

# 2020 Bull Trout Monitoring in the Wallowa Mountains



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Cover photo: Mary Edwards Photography – Lostine River Bull Trout 2012

## **ABSTRACT**

This report summarizes bull trout redd counts from surveys conducted in the Grande Ronde River and Imnaha River subbasins in 2020 and compares those with prior years. Streams surveyed in 2020 included: Lostine River, Little Minam River, Dobbin Creek, Big Sheep Creek, and Lick Creek. In most surveyed streams, redd counts were average to slightly below average compared to previous years. We plan to continue long-term population monitoring via redd counts in priority streams in the future, though some surveys will not be conducted on an annual basis but rather on an interval schedule (e.g., 5-10 year intervals). In 2020, we started collecting eDNA samples to fill information gaps on distribution and presence/absence of bull trout and brook trout in the Bear/Goat Creek watershed where hybridization is a primary threat. In the future, we will continue to use additional monitoring strategies like eDNA sampling, electrofishing, and/or snorkeling to monitor bull trout populations.

## **ACKNOWLEDGMENTS**

We acknowledge the 20-year effort put forth by the U.S. Fish and Wildlife Service (USFWS) and its many partners to conduct bull trout spawning ground surveys in the Willowa Mountains of Northeast Oregon. In 2019, the Nez Perce Tribe took on the role of coordinating some of these surveys and building on that long-term data set. This project would not have been possible without the dedication, hard work, funding, and assistance provided by all partners. We would like to thank the following partners who assisted in 2020: the USFWS, Oregon Department of Fish and Wildlife (ODFW), and United States Forest Service (USFS). Special thanks to staff who walked the streams, helped schedule surveys and surveyors, provided access to private property, helped with planning, assisted with grants, produced maps, or summarized data. These included: Gretchen Sausen, Paul Sankovich (USFWS); Sam Williams, Neal Espinosa, Aaron Maxwell, Brian Simmons, Jon Rombach (NPT); Sarah Brandy (USFS); and private property landowners on the Lostine River.

## **INTRODUCTION**

Bull trout were listed as threatened under the Endangered Species Act in 1998 following declines throughout their historic range. Extensive population monitoring has been implemented in NE Oregon and SE Washington to inform post-listing recovery efforts (Howell et al. 2018 and references therein; Sausen 2019). Bull trout spawning ground surveys (i.e., redd counts) have been a principal part of that monitoring, and redd counts have been conducted annually in selected streams within the Grande Ronde River and Imnaha River streams from 1999 to 2020. Survey data included in this report occurred within the Willowa River/Minam River, Little Minam River and Imnaha River bull trout core areas. In addition to redd counts, we started collecting water samples for eDNA analysis in 2020 to address information gaps on distribution of bull trout and brook trout in watersheds where hybridization could be a primary threat. eDNA sampling will add to the long-term redd count monitoring data and increase our knowledge and understanding of bull trout within the core areas.

Objectives of long-term monitoring include:

- Locate bull trout spawning areas.
- Determine redd (spawning nest) characteristics.
- Determine bull trout spawn timing.
- Collect spawning density data.
- Map the location of bull trout spawning reaches.
- Assess population trends for local bull trout populations.
- Fill in information gaps on distribution and abundance of bull and brook trout.
- Use the information to help assess long-term recovery of bull trout.

In this report, we summarize bull trout spawning ground and eDNA surveys conducted in the Grande Ronde and Imnaha subbasins in 2020 and compare spawning surveys with prior years. eDNA sample results complement our existing datasets and allow us to better understand and identify potential threats to local bull trout populations. This report addresses two priorities listed in the Northeastern Oregon/Southeastern Washington Monitoring Strategy (Howell et al. 2018): 1) continue long-term redd counts in designated stream reaches, and 2) use eDNA sampling to improve distribution information for bull trout and brook trout.

## **METHODS**

The Nez Perce Tribe and multiple partners conducted bull trout spawning ground and eDNA surveys for bull trout and brook trout in 2020 on selected streams in the Grande Ronde and Imnaha River subbasins. Survey sites were located within the Wallowa River/Minam River, Little Minam River and Imnaha River bull trout core areas. Streams surveyed for bull trout redds included: Lostine River, Little Minam River, Dobbin Creek, Big Sheep Creek, and Lick Creek (Figure 1). Water samples were collected for eDNA analysis from sites selected within the Bear/Goat Creek watershed including: Bear Creek, Little Bear Creek, Doc Creek, Goat Creek, McCubbin Creek and Granite Creek (Figure 1). We prioritized the Bear Creek watershed for eDNA analysis in 2020 to better understand the distribution of bull and brook trout in the basin, plan for future monitoring/research, and assess the potential threat of hybridization (Howell et al. 2018). Bull trout redd counts have been conducted annually in the Bear/Goat Creek watershed from 1999-2019. The long-term redd count data, combined with these eDNA results, will provide valuable information for designing additional monitoring in Bear Creek during the summer of 2021 (e.g., systematic electrofishing).

### ***Spawning Ground Surveys***

This project is part of a larger effort in NE Oregon and SE Washington that occurs in September and October during the bull trout spawning period. Surveyors walk rivers and streams through selected index areas and other suspected bull trout habitat to survey for redds. Index areas in this report refer to known bull trout spawning reaches that have been surveyed on an annual basis for about 20 years.

Survey protocol in 2020 was consistent with past monitoring efforts (Sausen 2019) and included: 1) visits to known bull trout redds and review of the survey form prior to the initial survey (for

inexperienced surveyors, when needed); 2) experienced bull trout redd count surveyors were paired with less experienced surveyors (on-the-job training); 3) new bull trout redds were identified and measured, data were recorded, and redds were flagged; and 4) all stream flagging was removed during the last survey of the year.

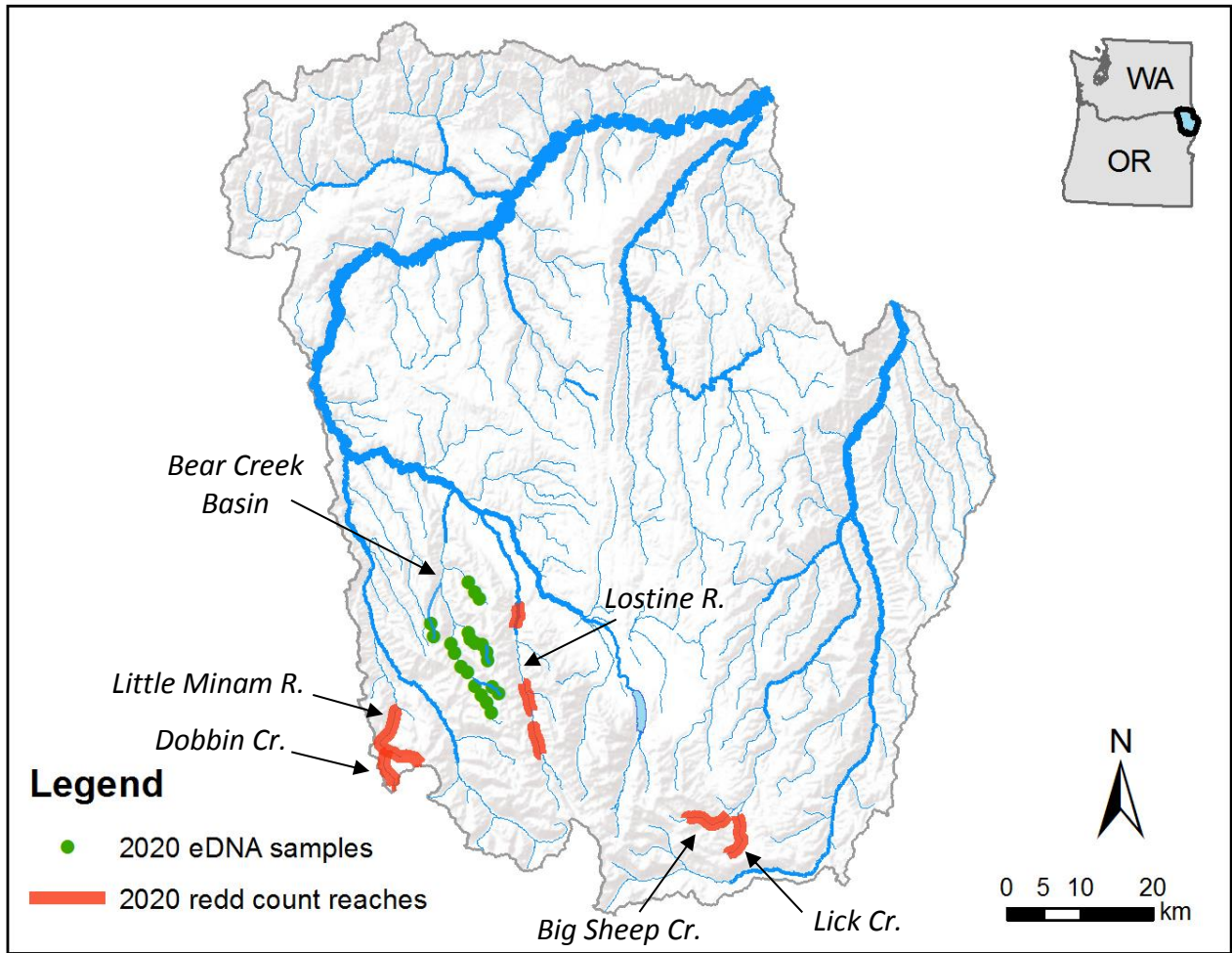
Data recorded during redd counts included: 1) date of survey; 2) stream location; 3) GPS location of each redd; 4) size of each redd (m); 5) visibility of each redd; 6) number of redds; and 7) approximate number and sizes of bull trout observed during surveys.

Bull trout redds were measured using the same methodology from 2004 through 2020 (Sausen 2019). Redd size is directly related to the size of the fish that created it and can be used to estimate the proportion of smaller resident bull trout to larger fluvial (migratory) bull trout (Howell & Sankovich 2012; Sausen 2019). We categorized redds  $< 1$  m in length as constructed by resident bull trout and redds  $\geq 1$  m in length or a total area  $\geq 0.4$  m<sup>2</sup> as redds constructed by fluvial bull trout. Size criteria were selected based on personal communications with Gretchen Sausen, USFWS, and data presented in Howell et al. 2018.

Based on past monitoring data, bull trout spawning in the study area typically occurs from about September 1 through October 15, and can occur as early as August 15 in the Imnaha River subbasin (Sausen 2019). In 2020, surveys were conducted twice between September 22 and October 14 (i.e., mid and late spawning season) on the Lostine River, Little Minam River, Dobbin Creek, Big Sheep Creek, and Lick Creek. We were unable to complete all the surveys during the second (i.e., late) survey on the Little Minam River and Dobbin Creek due to limited staffing.

### *eDNA Sampling*

We followed eDNA sampling protocols and methods outlined by the National Genomics Center for Wildlife and Fish Conservation (Carim et al. 2016). Sample site selection was informed by bull trout and brook trout distribution data (e.g., StreamNet) and advice from project partners. Specifically, we selected sites in designated critical bull trout habitat with moderate to high probability of detection (Young et al. 2017) but limited or no information on the current presence/absence of both species. eDNA results will contribute to The Aquatic eDNA Atlas (<https://www.fs.fed.us/rm/boise/AWAE/projects/the-aquatic-eDNAAtlas-project.html>), a crowd-sourced open-access database of eDNA data for aquatic species. Additionally, eDNA data from this project will fill in gaps for areas not assessed during The Range-Wide Bull Trout eDNA Project ([https://www.fs.fed.us/rm/boise/AWAE/projects/BullTrout\\_eDNA.html](https://www.fs.fed.us/rm/boise/AWAE/projects/BullTrout_eDNA.html)).

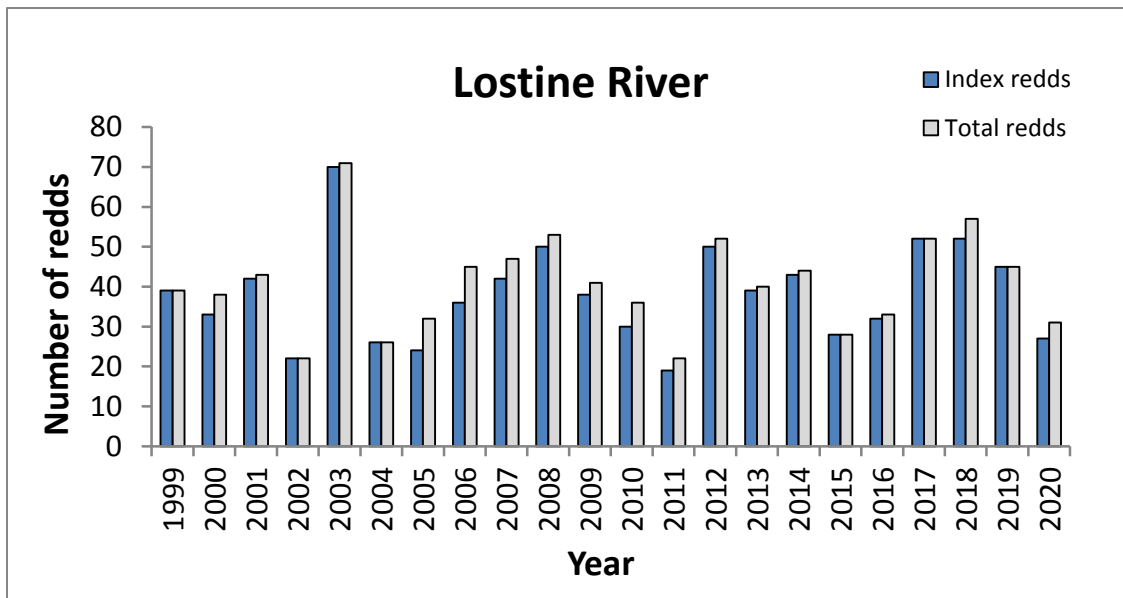


**Figure 1.** Location of bull trout spawning ground and eDNA surveys in 2020. See results section for detailed maps of each survey area.

## RESULTS & DISCUSSION

### *Lostine River Ground Surveys*

The Lostine River has been considered a moderately-strong population within the Grande Ronde River subbasin (Buchanan et al. 1997). The index reaches (8.1 miles) on the Lostine River have been surveyed annually from 1999-2020, with index reach counts ranging from 19 to 70 redds (Figure 2). In 2020, surveys were conducted twice, mid and late spawning season. In 2020, 27 redds or 3.3 redds/mile were documented during index reach surveys in the Lostine River. These counts were below the annual average of 39 redds per year in index reaches (1999-2019). The Lostine River has both resident and fluvial populations of bull trout. In 2020, we estimated 81% of the redds were made by fluvial fish and 19% by resident fish (Figure 3). See Appendix Table 1a for annual summary data from 1999-2020 of redds per reach and miles surveyed.



**Figure 2.** Bull trout total redds (grey bars) and index redds (blue bars) observed during spawning ground surveys from 1999 through 2020 in the Lostine River.

### 2020 Lostine River Bull Trout Redds

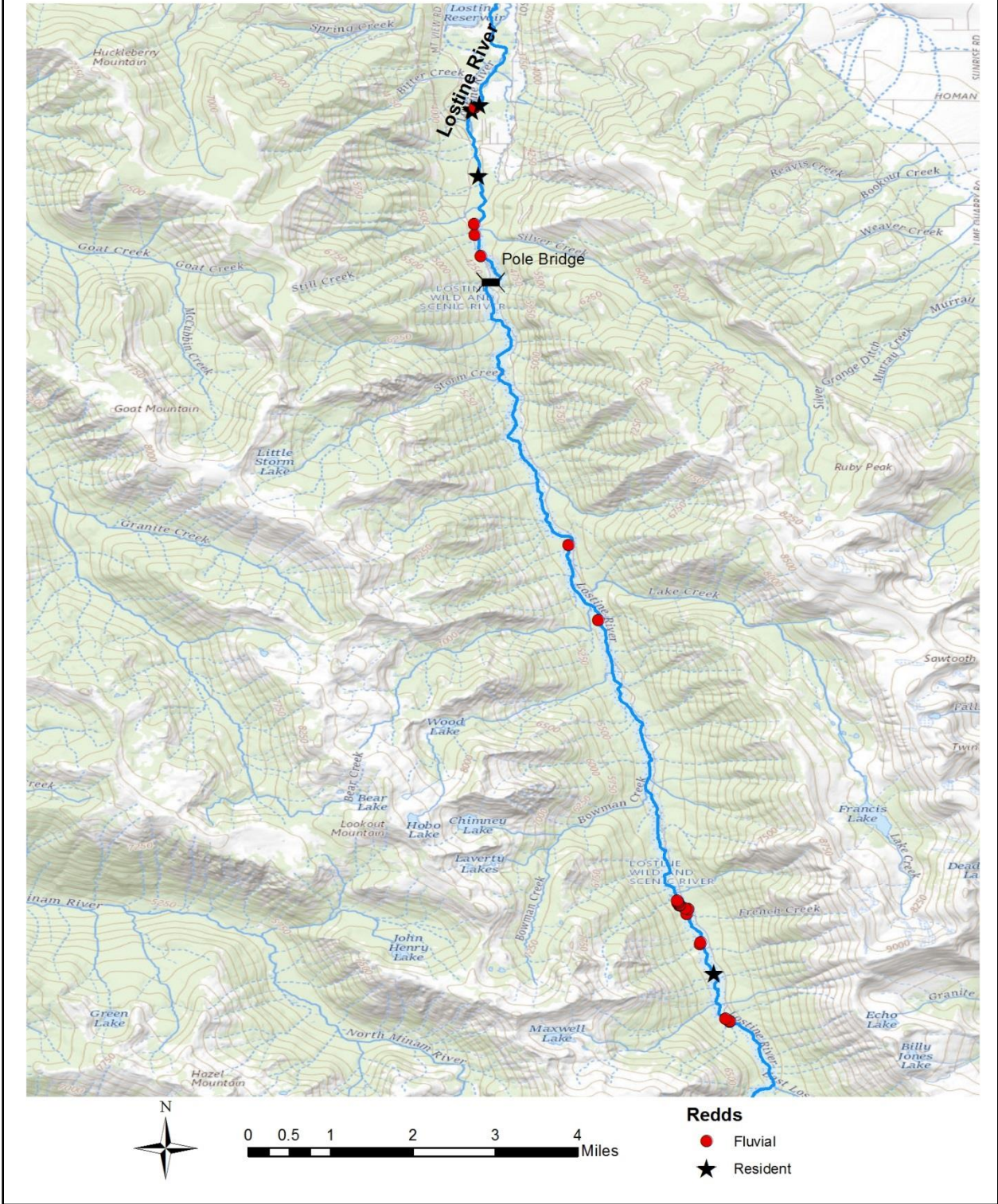
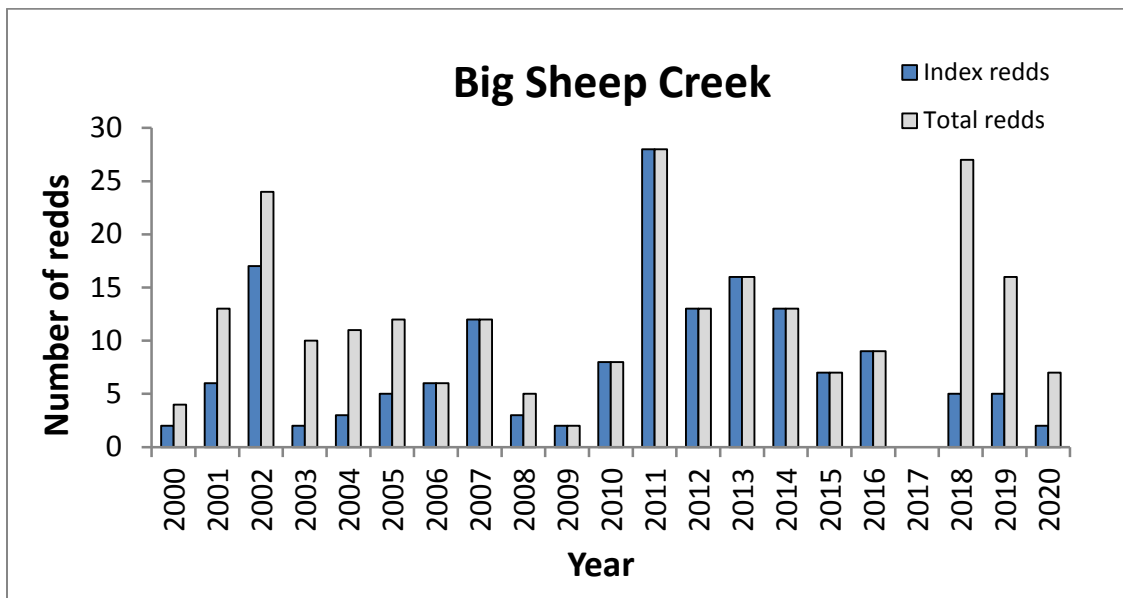


Figure 3. Location of bull trout redds observed on the Lostine River in 2020.

### Big Sheep Creek Spawning Ground Surveys

The index reach (1.9 miles) on Big Sheep Creek has been surveyed annually from 2000-2020, though the frequency of surveys has varied somewhat (see details in Appendix Table 1b). In 2020, surveys were conducted twice, mid and late spawning season. In 2020, 2 redds or 1.1 redds/mile were documented during the index surveys (Figure 4). From 2000-2019 the average redd count for the index reaches was 8.1 redds or 4.3 redds/mile. Big Sheep has both resident and fluvial populations of bull trout. In 2020, we estimated 86% of redds were made by resident fish and 14% by fluvial fish (Figure 5). The majority of redds (5 of 7) in 2020 were documented upstream of the Wallowa Valley Improvement Canal which is upstream of the index reach. See Appendix Table 1b for annual summary data from 2000-2020 of redds per reach and miles surveyed.



**Figure 4.** Bull trout total redds (grey bars) and index redds (blue bars) observed during spawning ground surveys from 1999 through 2020 in Big Sheep Creek. The Big Sheep Creek index reach was surveyed in 2017, but no redds were found.



# 2020 Big Sheep Creek Bull Trout Redds

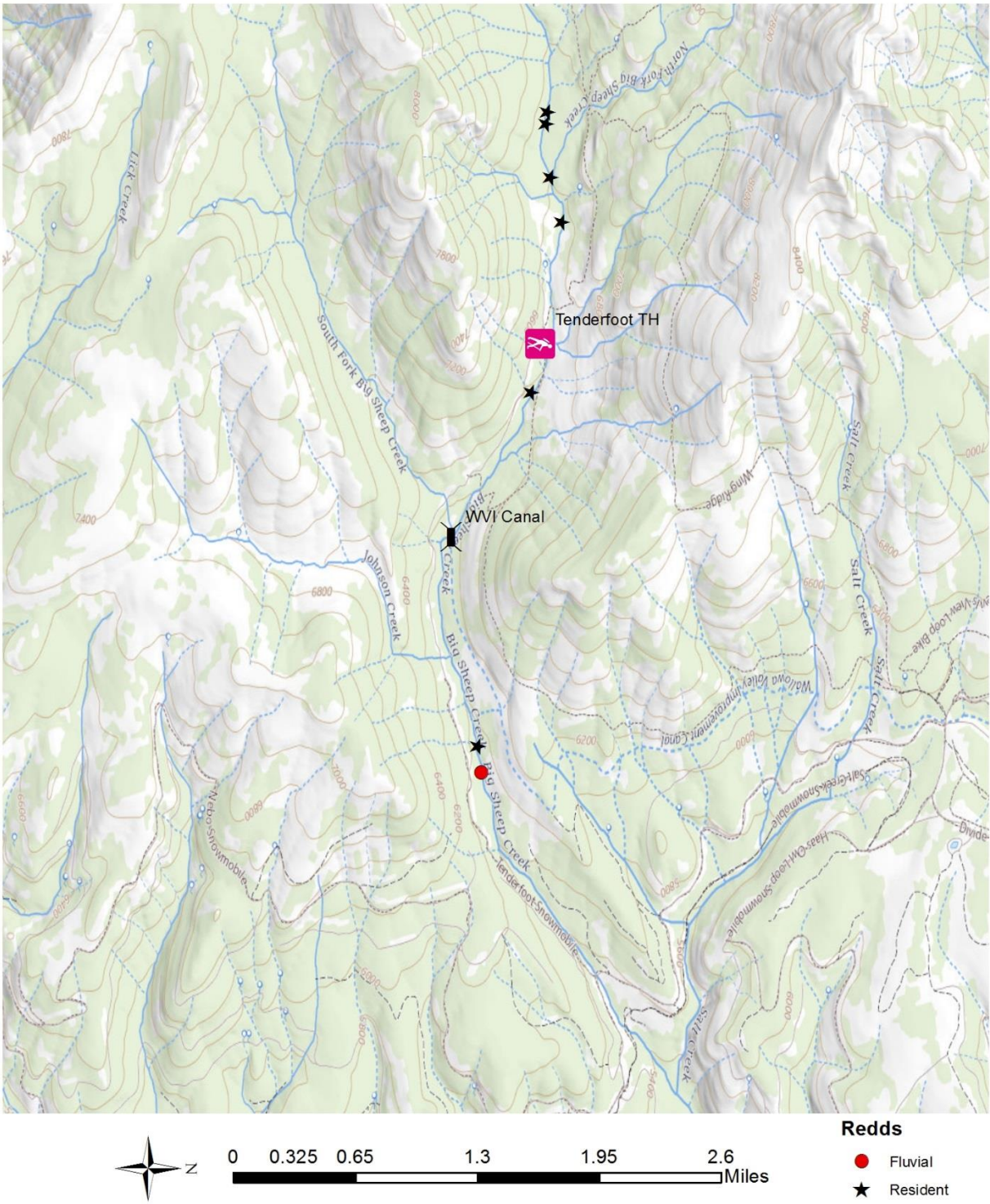
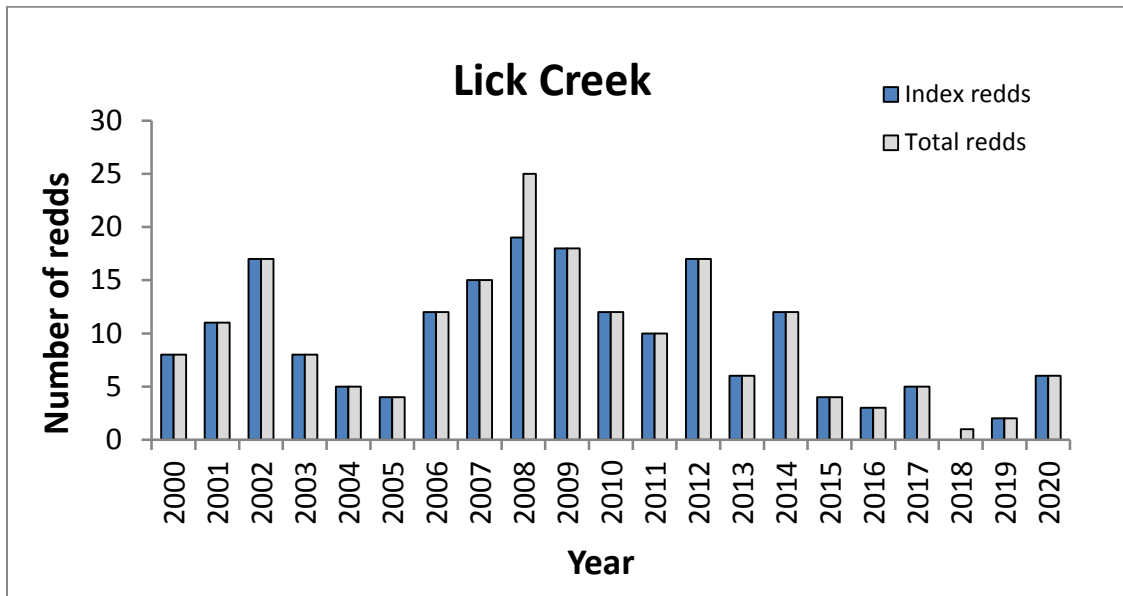


Figure 5. Location of bull trout redds observed in Big Sheep Creek in 2020.

## Lick Creek Spawning Ground Surveys

Index reaches (3.7 miles) were surveyed on Lick Creek from 2000-2017 and 2019-2020. A limited survey was conducted on Lick Creek in 2018; therefore, the 2018 survey data were not directly comparable to other years. Only index reaches have been surveyed in Lick Creek over this time period (2000-2020) with the exception of 2008, when additional reaches were surveyed. In 2020, bull trout spawning ground surveys were conducted twice, mid and late spawning season, and 6 redds were documented or 1.6 redds/mile (Figure 6). In comparison, the average for index reaches from 2000-2017, 2019 was 9.9 redds or 2.7 redds/mile. In 2020, we estimated 83% of the redds were made by fluvial fish and 17% by resident fish (Figure 7). See Appendix Table 1c for annual summary data from 2000-2020 of redds per reach and miles surveyed.

Of note, differentiating Chinook Salmon redds and fluvial bull trout redds in Lick Creek was more difficult than usual in 2020. Chinook spawning ground surveys were limited to a single pass due to wildfire smoke restrictions. Chinook redds were flagged during that survey, but the survey occurred prior to peak Chinook spawning. In addition, 83 adult Chinook Salmon were outplanted to Lick Creek from the Imnaha River weir in 2020. Experienced surveyors conducted the Lick Creek bull trout surveys, but the potential overlap in fluvial bull trout and Chinook Salmon redds added additional uncertainty in 2020.



**Figure 6.** Bull trout total redds (grey bars) and index redds (blue bars) observed during spawning ground surveys from 2000 through 2020 in Lick Creek. Survey efforts were limited to a single survey in one reach in 2018, so no index data were available for that year.

## 2020 Lick Creek Bull Trout Redds



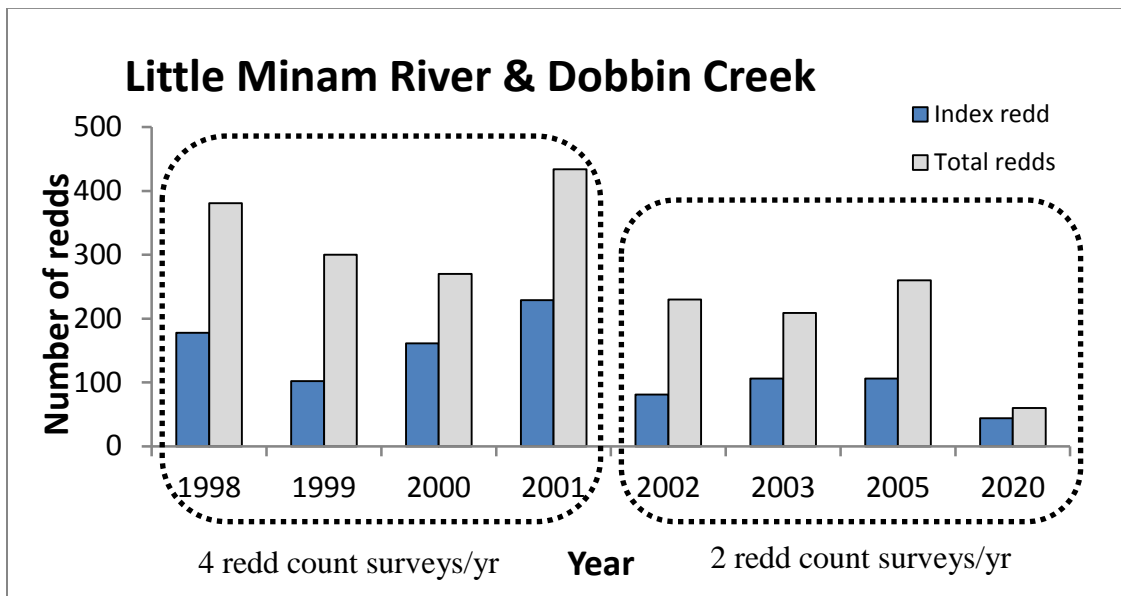
**Figure 7.** Location of bull trout redds observed Lick Creek in 2020.

### *Little Minam River and Dobbin Creek Spawning Ground Surveys*

The Little Minam River, including Dobbin Creek (a main tributary), were surveyed for bull trout redds from 1997-2003 and 2005. We used data and advice from those involved in previous surveys to best replicate past survey efforts in 2020. Surveys conducted in 1997 were primarily for training purposes, so we elected not to use those data for analysis. To facilitate comparison of redd counts across time, we identified index reaches based on the distribution of redds from the surveys conducted in the late 1990s and early 2000s. From 1998-2001 surveys were conducted four times in each reach. In 2002, 2003 and 2005 surveys were conducted twice in each reach. Index and total redd counts were notably higher (Table 1d) during the years when four surveys were completed in each reach (72% index redd increase, 48% total redd increase).

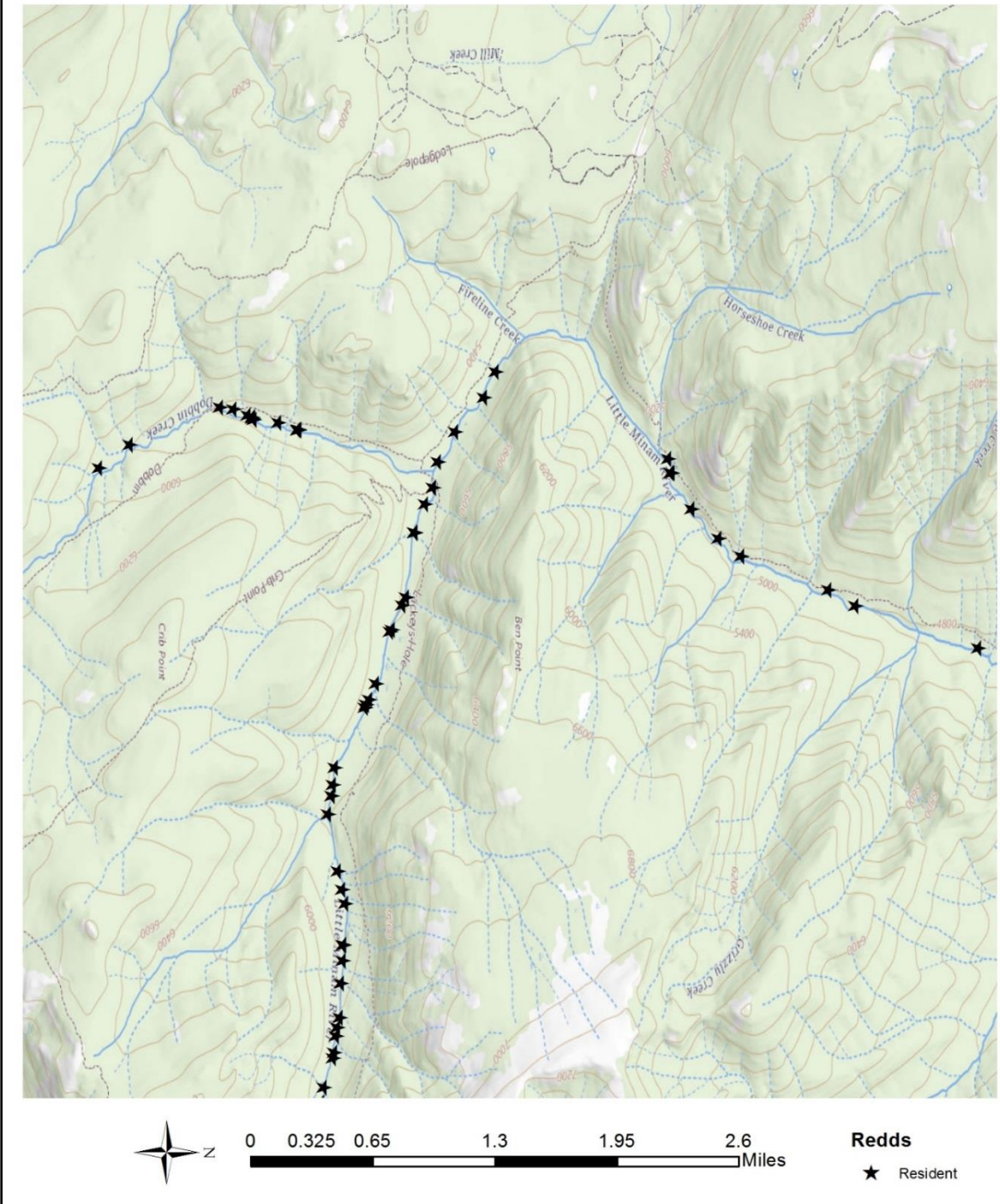
In 2020, index reach surveys were conducted twice, mid and late spawning season. We elected to compare 2020 index redd counts to 2002, 2003 and 2005 redd counts because the same number of surveys were conducted each year. In 2020, 44 redds or 10.4 redds/mile were documented during index reach surveys. This is a large decrease (123%) from the average of 98 redds or 23.8 redds/mile from the 2002-2005 surveys.

The monitoring strategy (Howell et al. 2018) suggests conducting redd counts twice per survey season at 8-10 year intervals in the Little Minam River, barring a dramatic change in the basin's environment (e.g., forest fire and debris flow). Based on the drastic decline in observed redds in 2020, we plan to survey the index reaches of the Little Minam basin in 1-3 year intervals to gain a better understanding of the trend in redd counts in this drainage.



**Figure 8.** Bull trout total redds (grey bars) and index redds (blue bars) observed during spawning ground surveys from 1998 through 2003, 2005 and 2020 on the Little Minam River and Dobbin Creek. In 2020, the index reaches were surveyed twice, but a few of the non-index reaches were only surveyed once.

## 2020 Little Minam River and Dobbin Cr Bull Trout Redds



**Figure 9.** Location of bull trout redds observed in the Little Minam River and Dobbin Creek in 2020.

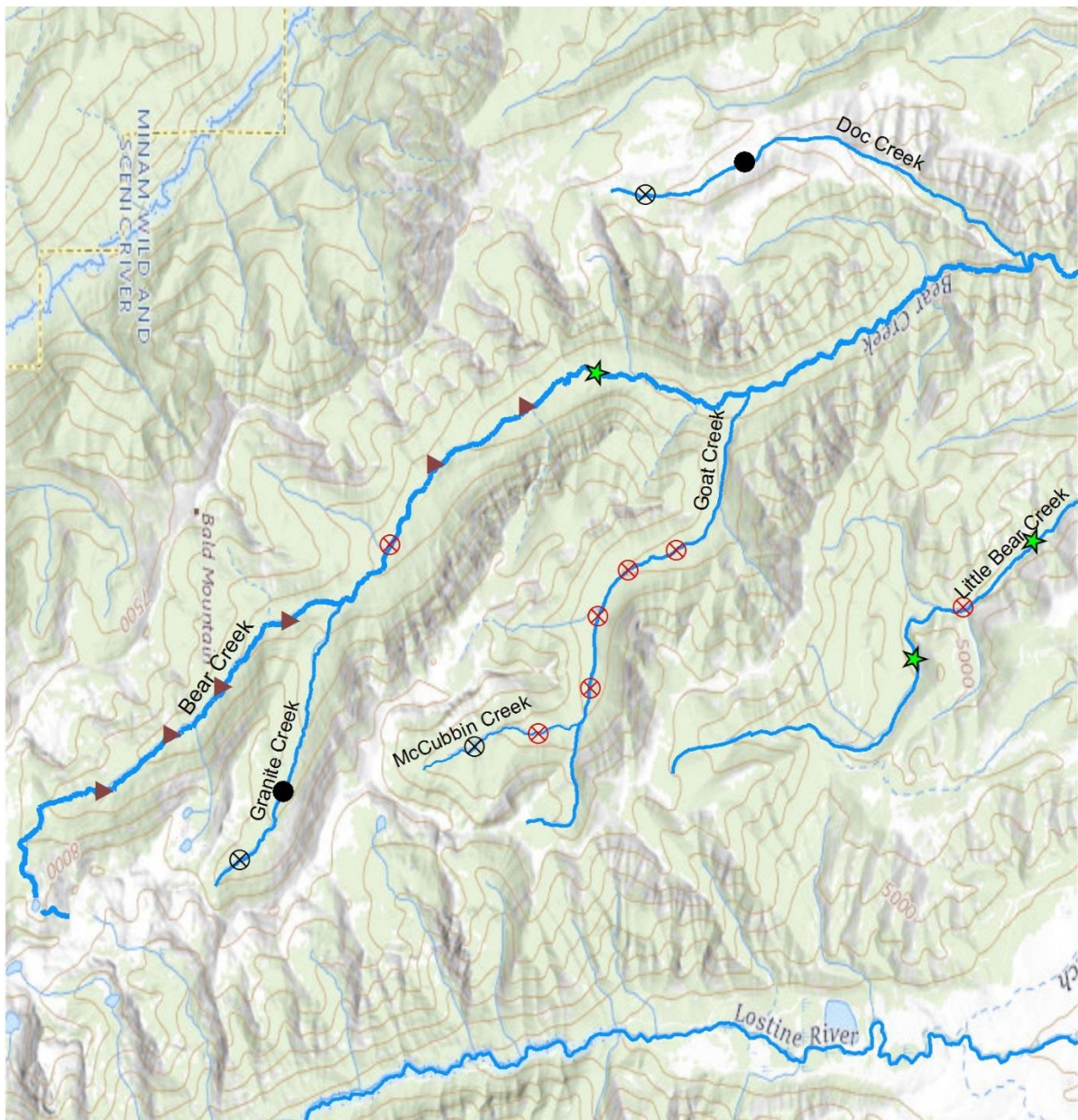
### *Bear/Goat Creek Watershed eDNA Sampling*

Index reaches on the Bear/Goat Creek watershed have been surveyed for bull trout redds annually from 1999-2019. Redd sizes suggest a mix of fluvial but predominantly small resident bull trout. Further monitoring and research are needed to better understand the resident and fluvial life histories of bull trout in this area as well as the potential threat of hybridization with brook trout (Howell et al. 2018). The recommended monitoring strategy is systematic electrofishing or snorkeling to determine distribution and relative abundance of bull trout, brook trout and hybrids (Howell et al. 2018). Strategic eDNA sampling will help us prioritize areas for electrofishing or snorkeling, and make these time-intensive monitoring strategies possible, given resource constraints. Table 1e details the sites we sampled for eDNA and the associated results. Interestingly, there was no overlap between brook trout and bull trout from the analyzed sites (Figure 10). Bull trout eDNA was not detected in the three isolated headwater systems (Goat/McCubbin, Doc, and Granite Creeks). Sampling also confirmed that bull trout still persist in Little Bear Creek. The lone bull trout detection in Bear Creek occurred at the downstream end of our sampling, but that site is still upstream of past redd count reaches in Bear Creek.



*Aaron Maxwell collecting an eDNA sample in Goat Creek.*

## 2020 Bear Cr Drainage eDNA Sites



### Detection

- ▲ Brook Trout
- ★ Bull Trout
- ⊗ Neither Species
- No Bull Trout
- ⊗ Not analyzed



0 0.75 1.5 3 4.5 6 Miles

**Figure 10.** eDNA sample sites and results within the Bear Creek subbasin.

## **CONCLUSIONS & FUTURE WORK**

A unique and valuable long-term bull trout redd count dataset has been collected for the study area of NE Oregon; 22 years of data from the Lostine River; 21 years of data from Big Sheep Creek and Bear Creek; and 18 years of data from the Imnaha River. As a whole, 22 years of redd surveys within the Imnaha River and Wallowa/Minam River subbasins has documented persistent and relatively stable bull trout populations. These long-term data are limited in bull trout recovery units, including the Mid-Columbia Recovery Unit, and we support continuing to build on this long-term dataset. Consistently collected redd count data are useful for determining relative abundance and distribution of bull trout populations, especially those populations with fish expressing fluvial life history strategies. These spawning ground survey data are also useful for monitoring the effects of and informing actions to address potential threats such as climate change, hybridization, and catastrophic disturbance.

We plan to continue long-term monitoring with spawning ground surveys in priority streams, as outlined in the Northeastern Oregon/Southeastern Washington Monitoring Strategy (Howell et al. 2018). Some spawning ground surveys will be conducted annually, while others will be conducted on an interval of 5-10 years, barring dramatic changes in survey site habitat (e.g., forest fire or debris flow).

In 2021, NPT and partner agencies will use eDNA sampling, electrofishing, and/or snorkeling to continue to collect data on the distribution and relative abundance of bull trout and brook trout, especially in areas where hybridization is a primary threat. Data collected using these sampling techniques, along with the long-term redd counts will increase our knowledge and understanding of bull trout within the core areas. NPT will coordinate with partner agencies (USFWS, Oregon Department of Fisheries and Wildlife, US Forest Service, and others) prior to field efforts to coordinate bull trout monitoring effort in NE Oregon and SE Washington. Project results will continue to be disseminated annually in a written report to the USFWS Project Officer and the Grande Ronde-Imnaha Bull Trout Recovery Workgroup.



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## APPENDIX

**Table 1a.** Bull trout spawning survey results for the Lostine River from 1999 through 2020.

Lostine River	<i>Index reach name (length)</i>				<i>Redd totals</i>		<i>Survey reach length</i>		<i>Redd density</i>	
	6 Mile Bridge to Lostine River Ranch (2.8 miles)	Williamson to Walla Walla (2.2 miles)	Bowman to French Camp (1.6 miles)	French Camp to Shady Falls (1.5 miles)	Index redds	Total redds	Index reach survey miles	Total survey miles	Index redds/mile	Total redds/mile
1999	1	0	18	20	39	39	8.1	9.8	4.8	4.0
2000	0	2	19	12	33	38	8.1	13.7	4.1	2.8
2001	2	1	16	23	42	43	8.1	14.4	5.2	3.0
2002	3	0	11	8	22	22	8.1	10.7	2.7	2.1
2003	3	6	18	43	70	71	8.1	10.5	8.6	6.8
2004	5	1	3	17	26	26	8.1	8.5	3.2	3.1
2005	0	3	9	12	24	32	8.1	10.5	3.0	3.0
2006	5	0	9	22	36	45	8.1	10.5	4.4	4.3
2007	4	2	5	31	42	47	8.1	10.1	5.2	4.7
2008	5	13	12	20	50	53	8.1	10.1	6.2	5.2
2009	0	8	7	23	38	41	8.1	10.1	4.7	4.1
2010	1	2	6	21	30	36	8.1	10.1	3.7	3.6
2011	1	0	3	15	19	22	8.1	10.1	2.3	2.2
2012	1	3	18	28	50	52	8.1	10.1	6.2	5.1
2013	1	1	10	27	39	40	8.1	10.1	4.8	4.0
2014	1	7	14	21	43	44	8.1	10.1	5.3	4.4
2015	0	2	11	15	28	28	8.1	10.1	3.5	2.8
2016	0	0	17	15	32	33	8.1	10.1	4.0	3.3
2017	0	0	25	27	52	52	8.1	10.1	6.4	5.1
2018	2	2	23	25	52	57	8.1	10.1	6.4	5.6
2019	0	0	20	25	45	45	8.1	8.1	5.6	5.6
2020	4	2	15	6	27	31	8.1	10.1	3.3	3.1

Notes: The Lostine was surveyed three times in 1999 and 2000. The Lostine was surveyed twice in survey years 2001-2019 (except Shady Campground and Turkey Flat areas were surveyed three times in 2005, 2006, and 2008, and Turkey Flat was surveyed three times in 2009). The Lostine River Ranch (OC Ranch) has been surveyed once (October) in recent years due to lack of access to this private land during hunting season. Pole Bridge to 6 Mile Bridge (included in the total redd numbers and total miles) was surveyed once in 2018. 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 1b.** Bull trout spawning survey results for Big Sheep Creek from 1999 through 2020.

Big Sheep Creek	<i>Index reach name (length)</i>	<i>Redd totals</i>		<i>Survey reach length</i>		<i>Redd density</i>	
	Canal to 39 rd. (1.9 miles)	Index redds	Total redds	Index reach survey miles	Total survey miles	Index redds/mile	Total redds/mile
2000	2	2	4	1.9	2.5	1.1	1.6
2001	6	6	13	1.9	2.5	3.2	5.2
2002	17	17	24	1.9	3.6	8.9	6.7
2003	2	2	10	1.9	3.6	1.1	2.8
2004	3	3	11	1.9	1.9	1.6	5.8
2005	5	5	12	1.9	2.9	2.6	4.1
2006	6	6	6	1.9	1.9	3.2	3.2
2007	12	12	12	1.9	2.9	6.3	4.1
2008	3	3	5	1.9	3.6	1.6	1.4
2009	2	2	2	1.9	1.9	1.1	1.1
2010	8	8	8	1.9	1.9	4.2	4.2
2011	28	28	28	1.9	1.9	14.7	14.7
2012	13	13	13	1.9	1.9	6.8	6.8
2013	16	16	16	1.9	1.9	8.4	8.4
2014	13	13	13	1.9	1.9	6.8	6.8
2015	7	7	7	1.9	1.9	3.7	3.7
2016	9	9	9	1.9	1.9	4.7	4.7
2017	0	0	0	1.9	1.9	0.0	0.0
2018	5	5	27	1.9	6.5	2.6	4.2
2019	5	5	16	1.9	4.3	2.6	3.7
2020	2	2	7	1.9	4.3	1.1	1.6

Notes: Survey frequency varied by year, surveys were conducted once in mid to late October in years 2000 and 2001, surveys were conducted twice, once in September and once in October in years 2002-2016 and years 2018-2019 with the exception of 2004 and 2017 it was only surveyed once.

**Table 1c.** Bull trout spawning survey results for Lick Creek from 1999 through 2020.

Lick Creek	<i>Index reach name (length)</i>		<i>Redd totals</i>		<i>Survey reach length</i>		<i>Redd density</i>	
	Meadow to 39 rd. (1.5 miles)	39 rd. to Quartz Creek (2.2 miles)	Index redds	Total redds	Index reach survey miles	Total survey miles	Index redds/mile	Total redds/mile
2000	0	8	8	8	3.7	3.7	2.2	2.2
2001	6	5	11	11	3.7	3.7	3.0	3.0
2002	3	14	17	17	3.7	3.7	4.6	4.6
2003	0	8	8	8	3.7	3.7	2.2	2.2
2004	1	4	5	5	3.7	3.7	1.4	1.4
2005	3	1	4	4	3.7	3.7	1.1	1.1
2006	5	7	12	12	3.7	3.7	3.2	3.2
2007	3	12	15	15	3.7	3.7	4.1	4.1
2008	4	15	19	25	3.7	3.7	5.1	6.8
2009	5	13	18	18	3.7	3.7	4.9	4.9
2010	7	5	12	12	3.7	3.7	3.2	3.2
2011	4	6	10	10	3.7	3.7	2.7	2.7
2012	4	13	17	17	3.7	3.7	4.6	4.6
2013	3	3	6	6	3.7	3.7	1.6	1.6
2014	5	7	12	12	3.7	3.7	3.2	3.2
2015	0	4	4	4	3.7	3.7	1.1	1.1
2016	0	3	3	3	3.7	3.7	0.8	0.8
2017	0	5	5	5	3.7	3.7	1.4	1.4
2018	1	N/A	1	1	1.5	1.5	0.7	0.7
2019	0	2	2	2	3.7	3.7	0.5	0.5
2020	4	2	6	6	3.7	3.7	1.6	1.6

Notes: Survey frequency varied by year, surveys were conducted once in mid to late October in years 2000 and 2001, and surveys were conducted twice, once in September and once in October in years 2002-2016. In 2017 and 2019, surveys were conducted once in October. In 2018 Lick Cr was only surveyed once in September and was limited to the lower reach.

**Table 1d.** Bull trout spawning survey results for Little Minam River and Dobbin Cr from 1998 – 2003, 2005 & 2020.

<b>Little Minam River &amp; Dobbin Creek</b>	<i>Index reach name (length)</i>			<i>Redd totals</i>		<i>Survey reach length</i>		<i>Redd density</i>	
	Little Minam: LM7 to LM6 (1.5 miles)	Little Minam: LM6 to Dobbin Mouth (1.4 miles)	Dobbin Cr: Dobb 1 to Dobb Mouth (1.2 miles)	Index redds	Total redds	Index reach survey miles	Total survey miles	Index redds/mile	Total redds/mile
1998	98	65	15	178	381	4.1	10.4	43.4	36.6
1999	62	30	10	102	300	4.1	10.4	24.9	28.8
2000	77	60	24	161	270	4.1	10.4	39.3	26.0
2001	96	90	43	229	434	4.1	10.4	55.9	41.7
2002	40	35	6	81	230	4.1	10.4	19.8	22.1
2003	57	34	15	106	209	4.1	10.4	25.9	20.1
2005	24	63	19	106	260	4.1	10.4	25.9	25.0
2020	14	20	10	44	60	4.1	10.4	10.7	5.8

Notes: From 1998-2001 surveys were conducted four times in each reach. In 2002, 2003, 2005 and 2020 surveys were conducted twice in each reach.

**Table 1e. eDNA Results Bear/Goat Cr System**

Site #	Stream Name	Zone	Easting	Northing	Date Collected	Bull Trout DNA Detected?	Brook Trout DNA Detected?	Comments
BC1	Bear Creek	11	457646	5026628	8/12/2020	Y	N	
BC2	Bear Creek	11	458149	5025299	8/12/2020	N	Y	
BC3	Bear Creek	11	459054	5023417	8/12/2020	N	Y	
BC4	Bear Creek	11	459943	5022632	8/12/2020	N	N	
BC5	Bear Creek	11	460981	5020719	8/13/2020	N	Y	
BC6	Bear Creek	11	461825	5019461	8/13/2020	N	NA	Brook Trout caught on hook and line
BC7	Bear Creek	11	462525	5018480	8/13/2020	N	NA	Brook Trout caught on hook and line
BC8	Bear Creek	11	463241	5017136	8/13/2020	N	NA	Brook Trout caught on hook and line
DC1	Doc Creek	11	454832	5029355	8/18/2020	N	NA	
DC2	Doc Creek	11	455232	5027582	8/18/2020	NA	NA	Did not analyze sample
GC1	Goat Creek	11	460102	5028084	8/12/2020	N	N	
GC2	Goat Creek	11	460316	5027198	8/12/2020	N	N	
GC3	Goat Creek	11	460926	5026638	8/12/2020	N	N	
GC4	Goat Creek	11	461930	5026448	8/12/2020	N	N	
GRAN1	Granite Creek	11	463267	5020583	8/18/2020	N	NA	
GRAN2	Granite Creek	11	464185	5019749	8/18/2020	NA	NA	Did not analyze sample
LBC1	Little Bear Creek	11	460018	5034971	8/5/2020	Y	N	
LBC2	Little Bear Creek	11	460882	5033638	8/5/2020	N	N	
LBC3	Little Bear Creek	11	461523	5032714	8/5/2020	Y	N	
McC1	McCubbin Creek	11	462504	5025470	8/13/2020	N	N	
McC2	McCubbin Creek	11	462643	5024303	8/13/2020	NA	NA	Did not analyze sample

Notes: Doc and Granite creeks were only analyzed for bull trout DNA. We held off on having sites DC2, GRAN2, McC2 analyzed; if sites immediately downstream had positive detections for bull trout presence these sites would have been analyzed. Numerous fish barriers, high gradient reaches, and limited stream flow were also contributing factors on why some sites were not analyzed.