four probable redds were identified and other questionable disturbances were investigated. No bull trout were seen during the survey. The average size of the probable redds was estimated to be 1.5 to 2 ft in diameter. Biologists did not feel confident in saying these were for sure bull trout redds but discounted the possibility of wildlife tracks and many other possibilities.

DISCUSSION

Characteristics of the probable redds on Scott Creek has caused discussions on their formation. If the gravel disturbances were redds it was unclear if they were completed or uncompleted redds from small resident fish or from larger adfluvial bull trout. Bull trout radio tagged in the Deadwood Reservoir population had migrated downstream from spawning locations by the time redd surveys were conducted on Scott Creek. The probable redds could have been made earlier and their form degraded before biologists conducted the survey. The three bull trout captured in the stilling basin demonstrated a very different migration timing than is seen in the reservoir. One bull trout upmigrated into Wilson Creek on September 28th the other two moved up on October 5th. Based on movement patterns of these fish Biologists could have been seeing incomplete redds in Scott Creek. Using substrate size as an indicator of fish size was not definitive either. Much more sand was present in the redds found in Scott Creek than Biologists have observed on other systems. After looking at a redd constructed by two radio tagged fish that moved up into Wilson Creek where high amounts of sand were present as well, Biologists felt more confident in their redd identification in Scott Creek.

The next step after identifying probable spawning in Scott Creek is to confirm this spawning and identify if it is from resident fish or migratory bull trout that could use the mainstem of the Deadwood River. Size of the probable redds suggest they would be either very large resident fish or smaller fluvial fish. Size of the redds seemed comparable to those found on the Malheur in Oregon. Reclamation is looking into possible ways to determine if there is a fluvial population of bull trout that uses Scott Creek and in turn would have to at least migrate through the mainstem Deadwood River to do so.

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