

# **2013 Bull Trout Redd Monitoring in the Wallowa Mountains**



**Prepared by:  
Gretchen Sausen  
U.S. Fish and Wildlife Service  
La Grande Field Office  
May 2014**

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## **ABSTRACT**

Bull trout were listed as threatened under the Endangered Species Act in 1998 due to declining populations. The U. S. Fish and Wildlife Service (Service) recommends monitoring populations in subbasins where little is known, including the Grande Ronde and Imnaha subbasins. Spawning survey data is important for determining relative abundance and distribution trends in bull trout populations. This report summarizes the 2013 bull trout spawning data collected in the Wallowa Mountains of NE Oregon and compares this with past years' data. Bull trout spawning surveys have been conducted on similar index areas for selected Grande Ronde and Imnaha River streams from 1999 to 2013. These surveyed streams are located within the Wallowa River/Minam River and Imnaha River bull trout core areas. Surveys in 2013 were conducted by fisheries consultants, the Service, Nez Perce Tribe (NPT), the Oregon Department of Fish and Wildlife (ODFW), U.S. Forest Service (USFS), Grande Ronde Model Watershed (GRMW), Freshwater Trust, and Anderson Perry Inc. In 2013, less survey miles and streams were surveyed on the Upper Imnaha due to a lapse in federal appropriations and weather conditions. The Nez Perce Tribe, Joseph Field Office were invaluable in their help with conducting and coordination of surveys during the time federal employees were not able to work. Objectives of the survey included; locate bull trout spawning areas, determine redd characteristics, determine bull trout timing of spawning, collect spawning density data, determine and compare the spatial distribution of redds along the Lostine River in 2006 through 2013, and over time use all of the data to assess local bull trout population trends and the long-term recovery of bull trout. Timing of spawning, total redds, redd sizes, and redd locations are documented in the report. The local bull trout populations were relatively stable for the survey period (1999-2013) and there was an increase in redd numbers on Bear/Goat Creek in 2013 and a decrease in redd numbers on the Lostine, Big Sheep, and Imnaha in 2013, compared to 2012. The Upper Imnaha had less stream miles surveyed in 2013 than in past years, nevertheless, redds per mile were also less than in past years. The Imnaha population is one of the strongholds within the Imnaha Subbasin. Big Sheep Creek and Little Sheep Creek populations within the Imnaha River core area are of concern for long-term viability due to issues with stream flows, fish passage, and connectivity. The Lostine River and Bear Creek contain brook trout and hybridization is likely occurring (the Lostine has had documented bull trout and brook trout pairing up for spawning).

## **ACKNOWLEDGMENTS**

The Service has, for the past ten years, provided staff time necessary for the coordination, implementation, and analysis and report summarization of this project. Prior to Service support of this project, the Wallowa-Whitman National Forest, Wallowa Mountains Office (WMO) had secured previous years' funding and support, and was responsible for the coordination, implementation, and analysis and report summarization. Due to a lapse in federal appropriations and associated furlough of government staff in 2013 (Oct 1-16th), the author was not allowed to work, and the Nez Perce Tribe stepped up to coordinate during this time period.

This project would not have been possible without the dedication, hard work, funding, and assistance provided by all the partners. Oregon Watershed Enhancement Board (OWEB) funding from 2007-2013 allowed the use of Del Sol Wilderness Adventures (2008-2013) for a horse/mule packer to pack our gear in and out of the Upper Imnaha to conduct our annual spawning survey in that drainage. The WMO in 2005 through 2007 and other commercial packers in past years provided this service. I would like to thank the partners in 2013 which included; the NPT, consultants, the USFS, ODFW, OWEB, GRMW, the Service, Freshwater Trust, and Anderson Perry, Inc. Special thanks to the people who walked the streams, helped with scheduling surveys and surveyors, provided access to private property, packed us into remote areas to survey, assisted with the OWEB grants, assisted in mapping, or summarized the data. These included: Gary Miller and John Stephenson (Service); Shannon Archuleta (USFS), Barry and Shirley Cox, Paul Arentsen, and Morgan Jenkins (Del Sol Wilderness Adventures Horse/Mule Packers and Winding Waters River Expeditions); Leigh Collins, Jeff Oveson, Coby Menton, and Mary Estes (Grande Ronde Model Watershed); Lynne Price, Caitlyn Ecklund, and Mac Huff (consultants); Peter Cleary, Ian Wilson, Eric Shoudel, Dave Bright, Mary Edwards, and Jim Harbeck (NPT); Jack Woods, Nancy Clarke, Stewart and Susan Coleman (landowners that provided access to private properties near the Lostine River); Aaron Maxwell (Freshwater Trust); and Sue Brady (Anderson Perry, Inc.).

## **INTRODUCTION**

Bull trout were listed as threatened under the Endangered Species Act in 1998 due to declining populations. The Service recommends monitoring populations in subbasins where little is known including the Grande Ronde and Imnaha subbasins (USFWS 2002). Spawning survey data is important for determining relative abundance and distribution trends in bull trout populations. A minimum of 15 years is needed for determining bull trout population trends (Maxwell 1999). Without adequate funding, it has been difficult to find sufficient numbers of experienced bull trout surveyors and packers for surveys in the back-country, and to obtain adequate supplies to get the work accomplished. OWEB funding for the project supported the continued survey of bull trout spawning areas in years 2007 through 2013 in the Wallowa Mountains of northeast Oregon. Bull Trout redd counts (spawning surveys) have been conducted annually on the Wallowa Valley, Hells Canyon National Recreation Areas (HCNRA), and Eagle Cap districts of the USFS and along some sections of private property of the Lostine River by the Service, NPT, contractors, ODFW, USFS, and volunteers for the past 13 to 15 years.

Objectives of the bull trout spawning surveys include:

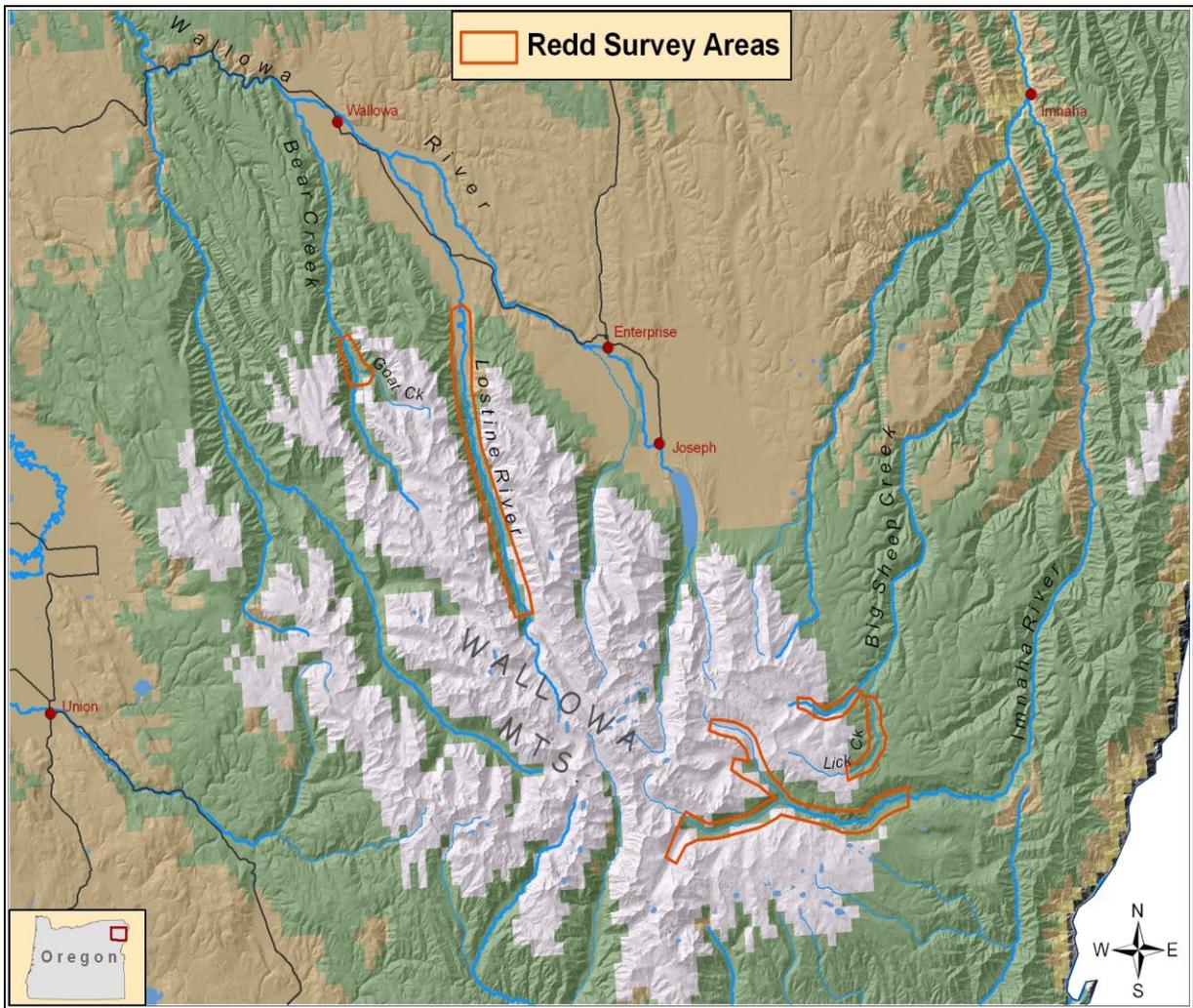
- Locate bull trout spawning areas.
- Determine redd (spawning nest) characteristics.
- Determine bull trout timing of spawning.
- Collect spawning density data.
- Map the location of the bull trout spawning reaches.
- Determine and compare the spatial distribution of redds along the Lostine River in 2005 through 2013. Collect UTM spatial redd data on Big Sheep, Lick Creek, and Middle Imnaha to compare after several years of data collection.
- Assess population trends for local bull trout populations.
- Use this information for helping assess the long-term recovery of bull trout.

## LOCATION

The Service and multiple partners conducted bull trout spawning surveys in 2013 on selected streams in the Grande Ronde and Imnaha Sub-Basins. These streams are located within the Wallowa River/Minam River and Imnaha River bull trout core areas. Stream systems surveyed in 2013 for bull trout redds included; the Lostine River, Bear and Goat Creeks, the Imnaha River, Big Sheep Creek and Lick Creek (Figure 1). In 2010, 2011, and 2013, exploratory surveys were conducted on Deer Creek commencing at the newly installed culvert at Rd. 8270 to 0.8 miles upstream.



**Lostine River, French Camp to Bowman Reach, with view of nearby mountains, Photo taken in 2010**



**Figure 1. Wallowa Mountain Bull Trout Redd Survey Areas.**

## METHODS

Bull trout spawning surveys on large rivers require as many as ten to twelve people in one day, to complete the surveys during the spawning period. Surveyors walk the rivers through the selected “index areas” to locate bull trout redds. Index areas in this report refer to known bull trout spawning reaches that have been surveyed in the same consistent locations on an annual basis.

This project is part of a larger effort in NE Oregon and SE Washington that occurs during September through October, the bull trout spawning period. Due to the lack of available experienced surveyors to conduct these surveys, we have had to increase our survey days on the accessible sections of the Lostine and Imnaha Rivers to two days, conducting half of the survey length one day and the other half the following day. Surveys were conducted twice (mid and late bull trout spawning season) on the Lostine River, Big Sheep Creek, Lick Creek, Middle Imnaha (Blue Hole to Indian Crossing), and Bear and Goat Creeks. One-time surveys were conducted late in the spawning season in 2013, on the Upper Imnaha River and tributaries, due to access and funding limitations. Exploratory surveys were conducted on Deer Creek in 2010-2013 for 0.8 miles of the stream. Appendix B, Table 1 compares survey data and survey frequency for 1999-2013

bull trout spawning surveys on selected Grande Ronde and Imnaha River streams. Stream miles surveyed (not including repeat surveys) for the above streams totaled 41.3 in 2007, 46.3 in 2008, 41.8 in 2009, 41.1 in 2010, 41.7 in 2011, 40.9 in 2012, and 35.0 in 2013. In 2013, there were less stream miles surveyed in the Upper Imnaha due to lack of personnel and weather conditions. Total redd numbers are all redds documented, and not necessarily comparable river miles (refer to Appendix B, Table 2a-2d for comparable reaches and redd counts for those sections).

The survey protocol (in addition to repeat surveys, or one-time late surveys where feasible) included; 1) visits to known bull trout redds and review of survey form prior to redd count survey, 2) experienced bull trout redd count surveyor(s) paired with inexperienced surveyor (on the job training), 3) bull trout redds measured, data recorded, and redds flagged during survey, and 4) all stream flagging removed post-surveys.



**Underwater view of bull trout pair on redd, Middle Fork Imnaha River 2012  
Photo by Carlos Camacho, NPT**

Data recorded during the bull trout spawning surveys included; 1) date of survey, 2) stream location, 3) size of redds, 4) visibility of redds, 5) number of redds, and 6) approximate number and sizes of bull trout observed during surveys. In past years, reach locations (upstream and downstream boundary UTM coordinates) were documented. In 2009 through 2013, in addition to the above, bull trout redd UTM locations on the Lostine River, Big Sheep Creek, Lick Creek, and Middle Imnaha within the “index areas” also was collected. Information collected during the bull trout spawning surveys is compiled by the Service and made available to other agencies (i.e., this report).



**Montana Pagano of NPT, measuring a bull trout redd  
on the Upper Imnaha River in 2012**



**Lynne Price (fisheries consultant) near spawning bull trout, Lostine River 2013  
Photo taken by Sue Brady, Anderson Perry, Inc (AP).**

## RESULTS

### Location of Bull Trout Spawning Habitat Areas Surveyed

Bull trout spawning surveys have been conducted on similar index areas for selected Grande Ronde and Imnaha River streams from 1999 to 2013. These surveyed streams are located within the Wallowa River/Minam River and Imnaha River bull trout core areas. During these years, bull trout spawning areas have been established for these streams, in particular, the Lostine and Imnaha Rivers. Redd characteristics also have been measured on these streams. The Middle Imnaha, consisting of the Imnaha River from the fish weir below Gumboot confluence to Indian Crossing, was not surveyed in 2005 through 2013, but this area was surveyed from 1999 to 2004 and is considered bull trout spawning habitat. This portion of known bull trout spawning habitat on the Imnaha was not surveyed for the past nine years because of limited funding, a lack of experienced surveyors, and a minimal number of redds documented in this area in past years. Bear Creek and Goat Creek were surveyed as in past years but the survey area of Bear Creek and Goat Creek increased from 1.9-3.8 total miles between 1999-2006 to 7.2 in 2007, and the survey frequency increased from generally once during the years 1999-2006 and twice in 2007. Although the survey area increased in 2007, the redd numbers did not increase substantially, especially in the lowermost survey reaches. In 2008 through 2013 the surveys were conducted twice in the spawning season and an additional 1.4 miles of Bear Creek was surveyed upstream of the comparable reach for a total of 3.2 miles. In 2010-2013, a survey for 0.8 miles of stream was conducted on Deer Creek.



**Ken Bronec (past consultant) surveying through downed wood  
on the Middle Fork Imnaha, 2012  
Photo by Carlos Camacho, NPT**

## Timing of Bull Trout Spawning

Timing of bull trout spawning for our surveyed streams, in general, is approximately September 1 through October 15, and as early as August 15 in the Imnaha River system. The Lostine River has been very consistent or predictable, with commencement of spawning documented in 2006 as early as the first week in September, but the Imnaha, a much larger system, has been less predictable. Mary Edwards, fisheries biologist with the NPT, observed bull trout and brook trout spawning near the acclimation facility on the Lostine River as early as late July 2010. Mary was underwater snorkeling at the time of her observation. This early bull trout spawning had not been previously observed. Bull trout surveys conducted in September-October 2010 did not confirm any bull trout redds in this location; but that could have been due to the high density of Chinook spawning that occurred in the area. The above information is based on documentation during bull trout spawning surveys and chinook surveys where bull trout were spawning.

We are not certain when spawning commences and ends within the Upper Imnaha, which includes; the mainstem, North Fork, South Fork, and Cliff Creek (a resident tributary). There are questions as to what time of the year, dependent on annual flows, bull trout pass over the falls. Some years we have seen fluvial size bull trout spawning in the South Fork Imnaha in mid-late September to early October and in recent years we have not. But in 2013, there were a few redds not measured in the South Fork Imnaha and Imnaha River, from the Upper Falls to Lower Falls, due to the redds still in progress. ODFW observed large fluvial bull trout spawning in the South Fork Imnaha River in mid-August 2005 (B. Knox, ODFW, pers. comm., 2005). ODFW has also observed fluvial bull trout spawning as early as mid-August, during chinook surveys, below the Imnaha falls and as late as early October, during our bull trout surveys, in several years (B. Smith, ODFW, pers. comm., 2005). In 2011, Upper Imnaha had smaller sized redds reported than in previous years, which could be a factor of smaller fish, but the documented fish sizes suggest fluvial fish; or that due to weather and stream conditions the fish are spawning later and these redds are incomplete. The Upper Imnaha survey is a one-time late September survey, so the total count is not expected. Cliff Creek, a resident bull trout tributary stream to South Fork Imnaha, had several redds that were still in progress at the time of the 2012 survey. Cliff Creek, the upper reach of the NF Imnaha, and the gorge sections of the Imnaha River above Blue Hole were not surveyed in 2013 due to lack of personnel and weather conditions. Additional years of observation and survey data are needed to fully understand bull trout spawning and adult movement in the Imnaha Sub-Basin, and Big Sheep and Bear Creek Watersheds.



**Bull Trout on the Lostine River, 2012**  
Photo taken by Mary Edwards Photography for FWS LFO

## **Total Number of Bull Trout Redds**

### *Lostine River*

Refer to Appendix B; Table 3a and 3b for bull trout redd count summary data for 2013. Forty total bull trout redds for 10.1 miles of survey, including Pole Bridge to Six Mile Bridge, were documented in 2013 on the Lostine River. The Pole Bridge to Six Mile Bridge section has not been surveyed every year. The following data for the Lostine River compares consistently surveyed index areas on the Lostine River (8.5 miles) from 1999 to 2013, excluding the Pole Bridge to Six Mile section (Figure 2). The Lostine River had a low of 19 redds in 2011, and a high of 70 redds in 2003. Redd numbers decreased again in 2004 but had been increasing through 2008. Redd numbers decreased in 2009 through 2011, with the lowest redd count in 2011, and increased in 2012 and decreased again in 2013. The fifteen-year average from 1999 to 2013 for the Lostine River is 37.3 redds, approximately 53 percent of the 2003 total. The highest bull trout redd numbers (“the bread and butter”) within the Lostine River has consistently been observed and recorded in the headwaters, from Shady Campground to Bowman, at approximately River Mile (RM) 24.5 to RM 22. In 2013, as in most years, the densities were greatest in the uppermost reach, from Shady Campground to French Camp, which is upstream of the chinook spawning index areas.

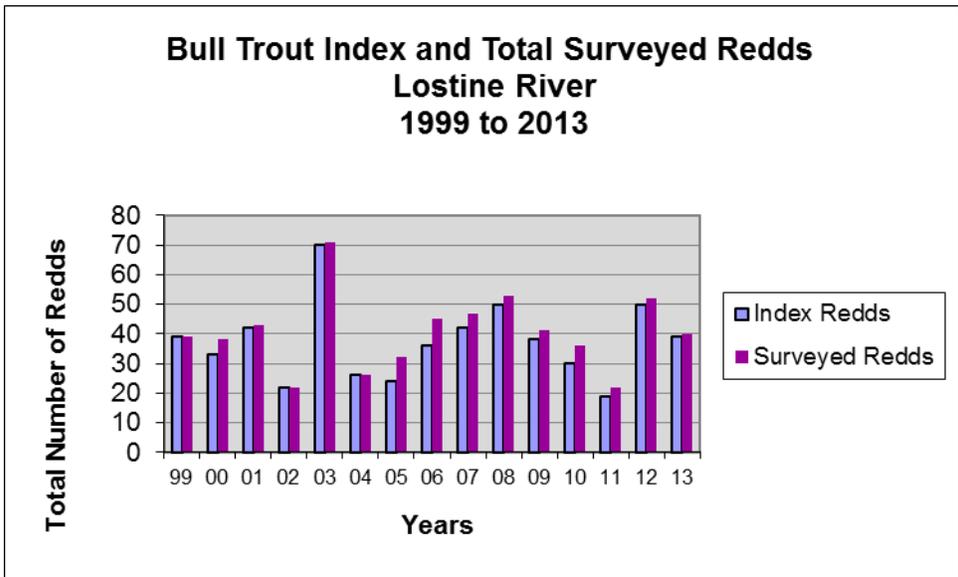
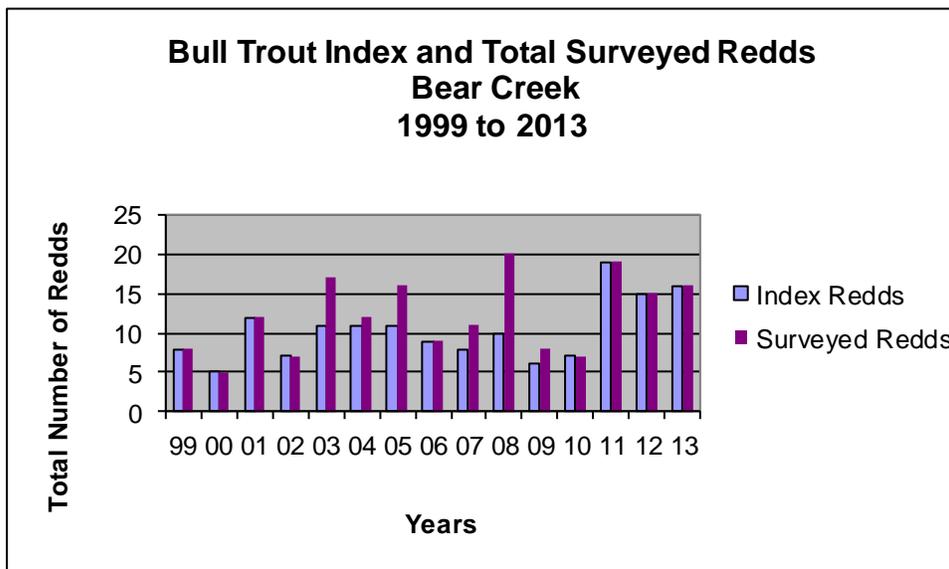


Figure 2. Comparison of bull trout surveyed redds and index redds (comparable miles) documented from 1999 to 2013 on the Lostine River.

*Bear Creek*

Sixteen total bull trout redds for 3.2 miles of survey were documented in 2013 on Bear Creek (including Goat Creek). The following data for Bear Creek compares consistently surveyed index areas on Bear Creek and Goat Creek (1.9 miles) from 1999 to 2013 (Figure 3). Redd counts on Bear Creek and Goat Creek had a low of 5 redds in 2000 and a high of 19 total redds in 2011, which is the highest count for the index area. The fifteen-year average from 1999 to 2013 is 10.3 redds for Bear and Goat Creeks. Bear Creek/Goat Creek spawning data collected from 1999 to 2006 is restricted in scope due to access and funding limitations, and surveys in 2007 were expanded to help identify total spawning area for bull trout in Bear and Goat Creeks. Although the survey area increased in 2007, the redd numbers did not increase substantially, especially in the lowermost survey reaches. In 2008 through 2013, the surveys were conducted twice in the spawning season and an additional 1.4 miles of Bear Creek was surveyed upstream of the comparable reach for a total of 3.2 miles. The highest bull trout redd counts for the survey sections on Bear/Goat Creeks have been recorded in Goat Creek, from the mouth to the waterfall, (RM 0 to RM 0.9), except in 2008, when more redds were documented in Bear Creek than in Goat Creek.



**Figure 3. Comparison of bull trout surveyed redds and index redds (comparable miles) documented from 1999 to 2013 on Bear Creek, including Goat Creek.**

The local bull trout population in the Lostine and Bear Creek surveys appears to be relatively stable for the survey period (1999-2013). Lostine River redd numbers decreased in 2013 and Bear Creek redd numbers were similar in 2012 and 2013 but lower than in 2011.

*Deer Creek*

In 2013, a survey was conducted on Deer Creek for approximately 0.8 miles of stream. The survey was located at the Deer Creek culvert at Rd. 8270 and upstream approximately 0.8 miles. The survey was conducted twice in 2010 through 2013 and no bull trout or redds were documented in 2013.

*Innaha River*

Sixty-eight total bull trout redds for 13.3 miles of survey, as compared to total of 19.4 miles of survey in previous years, were documented in 2013 on the Innaha River, from Indian Crossing to Blue Hole and upstream. This equates to 5.1 redds/mile in 2013 as compared to 2012 which had 12.4 redds/mile. In 2013, Indian Crossing to Blue Hole was surveyed once, late spawning season, and upstream areas were surveyed once, mid spawning season. The following data for the Innaha River compares consistently surveyed index areas on the Innaha River (17.5 miles) from 2001 to 2012 (Figure 4). The twelve-year average from 2001 to 2012 was 187 redds for the Innaha River system. Total redd numbers on the Innaha ranged from 101-262 within that period. The highest bull trout redd counts for the Innaha River from 2001 to 2012 was recorded in the Upper Innaha from Blue Hole to Cliff Creek, including Upper Innaha tributaries. In 2006 through 2008, there was a significant shift in documented spawning distribution from past years. In 2006 through 2008, the majority of the spawning bull trout were located from the Innaha falls to Indian Crossing, whereas, in past years the distribution had

higher numbers above the Blue Hole, which is located two miles upstream of Indian Crossing, as well as distribution of spawning bull trout in the upper tributary streams (South Fork and North Fork Innaha River).

In 2009, Cliff Creek, a resident bull trout tributary to South Fork Innaha, had the greatest total number of redds at 164 redds. But in 2010, 2011, and 2012 the redd count in this stream decreased to 45, 46, and 65, respectively. This lower count in Cliff Creek created a large decrease in the total count for the Innaha count, in recent years, during 2010 and 2011. Eighty percent of the total redds counted on the Innaha in 2009 were from Cliff Creek and in 2010 and 2011 this percentage decreased to 41 percent. In 2012, 136 redds, (68%) of the total redds documented on the Innaha, were fluvial and resident redds as compared to 42 redds (20%) in 2009. There is an upward trend in the Innaha River population in 2012 and downward trend in the Innaha River population in 2010 and 2011. If you subtract the resident Cliff Creek population from the Upper Innaha redd counts, there is a substantial downward trend from 2009 through 2011. Cliff Creek and several other Upper Innaha reaches were not surveyed in 2013.

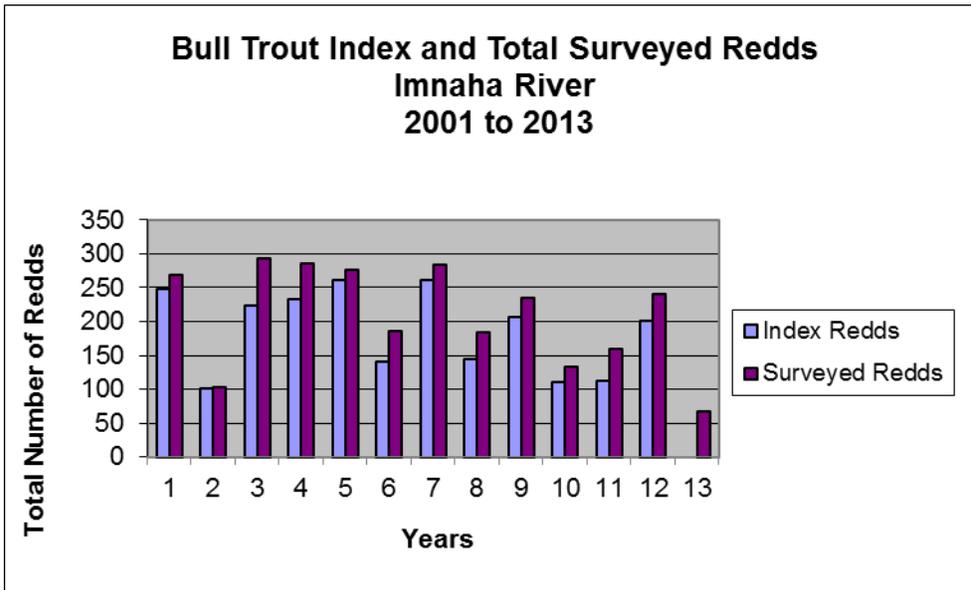
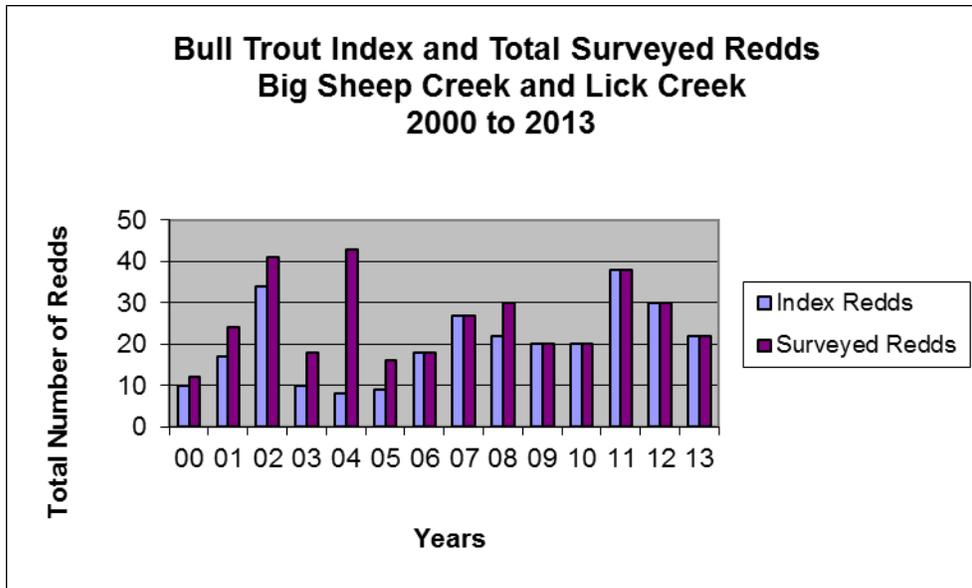


Figure 4. Comparison of bull trout surveyed redds and index redds (comparable miles) documented from 2001 to 2012 on the Innaha River. Index redds are not shown in 2013, since locations and miles are not comparable to past years.

*Big Sheep Creek/Lick Creek*

In 2013, twenty-two total bull trout redds for 7.6 miles of survey were documented for Big Sheep Creek and Lick Creek. These areas were surveyed twice in 2013, mid to late spawning season. The following data for Big Sheep Creek compares consistently surveyed index areas on Big Sheep and Lick Creek (7.6 miles) from 2000 to 2013 (Figure 5). The fourteen-year average from 2000 to 2013 was 20.4 redds for the Big Sheep system. Total redd numbers within the Big Sheep system ranged from 8-38 within that period; with the highest redd count of 38 in 2011. Redd surveys for bull trout in the Big Sheep system have been limited; in miles of survey, 7.6 to 14.1 miles from 2000 to 2013,

and in frequency. Surveys in 2000-2001 were conducted once late season, and in 2002, 2003, and 2005-2013, surveys were conducted twice, mid and late season, except for lower Lick Creek survey area that was monitored only once in 2010, due to lack of surveyors. In 2004, the survey was conducted once late season for Big Sheep and twice, mid and late season for Lick Creek.



**Figure 5. Comparison of bull trout surveyed redds and index redds (comparable miles) documented from 2000 to 2013 on Big Sheep and Lick Creeks.**

The local bull trout population in Big Sheep and Lick Creeks appear to be relatively stable for the survey period (2000-2013), with an increase in redd numbers in Big Sheep in 2011 and decreases in 2012 and 2013.

### Sizes of Bull Trout Redds

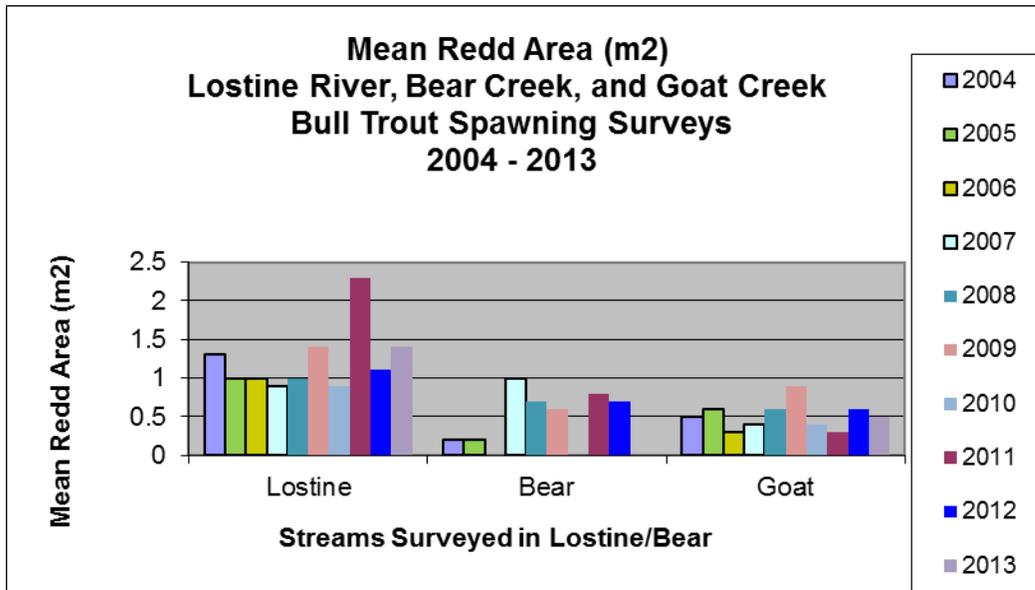
Bull trout redds were measured using the same methodology in 2004 through 2013 and comparison of bull trout redd sizes, by mean redd area (m<sup>2</sup>), for these years is illustrated below. There is a relationship between the size of a female salmonid and the size of the redd; large fish make large redds (Bjornn and Reiser 1991; P. Sankovich, Service, pers. comm., 2006; Howell and Sankovich 2012). In addition, length/frequency distributions of mature resident bull trout and mature fluvial bull trout do not overlap; therefore, there is little overlap in size of redds (P. Sankovich, pers. comm., 2006).

Howell and Sankovich (2012) report that redd surveys that include estimates of redd area and spawner lengths, could be used to sort migratory versus resident forms, which are useful attributes in assessing the status of populations. Bull trout redd size data is shown below for the Lostine/Bear and Imnaha systems comparing resident and migratory forms annually for these streams.

### *Lostine/Bear/Goat*

Figure 6 compares bull trout redd sizes for the Lostine River, Bear Creek, and Goat Creek in 2004-2013. Mean redd area ( $m^2$ ) ranged from 0.9-2.3 for the Lostine, 0.3-0.9 for Goat Creek, and 0.2-1.0 for Bear Creek. In 2011, the Lostine River had the largest mean redd area ( $m^2$ ) of 2.3 documented for this stream to date. The Bear Creek sample area was expanded in miles surveyed in 2007, in past years the redd area was smaller and more typical of resident redds, but in 2007 the redd area was larger and more typical of fluvial size bull trout redds. Brook trout are thought to be abundant in Bear Creek due to historical stocking in the headwater lakes. Bull trout redds were not observed or documented in Bear Creek within the index area in 2006 and a single redd was documented in 2013. In 2010, one bull trout redd was documented in Bear Creek. This single redd was much larger than typical, 4.8 mean redd area, and was found among Chinook redds. The survey crew stated that this redd or two redds were superimposed among Chinook redds. It was reported as one fluvial bull trout redd. The Lostine River contains brook trout, but for most survey years, brook trout spawning with bull trout was not observed. This changed in 2008 and more recently in 2012 where they appeared to be spawning together and hybrid fish were observed. Mary Edwards, fisheries biologist with the NPT, observed bull trout and brook trout spawning near the acclimation facility as early as late July 2010 while underwater snorkeling. Bull trout surveys conducted in September-October 2010 did not confirm any bull trout redds in this location. Mary Edwards photographed bull trout underwater during spawning timing and documented several phenotypic hybrid type bull trout. To date, reporting of genetic sample data for bull trout/brook trout in the Lostine and in Bear Creek has not occurred. Future genetic sampling in the Lostine will need to be conducted to confirm what percentage of the bull trout in the population are pure and which percentage are brook trout/bull trout hybrids.

Goat Creek is limited in available spawning habitat, but it appears to be the best available spawning habitat for fluvial fish in the Bear/Goat Creek system during drought years. Several miles of upper Bear Creek were dry due to low snowpack and summer drought conditions. It appears from the data in 2004-2013 that redds in Goat Creek were a combination of resident and fluvial fish, and in 2011, 2012, and 2013 dominated by more resident size redds. Two bull trout that were observed occupying one redd on Goat Creek in 2004 were less than 12 inches (<300 ml) and were on a redd that had an area of  $0.3 m^2$ ; therefore, this size of redd is resident, due to the fish size. The redd sizes in both the Lostine River and Bear Creek in 2011 and 2012 were dominated by fluvial size fish. More years of data collection on these streams should help us better understand the resident and fluvial life histories of bull trout in this area, relative to fish and redd sizes.



**Figure 6. Comparison of bull trout redd sizes [mean redd area (m<sup>2</sup>)] for Lostine River, Bear, and Goat Creeks sampled during bull trout spawning surveys, 2004-2013.**

Footnote: Bull trout redds were not observed in the index area of Bear Creek in 2006 and one extremely large fluvial redd was observed in 2010 (not included on graph, considered an outlier).

### *Imnaha and Big Sheep*

Figure 7 compares bull trout redd sizes for the sampled streams in the Imnaha system in years 2004-2013. Mean redd area (m<sup>2</sup>) ranged from 0.3-1.0 for Lick Creek, 0.1-0.8 for Big Sheep, 0.4-2.6 for Middle Imnaha, 0.8-1.8 for Upper Imnaha, 0.3-1.2 for N.F. Imnaha, 0.4-1.3 for S.F. Imnaha, and 0.1-0.4 for Cliff Creek. Middle Imnaha had only two redds observed in 2005 and three redds in 2004. In 2006-2008, Middle Imnaha had a large distribution of redds in this survey area, (sample size was 18 for 2006 and 2007 and 28 for 2008, compared to past years. Middle Imnaha in 2004 and 2006 had primarily fluvial size redds with resident redds documented in 2005 and a mix of fluvial and resident redds in 2007 and 2008. As shown in Figure 7, very large redds produced by large fluvial bull trout were documented on the Middle Imnaha in 2008. Redd numbers decreased in the Middle Imnaha in 2009 and 2010, to two redds for 2009 and four for 2010; and increased to nine redds in 2011 with a primarily fluvial component. Redds decreased to four in 2012 and increased to six in the Middle Imnaha. Several redds documented in the Middle Imnaha were noted as a complex in 2013 and only two redds were measured.

Overlap of bull trout and chinook redds in Lick Creek and the Imnaha River may make it difficult to differentiate between the two species spawning nests. 2004-2008 data indicate that Lick Creek has a combination of resident and fluvial redds with resident redds dominant in the six of the nine sample years (resident redds dominant in 2004, 2007-2010, 2012, and fluvial redds dominant in 2005, 2006, and 2013). In 2011 however, the data from Lick Creek indicate that fluvial and resident redd sizes are comparable with the fluvial redds smaller in comparison to previous years. By comparison, Big Sheep Creek was dominated by resident redds in all years sampled, except in 2009 with only one fluvial size and one resident redd.

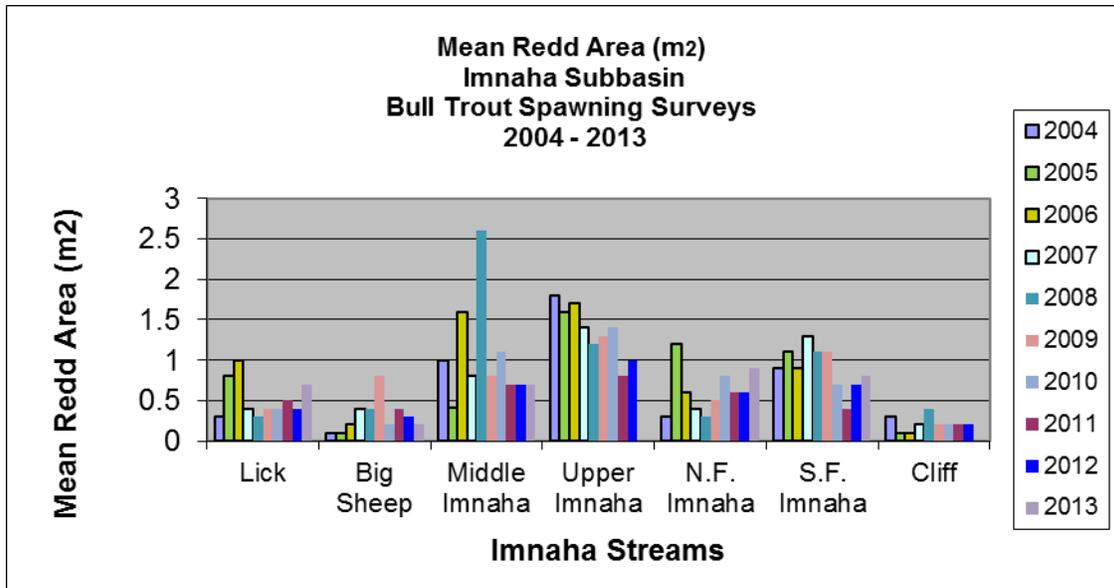


Figure 7. Comparison of bull trout redd sizes [mean redd area (m<sup>2</sup>)] for sampled streams in the Imnaha Subbasin, 2004-2013. (In 2013, no redd size data for Upper Imnaha and Cliff Creek. NF. Imnaha missing upper reach data in 2013).

In 2012, a large fluvial adult was holding downstream of the Wallowa Valley Improvement Canal (WVIC) diversion which had dewatered a portion of stream and limited available spawning and rearing habitat in this survey reach. One fluvial size redd was documented in Big Sheep during 2012). Upper Imnaha and South Fork Imnaha contained a majority of fluvial redds in 2012 with fluvial redds smaller in 2011. The Upper Imnaha was largely not surveyed in 2013 and SF Imnaha data was largely fluvial and sizes similar to 2012. North Fork Imnaha appears to have had more resident redds in 2004, 2007, and 2008, more fluvial size redds in 2005 and 2010, and a mix of fluvial and resident in 2006, 2009, 2011, and 2012. North Fork Imnaha was not completely surveyed in 2013, but data collected, which did not include the upper reach, had a dominant fluvial component.

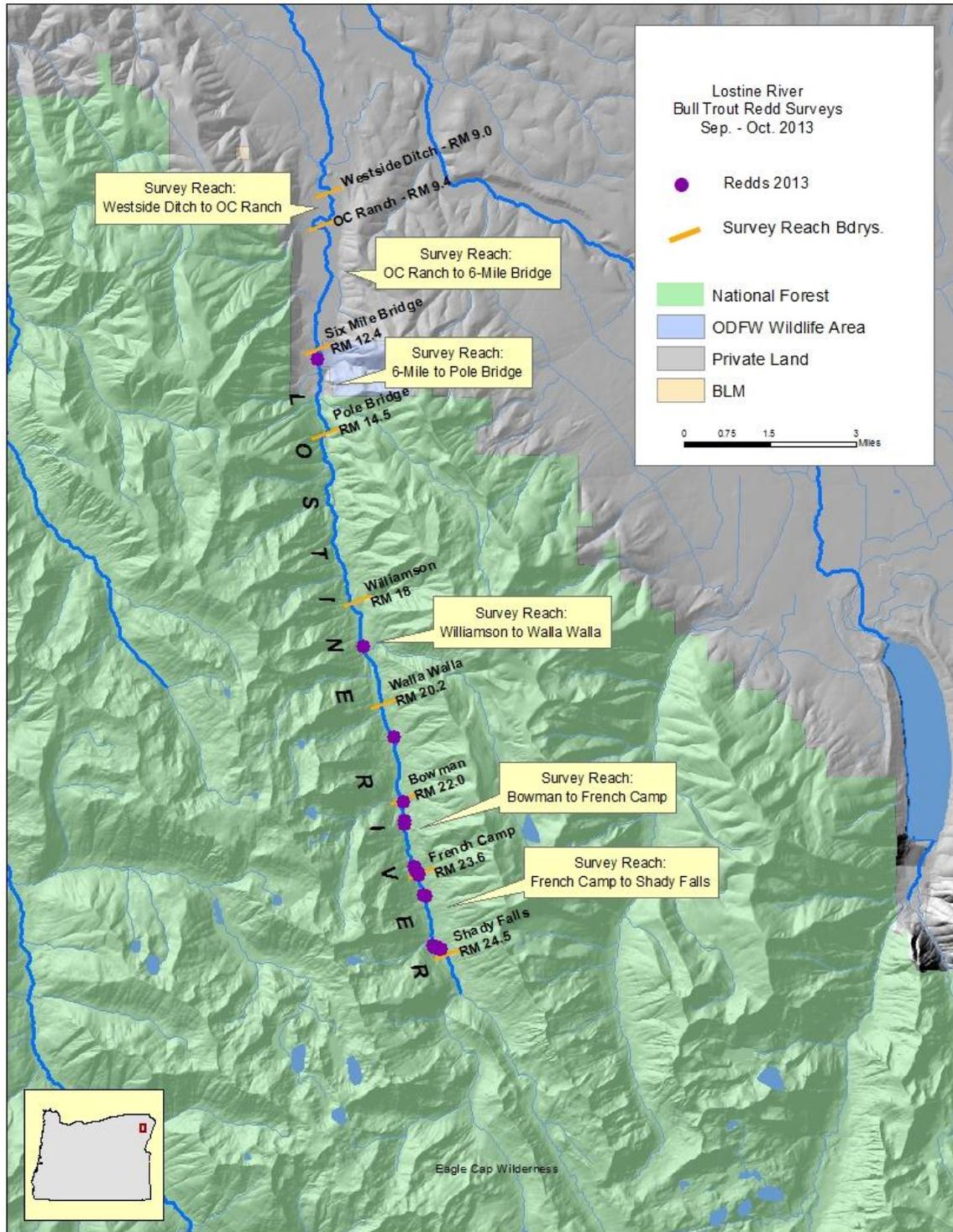
Cliff Creek is a known resident system with a waterfall near the mouth. The survey on Cliff Creek in 2004 included a large fluvial size redd near the confluence with the South Fork Imnaha and therefore the mean redd size was higher than in 2005 and 2006, when no fluvial redds were observed in Cliff Creek below the waterfall. In 2010, two resident size redds were recorded on Cliff Creek below the falls. In 2011 and 2012, surveyors reported several redds in progress on Cliff Creek. Cliff Creek had a mean redd size of 0.2 m<sup>2</sup> in 2012. Mean redd size was greater in 2004 (0.3 m<sup>2</sup>) as a result of a fluvial redd near the mouth and potential superimposition of redds above the barrier. The 2007 mean redd size included a few larger redds below the falls and near the mouth, which are presumed to be fluvial redds. The 2008 mean redd size was greatest above the falls, likely due to superimpositions of redds above the barrier. In 2008, not all of the redds were measured above the falls (31 of 52 total redds, 59.6%) and all redds were measured below the falls (1 of 1, 100%). The sample size in 2008 was large enough to get a good estimate of sizes of redds above and below the falls and at the same time completing the survey in a reasonable amount of time, while redds were still visible during daylight.

Cliff Creek was not surveyed in 2013. Refer to Tables 4a and 4b in Appendix B for additional information on 2013 bull trout redd characteristics.

### **Bull Trout Redd Distribution on the Lostine River**

The bull trout spawning surveys on the Lostine River in years 2005 through 2013 included collection of UTM coordinate data on the spatial distribution of the bull trout redds observed. Bull trout redds on the Lostine River, as well as in other surveyed streams, were often arranged in complexes (several redds located in close proximity to each other). Redds were primarily located in the French Camp to Shady Falls and Bowman to French Camp reaches along the Lostine River in 2005, 2006; 2007, 2010, 2011, 2012, and 2013 and several miles (approximately 10 miles) downstream of these reaches at the Six Mile Bridge to Pole Bridge reach. High site fidelity is documented by the overlapping of bull trout redds from 2005-2013, especially in the upper reaches of the Lostine River. In 2013, redd distribution was spread over the majority of the survey area but had the highest numbers in the upper reaches, French Camp to Shady and Bowman to French Camp. In 2005-2007, and 2010-2013 few redds, 0-3 were documented in the Williamson to Walla Walla Reach. In 2008 and 2009, densities of bull trout redds were higher in the Williamson to Walla Walla Reach location where several redds, 13 and 8, respectively were documented during these years (Sausen 2013 and Figure 8). In 2013, 27 redds (67.5%) were observed in the French Camp to Shady reach, 10 redds (25%) in the Bowman to French Camp reach, one redd (2.5 %) in the Williamson to Walla Walla reach, one redd (2.5 %) in the Six Mile Bridge to Pole Bridge Reach, and one redd (2.5%) in the OC Ranch to Lundquist Bridge reach, with redds in this reach typically found, upstream and slightly downstream of the acclimation facility (Figure 8).

Sections of the Lostine River were not surveyed due to; insufficient spawning gravels, boulder and cobble being the dominant substrate, and difficult access. These non-surveyed areas included; Bowman to Walla Walla, for approximately 2.2 miles, and Williamson to Pole Bridge, approximately 3.5 miles in length. Downstream of Westside Ditch on the Lostine River, for approximately 9 miles, is private property that is not surveyed due to lack of bull trout spawning gravels, higher stream temperatures, and low flows associated with irrigation withdrawal.



**Figure 8. Map of the Lostine River showing bull trout redd survey reaches and bull trout redd locations in 2013.**

## DISCUSSION

### *Survey Challenges in 2013*

The bull trout spawning surveys in October of 2013 were a challenge to complete as a result of federal employees put on furlough for 16 days during early October. This affected the author, coordinating and conducting the surveys, and others from the federal government, including employees from the USFS, which were planning to assist with surveys. The Nez Perce Tribe, Joseph Field Office was invaluable in their help with conducting and coordination of the surveys during the furlough. Poor weather conditions and the furlough resulted in fewer personnel available to complete the usual 17.5 miles of comparable stream and 19.5 total miles for the Upper Imnaha surveys. In 2013, only 13.4 miles were surveyed in the Upper Imnaha River system. In 2013, Cliff Creek and several Upper Imnaha mainstem gorge reaches were not surveyed. In 2013, North Fork Imnaha River had less survey miles conducted upstream of the Middle Fork Imnaha confluence. In 2013, the SF Imnaha River was not surveyed in the lower reach, from NF Imnaha River confluence to Soldier Creek. In 2013, the SF Imnaha River survey had more miles surveyed than in previous years, due to confusion on survey protocol for this reach. The survey protocol for this stream is for the surveyors to take out and put back in in known areas, due to poor spawning habitat conditions, and since they surveyed through these sections, more miles were surveyed. The Middle Imnaha River reach, from Blue Hole to Indian Crossing, was surveyed only once in 2013 due to changes in the schedule for the Upper Imnaha survey. The data on the Upper Imnaha River is not completely comparable to previous years, due to these survey challenges.

### *Future Needs*

Bull trout redd monitoring in the Wallowa Mountains was accomplished from 1999 to 2013 using skilled bull trout redd surveyors (a mix of experienced paired with inexperienced). Skilled surveyors will continue to be needed for future redd surveys. Several studies (Howell and Sankovich 2012; Dunham et al. 2001) point out the importance of using skilled surveyors to reduce measurement error. Training and retaining skilled surveyors to conduct these surveys has been a challenge and will likely remain a challenge into the future.

In the future, we recommend an exploratory survey be conducted in the headwaters of Bear Creek to obtain some baseline information on locations and densities for resident bull trout redds in this upper reach. At the same time, observations of densities of brook trout and any potential concerns for interbreeding could be initially assessed.

Deer Creek had an exploratory survey conducted in 2009. No redds or bull trout were located in 2009. The surveyors recommended continuing this survey in 2010 upstream of the Rd 8920 culvert for approximately one mile. The recommendation was to survey this stream perhaps not every year, but often enough to get some trend information. In 2010, 2011, 2012, and 2013 experimental surveys were conducted twice from the Rd. 8920 culvert to 0.8 miles upstream and proved to be worth the walk in 2011. Twelve resident-size redds and thirty-nine bull trout in 2010 and nine resident-size redds and twenty-three bull trout in 2011 were reported in this Deer Creek survey reach. Only one bull trout

redd was documented on this survey in 2012 and none in 2013, most likely due to low flows. Recommend that this reach of Deer Creek be surveyed in future years by the USFS, dependent on flows and available surveyors and funding. It is not a priority to survey as part of this effort due to difficulty of access below the culvert and lack of sufficient flows above the culvert in recent years.

Currently, there is no bull trout redd data available for the mainstem Minam River (and tributaries, excluding the Little Minam River). The author recommends future exploratory redd surveys in the Minam River and upper tributaries to obtain some baseline information on locations and densities of redds in this system.

We also recommend continued surveys of bull trout in the Oregon side of the Wenaha with the continued help of ODFW chinook surveyors and potentially a second, later (October) survey; if funds, surveyors, access and weather make this feasible.

The East Fork Wallowa River, upstream of Wallowa Lake, was surveyed by the author in 2011 for 0.8 miles of stream, to assist PacifiCorp Energy with bull trout spawning data collection as part of the relicense for Wallowa Falls Hydroelectric Project. No redds were located during this survey. PacifiCorp had surveyed the East Fork Wallowa River previously in 2010 and found two fluvial bull trout paired up on one redd (PacifiCorp 2013). Recommend that PacifiCorp continue to survey this stream in the future, as part of data for the new license and to further understand the bull trout spawning population upstream of Wallowa Lake.

Overall, future needs for this project include continued funding and support from all involved parties (Service, ODFW, NPT, USFS, private land owners, volunteers, and others) for conducting and reporting bull trout redd counts in the Wallowa Mountains. OWEB Phase II Wallowa Mountains Bull Trout Redd Monitoring (2010-2011) was submitted for funding in October 2009 and received funding for 2010, 2011, and funding was extended into 2012. A Phase III Wallowa Mountains Bull Trout Redd Monitoring (2012-2013) was submitted for OWEB funding in October 2011 and was funded. This Phase III OWEB funding supports these surveys in 2012, 2013, and we have received permission for an extension into 2014.

At least 15 years (consecutive years) of bull trout redd data are needed for trend data (Maxwell 1999) and for bull trout recovery data needs. Caution must be exercised in using the above bull trout spawning data for adult population trends until at least 15 years of data have been collected. However, dependent on the stream we have met this goal or we are very close to this goal! To date, we have comparable bull trout redd data; 15 years completed on Lostine River and Bear Creek; 14 years completed on Big Sheep Creek; and 13 years completed on the Imnaha River.

## CONCLUSION

The local bull trout populations were relatively stable for the survey period (1999-2013) and there was an increase in redd numbers on Bear/Goat Creek in 2013 and a decrease in redd numbers on the Lostine, Big Sheep, and Imnaha in 2013 compared to 2012. The Upper Imnaha has less stream miles surveyed in 2013 than in past years, nevertheless, the redds per mile for this stream system were fewer in 2013, compared to past years.

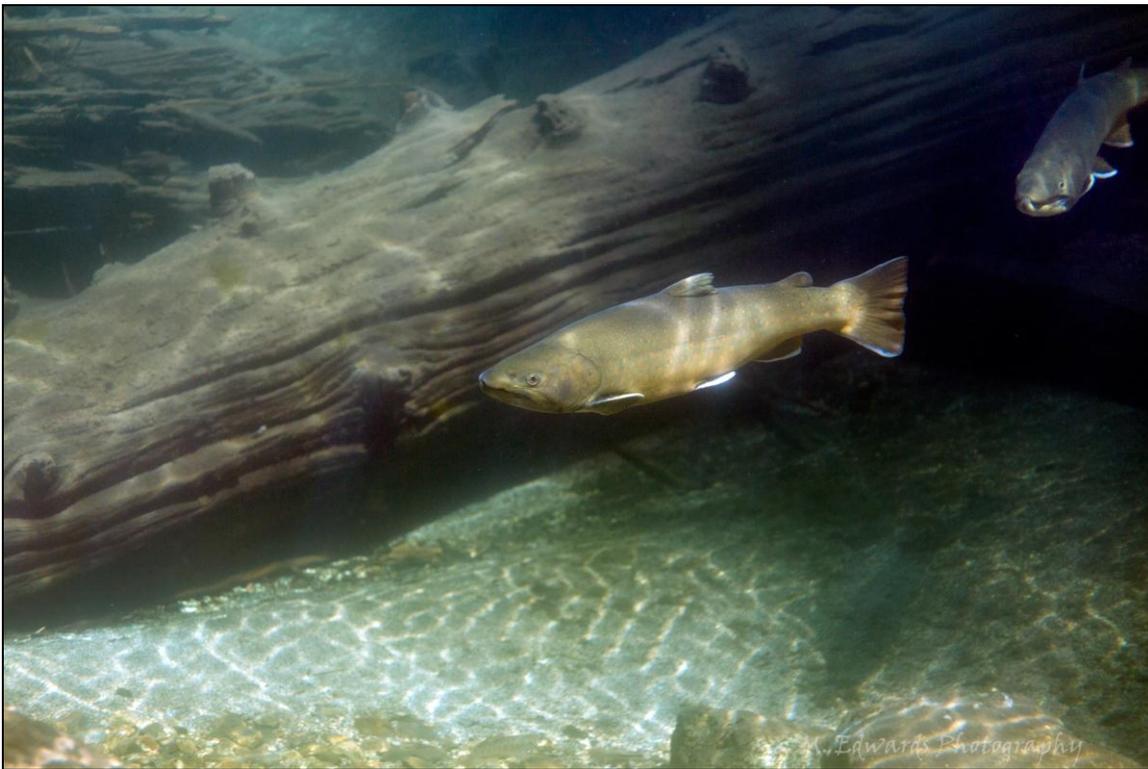
The Imnaha population is one of the strongholds within the Imnaha Subbasin as it has multiple age classes, contains fluvial fish, has an anadromous prey base and connectivity with the Snake River, and bull trout are distributed throughout the habitat. Primary spawning activity on the Imnaha River has been documented to occur in the headwaters which lie within wilderness. Both fluvial and resident life history forms are present. The Imnaha River is rated at low risk of extinction, and Big Sheep is rated “of special concern” (Buchanan et al. 1997). The Recovery goals are to keep the local populations viable within this entire Imnaha core area and allow the local populations to be connected (within themselves) and to one another. Lick Creek has no barriers to passage and has a functioning resident and fluvial population. Big Sheep and Little Sheep have some issues with flows, fish passage, and connectivity and loss of fish due to WVIC; as well as fish passage concerns associated with two USFS culverts on Little Sheep Creek. The canal system (WVIC) in Big Sheep and Little Sheep watersheds (within the Imnaha bull trout core area) contributes to the loss of bull trout out of this core area and into the Grande Ronde and most likely to their loss, due to diversions downstream (Whitesel and Hudson, pers.comm 2013).

The Lostine River is considered a moderately-strong population within the Grande Ronde Sub basin. Our results are consistent with Buchanan et al. (1997). Lostine River and Bear Creek contain brook trout and the degree of hybridization is unknown; although 2010 and 2012 photos by Mary Edwards (NPT) and 2012 spawning data suggests bull trout pairing with brook trout and hybridization much more likely than past information has shown. The Lostine River had a decrease in redd counts in 2013 (40 compared to 52 in 2012). Many of the spawning fish observed in 2012 appeared to have brook trout hybrid phenotypic characteristics, which is alarming. This was not documented in 2013, but no underwater photos were taken during this time. Limited redd count data is available on Bear Creek and this portion of the Lostine River/Bear Creek local population has been listed as a special concern by Ratliff and Howell (1992). Future genetic analysis of bull trout and brook trout is critically needed, especially in the Lostine River to help determine the significance of this threat.

Dehaan et al. (2009) studied hybridization between bull trout and brook trout in the Malheur River system and suggest that relative abundance of brook trout and habitat quality are important factors to consider when evaluating the threat of hybridization to bull trout populations. The Lostine River, especially in the spawning reaches has good habitat quality. So, hopefully this overall good quality spawning habitat in the upper Lostine River will benefit the bull trout and help minimize the odds of hybridization with brook trout in the long-term.



**Underwater photo of a pair of fish on the Lostine River, 2012**  
**In front, appears to be a bull trout/brook trout hybrid and in back appears to be a pure bull trout**  
**Photo taken by Mary Edwards Photography for the FWS LFO**



**Underwater photo of a pair of bull trout on the Lostine River, 2012**  
**Photo taken by Mary Edwards Photography for the FWS LFO**

## REFERENCES

- Al-Chokhachy, R., P. Budy, and H. Schaller. 2005. Understanding the significance of redd Counts: a comparison between two methods for estimating the abundance of and monitoring bull trout populations. *North American Journal of Fisheries Management* 25:1505-1512.
- Bellerud, B.L., S. Gunkel, A.R. Hemmingsen, D.V. Buchanan, and P.J. Howell. 1997. Bull Trout Life History, Genetics, Habitat Needs, and Limiting Factors in Central and Northeast Oregon. 1996 Annual Report. Project Number 95-54. Bonneville Power Administration, Portland, OR.
- Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. *American Fisheries Society Special Publications* 19:139-179.
- Bonar, S.A., M. Divens, and B. Bolding. 1997. Methods for sampling the distribution and abundance of bull trout/Dolly Varden. Washington Department of Fish and Wildlife Research Report No. RAD97-05. Olympia, WA. 48 p.
- Buchanan, D.V., M.L. Hanson, and R.M. Hooton. 1997. Status of Oregon's Bull Trout. Oregon Department of Fish and Wildlife, Portland, Oregon.
- DeHaan, Patrick, W., L.T. Schwabe, and W. R. Ardren. 2010. Spatial Patterns of Hybridization between Bull Trout, *Salvelinus confluentus*, and Brook Trout, *Salvelinus fontinalis* in an Oregon Stream Network. *Conservation Genetics*. 11 (3): 935-949.
- Dunham, J., B. Rieman, and K. Davis. 2001. Sources and Magnitude of Sampling Error in Redd Counts for Bull Trout. *North American Journal of Fisheries Management* 21:343-352.
- Ecovista. 2004. Salmon Subbasin Management Plan. For the Nez Perce Tribe Watershed Division and Shoshone Bannock Tribe as part of Northwest Power and Conservation Council's Fish and Wildlife Program.
- Ecovista. 2004a. Imnaha Subbasin Plan. Plan includes Assessment, Inventory, and Management Plan. For Nez Perce Tribe as part of Northwest Power and Conservation Council's Fish and Wildlife Program.
- Howell, P. J. and P. M. Sankovich. 2012. An evaluation of redd counts as a measure of bull trout population size and trend. *North American Journal of Fisheries Management*. 32:1, 1-13.
- Krueger, C. C., and D. J. Decker. 1993. The process of fisheries management. Pages 33-54 in C. C. Kohler and W. A. Hubert, editors. *Inland fisheries management in North America*. American Fisheries Society, Bethesda, Maryland.
- Maxwell, B.A. 1999. A power analysis on the monitoring of bull trout stocks using redd counts. *North American Journal of Fisheries Management*. 19: 860-866.

- Nowak, C. M. and 25 co-authoring agencies. 2004. Grande Ronde Subbasin Plan. Prepared for the Northwest Power and Conservation Council.
- PacifiCorp Energy. 2013. Threatened and Endangered Species Annual Report. T & E Permit # 154573-1. East Fork Willowa River – 2013. Jeremiah Doyle, PacifiCorp Energy, Portland, OR. November 2013.
- Ratliff, D.E. and P.J. Howell. 1992. The status of bull trout populations in Oregon. Pages 10 to 17 In: P.J. Howell and D.V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.
- Rieman, B.E. and D.L. Myers 1997. Use of redd counts to detect trends in bull trout (*Salvelinus confluentus*) populations. *Conservation Biology* 11:1015-1018.
- Sankovich, P. m., S.L. Gunkel, A.R. Hemmingsen, I.A. Tattam, and P.J. Howell. 2003. Migratory patterns, structure, abundance, and status of bull trout populations from subbasins in the Columbia Plateau. 2002 Annual Report. Project 199405400. Bonneville Power Administration, Portland, OR.
- Sausen, G. 2013. 2012 Bull Trout Redd Monitoring in the Willowa Mountains. Unpublished report. U.S. Fish and Wildlife Service, La Grande Field Office, La Grande, Oregon. 50 pp.
- Starcevich, S.J., S. Jacobs, and P.J. Howell. 2005. Migratory Patterns, Structure, Abundance, and Status of Bull Trout Populations from Subbasins in the Columbia Plateau and Blue Mountain Provinces. 2004 Annual Report. Project 199405400. Bonneville Power Administration, Portland, OR.
- Taper, M.L., D.F. Staples, and B.B. Shepard. 2005. Observer Error Structure in Bull Trout Redd Counts in Montana Stream: Implications for Inference on True Redd Numbers. *North American Journal of Fisheries Management*, in-review. Presented as a Power Point Presentation at ScCS meeting in Glacier Park Montana, September 7-9, 2005.
- U.S. Department of the Interior, Fish and Wildlife Service. 2002. Chapter 11, Grande Ronde River Recovery Unit, Oregon and Washington and Chapter 12, Imnaha-Snake Rivers Recovery Unit. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.
- U.S. Fish and Wildlife Service. 1999 – 2012. Unpublished bull trout spawning survey data on file at La Grande Field Office, U.S. Fish and Wildlife Service, La Grande, Oregon.

### **Personal Communication**

- Knox, B. 2005. Communication between Bill Knox and Gretchen Sausen concerning timing of bull trout spawning in August on the Imnaha River, observed during chinook surveys. Oregon Department of Fish and Wildlife, Enterprise, Oregon.
- Sankovich, P. 2006. Communication between Paul Sankovich and Gretchen Sausen concerning size of bull trout redds and fish size. La Grande Field Office, La Grande, OR.
- Smith, B. 2005. Communication between Brad Smith and Gretchen Sausen concerning timing of bull trout spawning in August through October on the Imnaha River, observed during chinook and bull trout surveys. Oregon Department of Fish and Wildlife, Enterprise, Oregon.
- Whitesel, T. and Hudson, M. 2013. Notes from February 4, 2013 meeting with FWS, ODFW, Freshwater Trust, NMFS, and Water Resources discussing FWS Research - Preliminary results on bull trout research in Big Sheep Watershed and connectivity, fish passage, and flow concerns associated with the WVIC in the watershed. Meeting located via conference call with FWS Research Vancouver Office and other attendees present at FWS, La Grande Field Office, La Grande, OR.

## APPENDIX A – PHOTOS TAKEN AT SURVEY LOCATIONS



**Upper Imnaha survey crew in 2012**  
**Front row; Lynne Price (consultant)**  
**Middle row; author on left, and to her right; Montana Pagano (NPT)**  
**Back row; Eric Shoudel (NPT), Carlos Camacho (NPT),**  
**Caitlyn Ecklund (ODFW); Ken Bronec (past consultant)**  
**Photo by Morgan Jenkins**



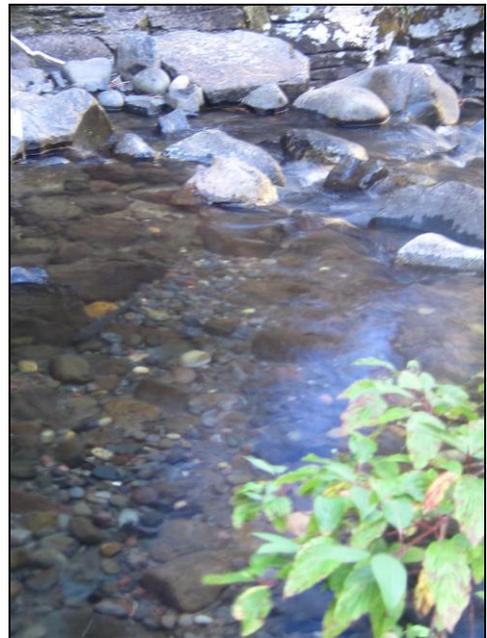
**Bull Trout near active spawning area on the Lostine River, 2013.**  
**Photo by Sue Brady, AP.**



**Ian Wilson (Nez Perce Tribe) and Kyle Bratcher (ODFW) getting ready to survey Goat Creek, 2013**



**Ian Wilson at Goat Creek Falls, 2013**



**Bull trout redds on Goat Creek, 2013**



**Downstream of Wallowa Valley Improvement Canal Diversion on Big Sheep, September 2013, photo by Lynne Price**



**Underwater view of Lostine River with bull trout male, Photo by Sue Brady of AP, 2013**



**APPENDIX B – TABLES**

**Table 1 – Bull Trout Spawning Surveys and Survey Frequencies for selected Grande Ronde River and Imnaha River Streams, 1999-2013**

<b>Stream</b>	<b>Year</b>	<b>Dates</b>	<b>Survey Frequency</b>	<b>Total Redds</b>	<b>Total Miles</b>	<b>Total Redds/Mile</b>
Lostine River	1999	9/16,9/23,10/12	3 Times	39	9.75	4.0
	2000	9/21,9/28,10/12	3 Times	38	13.74	2.8
	2001	9/17-18,10/11-12	Twice	43	14.4	3.0
	2002	9/23-24,10/7-8	Twice	22	10.7	2.1
	2003	9/23-24,10/6-7	Twice	71	10.5	6.8
	2004	9/14-15,10/5-6	Twice	26	8.5	3.1
	2005	9/15, 9/21-22, 10/3-10/4	Twice, and 3 Times in Turkey Flat and Shady Campground areas	32	10.5	3.0
	2006	9/14, 9/20-21, 10/2-10/4	Twice, and 3 Times in Turkey Flat and Shady Campground areas	45	10.5	4.3
	2007	9/19-9/20, 10/3-10/4	Twice	47	10.1	4.7
	2008	9/17, 10/1-10/2, 10/9-10/10	Twice, and 3 Times in Turkey Flat and Shady Campground	53	10.1	5.3
	2009	9/11, 9/23-24, 10/7-10/8	Twice, and 3 Times in French Camp to Bowman	41	10.1	5.2
	2010	9/22, 10/6, 10/7	Twice	36	10.1	3.6
	2011	9/21-9/22, Oct 5-6	Twice	22	10.1	2.2
2012	9/17, 9/19, Oct 3-4	Twice	52	10.1	5.2	
2013	9/16, 9/18, 9/24, Oct 7-8	Twice	28	10.1	2.8	
Bear Creek	1999	9/7,9/22	Once Bear, Twice Goat	6	1.8	3.3
(including Goat Cr)	2000	10/18	Once	5	1.8	2.8
	2001	10/16	Once	12	2.3	5.2
	2002	10/15	Once	7	2.3	3.0
	2003	10/16	Once	17	3.8	4.5
	2004	10/1	Once	11	2.3	4.8

	2005	10/11	Once	16	2.8	5.7
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**Table 1 (Continued)– Bull Trout Spawning Surveys and Survey Frequencies for Selected Grande Ronde River and Imnaha River Streams, 1999-2013**

Stream	Year	Dates	Survey Frequency	Total Redds	Total Miles	Total Redds/Mile
Bear Creek	2006	10/10	Once	9	1.9	4.7
	2007	9/17, 10/9	Twice, Exploratory (more reaches than past years)	11	7.2	1.5
	2008	9/30, 10/7	Twice	20	3.2	6.3
	2009	9/22, 10/13	Twice	8	3.2	2.5
	2010	9/16, 10/13	Twice	7	3.2	2.2
	2011	9/20, 10/11	Twice	19	3.2	5.9
	2012	9/20, 10/10	Twice	15	3.2	4.7
	2013	9/19, 10/10	Twice	16	3.2	5.0
Deer Creek	2009	10/14	Once	0	1.5	0
	2010	9/17, 10/4	Twice	12	0.8	15
	2011	9/19, 10/12	Twice	9	0.8	11.3
	2012	9/21, 10/12	Twice	1	0.8	1.0
	2013	9/23, 10/15	Twice	0	0.8	0
EF Wallowa	2011	10/9	Once	0	0.8	0
Imnaha River	1999	9/20,28,10/11	Middle = Thrice	14	15.2	0.9
(excluding Big Sheep)	2000	9/20,22,25,26,27,10/11	Upper = Once, Middle = Twice	92	29.1	3.2
	2001	9/20,21,10/1,2,3,9,10	Upper = Once, Middle = Twice	291	31.3	9.3
	2002	9/25,26,9/30,10/1-2,10/10-11	Upper = Once, Middle = Twice	113	30.5	3.7
	2003	9/25-26,9/29-30,10/1,10/8-9	Upper = Once, Middle = Twice	291	31.3	9.3
	2004	9/15-9/16,9-27,28,29,10/7-8	Upper = Once, Middle = Twice	292	31.6	9.2
Middle=Blue Hole to Indian	2005	9/26-28, 10/7	Once Upper and Middle	276	19.4	14.2
2005-2010	2006	9/25-28,10/5	Upper = Once, Middle = Twice	186	19.4	9.6
	2007	9/24-27, 10/5	Upper = Once, Middle = Twice	284	19.4	14.6

	2008	9/22-25, 10/6	Upper = Once, Middle = Twice	190	19.4	9.8
	2009	9/28-30, 10/1, 10/9	Upper = Once, Middle = Twice	235	19.4	12.1

**Table 1 (Continued)– Bull Trout Spawning Surveys and Survey Frequencies for Selected Grande Ronde River and Imnaha River Streams, 1999-2013**

Stream	Year	Dates	Survey Frequency	Total Redds	Total Miles	Total Redds/Mile
Imnaha River	2010	9/27-29, 9/30, 10/8	Upper = Once, Middle = Twice	133	19.4	6.9
	2011	9/26-28, 9/29, 10/7	Upper = Once, Middle = Twice	160	19.4	8.2
	2012	9/24-26, 9/27, 10/11	Upper = Once, Middle = Twice	240	19.4	12.4
	2013	10/1, 10/2, 10/3, 10/11	Once Upper and Middle	68	13.3	5.1
	1999	9/21,29,30,10/18,19	Once	20	14.2	1.4
Big Sheep [(including Lick, and Salt). Salt Cr. not surveyed post 2003, and Upper Big Sheep exploratory in 2004].	2000	10/13-10/16	Once	12	8.4	1.4
	2001	10/14,10/17	Once	24	8.4	2.9
	2002	9/30,10/1,10/14-15	Twice	41	9.3	4.4
	2003	9/22,10/14	Twice	18	9.3	1.9
	2004	9/20,9/28-9/29,9/30,10/4,10/19	Once Big Sheep, Twice Lick	43	14.1	3.0
	2005	9/19-20, 10/6	Twice	16	8.6	1.9
	2006	9/19, 10/4	Twice	18	7.6	2.4
	2007	9/21, 10/2	Twice	27	8.6	3.1
	2008	9/29, 10/1, 10/10	Twice except once exploratory Quartz creek tributary to Lick and once Lick Creek 39 Rd to meadow	30	9.1	3.3
	2009	9/16, 10/6	Twice	20	7.6	2.6
2010	9/15, 10/5	Twice except once Lick Creek 39 Rd. to Meadow	20	7.6	2.6	
2011	9/15. 10/4	Twice	38	7.6	5.0	

	2012	9/11, 9/18, 10/9	Twice	30	7.6	3.9
	2013	9/10, 9/17, 10/9	Twice	22	7.6	2.9

**Table 2a–Bull Trout Spawning Surveys for the Lostine River Comparing 1999 to 2013 Surveys**

Stream	Survey Years														
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	<b>Redds Surveyed</b>														
<b>Reaches (Miles Surveyed)</b>															
Lundquist Bridge to OC Ranch (2.8)	1	0	2	3	3	5	0	5	4	5	0	1	1	1	1
Williamson to Walla Walla (2.2 miles)	0	2	1	0	6	1	3	0	2	13	8	2	0	3	1
Bowman to French Camp (1.6 miles)	18	19	16	11	18	3	9	9	5	12	7	6	3	18	10
French Camp to Shady Falls (1.5)	20	12.0	23	8	43	17	12	22	31	20	23	21	15	28	27
<b>Lostine Total Redds (Comparable Reaches)</b>	<b>39</b>	<b>33</b>	<b>42</b>	<b>22</b>	<b>70</b>	<b>26</b>	<b>24</b>	<b>36</b>	<b>42</b>	<b>50</b>	<b>38</b>	<b>30</b>	<b>19</b>	<b>50</b>	<b>39</b>
<b>Lostine Total Miles of Comparable Stream</b>	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
<b>Lostine Redds/Mile Comparable Stream</b>	<b>4.6</b>	<b>3.9</b>	<b>4.9</b>	<b>2.6</b>	<b>8.2</b>	<b>3.1</b>	<b>2.8</b>	<b>4.2</b>	<b>5.2</b>	<b>6.2</b>	<b>4.7</b>	<b>3.7</b>	<b>2.3</b>	<b>6.2</b>	<b>4.8</b>
<b>Total Redds For Year</b>	39	38.0	43.0	22.0	71.0	26.0	32.0	45	47	53	41	36	22	52	40
<b>Total Miles Surveyed For Year</b>	9.8	13.7	14.4	10.7	10.5	8.5	10.5	10.5	10.1	10.1	10.1	10.1	10.1	10.1	10.1
<b>Total Redds/Mile For Year</b>	4.0	2.8	3.0	2.1	6.8	3.1	3.0	4.3	4.6	5.2	4.1	3.6	2.2	5.2	4.0

Notes: The Lostine was surveyed three times in 1999 and 2000. During survey years 2001-2013, the Lostine was surveyed twice (except Shady Campground and Turkey Flat areas were surveyed three times in 2005, 2006, and 2008 and French Camp to Bowman was surveyed three times in 2009). Dates of Lostine bull trout spawning surveys generally commenced as early as the second or third week in September and the last survey was conducted in the first or second week in October.

**Table 2b – Bull Trout Spawning Surveys for Bear and Goat Creeks Comparing 1999 – 2013 Surveys**

Stream	Survey Years												11	12	13	
	99	00	01	02	03	04	05	06	07	08	09	10				
<b>Bear Creek</b>																
	<b>Redds Surveyed</b>															
<b>Reaches (miles surveyed)</b>																
Bear: Goat Confluence to Wilderness Boundary (1mile)	0	2	3	1	2	3	5	0	1	6	1	1	4	3	0	
Goat Creek: Mouth to Falls (0.9)	8	3	9	6	9	8	6	9	7	4	5	6	15	12	15	
<b>Bear (and Goat) Total Redds (Comparable Reaches)</b>	<b>8</b>	<b>5</b>	<b>12</b>	<b>7</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>9</b>	<b>8</b>	<b>10</b>	<b>6</b>	<b>7</b>	<b>19</b>	<b>15</b>	<b>15</b>	
<b>Bear Creek Total Miles of Comparable Stream</b>	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
<b>Bear Creek Redds/Mile Comparable Stream</b>	<b>4.2</b>	<b>2.6</b>	<b>6.3</b>	<b>3.7</b>	<b>5.8</b>	<b>5.8</b>	<b>5.8</b>	<b>4.7</b>	<b>4.2</b>	<b>5.3</b>	<b>3.2</b>	<b>3.2</b>	<b>10</b>	<b>7.9</b>	<b>7.9</b>	
<b>Total Redds For Year</b>	8	5	12	7	17	12	16	9	11	20	8	7	19	15	16	
<b>Total Miles Surveyed For Year</b>	1.9	1.9	2.3	2.3	3.8	2.3	2.8	1.9	7.2	3.2	3.2	3.2	3.2	3.2	3.2	
<b>Total Redds/Mile For Year</b>	4.2	2.6	5.2	3.0	4.5	5.2	5.7	4.7	1.5	6.3	2.5	2.2	5.9	4.7	5.0	

Notes: These surveys were conducted once from 1999-2006, usually late in the spawning season, the first or second week in October [except in 1999, surveys were conducted in September (on 9/7 and 9/22)]. In 2007, the surveys included several additional “experimental” miles and were conducted twice in the spawning season, once in mid-September and once in early October. In 2008 - 2013, the surveys were conducted twice in the spawning season and an additional 1.4 miles of Bear Creek was surveyed upstream of the comparable reach.

**Table 2c – Bull Trout Spawning Surveys for the Imnaha River, Comparing 2001 – 2013 Surveys**

Stream	Survey Years										11	12	13
	01	02	03	04	05	06	07	08	09	10			
<b>Imnaha River</b>													
	<b>Redds Surveyed</b>												
<b>Reaches (miles surveyed)</b>													
<b>South Fork Imnaha and tributaries:</b>													
Cliff Creek, mouth to 2.5 miles (2.5 miles)	96	22	57	65	61	17	93	52	164	45	46	65	No survey
South Fork Imnaha, NF to Soldier (1.5 miles)	6	7	14	12	44	9	30	6	7	2	10	28	No survey
South Fork Imnaha, Soldier to Cliff (3.1 miles)	33	18	37	29	55	26	37	15	8	27	13	54	41*
<b>North Fork Imnaha:</b>													
North Fork, above Middle Fork (4.1 miles)	49	18	40	68	39	18	30	17	2	4	6	9	5*
North Fork, below Middle Fork to mouth (2.1 miles)	2	8	15	9	21	6	7	5	3	12	2	11	6
Middle Fork, mouth to falls (0.8 miles)	12	0	12	6	24	7	17	8	7	5	2	3	3
<b>Imnaha River:</b>													
Imnaha River, NF to Falls (0.6 miles)	0	3	5	1	2	3	2	1	0	0	0	6	0
Imnaha River, Falls to lower falls (0.8 miles)	41	18	35	40	13	37	28	12	13	11	25	21	7
Imnaha River, Blue Hole to Indian Crossing (2.0 miles)	8	7	9	3	2	18	18	28	2	4	9	4	6
<b>Imnaha Total Redds (Comparable Reaches)</b>	<b>247</b>	<b>101</b>	<b>224</b>	<b>233</b>	<b>261</b>	<b>141</b>	<b>262</b>	<b>144</b>	<b>206</b>	<b>110</b>	<b>113</b>	<b>201</b>	<b>N/a*</b>
<b>Imnaha Total Miles of Comparable Stream</b>	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	n/a
<b>Imnaha Redds/Mile Comparable Stream</b>	<b>14.1</b>	<b>5.8</b>	<b>12.8</b>	<b>13.3</b>	<b>14.9</b>	<b>8.1</b>	<b>15.0</b>	<b>8.23</b>	<b>11.8</b>	<b>6.3</b>	<b>6.5</b>	<b>11.5</b>	<b>n/a</b>
<b>Total Redds For Year</b>	291	113	291	292	276	186	284	184	235	133	160	240	68
<b>Total Miles Surveyed For Year</b>	31.3	30.5	31.3	31.6	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	13.4*
<b>Total Redds/Mile For Year</b>	9.3	3.7	9.3	9.2	14.2	9.6	14.6	9.5	12.1	6.9	8.2	12.4	5.1

Notes: All reaches except Blue Hole to Indian Crossing were surveyed once in years 2001-2012. The Blue Hole to Indian Crossing was surveyed twice in September and October from 2001-2013, except in 2005 and 2013 it was surveyed once. Due to government shut-down and furlough, and poor late season weather conditions in 2013, fewer personnel were available which caused less miles to get accomplished. S.F. Imnaha Cliff to Soldier was surveyed differently in 2013, the number of redds is for more miles than in past years. N.F to Soldier did not get surveyed in 2013. NF above MF did not get fully surveyed in 2013. Cliff creek did not get surveyed in 2013. The gorge sections of the Upper Imnaha did not get surveyed in 2013. N/A was documented for comparable reaches, as reaches not comparable to past years. Total stream miles surveyed (13.4) is estimated.

**Table 2d – Bull Trout Spawning Surveys for Big Sheep Creek and Lick Creek, Comparing 2001 – 2013 Surveys**

Stream	Survey Years														
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	
<b>Big Sheep Creek (including Lick Creek)</b>			<b>Redds Surveyed</b>												
<b>Reaches (miles surveyed)</b>															
Big Sheep, canal to 39 rd. (1.9 miles)	2	6	17	2	3	5	6	12	3	2	8	28	13	16	
Lick Creek, Meadow to 39 rd. (1.5 miles)	0	6	3	0	1	3	5	3	4	5	7	4	4	3	
Lick Creek, 39 rd. to Quartz Creek (4.2 miles)	8	5	14	8	4	1	7	12	15	13	5	6	13	3	
<b>Big Sheep Total Redds (Comparable Reaches)</b>	<b>10</b>	<b>17</b>	<b>34</b>	<b>10</b>	<b>8</b>	<b>9</b>	<b>18</b>	<b>27</b>	<b>22</b>	<b>20</b>	<b>20</b>	<b>38</b>	<b>30</b>	<b>22</b>	
<b>Big Sheep Creek Total Miles of Comparable Stream</b>	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	
<b>Big Sheep Creek Redds/Mile Comparable Stream</b>	<b>1.3</b>	<b>2.2</b>	<b>4.5</b>	<b>1.3</b>	<b>1.1</b>	<b>1.2</b>	<b>2.4</b>	<b>4.6</b>	<b>2.9</b>	<b>2.6</b>	<b>2.6</b>	<b>5.0</b>	<b>3.9</b>	<b>2.9</b>	
<b>Total Redds For Year</b>	12	24	41	18	43	16	18	27	30	20	20	38	30	22	
<b>Total Miles Surveyed For Year</b>	8.4	8.4	9.3	9.3	14.1	8.6	7.6	8.6	9.6	7.6	7.6	7.6	7.6	7.6	
<b>Total Redds/Mile For Year</b>	1.4	2.9	4.4	1.9	3.0	1.9	2.4	3.1	3.1	2.6	2.6	5.0	3.9	2.9	

Notes: Survey frequency varied by year, surveys were conducted once in mid to late October in years 2000 and 2001 for both Big Sheep and Lick Creek, and surveys were conducted twice, once in September and once in October in years 2002-2013, except for Big Sheep which was surveyed once in 2004; and Lick Creek (Meadow to 39 Rd.) was surveyed once in 2010.

Bull Trout Spawning Surveys  
For Some Grande Ronde Tributaries, 2013  
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Grande Ronde Basin Stream Reach, Section	Date(s)	Kilometers	Miles	Redds					Total	Bull Trout Observed (mm)			
		Surveyed	Surveyed	Occ	Unocc	Total	Per km	Per Mile	But obs	<6"(150mm)	<12" (~300mm)	<18"(450mm)	>18"(450mm)
<b>Bear Creek</b>													
Goat Cr (Mouth to Falls)	19-Sep	1.4	0.9	5.0	8.0	13.0	9.0	14.4	10.0	3.0	3.0	3.0	1.0
Goat Cr (Mouth to Falls)	10-Oct			1.0	1.0	2.0	1.4	1.5	2.0	0.0	1.0	0.0	1.0
Bear Creek (Standley Trail to USFS Cabin)	19-Sep	1.4	0.9	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0
Bear Creek (Standley Trail to USFS Cabin)	10-Oct			0.0	1.0	1.0	0.7	0.8	0.0	0.0	0.0	0.0	0.0
Bear Creek (USFS Cabin to Goat Creek)	19-Sep	0.8	0.5	0.0	0.0	0.0	0.0	0.0	3.0	2.0	1.0	0.0	0.0
Bear Creek (USFS Cabin to Goat Creek)	10-Oct			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bear Creek (Goat Creek to Wilderness Boundary)	19-Sep	1.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bear Creek (Goat Creek to Wilderness Boundary)	10-Oct			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Bear Creek Total</b>		<b>5.1</b>	<b>3.2</b>	<b>6.0</b>	<b>10.0</b>	<b>16.0</b>	<b>3.1</b>	<b>5.0</b>	<b>16.0</b>	<b>6.0</b>	<b>5.0</b>	<b>3.0</b>	<b>2.0</b>
<b>Lostine River</b>													
Lundquist Bridge to OC Ranch	24-Sep	4.4	2.8	0.0	0.0	0.0	0.0	0.0	8.0	0.0	2.0	5.0	1.0
Lundquist Bridge to OC Ranch	8-Oct			0.0	1.0	1.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0
Pole Bridge to 6 Mile Bridge	18-Sep	3.2	2.0	0.0	1.0	1.0	0.3	0.5	1.0	0.0	0.0	0.0	1.0
Pole Bridge to 6 Mile Bridge	8-Oct			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Williamson to Walla Walla	18-Sep	3.5	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Williamson to Walla Walla	8-Oct			0.0	1.0	1.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0
Bowman to French Camp	16-Sep	2.6	1.6	1.0	6.0	7.0	2.7	4.4	5.0	0.0	0.0	5.0	0.0
Bowman to French Camp	7-Oct			0.0	3.0	3.0	1.2	1.9	4.0	0.0	4.0	0.0	0.0
French Camp to Shady Falls	16-Sep	2.4	1.5	10.0	5.0	15.0	6.3	10.0	36.0	1.0	8.0	9.0	18.0
French Camp to Shady Falls	7-Oct			0.0	12.0	12.0	5.0	8.0	0.0	0.0	0.0	0.0	1.0
<b>Lostine River Total</b>		<b>16.2</b>	<b>10.1</b>	<b>11.0</b>	<b>29.0</b>	<b>40.0</b>	<b>2.5</b>	<b>4.0</b>	<b>54.0</b>	<b>9.0</b>	<b>14.0</b>	<b>19.0</b>	<b>21.0</b>
<b>Deer Creek</b>													
Rd 8270 Road Crossing upstream 0.8 miles	23-Sep	1.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Rd 8270 Road Crossing upstream 0.8 miles	15-Oct			0	0	0.0	0.0	0.0	0.0	0	0	0	0
<b>Deer Creek Total</b>		<b>1.3</b>	<b>0.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Grande Ronde Basin Total</b>													



Table 2b  
 Bull Trout Spawning Surveys  
 For the Imnaha River, 2013  
 USFWS, La Grande Field Office

Imnaha Basin Stream Reach, Section	Date(s)	Kilometers Surveyed	Miles Surveyed	Occ	Redds			Per km	Per Mile	Total But obs	Bull Trout Observed (mm)			
					Unocc	Total					<6"(150mm)	<12" (~300mm)	<18"(450mm)	>18"(450mm)
<b>Upper Imnaha System</b>														
<b>South Fork Tributaries</b>														
Cliff Cr., mouth to 3.6 km*	not surveyed	0.0	0.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
<b>South Fork Tributaries Total</b>		<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	
<b>North Fork</b>														
Middle Fork., mouth to falls	2-Oct	1.3	0.8	0.0	3.0	3.0	2.3	3.7	1.0	0.0	1.0	0.0	0.0	
N. Fk., above M. Fk. (part of reach 3-7)*	10/01-10/02	3.2	2.0	0.0	5.0	5.0	1.6	2.5	2.0	0.0	2.0	0.0	0.0	
N. Fk., below M. Fk. (reach 1-2)	2-Oct	3.4	2.1	3.0	3.0	6.0	1.8	2.8	3.0	0.0	0.0	0.0	3.0	
<b>North Fork Total</b>		<b>7.9</b>	<b>4.9</b>	<b>3.0</b>	<b>11.0</b>	<b>14.0</b>	<b>1.8</b>	<b>0.4</b>	<b>6.0</b>	<b>0.0</b>	<b>3.0</b>	<b>0.0</b>	<b>3.0</b>	
<b>South Fork</b>														
S. Fk., North Fork to Soldier Cr.*	not surveyed	0.0	0.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
S. Fk., Soldier to Cliff Cr.*	10/01-10/02	8.0	5.0	2.0	39.0	41.0	5.1	8.2	3.0	1.0	1.0	1.0	0.0	
<b>South Fork Total</b>		<b>8.0</b>	<b>5.0</b>	<b>2.0</b>	<b>39.0</b>	<b>41.0</b>	<b>5.1</b>	<b>8.2</b>	<b>3.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>0.0</b>	
<b>Upper Imnaha</b>														
Upper Imnaha Falls to North Fork	3-Oct	1.0	0.6	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	
Upper Imnaha Falls to lower falls	3-Oct	1.3	0.8	2.0	5.0	7.0	5.4	8.7	15.0	0.0	1.0	1.0	13.0	
Falls downstream .67 mi. to beg. of gorge*	not surveyed	0.0	0.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Lower end of gorge to next gorge (.25 mi)*	not surveyed	0.0	0.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Canyon above slide to canyon just above slide*	not surveyed	0.0	0.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
<b>Upper Imnaha Total</b>		<b>2.3</b>	<b>1.4</b>	<b>2.0</b>	<b>5.0</b>	<b>7.0</b>	<b>3.0</b>	<b>4.9</b>	<b>17.0</b>	<b>0.0</b>	<b>1.0</b>	<b>1.0</b>	<b>15.0</b>	

Table 2b  
**Bull Trout Spawning Surveys**  
**For the Imnaha River, 2013**  
**USFWS, La Grande Field Office**

Imnaha Basin Stream Reach, Section	Date(s)	Kilometers Surveyed	Miles Surveyed	Occ	Redds			Per km	Per Mile	Total But obs	Bull Trout Observed (mm)			
					Unocc	Total					<6"(150mm)	<12" (~300mm)	<18"(450mm)	>18"(450mm)
<b>Middle Imnaha</b>														
Blue Hole to Indian Crossing	11-Oct	3.2	2.0	0.0	6.0	6.0	1.9	3.0	0.0	0.0	0.0	0.0	0.0	
<b>Middle Imnaha Total</b>		<b>3.2</b>	<b>2.0</b>	<b>0.0</b>	<b>6.0</b>	<b>6.0</b>	<b>1.9</b>	<b>3.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	
<b>Big Sheep System</b>														
Big Sheep, Canal to Rd. 39	17-Sep	3.1	1.9	5.0	10.0	15.0	4.8	7.9	22.0	3.0	17.0	1.0	1.0	
Big Sheep, Canal to Rd. 39	9-Oct			0.0	1.0	1.0			0.0	0.0	0.0	0.0	0.0	
Lick Cr. Meadow to 39 rd.	10-Sep	2.4	1.5	0.0	0.0	0.0	1.3	2.0	8.0	0.0	8.0	0.0	0.0	
Lick Cr. Meadow to 39 rd.	9-Oct			0.0	3.0	3.0			0.0	0.0	0.0	0.0	0.0	
Lick Cr. 39 Rd. to Quartz Cr.	17-Sep	6.8	4.2	1.0	2.0	3.0	0.0	0.0	8.0	3.0	5.0	0.0	0.0	
Lick Cr. 39 Rd. to Quartz Cr.	9-Oct			0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	
<b>Big Sheep System Total</b>		<b>12.3</b>	<b>7.6</b>	<b>6.0</b>	<b>16.0</b>	<b>22.0</b>	<b>1.8</b>	<b>2.9</b>	<b>38.0</b>	<b>6.0</b>	<b>30.0</b>	<b>1.0</b>	<b>1.0</b>	
<b>Imnaha Basin Total (Page 1)</b>														
		<b>18.2</b>	<b>11.3</b>	<b>7.0</b>	<b>55.0</b>	<b>62.0</b>	<b>3.4</b>	<b>5.5</b>	<b>26.0</b>	<b>1.0</b>	<b>5.0</b>	<b>2.0</b>	<b>18.0</b>	
<b>Imnaha Basin Total (Page 2)</b>														
		<b>27.8</b>	<b>17.2</b>	<b>6.0</b>	<b>22.0</b>	<b>28.0</b>	<b>1.8</b>	<b>2.9</b>	<b>38.0</b>	<b>6.0</b>	<b>30.0</b>	<b>1.0</b>	<b>1.0</b>	
<b>Imnaha Basin Total Pages 1 &amp; 2)</b>														
		<b>33.7</b>	<b>20.9</b>	<b>13.0</b>	<b>77.0</b>	<b>90.0</b>	<b>2.7</b>	<b>4.3</b>	<b>64.0</b>	<b>7.0</b>	<b>35.0</b>	<b>3.0</b>	<b>19.0</b>	

**Table 4a –  
Summary of Measured Bull Trout Redds, Grande Ronde River Basin  
Lostine River and Goat Creek 2013**

Stream	n*1		Length (M)	Width (M)	Area (m2)	Length/Width ratio
Lostine	29	mean	1.6	0.8	1.4	2.0
		sd	0.7	0.3	1.3	0.6
		max	3.7	2.1	6.7	3.7
		min	0.7	0.4	0.2	1.2
Goat	15	mean	1.0	0.5	0.5	2.1
		sd	0.3	0.1	0.3	0.6
		max	1.5	0.9	1.3	3.1
		min	0.6	0.3	0.2	1.3

\*n = number of redds observed and measured (sample size).

**Table 4b – Summary of Measured Bull Trout Redds, Imnaha River Basin 2013**

<b>Stream</b>	<b>n*1</b>		<b>Length (M)</b>	<b>Width (M)</b>	<b>Area (m2)</b>	<b>Length/Width ratio</b>
<b>Lick Creek</b>	<b>6</b>	<b>mean</b>	<b>1.0</b>	<b>0.6</b>	<b>0.7</b>	<b>1.7</b>
		<b>sd</b>	<b>0.3</b>	<b>0.1</b>	<b>0.3</b>	<b>0.5</b>
		<b>max</b>	<b>1.5</b>	<b>0.7</b>	<b>1.1</b>	<b>2.4</b>
		<b>min</b>	<b>0.5</b>	<b>0.5</b>	<b>0.2</b>	<b>1.0</b>
<b>Big Sheep Creek</b>	<b>10</b>	<b>mean</b>	<b>0.5</b>	<b>0.4</b>	<b>0.2</b>	<b>1.5</b>
		<b>sd</b>	<b>0.2</b>	<b>0.1</b>	<b>0.1</b>	<b>0.6</b>
		<b>max</b>	<b>0.9</b>	<b>0.6</b>	<b>0.4</b>	<b>2.3</b>
		<b>min</b>	<b>0.3</b>	<b>0.2</b>	<b>0.1</b>	<b>0.7</b>
<b>Middle Imnaha</b>	<b>2</b>	<b>mean</b>	<b>1.3</b>	<b>0.5</b>	<b>0.7</b>	<b>2.5</b>
		<b>sd</b>	<b>0.4</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>
		<b>max</b>	<b>1.6</b>	<b>0.6</b>	<b>1.0</b>	<b>2.6</b>
		<b>min</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.7</b>
<b>N.F. Imnaha</b>	<b>14</b>	<b>mean</b>	<b>1.4</b>	<b>0.6</b>	<b>0.9</b>	<b>2.1</b>
		<b>sd</b>	<b>0.5</b>	<b>0.2</b>	<b>0.5</b>	<b>0.6</b>
		<b>max</b>	<b>2.3</b>	<b>0.8</b>	<b>1.7</b>	<b>3.1</b>
		<b>min</b>	<b>0.2</b>	<b>0.2</b>	<b>0.1</b>	<b>1.2</b>
<b>S.F. Imnaha</b>	<b>34</b>	<b>mean</b>	<b>1.2</b>	<b>0.6</b>	<b>0.8</b>	<b>1.3</b>
		<b>sd</b>	<b>0.4</b>	<b>0.2</b>	<b>0.4</b>	<b>0.8</b>
		<b>max</b>	<b>2.5</b>	<b>1.4</b>	<b>2.2</b>	<b>3.1</b>
		<b>min</b>	<b>0.4</b>	<b>0.2</b>	<b>0.1</b>	<b>0.6</b>

**Footnote 1: n = number of redds observed and measured (sample size).**

**In Memory of  
Kenneth Mathew Bronec  
(Ken Bronec)  
Nov. 4, 1950 – June 12, 2013**



Wallowa Mountain bull trout surveys will not be the same with the passing of Ken Bronec, Ken died at home in Joseph on June 12, 2013 at the age of 62. Ken was very enthusiastic and loved to help with bull trout surveys from the beginning, the fall of 1997 to the fall of 2012, prior to his passing. The initial bull trout survey into the Upper Innaha was conducted by Ken, Lynne Price, and the author, in September 1997. We hiked the Lick Creek trail down to the Innaha River and surveyed an upstream reach of the SF Innaha River and then later that same day, hoofed it back up the steep trail. Ken really enjoyed helping with these surveys as a USFS biologist and later post retirement, a paid consultant. He was passionate in his love for recreating in the outdoors as well as passionate for the conservation of these resources.

Ken was born in 1950 in Corvallis, Oregon. The only son of Mathew and Vivian Bronec, he had five sisters. His family moved to Salem during his elementary years, and he later attended Serra Catholic High School in the Class of 1968. After high school Ken served in the U.S. Coast Guard and received degrees from Central Oregon Community College and University of Idaho. He then started working for the U.S. Forest Service. In 1978 Ken transferred to the Wallowa-Whitman National Forest in Wallowa County where he worked for 27 years in timber management and as a fisheries biologist. He and his wife Clare were married that same year and celebrated 34 years of marriage. In 1980, Ken and Clare's daughter Carley was born. Carley and her husband Jesse Showen brought great joy to their lives with the birth of grandson Jack, in 2011.

In Wallowa County Ken and Clare were able to pursue their love of the outdoors. Ken was an avid skier both in the back country and at Ferguson Ridge Ski Area. He also loved hiking, climbing many of the peaks in the Wallowa's, biking, fishing, gardening and cooking. His fitness level was legendary among his friends and acquaintances. Ken was instrumental in establishing the original Nordic shelter at Big Sheep and later the Redmont Shelter for the Nordic Ski Club and helping maintain the Nordic trails at Salt Creek Summit. He served many years on the National Ski Patrol at Fergi, as well as on the board of the Eagle Cap Ski Club. Ken helped establish the Wallowa Avalanche

Center and volunteered many training hours. Ken enjoyed running the Hood to Coast and Rainier to Pacific with friends and family, played numerous years of town team basketball, and camped for 30 years with his family and many friends at the annual Labor Day Indian Crossing Camp Out.

Ken consistently helped with bull trout spawning surveys except when he was having cancer treatments or celebrating his anniversary with his wife. We will miss you Ken and will think of you during our annual surveys and especially around the campfire at the NF Innaha during the Upper Innaha three-day survey. May the fishes be with you! Refer to photos below of Ken helping with past bull trout surveys.



**Terminal Gravity get together post bull trout surveys  
(Ken, author, and Rick Christian)**



**September 2010 Upper Imnaha Bull Trout Survey Team  
(Author, Ian Wilson, Ken, Jeff Yanke, Lynne Price, and Brad Smith)**



**Ken surveying Middle Fork Imnaha in 2012**



**Ken holding a brook trout at the Lostine River**



**Ken measuring bull trout redd - Lostine River**



**Ken surveying the Lostine River  
with crew member Suzanne Anderson**



**Ken surveying for bull trout on the Lostine River at Turkey Flat**



**View from trail, Ken enjoyed surveying the North Fork Imnaha**



**Ken hiking with Eric Shoudel crew member in the Upper Imnaha in 2012  
Happy Trails!**