Potlatch River Watershed Management Plan - 2019 Amendment

Wild Steelhead Recovery Guidance

4 November 2019

Sponsored by

Latah Soil and Water Conservation District

220 East 5th Street

Moscow, Idaho

Prepared by

Potlatch Implementation Group

Preface

The "Potlatch River Watershed Management Plan – 2019 Amendment, *Wild Steelhead Recovery Guidance*" (2019 Amendment) described herein amends the 2007 Potlatch River Watershed Management Plan. The developers of the 2007 Potlatch Plan unanimously selected the following goal statement: "The goal of the Potlatch River Watershed Management Plan is to specify protection, connection, and restoration strategies to help restore steelhead to a robust, self-sustaining population in the Potlatch River watershed" (Chapter 7, page 1). This 2019 Amendment does not alter that goal statement but intends to inform future restoration efforts based on current steelhead abundance and distribution data, habitat conditions throughout the watershed, and lessons learned from restoration implementation since 2007.

This 2019 Amendment represents a collaboration by professional staff representing local, state, and federal agencies working on steelhead recovery in the Potlatch River. The agencies who have developed the 2019 Amendment will also be the sponsors for developing and implementing future actions as envisioned in this document; the participants include the following.

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Cover: Potlatch River looking upstream near the confluence with Corral Creek, K. Stinson, Latah SWCD
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Introduction

Steelhead (*Oncorhynchus mykiss*) in the Potlatch River are listed as threatened under the Endangered Species Act (ESA), and limited resources are available to implement actions for steelhead population recovery. Watershed partners have collaborated on restoration efforts to maximize the use of limited resources, to achieve the best possible results. The development of this recovery guidance is part of our efforts to optimize actions that address limiting factors in areas where there is the greatest potential for positive biological response, ultimately accelerating recovery of steelhead in the Potlatch River watershed (Figure 1 Location Map).

Improving steelhead production and productivity in the Potlatch River is the outcome expected from habitat restoration implementation. Most of this implementation will be accomplished using leveraged funding from the Pacific Coastal Salmon Recovery Fund, which is financed by the National Marine Fisheries Service (NMFS), and funding from the Bonneville Power Administration which finances implementation of the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program.

Funds are available to project sponsors once each year. Bonneville Power Administration money is available for use within one-year contract terms and Pacific Coastal Salmon Recovery Funds are administered via three-year contracts. The known stability of available (albeit limited) funding is through Fiscal Year 2022 by the Extension and Restatement of the 2008 Columbia Basin Fish Accords Memorandum of Agreement and Fiscal Year 2019 PCSRF funding. Future funding will depend on negotiation with the Bonneville Power Administration and Congressional support for the Pacific Coastal Salmon Recovery Fund.

Project sponsors must be poised to implement recovery actions each year to maximize the magnitude of steelhead habitat recovery from limited funds. By extension, this will require that sponsors have multiple projects in various stages of development at any given time.

Collectively this 2019 Amendment and funding availability provide a framework for an agreed-upon inter-agency strategy for steelhead recovery in the Potlatch River watershed during the next five years. This strategy provides the participating partners with tools to optimize flexible planning so that opportunities can be identified and used to the best advantage in steelhead recovery. This strategy, while supporting opportunistic actions in the watershed, does not suggest random restoration. The nature of this recovery guidance focuses priority action types in priority locations for optimal steelhead recovery.

Potlatch Implementation Group

Historical Context

The Potlatch River Watershed Management Plan (2007 Potlatch Plan) was produced in 2007 by the Latah Soil and Water Conservation District (Latah SWCD) to provide broad guidance for implementation of habitat restoration actions to increase production of ESA-listed

Snake River steelhead in the Potlatch River watershed. A collaborative group of agency representatives was formed in 2005 to consult on the development of the 2007 Potlatch Plan. The Clearwater Technical Group was created in 2008 for interagency discussions regarding work throughout the Clearwater River subbasin. Interagency subgroups from the Clearwater Technical Group were subsequently formed to focus on specific areas in the Clearwater, including one for the Potlatch River. This group met for a variety of objectives, including the following: 1) prepare for the 2007-2009 solicitation for Bonneville Power Administration funding to implement projects for the Northwest Power and Conservation Council's Fish and Wildlife Program; 2) review and amend implementation priorities for the Potlatch Plan in 2009; and 3) prepare for the 2013 Geographic Review.

The *Potlatch Implementation Group* (Potlatch Group) was organized in late 2014. The Potlatch Group provides an interagency forum to discuss, exchange information, and review habitat restoration projects intended to benefit the recovery of ESA-listed steelhead in the Potlatch River watershed. Potlatch River steelhead are part of the Clearwater River Lower Mainstem population of the Clearwater Major Population Group and the Snake River Distinct Population Segment. The Potlatch River Watershed Plan 2019 Amendment is based on data from Idaho Department of Fish and Game collected as part of their Potlatch River Steelhead Monitoring and Evaluation project (PRSME). These data are augmented by experience from restoration implemented by the Latah Soil and Water Conservation District and Idaho Department of Fish and Game since 2007.

The 2019 Amendment effectively updates Chapter 3 Fish Resources, Chapter 4 Limiting Factors, and Chapter 7 Implementation Plan of the 2007 Potlatch Plan. This 2019 Amendment aligns with several regional programs, funding sources, and the 2017 National Marine Fisheries Service ESA Recovery Plan for Snake River Idaho Spring/Summer Chinook Salmon and Snake River Basin Steelhead (2017 Recovery Plan). Program coordination includes the following:

- 2017 Recovery Plan
- Columbia River Basin Fish and Wildlife Program
- Pacific Coastal Salmon Recovery Fund Program

<u>Organization and Function</u>

The Potlatch Group was organized to provide an interagency forum for informal and collaborative discussions that would be beneficial to the effectiveness and efficiency of steelhead habitat restoration work in the Potlatch River watershed, regardless of funding sources. Public agency participation in this group includes the following: Latah Soil and Water Conservation District, Idaho Department of Lands, Idaho Department of Fish and Game, Idaho Office of Species Conservation, Idaho Department of Environmental Quality, National Marine Fisheries Service, Natural Resources Conservation Service, Nez Perce-Clearwater National Forests, Bonneville Power Administration, and Pacific States Marine Fisheries Commission. The Idaho Office of Species Conservation provides the group with staff support.

It is the intention of the Potlatch Group to meet monthly (intermittent during field season) to enhance collaboration and coordination for habitat restoration project planning, engineering, design, implementation, and to review new PRSME data. Meetings provide opportunities for participants to exchange information, identify restoration/protections needs and opportunities in the watershed, and coordinate and consult with expertise available among participants.

2019 Potlatch Plan Amendment Nexus with the 2017 Recovery Plan

The 2019 Amendment supports the NMFS 2017 Recovery Plan recovery objectives. Restoration work will support the 2017 Recovery Plan as follows:

- The Interior Columbia Technical Review Team identified viable recovery scenarios for each Major Population Group in the ESA-listed Snake River steelhead Distinct Population Segment to direct recovery. The recovery scenario for the Clearwater includes selection of the Clearwater River lower mainstem population, which is the only large-size extant population in the Major Population Group and must, at a minimum, attain a “Viable” status to meet the Interior Columbia Technical Review Team size criterion. The proposed “Viable” status for the Clearwater River lower mainstem population means recovery work must result in a low (1 to 5%) risk of extinction over 100 years. This population is included as part of the viable recovery scenario because it is the only predominantly A-run population in the Major Population Group, with a low (<15%) B-run contribution. Also, recent genetic analysis by Idaho Department of Fish and Game found that the Clearwater River lower mainstem population exhibits no evidence of hatchery influence on its genetic composition (NMFS 2017, section 6.2.33).
- The Potlatch River is a Major Spawning Area for the Clearwater River lower mainstem population (NMFS 2017, section 6.2.39).
- The Potlatch River has been identified as one of the highest priority watersheds for protection and restoration within the Clearwater River lower mainstem population (NMFS 2017, section 6.2.58).
- Subwatersheds identified by the Idaho Department of Fish and Game via the Potlatch River Steelhead Monitoring and Evaluation project for focused restoration work by the Potlatch Group are discussed below.
- Habitat restoration actions will be designed to address factors limiting the production of ESA-listed steelhead in the Clearwater River lower mainstem population as identified in the 2017 Recovery Plan (NMFS 2017, section 6.2.47).

Restoration actions implemented as part of the 2019 Amendment and under this guidance to benefit steelhead production will align with the tributary habitat strategy detailed in the 2017 Recovery Plan (section 4.1.2, pg. 94):

> The regional tributary habitat strategy is to protect, conserve, and restore natural ecological processes at the watershed scale that support population viability. This recovery strategy is founded on the concepts presented in several salmonid habitat recovery planning documents and scientific studies (e.g., Beechie and Bolton 1999; Roni et al. 2002; Beechie et al. 2003; Roni et al. 2005; Stanley et al. 2005;

Isaak et al. 2007; Roni et al. 2008; Beechie et al. 2010; Beechie et al. 2013; Roni and Beechie 2013). These studies demonstrate that habitat conditions and aquatic ecosystem functions are a result of the interaction between watershed controls (such as geology and climate), watershed processes (such as hydrology and sediment transport), and land use. Scientists and resource managers recognize that restoration actions that carefully integrate watershed or ecosystem processes are most likely to be successful at restoring depleted salmonid populations (Beechie et al. 2003).

Restoration actions selected for implementation in the Potlatch River watershed will reflect the general habitat restoration priorities identified in the 2017 Recovery Plan, including the following (NMFS 2017, section 6.2 p.59):

- Inventory migration barriers and prioritize for treatment.
- Restore hydrologic processes to retain surface and subsurface flow [Potlatch Group addition] by reducing runoff from altered land surfaces; this will also contribute to reducing stream temperatures.
- Restore channel-forming processes by reestablishing floodplains, restoring incised channels, and rehabilitating stream channels that have been straightened.
- Restore native plant diversity to stabilize soil, increase ground cover, prevent weed encroachment, create streamside shade, and improve large woody debris recruitment. Natural vegetation will in turn provide improved habitat for amphibians, reptiles, pollinators, and other wildlife.
- Reduce erosion and fine sediment delivery to streams from sources associated with agriculture, roads, road drainage systems, and other land uses.

Whenever feasible, recovery activities should be designed to preserve, restore, or rehabilitate natural habitat-forming processes (i.e. flood frequency and magnitude, sediment supply, and wood recruitment). When natural processes are compromised by irreversible alterations (e.g., highways or homes), or when time needed to recover natural processes is too long, artificial structures may be appropriate substitutes for missing habitat components (NMFS 2017, section 6.2 p.59).

Climate Change

The following discussion was adapted from the National Marine Fisheries Service 2017 Recovery Plan, Section 4.7.

Changes in temperature, precipitation, and ocean acidification due to climate change have implications for survival of steelhead in their freshwater, estuarine, and marine habitats. Changes in the timing of migration out of or into a river, reproduction, age at maturity, age at juvenile migration, as well as growth, survival and fecundity are associated with changes in temperature. Experts predict warmer temperatures will result in more precipitation falling as rain rather than snow; snow pack will diminish; and stream flow volume and timing will be altered.

Biological effects of climate change in freshwater habitat could include the following:

- Warmer water temperatures during incubation may accelerate the rate of egg development and result in earlier fry emergence and dispersal, which could be either beneficial or detrimental depending on location and prey availability.
- Reduced summer and fall flows may reduce the quality and quantity of juvenile rearing habitat, strand fish, or make fish more susceptible to predation and disease.
- Reduced flows/higher temperatures late summer and fall may decrease parr-to-smolt survival.
- Warmer temperatures will increase metabolism, which may increase or decrease juvenile growth rates and survival, depending on availability of food.
- Overwintering survival may be reduced if increased flooding reduces suitable habitat.
- Timing of smolt migration may be altered due to a modified timing of the spring freshet, such that there is a mismatch with ocean conditions and predators.

Higher water temperatures will also favor non-salmonid species that are better adapted to warmer water, including potential predators and competitors.

The Independent Science Advisory Board (2007) developed recommendations to incorporate climate change considerations into tributary restoration and recovery planning, which were adopted by National Marine Fisheries Service into the 2017 Recovery Plan. These recommendations were adopted into the 2019 Amendment; they include the following:

1. Minimize increases in summer temperatures in affected streams by implementing measures to retain and enhance shade along stream channels and augment summer flow;
2. Provide mitigation for declining summer flows by protecting and restoring wetlands, meadows, floodplains, other landscape features that store water, and assessing the potential to augment flows from existing manmade reservoirs. Beechie et al. (2013) provide advice on the types of habitat restoration actions most likely to ameliorate climate change and increase salmonid resilience. They found that restoring floodplain connectivity, restoring stream flow regimes, and restoring incised channels (such as through beaver reintroduction) are the actions most likely to ameliorate stream flow and temperature changes and increase habitat diversity and population resilience (Beechie et al. 2013; see Table 3, incorporated here in Appendix A).

<u>Adaptive Management</u>

Adaptive management provides a mechanism to incorporate data obtained through monitoring and evaluation into design and implementation of ongoing restoration actions. Adaptive management also provides recovery planners with tools to adjust recovery strategies. Steelhead monitoring has been ongoing since 2005 with the objective to evaluate fish and habitat responses to habitat restoration implementation in the watershed. The PRSME project is discussed in more detail under the section titled “Effectiveness Monitoring and Modeling” (page

27). Information and findings provided by this project have also been used to focus future restoration efforts as provided in this 2019 Amendment.

Project development, implementation, monitoring, assessment, and evaluation are recurring themes among the Potlatch Group. This exchange occurs through regular meetings of the group and field excursions organized throughout the year. This work was fundamental to the development by the Potlatch Group of the priority process-based restoration strategies described in the definitions section (page 33). Future changes to the 2019 Amendment will be directed by adaptive management.

2019 Potlatch Plan Amendment Nexus with the Clean Water Act

Idaho has established water quality standards, as required by the Clean Water Act. These standards are designed to protect, restore, and preserve water quality in surface waters with designated beneficial uses, such as salmonid spawning, contact recreation, and domestic water supply. Existing beneficial uses are those attained in waters on or after November 28, 1975, regardless how they are designated in the Idaho Department of Environmental Quality Rules, IDAPA 58.01.02. The Idaho Department of Environmental Quality presumes undesignated surface waters will support cold-water aquatic life and primary or secondary contact recreation beneficial uses and applies the water quality criteria for these presumed uses (IDAPA 58.01.02). The subwatersheds this 2019 Amendment addresses have the presumed uses of cold-water aquatic life and secondary contact recreation, with existing salmonid spawning.

The Clean Water Act requires assessment and a Total Maximum Daily Load analysis be developed for surface waters in Idaho. These have been completed for the Potlatch River and tributaries (IDEQ 2010 rev.). An implementation plan to address nonpoint pollution resulting from agricultural land uses was also developed for the Potlatch River watershed (Dansart 2010).

Table 1. Information for this table of streams to be addressed by the 2019 Amendment is from the *Potlatch River Watershed TMDL Five-Year Review* (IDEQ 2017).

Stream Name	Pollutants	Use Support Status	Notes
Big Bear Creek	E. coli, water temperature	NFS	
West Fork Little Bear Creek	E. coli, nitrogen (Total), sediment	NFS	Tributary to Little Bear Creek, a tributary to Big Bear Creek
Corral Creek	water temperature	NFS (Cold, SS) FS (SCR)	
East Fork Potlatch River	water temperature	NFS (Cold, SS) FS (SCR)	Mainstem below confluence with Ruby Creek
Ruby Creek	E. coli, water temperature	NFS	Tributary to East Fork Potlatch River

Note: Cold = cold-water aquatic life; FS = fully support; NFS = not fully supporting; SCR = secondary contact recreation; SS = salmonid spawning

The United States Environmental Protection Agency approved the Idaho Pollutant Discharge Elimination System Program and authorized the transfer of permitting authority to the state beginning on July 1, 2018. The Idaho program requires facilities discharging waste from a point source (e.g. pipe) into waters of the United States to obtain discharge permits. This permit issued by Idaho contains limits on what can be discharged and other provisions to ensure that the discharge does not harm water quality or the public's health.

Four of the eight permitted point sources in the Potlatch River are currently in the process of renewing permits, which include the following towns: Troy, Kendrick, Deary, and Bovill. The three National Pollutant Discharge Elimination System multi-sector general permits, shown below, will transition to the Idaho Pollutant discharge Elimination System Program July 1, 2020.

Table 2. Permitted Point Sources in the Potlatch River

Permit ID #	Facility Name	NPDES Type
ID0023604	City of Troy WWTP	POTW
ID0024554	City of Kendrick WWTP	POTW
ID0020788	City of Deary WWTP	POTW
ID0022861	City of Bovill WWTP	POTW
ID0023761	City of Juliaetta WWTP	POTW
IDR00A231	The McGregor Company	MSGP
IDR053100	I-Minerals Bovill Kaolin Project	MSGP
IDR053101	Bovill Mine	MSGP

Notes: MSGP = multi-sector general permit; POTW = publicly owned treatment works; WWTP = wastewater treatment plant

The Lewiston Regional Office of the Idaho Department of Environmental Quality conducts Beneficial Use Reconnaissance Program surveys in the summer throughout the Potlatch River watershed on a rotating schedule with other areas in the Clearwater subbasin. Priorities for these surveys are areas in which restoration has been implemented.

Project sponsors apply for Clean Water Act §319 program funds, provided by the United States Environmental Protection Agency and administered by the Idaho Department of Environmental Quality to address water quality issues throughout the Potlatch River watershed. Often, these funds are used in conjunction with steelhead habitat restoration funding in subwatersheds this 2019 Amendment addresses.

All the process-based restoration strategies discussed in this document will contribute to improving water quality. However, there are circumstances, that may direct actions toward site-specific treatments to benefit water quality and meet Idaho water quality standards and/or issues related to Idaho’s Total Maximum Daily Load reduction efforts.

Actions needed to improve instream water quality for steelhead or reduce point/non-point pollution entry into streams may include maintaining stream temperatures, reducing sediment and temperature, and removal from or prevention of nutrients, toxins, sewage, or refuse in streams. This strategy will be closely coordinated with Idaho’s Total Maximum Daily Load programs.

Priority Subwatersheds in the Potlatch River

The Potlatch River is the largest tributary to the lower Clearwater River subbasin, within the Columbia River Basin. The Potlatch River watershed, comprised of approximately 377,776 acres (590 square miles), is characterized by steep basaltic canyons rimmed by rolling crop land in the lower reaches, and by timbered hills and high meadow terrain in the upper reaches. The Potlatch River originates northeast of Bovill in the Beals Butte area (Figure 1). The basin ranges in elevation from 4,932 feet on Beals Butte to approximately 1,000 feet at the confluence with the Clearwater River. The communities of Bovill, Helmer, Deary, Troy, Juliaetta, and Kendrick are the principal towns within the watershed.

The Potlatch River is approximately 56 miles long and traverses the southern half of Latah County in a southwesterly direction with roughly 1,900 miles of tributary streams within ten subwatersheds. The diversity of geography, precipitation, land management, and landuse in the watershed is illustrated by Figures 2-5 (Dansart 2010).

<u>Tier I Priority Subwatersheds</u>

Priority subwatersheds (Tier I subwatersheds) were selected by a subcommittee of fish biologists from the Potlatch Group. Selection of Tier I subwatersheds was based upon the following criteria:

- The subwatershed has adequate steelhead resources to generate a detectable response in steelhead production and/or productivity via restoration of habitats and ecosystem processes. (see Figure 6 and annual PRSME project reports)
- The subwatershed is large enough to support multiple life stages of steelhead. (See Figure 1)
- The restoration actions selected are expected to result in a detectable biological response in steelhead production within five years (i.e., juvenile distribution, density, survival, growth) and productivity within ten years (i.e., smolt per female productivity) following completion of high priority projects.

Following are descriptions of the three Tier I subwatersheds:

<u>Big Bear Creek</u> is the largest subwatershed of the Potlatch River, comprising approximately 100,745 acres. Within the Big Bear Creek watershed, Little Bear Creek drains approximately 39,745 acres, and Big Bear Creek itself drains the remaining approximately 61,000 acres. The drainage area includes 51,500 acres of private lands. State lands (3,400 acres) are distributed in several areas near the watershed divide. Nez Perce-Clearwater National Forests lands (5,800 acres) are in the northwest corner of the watershed. Forty acres of BLM land is located just south of Dry Creek Road, in the lower central portion of the watershed. Headwaters originate six miles northwest of the town of Deary; the creek flows north to south with a predominantly southern exposure for about 22 miles before reaching its outlet immediately southwest of Kendrick High School.

The section of Big Bear Creek from West Fork Big Bear Creek to the mouth drains the forested hills and grasslands west of the town of Deary. Big Bear Creek carves a steep canyon as it leaves the plateau on its way toward its confluence with Little Bear Creek. Little Bear Creek (the main tributary) joins Big Bear Creek about one mile upstream of the confluence with the Potlatch River.

Figure 1.

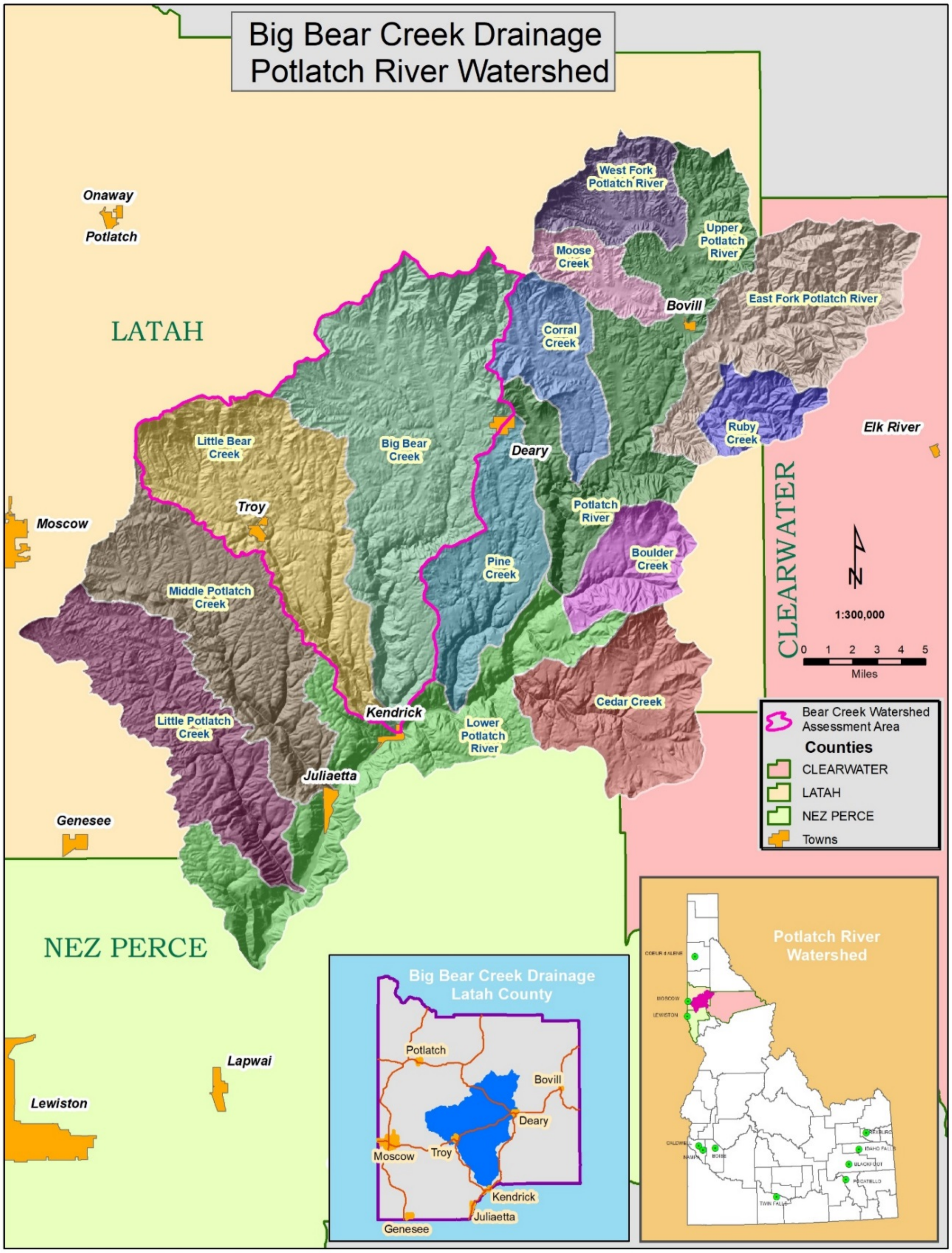
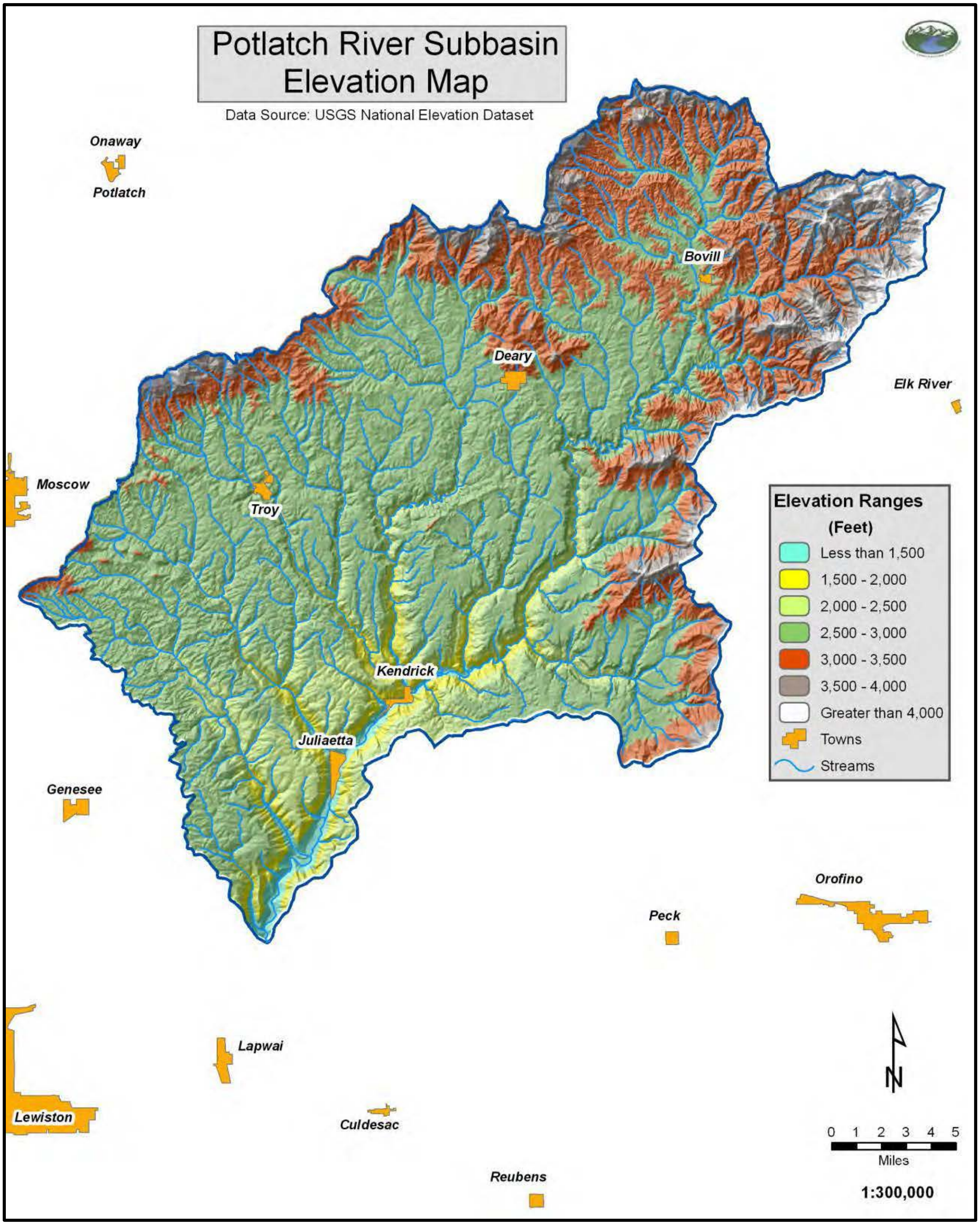
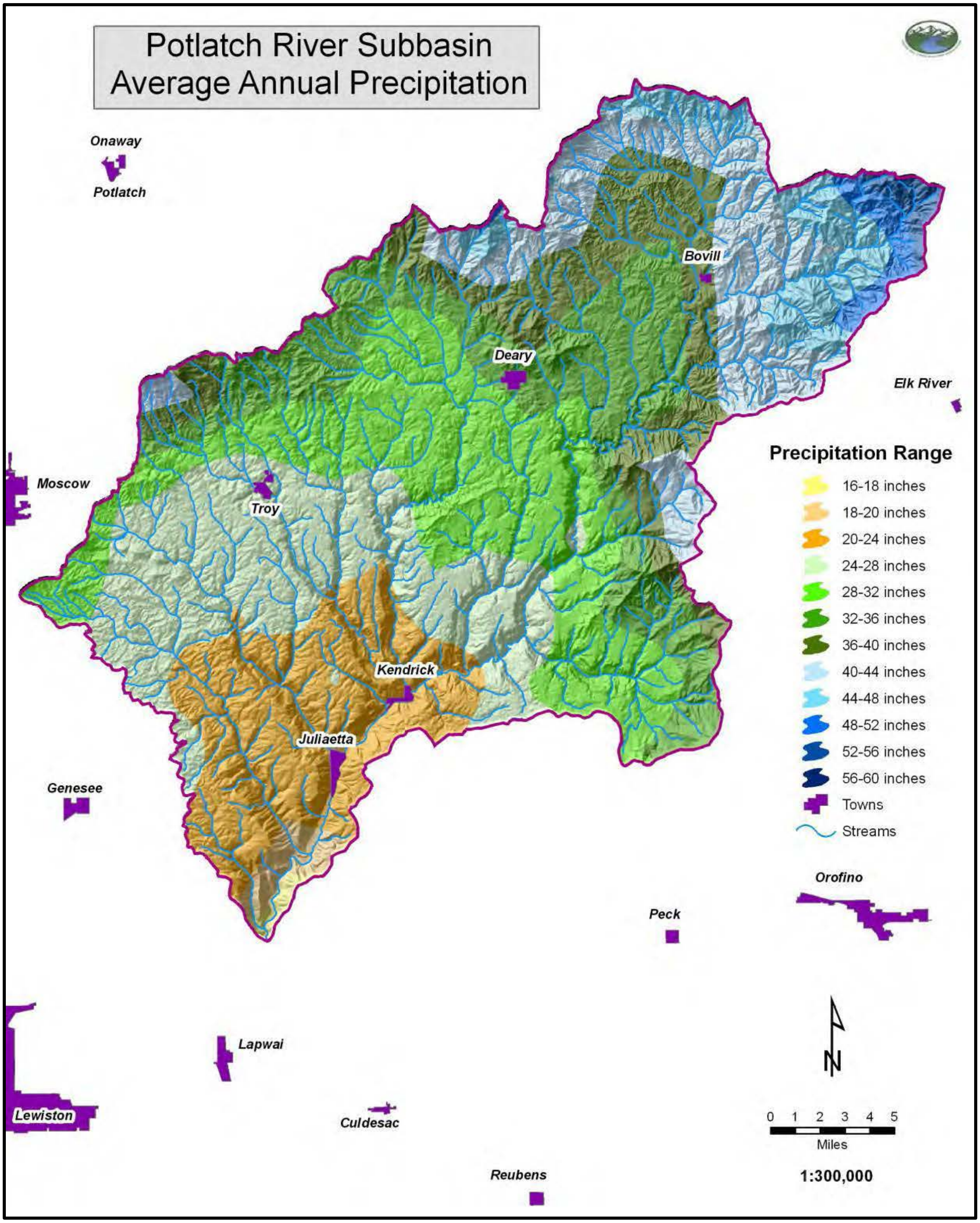


Figure 2.



Potlatch River Subbasin
Elevation Map
Data Source: USGS National Elevation Dataset
Onaway
Potlatch
Bovill
Deary
Elk River
Moscow
Troy
Kendrick
Juliaetta
Genesee
Orofino
Peck
Lapwai
Lewiston
Culdesac
Reubens
Elevation Ranges
(Feet)
Less than 1,500
1,500 - 2,000
2,000 - 2,500
2,500 - 3,000
3,000 - 3,500
3,500 - 4,000
Greater than 4,000
Towns
Streams
N
0 1 2 3 4 5
Miles
1:300,000

Figure 3.



Potlatch River Subbasin
Average Annual Precipitation
Onaway
Potlatch
Bovill
Deary
Elk River
Moscow
Troy
Kendrick
Juliaetta
Genesee
Peck
Orofino
Lapwai
Lewiston
Culdesac
Reubens
Precipitation Range
16-18 inches
18-20 inches
20-24 inches
24-28 inches
28-32 inches
32-36 inches
36-40 inches
40-44 inches
44-48 inches
48-52 inches
52-56 inches
56-60 inches
Towns
Streams
N
0 1 2 3 4 5
Miles
1:300,000

Figure 4.

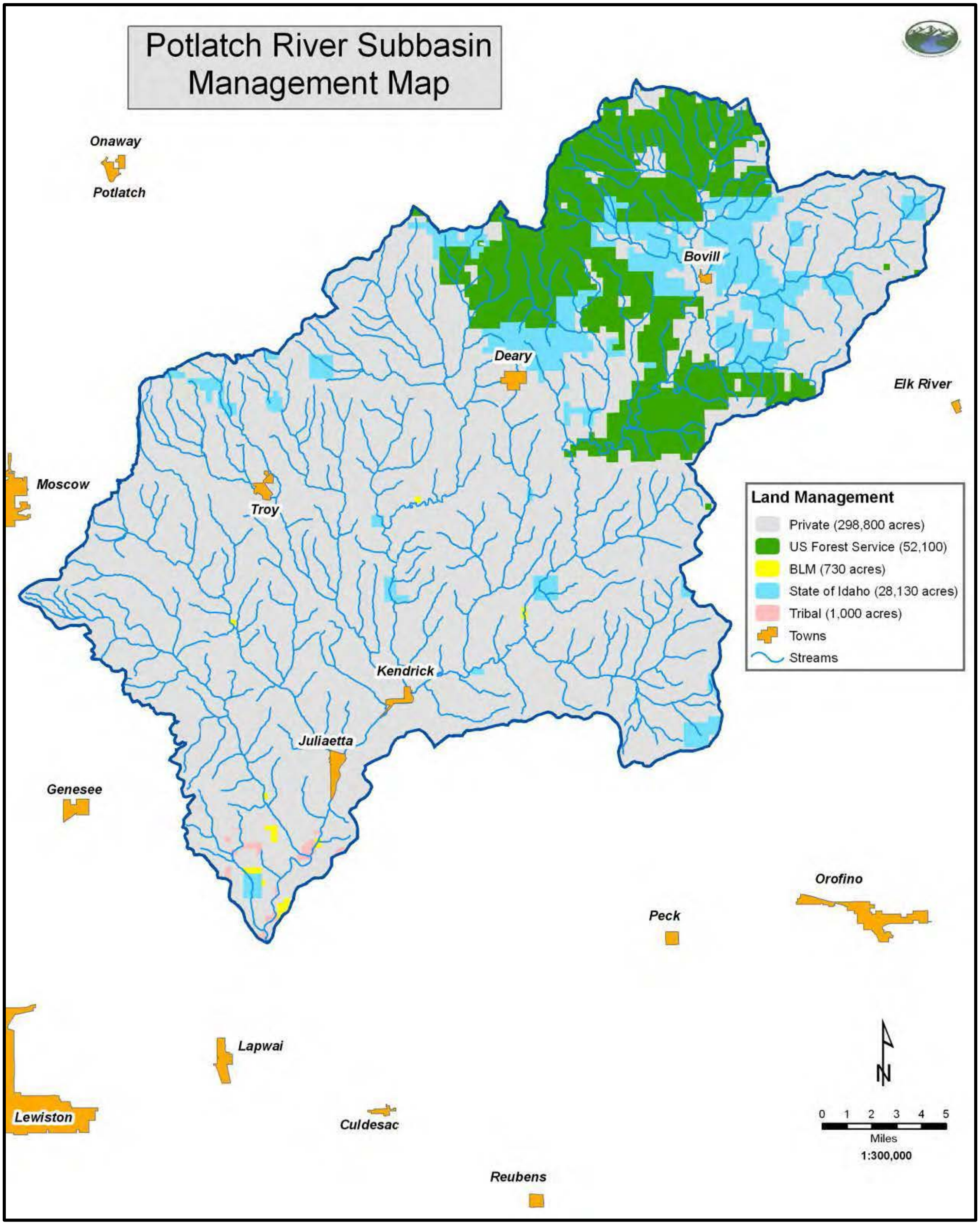
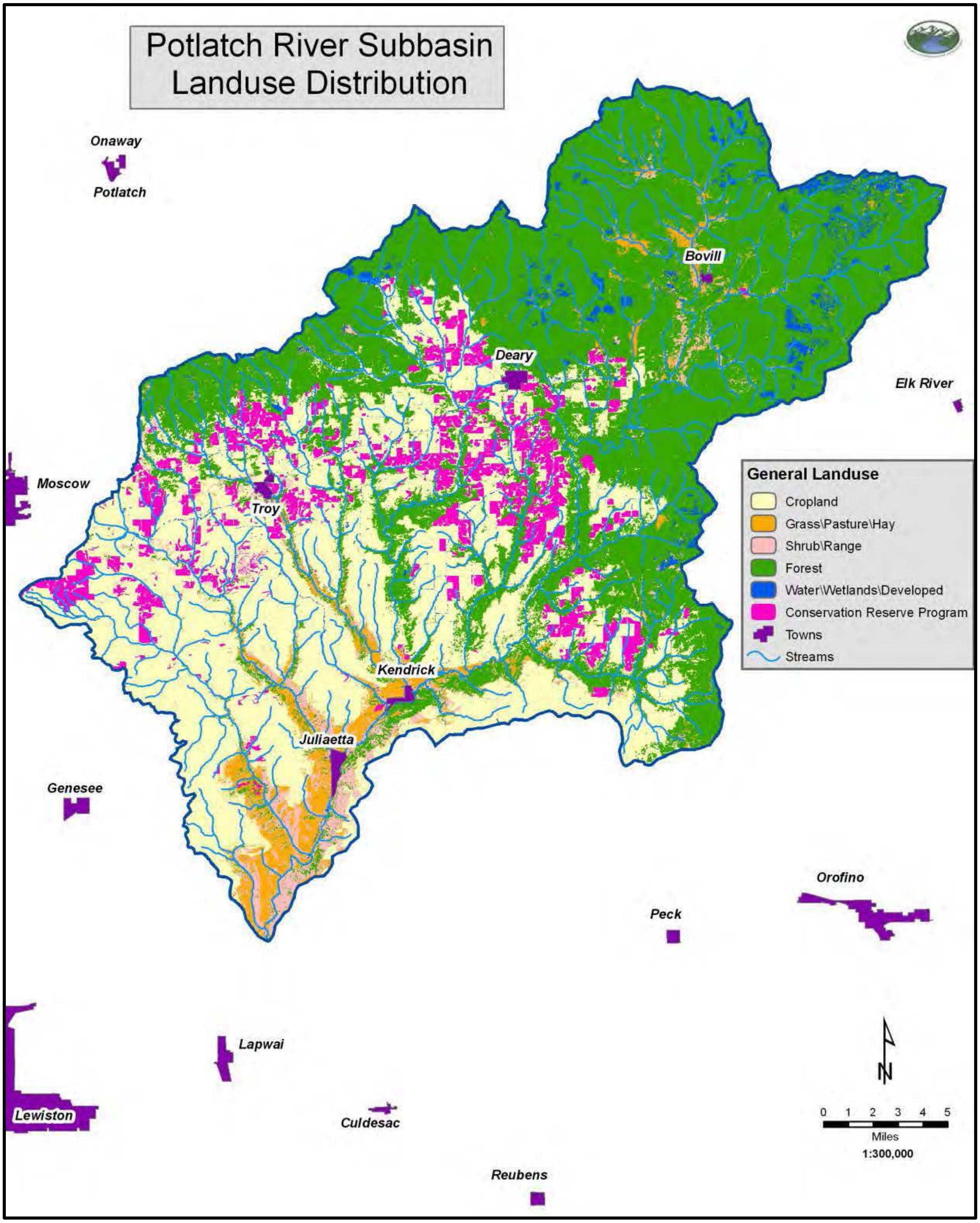

Potlatch River Subbasin Management Map
Onaway
Potlatch
Bovill
Deary
Elk River
Moscow
Troy
Kendrick
Juliaetta
Genesee
Orofino
Peck
Lapwai
Lewiston
Culdesac
Reubens
Land Management
Private (298,800 acres)
US Forest Service (52,100)
BLM (730 acres)
State of Idaho (28,130 acres)
Tribal (1,000 acres)
Towns
Streams
N
0 1 2 3 4 5
Miles
1:300,000

Figure 5.



Potlatch River Subbasin
Landuse Distribution
Onaway
Potlatch
Bovill
Deary
Elk River
Moscow
Troy
General Landuse
Cropland
Grass\Pasture\Hay
Shrub\Range
Forest
Water\Wetlands\Developed
Conservation Reserve Program
Towns
Streams
Kendrick
Juliaetta
Genesee
Orofino
Peck
Lapwai
Lewiston
Culdesac
Reubens
N
0 1 2 3 4 5
Miles
1:300,000

The most heavily forested lands (20,740 acres) are in the northern third of Big Bear Creek. Open forest and shrublands (16,100 acres) cover much of the remaining watershed and are grazed by livestock. The canyons of Big Bear Creek steepen and narrow significantly from 2,300 feet in elevation just above Dry Creek to about 1,350 feet just above the mouth of Little Bear Creek; the canyon widens significantly for the next mile to the drainage outlet at the Potlatch River.

Headwater geology of Big Bear Creek consists of metamorphic rocks of the Wallace Formation intruded by granitic rocks in the upper northeast corner, adjacent to younger rhyolitic and dacitic volcanic rocks. Metamorphic rocks are also exposed at several additional localities along both the eastern and western watershed boundaries. Much of the remaining watershed is underlain by Columbia River Basalt flows which are overlain by or include interbeds of Latah formation sediments. Alluvial deposits are found along stream channels with more extensive occurrences in upland areas (IGS 2012).

Lower Big Bear Creek flows through a canyon stretch to Big Bear Falls, located at about stream mile 5.4. The canyon continues above Big Bear Falls for an additional 19.5 stream miles, where the stream transitions into agricultural uplands; there are approximately 26 additional stream miles in the agricultural uplands. The canyon miles have more intact stream habitat than are in the agricultural upland streams. The headwaters of Big Bear Creek contain another 17.9 miles of forested streams. Landownership in the headwaters is primarily private except for watersheds of Schwartz and East Fork Big Bear creeks, most of which are managed by the Idaho Department of Lands, with some managed by the Nez Perce-Clearwater National Forests.

Juvenile steelhead production in the Big Bear Creek drainage appears to be severely impacted by Big Bear Falls. There is a 100-fold increase in juvenile steelhead densities directly below Big Bear Falls compared with densities immediately upstream (Bowersox et al. 2016). Furthermore, IDFG annual monitoring has documented that steelhead densities are typically higher in the canyon section below the falls compared to the agricultural upland section upstream (Stiefel et al. 2015a, b). Big Bear Falls is not a complete barrier to steelhead migration. Bowersox et al. (2016) documented juvenile steelhead directly above the falls and confirmed there is exchange of genetic material between headwater resident *O. mykiss* populations and the downstream anadromous population. Five of the ninety-nine adult steelhead sampled at the Big Bear Creek weir downstream of the falls from 2007-2011 were genetically assigned to the resident headwater population (Bowersox et al. 2016). Furthermore, historical accounts describe individuals harvesting adult steelhead in the headwaters of Big Bear Creek (Robbin Johnston, Nez Perce Clearwater National Forest archeologist, personal communication) which suggests steelhead historically accessed the entire Big Bear Creek drainage. However, conversion of the uplands surrounding Big Bear Creek into cropland have altered the intensity and timing of spring runoff conditions. Thus presently, migration above the falls is likely limited and may only occur under ideal flow conditions. Based on consistently higher juvenile production below the falls compared to above the falls, as well as data from adult steelhead telemetry studies, IDFG concludes the falls are a major impediment to steelhead migration in the tributary.

The canyon continues above Big Bear Falls for an additional 19.5 stream miles. Big Bear Creek then enters agricultural uplands and flows for approximately 26 miles through relatively degraded habitat. The headwaters of Big Bear Creek contain another 17.9 miles of forested streams. Landownership in the headwaters is primarily private except in the Schwartz and East Fork Big Bear creek watersheds. Those two streams are the only headwater streams with perennial flow and are predominantly managed by Idaho Department of Lands and U.S. Forest Service (Ulschmid et al. in prep). Despite limited passage at Big Bear Falls, IDFG monitoring and modeling work has verified the Big Bear Creek watershed (including Little Bear Creek) as the most productive steelhead drainage in the entire Potlatch River watershed (Uthe et al. 2017).

Thermal regimes in upper Big Bear Creek are driven by snowmelt and are significantly colder than the rain- and snowmelt-influenced regimes of the downstream canyon reaches in the subwatershed (Bowersox et al. 2016). Peak spawn timing of steelhead in two Potlatch River tributaries, lower Big Bear Creek and the East Fork Potlatch River, is often separated by 3–4 weeks (Bowersox et al. 2011). Spawning occurs later in the East Fork Potlatch River due to its higher elevation and colder temperature regime. Land uses in Big Bear Creek are diverse and are illustrated by Table 3 and Figure 7.

Table 3. Big Bear Creek and West Fork Little Bear Creek Land Uses

Land Use Category	Acres	Percent of Subwatershed
Cropland	9,230	11.5%
Conservation Reserve Program	8,780	10.9%
Grass/Crop	240	0.3%
Hay	5,410	6.7%
Pasture	1,520	1.8%
Orchard	50	<0.1%
Grass	810	1%
Wetlands	60	<0.1%
Shrub/Grass	4,500	5.6%
Tree/Shrub/Grass	25,050	31.1%
Tree/Shrub (Forest)	24,330	30.2%
Urban	410	0.5%
Waste Water Treatment Plant	16	<0.1%
Industrial	30	<0.1%
Rock Pit	45	<0.1%
Cemetery	19	<0.1%
TOTAL (BB & WFLB)	80,500	(only >0.1%) 99.6%

The mainstem of Little Bear Creek is formed at the confluence of Spring Valley Creek and Nora Creek, approximately 2.5 miles south of State Highway 8. The creek flows north to south for approximately 12.5 miles to the confluence with the West Fork Little Bear Creek. Little Bear Creek then flows approximately 8 miles to the confluence with Big Bear Creek.

The West Fork Little Bear Creek drains approximately 19,800 acres and is the largest tributary to Little Bear Creek. The watershed is entirely private, except for 924 acres of state land located within the headwaters of Felton Creek and lower Big Meadow Creek. The West Fork

Little Bear Creek is approximately 12 miles long, originating roughly five miles northwest of Troy, Idaho. The stream flows southeast through the town of Troy and down a narrow canyon before entering Little Bear Creek. Land uses in this subwatershed are shown on Figure 8.

The upper third of the West Fork Little Bear Creek is underlain by granitic bedrock. Apart from a small exposure of metasedimentary rock along the western boundary, the remainder of the watershed is underlain by basalt interbedded and overlain by Latah formation sediments. Alluvial deposits are found along stream channels; Onaway Basalt is exposed adjacent to stream channels above the canyon section (IGS 2012).

Wastewater treatment facilities are located within the Big Bear Creek subwatershed in the towns of Troy and Deary. Another facility for the town of Kendrick is located along the mainstem of the Potlatch River near the confluence with Big Bear Creek. There is one National Pollutant Discharge Elimination System-multi-sector general permit located near Kendrick for the McGregor Company. The McGregor Company is the largest independent fertilizer, agri-chemical, and agriculture equipment dealer in the Pacific Northwest.

The discussion of the Big Bear Creek subwatershed is absent detail for the Little Bear Creek mainstem and Big Meadow Creek. This description will be added after land use mapping and figure development is completed for these areas.

Trapping Restoration Beavers

Holding Restoration Beavers

Releasing Restoration Beavers

Figure 6.

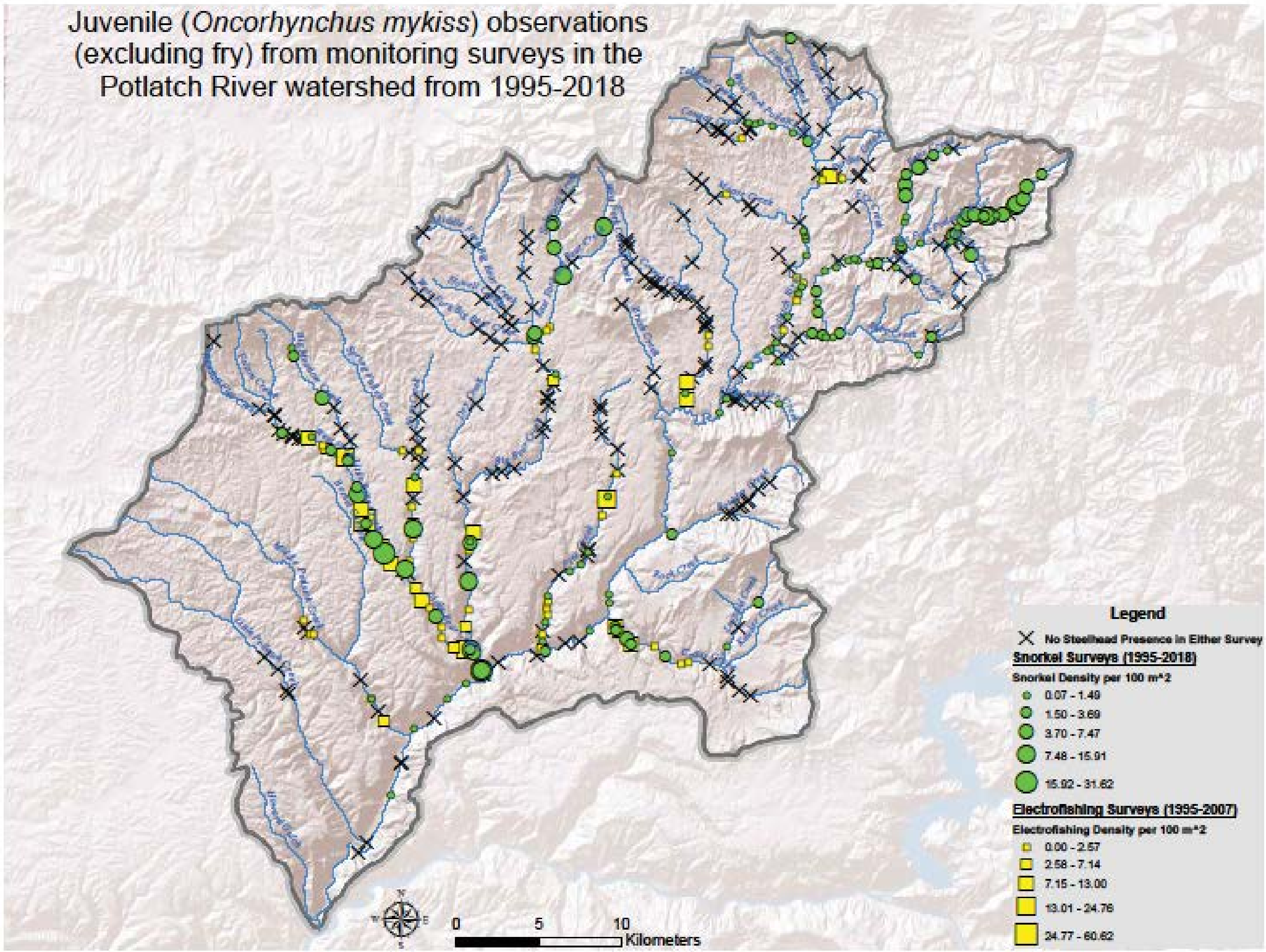

Juvenile (*Oncorhynchus mykiss*) observations
(excluding fry) from monitoring surveys in the
Potlatch River watershed from 1995-2018
Legend
No Steelhead Presence in Either Survey
Snorkel Surveys (1995-2018)
Snorkel Density per 100 m^2
0.07 - 1.49
1.50 - 3.69
3.70 - 7.47
7.48 - 15.91
15.92 - 31.62
Electrofishing Surveys (1995-2007)
Electrofishing Density per 100 m^2
0.00 - 2.57
2.58 - 7.14
7.15 - 13.00
13.01 - 24.76
24.77 - 60.62
0
5
10
Kilometers

Figure 7.

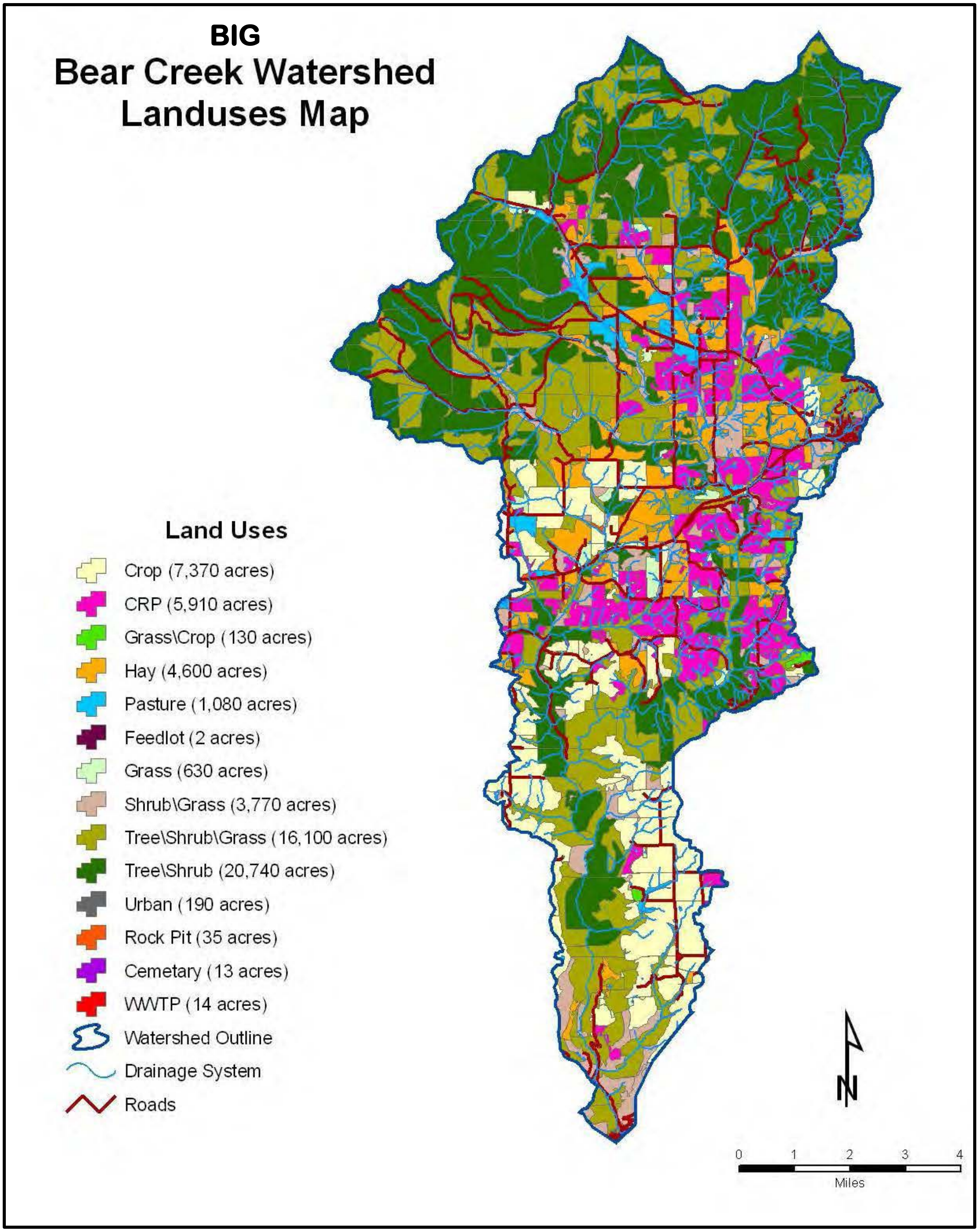
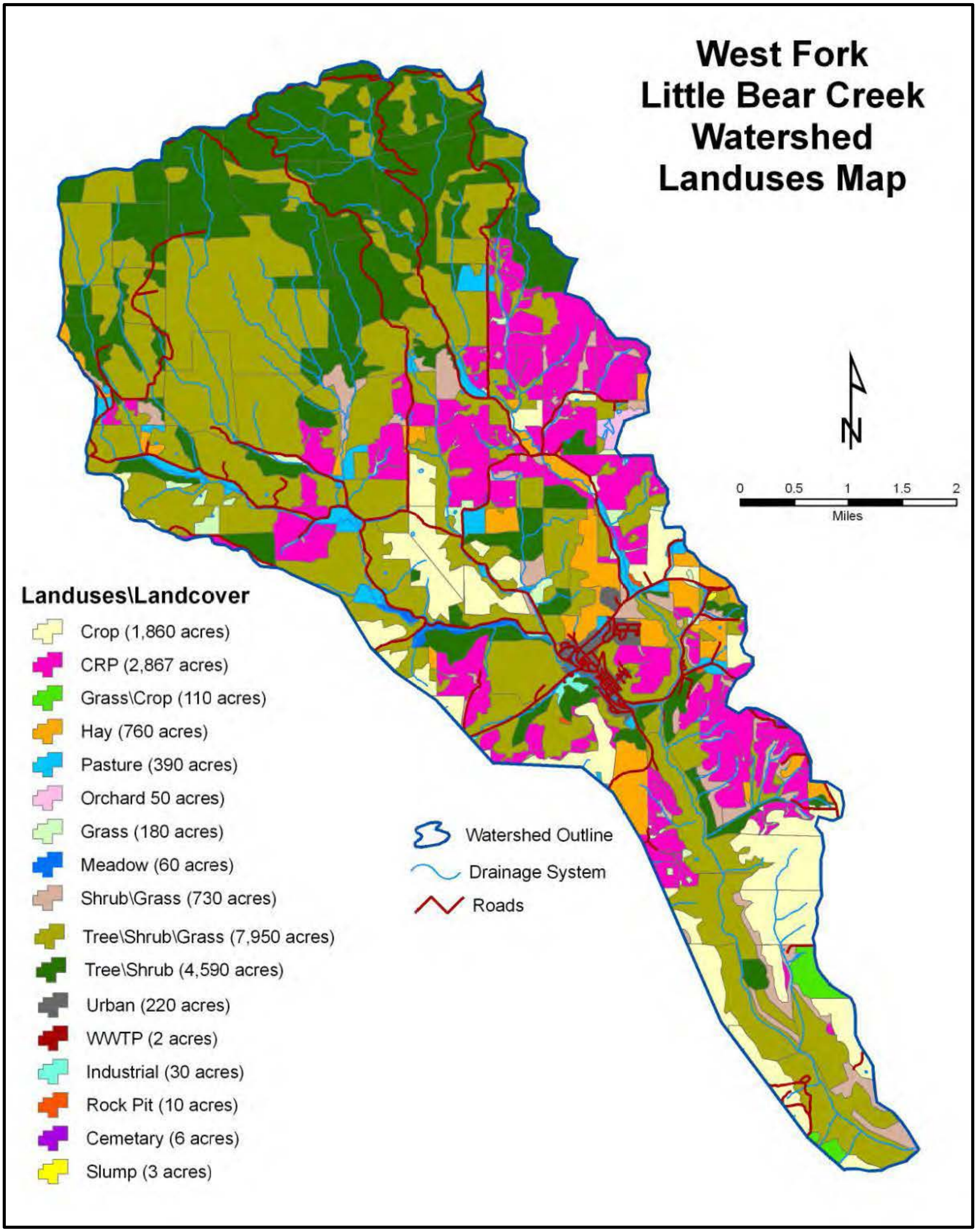

BIG
Bear Creek Watershed
Landuses Map
Land Uses
Crop (7,370 acres)
CRP (5,910 acres)
Grass\Crop (130 acres)
Hay (4,600 acres)
Pasture (1,080 acres)
Feedlot (2 acres)
Grass (630 acres)
Shrub\Grass (3,770 acres)
Tree\Shrub\Grass (16,100 acres)
Tree\Shrub (20,740 acres)
Urban (190 acres)
Rock Pit (35 acres)
Cemetary (13 acres)
WWTP (14 acres)
Watershed Outline
Drainage System
Roads
N
0 1 2 3 4
Miles

Figure 8


West Fork
Little Bear Creek
Watershed
Landuses Map
0
0.5
1
1.5
2
Miles
N
Landuses\Landcover
Crop (1,860 acres)
CRP (2,867 acres)
Grass\Crop (110 acres)
Hay (760 acres)
Pasture (390 acres)
Orchard 50 acres)
Grass (180 acres)
Meadow (60 acres)
Shrub\Grass (730 acres)
Tree\Shrub\Grass (7,950 acres)
Tree\Shrub (4,590 acres)
Urban (220 acres)
WWTP (2 acres)
Industrial (30 acres)
Rock Pit (10 acres)
Cemetary (6 acres)
Slump (3 acres)
Watershed Outline
Drainage System
Roads

The East Fork Potlatch River originates in the northwest corner of Clearwater County and flows southwest to its confluence with the Potlatch River between Moose Creek and Corral Creek. Mean annual flow is estimated at about 62 cfs (IDEQ 2008, 2010 rev.). Watershed elevations range from 2,670 feet, where the East Fork joins the Potlatch River, to almost 5,000 feet along the northern divide. The watershed is primarily underlain by gneiss, schist, and quartzite of the Wallace and St. Regis formations intruded by granite and rhyolitic dike rocks. Latah Formation sediments overlay the basement rocks near the western divide. Valley bottoms are underlain by alluvium (IGS 2012).

The East Fork Potlatch River is a forested watershed, 39,550 acres in size. Most lands are private timberland (25,825 acres); Idaho Department of Lands (8,875 acres), and Nez Perce-Clearwater National Forests (4,850 acres) manage the remaining acres. There is no farming in the watershed, but approximately 60 acres are enrolled in the Farm Service Agency's Conservation Reserve Program. About 150 acres of pasture was noted, mostly in degraded wetlands just east of Bovill; a few acres of pasture were observed near the mouth of the East Fork Potlatch River. Active timber harvest is occurring within the watershed; some areas appear to be clearcut. A state tree farm is also present within the watershed.

Ruby Creek (8,100 acres), the largest tributary in this subwatershed, originates southeast of Bovill and flows northwest to its confluence with the East Fork Potlatch River. The Ruby Creek subwatershed is comprised of forest lands with degraded wetlands along some stream drainages. Timber harvest is the primary land use. Management of the forested lands is divided between private (3,700 ac), Idaho Department of Lands (2,130 ac), and the Nez Perce-Clearwater National Forests (2,300 ac). Watershed elevations range from 2,770 feet where Ruby Creek empties into the East Fork Potlatch to almost 4,700 feet on Jackson Mountain. The entire watershed is underlain by metamorphic rocks intruded by granite and rhyolitic dike rocks. Latah Formation sediments overlay the basement rocks near the western divide. Valley bottoms are underlain by alluvium (IGS 2012).

Other major tributaries to the East Fork Potlatch River include Mallory Creek, Pivash Creek, Bloom Creek, Bobs Creek, Jackson Creek, and Fry Creek. Clearwater Soil and Water Conservation District staff conducted a riparian survey of these tributaries in 2011. The final report for the survey includes narrative descriptions and photographs of pre-restoration condition of these tributaries. (Hoffman 2012). Land uses in the East Fork Potlatch River are illustrated in Table 4, Figures 9 and 10. In the EFK, juvenile steelhead production is the highest in the upper reaches of the drainage, upstream of the confluence with Pivash Creek (Figure 6)

Table 4. East Fork Potlatch River Land Uses

Land Use Category	Acres	Percent of Subwatershed
Conservation Reserve Program	60	0.2%
Pasture	150	0.4%
Tree Farm	10	<0.1%
Wetlands	730	2%
Shrub/Grass	150	0.4%
Tree/Shrub/Grass	4,120	10%
Tree/Shrub (Forest)	34,330	87%
TOTAL	39,550	100%

Figure 9.

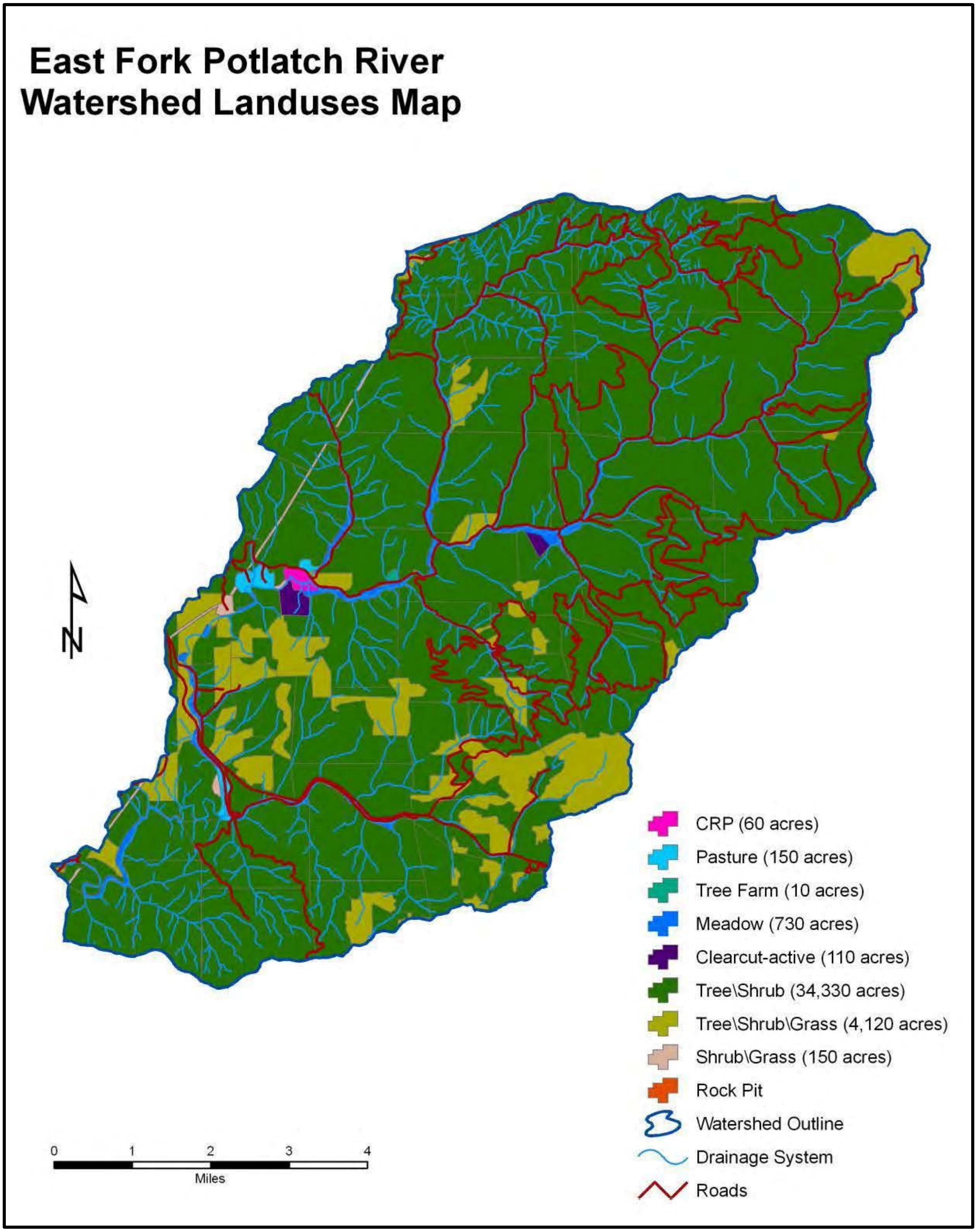
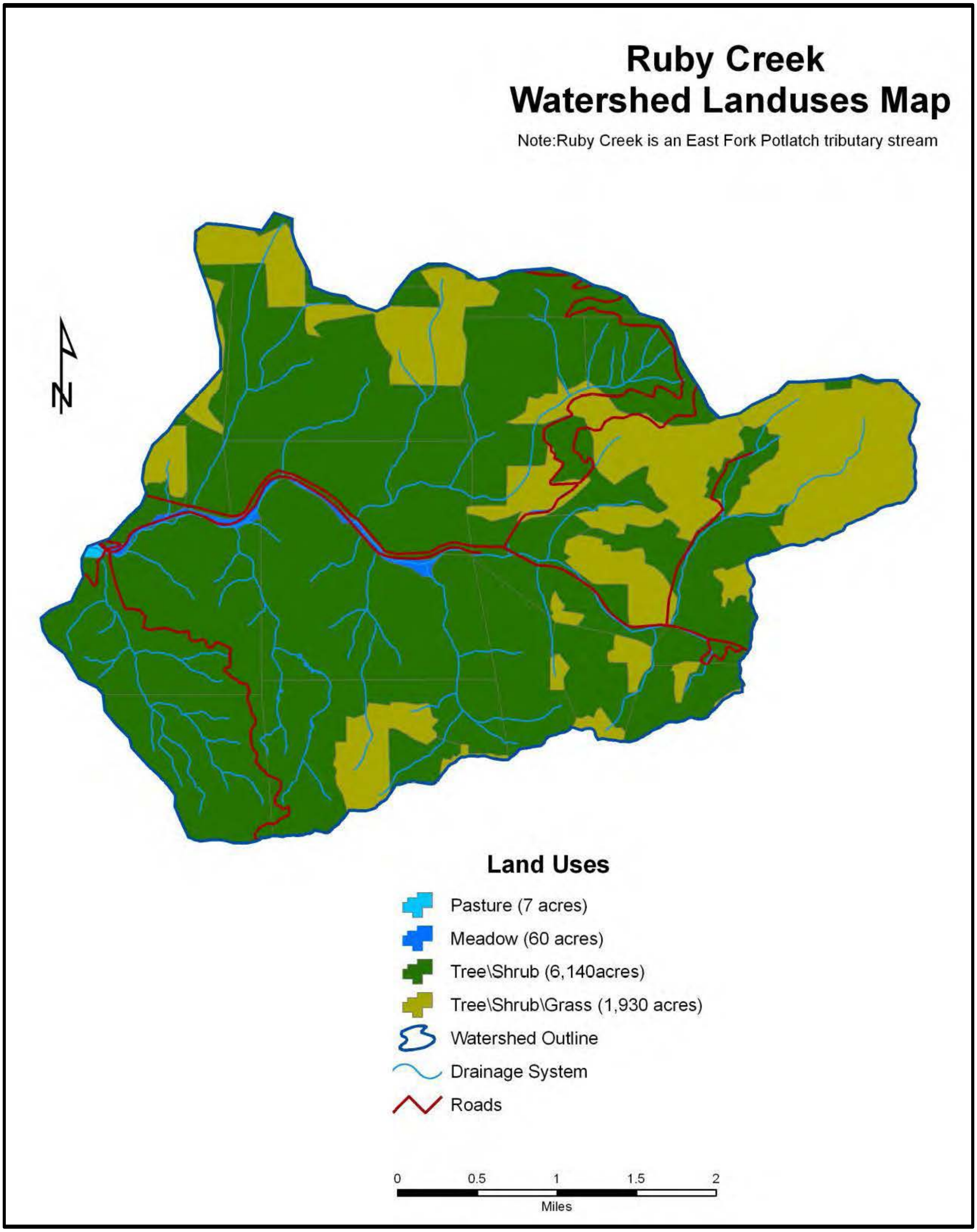

East Fork Potlatch River
Watershed Landuses Map
CRP (60 acres)
Pasture (150 acres)
Tree Farm (10 acres)
Meadow (730 acres)
Clearcut-active (110 acres)
Tree\Shrub (34,330 acres)
Tree\Shrub\Grass (4,120 acres)
Shrub\Grass (150 acres)
Rock Pit
Watershed Outline
Drainage System
Roads
0
1
2
3
4
Miles
N

Figure 10.



Ruby Creek
Watershed Landuses Map
Note:Ruby Creek is an East Fork Potlatch tributary stream
N
Land Uses
Pasture (7 acres)
Meadow (60 acres)
Tree\Shrub (6,140acres)
Tree\Shrub\Grass (1,930 acres)
Watershed Outline
Drainage System
Roads
0
0.5
1
1.5
2
Miles

Corral Creek Corral Creek is included in the Tier I subwatersheds because of the amount of wetland restoration that has occurred and the need to continue monitoring to evaluate the efficacy of this restoration technique to improve low summer baseflows. Most streams in the Potlatch River watershed are flow-limited; however, there is very little surface water withdrawal in the watershed, so strategies to enhance flow are limited. Monitoring of process-based restoration of wetlands in Corral Creek, a south-facing subwatershed of about 14,341 acres, suggests this may be one. An excerpt from Dansart (2017, rev. 2018) Draft: Racetrack Meadow Restoration – A Short 2017 Summary, describes monitoring in this meadow from 2011-2017, restoration was initiated in 2013, and is incorporated here as Appendix B.

Most of the land in Corral Creek is managed by the Nez Perce - Clearwater National Forests (7,400 ac). The state of Idaho manages an additional 3,000 acres of timberland, and there are approximately 1,950 acres of privately-owned forestland. The remaining 2,000 acres is privately-owned cropland, hay, pasture, or designated in the Conservation Reserve Program. Most federal and state lands are located north of State Highway 3 and most private lands are in the lower half of the drainage.

Corral Creek is a third order stream at its confluence with the Potlatch River. The headwaters originate about 8 miles to the north and east of the community of Helmer. Corral Creek generally flows from the north to south. Elevations range from just over 4,000 feet on the northernmost edge of the watershed to 2,370 feet at the stream's canyon outlet at the Potlatch River. The northernmost watershed has granitic bedrock, while the western central portion is comprised of rhyolitic and dacitic volcanic rocks. Basalts make up the bedrock geology in the southern and eastern portions of the Corral Creek watershed; the volcanic flows lap up against granitic and older volcanic rocks that make up the higher elevation areas. Sediments of the Latah formation overlay and are interbedded with Columbia River Basalt. Latah sediment interbeds and landslide deposits are present in the canyons formed by Corral Creek, in addition to more commonly encountered alluvial deposits along stream channels.

Forested lands comprise more than 80% of the watershed. In the southern one-third of the drainage area, less than 300 acres of uplands are cropped, with an additional 500 acres dedicated as Conservation Reserve Program acres. Grass wetlands and grassy shrubland are located adjacent to stream channels on forest lands. Scattered livestock grazing occurs throughout the watershed. The community of Helmer is in the southeastern portion of the watershed along State Highway 3, which transects the southern third of the drainage area.

Land uses in Corral Creek are shown in Table 5 and Figure 11, which were developed for the Potlatch River Subbasin Total Maximum Daily Load Implementation Plan for Agriculture. This document was produced before wetland restoration was first implemented in 2013 and it is interesting to note that there were no wetlands identified during mapping of the watershed (Dansart 2010). Juvenile steelhead production is limited to the lower reaches in Corral Creek (Figure 6), although juvenile salmonid fry have been observed in upper reaches near the confluence with the West Fork Corral Creek.

Table 5. Corral Creek Land Uses

Land Use Category	Acres	Percent of Subwatershed
Cropland	280	2%
Conservation Reserve Program	510	4%
Hay	200	1%
Pasture	80	0.5%
Grass	560	4%
Shrub/Grass	320	2%
Tree/Shrub/Grass	2,650	18%
Tree/Shrub (Forest)	9,700	68%
Urban	30	0.2%
Waste Water Treatment Plant	10	<0.1%
Rock Pit	10	<0.1%
TOTAL	14,350	99.7%

Tier II Subwatersheds

Subwatersheds in the Potlatch River not identified as Tier I are considered Tier II subwatersheds even though steelhead may be present in many Tier II streams. Restoration work in Tier II subwatersheds is expected to be implemented using funding available for work not limited to ESA-listed steelhead recovery or by agencies with internal non-competitive funding resources. Tier II projects that offer an unexpected opportunity to address limiting factors to steelhead, unanticipated need, problem, urgency, or innovation should be considered.

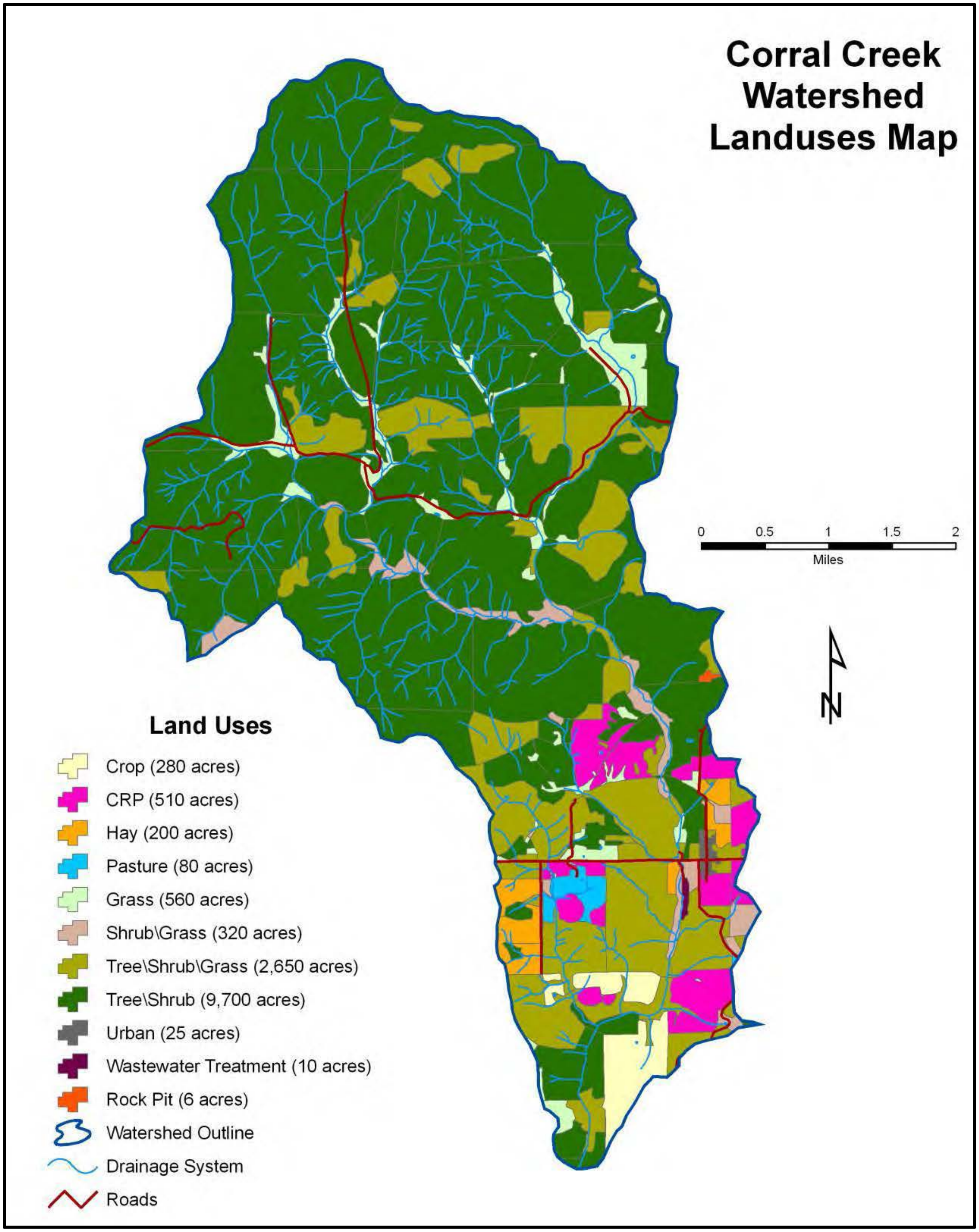
Effectiveness Monitoring and Modeling

Effectiveness Monitoring

The Potlatch River Steelhead Monitoring and Evaluation project is the sole habitat restoration effectiveness monitoring work for the Potlatch River watershed. The program was initiated in 2005 with Pacific Coastal Salmon Recovery Funds and was integrated into the National Marine Fisheries Service's Intensively Monitored Watershed program in 2007. The Potlatch River Steelhead Monitoring and Evaluation (PRSME) project continues to be funded through both sources. This monitoring work has established baseline levels of steelhead production and productivity and documented steelhead life history strategies exhibited within index drainages. The hierarchical monitoring design of the Potlatch River Steelhead Monitoring and Evaluation project is described below. (See annual reports for the PRSME project.)

The Potlatch River watershed is comprised of two distinct areas with notable differences in stream morphology, hydrology, and land use (Johnson 1985; Bowersox and Brindza 2006), as well as distinct limiting factors. The lower Potlatch River is defined as the drainage area downstream of and including Boulder Creek (Figure 1) and is characterized by steep basaltic canyons rimmed by rolling cropland. Most of the land in this area is privately owned and the principal land use is agriculture. The predominant stream type in the lower study area is a canyon stream with relatively high gradient, large substrate size, riffle/pocket water habitat types, and a flashy hydrograph (Bowersox and Brindza 2006). The upper Potlatch River encompasses the drainage area upstream of Boulder Creek (Figure 1) and is characterized by timbered hills and meadow terrain. The predominant stream type in this area is a forestland stream with relatively

Figure 11.


Corral Creek
Watershed
Landuses Map
0
0.5
1
1.5
2
Miles
N
Land Uses
Crop (280 acres)
CRP (510 acres)
Hay (200 acres)
Pasture (80 acres)
Grass (560 acres)
Shrub\Grass (320 acres)
Tree\Shrub\Grass (2,650 acres)
Tree\Shrub (9,700 acres)
Urban (25 acres)
Wastewater Treatment (10 acres)
Rock Pit (6 acres)
Watershed Outline
Drainage System
Roads

low gradient, dense forest canopy cover, meadows, small substrate composition, and cooler water temperatures (Bowersox and Brindza 2006). Most of the land in the upper Potlatch is publicly managed, but there are some tracts owned by private industrial timberland companies; the primary land use is timber production.

The goal of this monitoring project is to evaluate steelhead and habitat responses to habitat restoration implementation in the Potlatch River watershed and is designed to assess responses at multiple scales within both study areas. The monitoring objectives for the Potlatch River Steelhead Monitoring and Evaluation project are:

1. Assess steelhead/resident *O. mykiss* production and productivity within the two index drainages.
    a. Determine abundance of juvenile steelhead emigrants from the index drainages.
    b. Estimate adult steelhead escapement into the index drainages.
    c. Examine adult steelhead spawning distribution and habitat use within the index drainages.
2. Monitor juvenile steelhead density, survival, and growth in control and treatment tributaries within the upper and lower Potlatch River study areas.

3. Monitor change in habitat conditions associated with habitat restoration projects in the control and treatment tributaries within the upper and lower Potlatch River study areas.

At the broadest scale, a before/after comparison of steelhead production and productivity is done for two index drainages. Index drainages are Big Bear Creek in the lower study area and the East Fork Potlatch River in the upper study area, both streams are Tier I subwatersheds for restoration. (Figure 1). Multiple life stages are monitored to allow assessment of size- or age-specific responses. Results are intended to assess the total benefits of restoration (sum of all projects) for steelhead in each index drainage. The PRSME project will describe how steelhead respond to restoration actions and inform adaptive management decision-making.

Tributary–scale monitoring is conducted to assess specific restoration effects on juvenile steelhead production metrics (density, survival, and growth) and habitat conditions to isolate responses by restoration type. This scale of monitoring occurs in both treatment streams, where restoration is actively occurring, and control streams, where restoration is restricted. The PRSME project design for the lower Potlatch River focuses on the following treatment streams: Big Bear Creek, Little Bear Creek, and West Fork Little Bear Creek. The control stream for the lower Potlatch River is Pine Creek, which is not a tributary of Big Bear Creek. The treatment stream for the upper Potlatch River is the East Fork Potlatch River and the control stream is the West Fork Potlatch River (Figure 1).

Reach-scale monitoring is conducted to assess project design expectations versus actual outcomes of individual projects. For example, a large woody debris installation would be monitored to assess if changes in channel-forming processes increased fish use. This finer scale of monitoring allows managers to understand the relationships between specific restoration actions, respective habitat condition changes, and steelhead responses.

The PRSME design will allow better understanding of the relationships between habitat restoration actions and steelhead responses and how these then may be used for adaptive management decision-making.

Pre-Implementation Effectiveness Modeling

Prioritizing habitat restoration work while managing expectations of project funders, implementers, and partners is challenging. The Idaho Department of Fish and Game developed an individual-based life-cycle model (Grimm and Railsback 2005), to forecast potential responses of juvenile steelhead production to proposed restoration actions within the index drainages (Forecast Model). The working hypothesis for this model is that an increase of available intact habitat will increase juvenile steelhead emigrant production. The model was tested using two restoration scenarios: 1) increase the total accessible tributary habitat by implementing restoration actions to increase longitudinal connectivity; 2) improve currently accessible tributary habitat by implementing restoration actions. Model results were scaled to an emigrants-per-kilometer benefit estimate to allow comparison of different restoration strategies.

Scenario #1 was used for tributaries in the Big Bear Creek index drainage to forecast potential response of juvenile steelhead emigrant production to an increase of available tributary habitat. The modeling assessed the potential response of steelhead to implementation of the following projects: Big Bear Falls passage improvement, Big Meadow Creek culvert modification, and Spring Valley Creek flow enhancement. Collectively these three projects would approximately double the linear amount of freshwater habitat currently available in the drainage.

Scenario #2 was used for the East Fork Potlatch River index drainage to forecast potential response of juvenile steelhead emigrant production to restoration of currently accessible habitat. The modeling assessed the potential response of steelhead to restoration work focusing on large woody debris installation and riparian/wetland vegetation restoration (see definitions page 31).

Results from the Forecast Model suggest projects have the potential to generate detectable responses in juvenile steelhead emigrant production, though the magnitude and timeframe of response differed between scenarios (Uthe et al. 2017). Model results for Big Bear Creek indicated that the implementation of the three large-scale projects (Scenario #1) could potentially increase mean emigrant production significantly (> 90% increase) in the drainage. Model results for the East Fork Potlatch River suggested proposed large woody debris installation and riparian treatments (Scenario #2) could potentially increase emigrant production between 10 - 43% (Uthe et al. 2017).

Moving forward, the Forecast Model could be used to evaluate juvenile steelhead emigrant production responses to future actions in the Potlatch River watershed. Furthermore, modeling results could be combined with project costs to evaluate the cost-benefit of individual projects. The utility and limits of this approach are contingent on the proposed project producing quantifiable responses in fish production that can be parameterized into the model.

Potlatch Implementation Group – Project Identification Principles

The Potlatch Group has agreed upon a suite of priority process-based restoration strategies that they have assessed will best address limiting factors, that were identified by the PRSME project, to steelhead production in each subwatershed. The following definition of process-based restoration is from Beechie, et al. 2010:

> Process-based restoration aims to reestablish normative rates and magnitudes of physical, chemical, and biological processes that sustain river and floodplain ecosystems. Ecosystem conditions at any site are governed by hierarchical regional, watershed, and reach-scale processes controlling hydrologic and sediment regimes; floodplain and aquatic habitat dynamics; and riparian and aquatic biota. We outline and illustrate four process-based principles that ensure river restoration will be guided toward sustainable actions: (1) restoration actions should address the root causes of degradation, (2) actions must be consistent with the physical and biological potential of the site, (3) actions should be at a scale commensurate with environmental problems, and (4) actions should have clearly articulated expected outcomes for ecosystem dynamics. Applying these principles will help avoid common pitfalls in river restoration, such as creating habitat types that are outside of a site's natural potential, attempting to build static habitats in dynamic environments, or constructing habitat features that are ultimately overwhelmed by unconsidered system drivers.

Whenever feasible, recovery activities should be designed to preserve, restore, or rehabilitate natural habitat-forming processes (i.e. flood frequency and magnitude, sediment supply, and large woody debris recruitment). When natural processes are compromised by irreversible alterations, such has highways or homes, or when time needed to recover natural processes is too long, artificial structures may be appropriate substitutes for missing habitat components (NMFS 2017, section 6.2 p.59). Restoration strategies outlined in Table 6 are consistent with this definition of process-based restoration.

<u>Potlatch Implementation Plan</u>

The Potlatch Group will develop five-year implementation plans and update these to support the recovery goals for steelhead in the Potlatch River watershed. The most defined projects to-date are described in the 2018-2022 Implementation Plan and are targeted for design and/or implementation in this five-year term. Projects that become part of a Five-Year Potlatch Implementation Plan will have benefited from early discussion and analysis by participants of the Potlatch Group. Future project development will focus on the guidance provided throughout the remainder of this document. The guidance for project identification focuses on a set of principles designed to identify high priority projects for future consideration. Discussion and analysis will proceed in an iterative process to include the following:

- Project concept is identified for implementation in a Tier I subwatershed.
- Project will address primary and/or secondary factors that limit steelhead productivity.
- Projects will address limiting factors by implementing priority restoration strategies.
- Project has the potential to provide: 1) near-term biological response in steelhead production within five years (i.e., juvenile distribution, density, survival, and growth) and productivity within ten years (i.e., smolt per female productivity); 2) long-term functioning of ecosystem processes; and 3) improved steelhead habitat.

It is expected that this process will identify individual projects and/or bundles of projects that are complementary and cumulative, with quantitative predictions of restoration outcomes (benefits) for steelhead production and productivity in Tier I subwatersheds.

Projects that become part of a Potlatch Five-Year Implementation Plan do not require a project lead or sponsor identified for initiation. However, as projects continue through the development process, these roles will be identified based on funding and sponsors' capacity to implement proposed projects. Agency commitments must be made while considering resource capacity and ability to implement within identified timelines. This process will allow projects to fully benefit from the cumulative effects of complementary projects that are proposed by participating agencies.

The Potlatch Group refined the *General Habitat Restoration Priorities* from the 2017 Recovery Plan into the 2019 Amendment's *Priority Process-Based Restoration Strategies* to address primary and secondary limiting factors to steelhead in Potlatch Tier I subwatersheds. The priority process-based restoration strategies are defined in the Definitions section beginning on page 31. Table 6 correlates the 2017 Recovery Plan limiting factors terminology with those in the 2019 Amendment (defined by the PRSME project) and with the respective priority process-based restoration strategies (defined by the Potlatch Group) relative to both. Table 7 provides the primary and secondary limiting factors and priority process-based restoration strategies for subwatersheds and drainages in the 2019 Amendment.

Table 6. 2017 Recovery Plan, 2019 Amendment, and Process-based Restoration Strategies.

2017 Recovery Plan Limiting Factors	2019 Potlatch Plan Amendment Limiting Factors	Process-based Restoration Strategies
migration barrier	passage	-longitudinal connectivity (fish passage) -acquisition/conservation easement
elevated water temperatures	water temperature extremes: may include high summer temperatures and/or low winter temperatures	-instream channel treatment -lateral and vertical connectivity -reservoir management -riparian/wetland vegetation restoration -upland erosion and sediment source reduction -acquisition/ conservation easement -protect springs, seeps and wetlands
reduced flow during critical periods and altered hydrology – flow timing	low flow: includes low summer baseflow and flow timing related to effects of climate change or other land use effects on the hydrograph	-instream channel treatment -lateral and vertical connectivity -reservoir management -riparian/wetland vegetation restoration -acquisition/conservation easement -protect springs, seeps and wetlands
excess sediment	sediment: erosion and sediment delivery to streams	-instream channel treatment -lateral and vertical connectivity -reservoir management -riparian/wetland vegetation restoration -upland erosion and sediment source reduction -acquisition/ conservation easement -protect springs, seeps and wetlands
reduced floodplain connectivity and incised streams	floodplain/incised stream	-instream channel treatment -lateral and vertical connectivity -riparian/wetland vegetation restoration -acquisition/conservation easement
degraded riparian	riparian	-instream channel treatment -lateral and vertical connectivity -riparian/wetland vegetation restoration
reduced habitat complexity	habitat complexity	-instream channel treatment -lateral and vertical connectivity -riparian/wetland vegetation restoration

<u>Definitions – Priority Process-based Restoration Strategies</u>

Acquisition/Conservation Easement

A conservation easement is a voluntary legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land to protect the conservation values of the property. Affirmative outcomes are generally negotiated in the easement to directly address factors that limit fish or wildlife resources. The conservation easement should include explicit language to protect the conservation values of the property should the property change ownership.

Flow enhancement

See definition for “lateral and vertical connectivity” (wetland restoration) and reservoir management.

Instream channel treatment

Identify implementation actions to improve, increase, or restore the physical conditions of habitat below the ordinary high-water mark to support an increase in steelhead production. Channel-forming processes selected for implementation will target habitat factors that will promote smolt productions.

There may be areas where processes essential to ecosystem health have been disrupted or disconnected such that recovery may not be possible or may require decades or centuries to achieve. In these circumstances managed input of material to the stream may be a reasonable shorter-term substitute (NMFS 2017). Improvements in physical habitat following wood placement such as increased pool area, cover, and habitat complexity have been documented (Roni et al. 2013).

Restoration techniques may include, but are not limited to the following:

- realign channel
- install instream habitat structure
- place spawning gravel
- livestock best management practices, including:
  - exclude or manage grazing
  - develop off-channel water source
  - hardened stream crossings, and
- beaver translocation.

Lateral and vertical connectivity (restoration of hydrologic processes)

Identify the causes of floodplain disconnection and incised channel morphology within a treatment reach. These conditions impact streamflow, creating degraded conditions for fish at all life stages and reduced quantity and quality of instream channel complexity and availability of off-channel habitat. Restoration design should address the hydrologic processes that have interrupted floodplain and channel functions and should be tailored to the local physical and biological potential. Implementation of the preferred design will slow streamflow through the treated area and increase water infiltration and groundwater storage to improve late season baseflow and restore riparian vegetation.

Restoration techniques may include, but are not limited to the following:

- remove floodplain berm or levee;
- install floodplain roughness structures and microtopography;
- reconnect historic channel morphology and/or another channel realignment;
- create off-channel habitat;
- install instream structure;

- restore connected wetland(s) and hydrology;
- restore incised channels and eliminate causes for channel incising (install channel diversions to historic channel, ditch plugs, and create wetland cells);
- restore riparian vegetation – See riparian/wetland vegetation restoration below;
- implement road best management practices, including realignment, abandonment, or decommissioning, culvert or bridge installation, and road rocking;
- implement livestock best management practices, such as fencing, hardened stream crossing, off-channel water development;
- translocate beaver and implement best management practices to sustain beaver colonies (Heekin and Hohle 2019); and
- manage and treat invasive species.

Longitudinal connectivity

Identify and fix barriers to steelhead passage for all life stages and prioritize opportunities to reconnect habitat. These may be full barriers, partial barriers at some flows, or velocity barriers.

Restoration techniques may include, but are not limited to the following:

- Replace or modify road culverts with passage friendly structures meeting NMFS passage criteria;
- Correct existing anthropogenic passage barriers such as unscreened diversions, stream crossings, or instream structures; and
- Remove or modify other barriers to steelhead movement (i.e. dams, Big Bear Falls) to enhance passage and increase vertical connectivity.

Reservoir management

Reservoir management means using stored water from a headwater reservoir to conduct low volume water releases to supplement downstream flows in tributaries that are flow-limited. This treatment can improve flow conditions and water quality downstream of the discharge point during base flow periods (Brooks and Treasure 2014; Ulschmid et al. in prep).

- Use headwater reservoirs on Spring Valley Creek and Big Meadow Creek to conduct low volume flow releases to supplement downstream flows.
- Where process-based restoration is not a mitigation option, examine the feasibility of developing new headwater reservoirs to use water releases to supplement other flow-limited tributaries.

Riparian/Wetland vegetation restoration

The 2017 Recovery Plan requires the use of native plant species when restoring riparian and wetland vegetation. Revegetation efforts should be focused on all disturbed areas using a diverse mix of native trees, shrubs, forbs, grasses, and grasslike species. Use of a diverse mix of species will enhance steelhead habitat by providing a variety of rooting depths for soil stability, increasing shade, providing a source for future wood recruitment, limiting weed encroachment, and increasing habitat for native wildlife (e.g., beavers, birds, pollinators).

Techniques to re-establish native vegetation on project sites include:

- begin native plant revegetation immediately following construction;
- re-seed and plant all disturbed areas with a combination of sedge mats, seeds, container plants and cuttings;
- continue to plant for two or more years, depending on site conditions and specific project site needs;
- decompact (when needed) and reshape disturbed areas with embedded wood and slash to promote roughness, retain sediment, provide improved microsite conditions, and trap native seed stock;
- cover seeded areas with a certified weed-free straw mulch to improve germination rates, reduce soil erosion, and retain soil moisture;
- use a weed barrier or mulch around base of container plantings to prevent weed encroachment and retain soil moisture;
- protect new plantings from herbivory until plants can withstand browsing pressure;
- irrigate new plantings as needed to increase survival and to achieve more rapid stabilization of disturbed areas; and
- practice invasive plant management throughout pre-construction, construction, and revegetation phases.

Upland erosion and sediment source reduction

These landscape actions are implemented above the floodplain and are intended to benefit steelhead habitat by reducing or eliminating delivery of non-point source pollutants to streams (e.g., sediment). Numerous practices or treatments are associated with these project types:

- Road treatments to reduce or eliminate sediment delivery to streams, including structures to contain/control run-off from roads and adjacent affected areas, road reconstruction or reinforcement, road drainage improvement, and roadside vegetation. Treatments may include roads that extend into or are in a riparian area.
- Road treatments closing, abandoning, relocating, decommissioning, or obliterating existing roads (including parking areas) will reduce or eliminate sediment delivery to stream and/or to improve riparian habitat. These roads may include riparian area.
- Construct sediment basins, sediment collection ponds, sediment traps, or water bars.
- Control upland erosion by planting, revegetating, or developing grassed waterways.
- Treat upland vegetation through removal and control of noxious weeds, pre-commercial tree thinning, prescribed burning, and stand conversions. These landscape actions do not include industrial timber production.
- Upland treatments stabilize hillslopes by controlling erosion. Treatments will also stabilize landslide hazard areas and, surface erosion hazards, restore or rehabilitate these areas and, treat incorporating non-agricultural terracing.
- Initiate low, no till, or conservation tillage practices and agricultural conservation best management practices.
- Upland livestock management actions control erosion and sediment delivery to streams or riparian areas. Actions may include livestock watering schedules and grazing management plans, upland fencing, livestock water development (off-

channel watering or livestock water supply), and installation of upland ditches, wells, and ponds.

- Improve or restore trails and campgrounds to control erosion and sediment delivery to streams. These trails and campgrounds may include riparian areas.
- Protect, create, or improve upland wetlands not connected to streams.

Protect springs, seeps, and wetlands

Identify buffers needed to protect and/or enhance springs, seeps, and wetlands on a case-by-case basis. Assess the potential benefit for a conservation easement.

Limiting Factors and Process-based Restoration Strategies

Table 7 illustrates **Tier I** and **Tier II** subwatersheds for treatment in the Potlatch River. Tier I subwatersheds are expected to have the highest and most immediate steelhead response to restoration implementation. Tier II subwatersheds are identified to provide a watershed-wide vision of interests and potential restoration work that represents all Potlatch Group participants. Some restoration work implemented by participants will not be associated with funding from the Pacific Coastal Salmon Recovery Fund or the Bonneville Power Administration. Participants with additional policy and management mandates include the Forest Service, Natural Resources Conservation Service, and Idaho Department of Lands; these agencies are expected to participate with the Potlatch Group but frequently implement restoration actions benefiting watershed processes and/or fish using agency or other funding not limited to ESA-listed fish habitat work. They may also partner with projects to be implemented in Tier I watersheds.

Grass widows restored to meadow

Camas restored to meadow

Table 7. Limiting Factors and Process-based Restoration Strategies by Subwatershed and Tier

Subwatershed	Primary Limiting Factor	Secondary Limiting Factors	Primary Process-based Restoration Strategies	Secondary Process-based Restoration Strategies	Data Gaps
Tier I Subwatersheds					
Big Bear Creek					
Big Bear - above Big Bear Falls	Passage		Longitudinal connectivity		Barrier Assessment
Big Bear – above Big Bear Falls	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity Reservoir management	Lateral/Vertical connectivity Instream channel treatment	Monitor habitat environmental conditions above Big Bear Falls
Big Bear – below Big Bear Falls	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity Reservoir management	Lateral/Vertical connectivity Instream channel treatment	Monitor habitat environmental conditions below Big Bear Falls
West Fork Little Bear (tributary)	Passage		Longitudinal connectivity		Barrier assessment
Little Bear Creek	Passage		Longitudinal connectivity		Barrier assessment
Little Bear Creek	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity / Reservoir management	Lateral/Vertical connectivity Instream channel treatment	Improve understanding of life cycle mortality; unknown how well instream treatments would perform in canyon reaches
Corral Creek					
Corral Creek	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity Reservoir management	Lateral/Vertical connectivity Instream channel treatment	Continue to assess downstream effects
East Fork Potlatch River					
East Fork Potlatch	Habitat complexity	Water temperature - high summer and low winter Sediment	Instream channel treatment	Lateral/Vertical connectivity Upland erosion and sediment reduction	Sediment source assessment (IDFG has embeddedness data to analyze) and use of tributary habitat

Subwatershed	Primary Limiting Factor	Secondary Limiting Factors	Primary Process-based Restoration Strategies	Secondary Process-based Restoration Strategies	Data Gaps
Tier II Subwatersheds					
Pine (BACI control)	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity Reservoir management	Instream channel treatment Riparian/Wetland vegetation restoration	
Potlatch Mainstem upper – Moose to headwaters, West Fork (BACI control) & tributaries	Water temperature Sediment	Habitat complexity	Upland treatments Lateral and Vertical connectivity	Instream channel treatment	
Potlatch Mainstem middle-EF confluence to Moose	Habitat complexity	Water temperature - high summer and low winter	Instream channel treatment	Lateral and Vertical connectivity	*O. mykiss* use of mainstem for spawning and summer rearing?
Potlatch Mainstem lower - BB to EF	Low flow	Water temperature high in summer and low in winter	Needs assessment	Needs assessment	Uncertain limiting factor and use; *O. mykiss* use of mainstem for spawning and summer rearing?
Potlatch Mainstem – lower Clearwater to BB	Low flow	Water temperature Habitat complexity Predators *Salvelinus fortinalis)*	Needs assessment	Needs assessment	*O. mykiss* use of mainstem for spawning and summer rearing?
Little Potlatch	Low flow	Habitat complexity	Lateral/Vertical connectivity Reservoir management	Instream channel treatment	
Middle Potlatch	Low flow	Habitat complexity	Lateral/Vertical connectivity Reservoir management	Instream channel treatment	

Subwatershed	Primary Limiting Factor	Secondary Limiting Factors	Primary Process-based Restoration Strategies	Secondary Process-based Restoration Strategies	Data Gaps
Tier II Subwatersheds Continued					
Cedar	Low flow	Habitat complexity	Lateral/Vertical connectivity Reservoir management	Instream channel treatment	
Brush, Hog Meadow, Little Boulder	Low flow	Floodplain/incised stream Habitat complexity	Lateral/Vertical connectivity Reservoir management	Lateral/Vertical connectivity Instream channel treatment	
Boulder	Passage	Instream flow	Longitudinal connectivity	Lateral/Vertical connectivity Reservoir management	

Potlatch River Watershed – Implementation Plan 2018-2022

The following resources were used to develop the focus for this 2019 amendment and the 2018-2022 Implementation Plan: 1) NMFS 2017 Recovery Plan, 2) Idaho Department of Fish and Game PRSME data, and 3) professional experience and judgement of restoration implementers.

This 2019 Amendment includes revision to the Implementation Plan in Chapter 7 of the 2007 Potlatch River Watershed Management Plan. The new Implementation Plan will include three Five-year Implementation Plans, the first of which is included herein. The latter two Implementation Plans are in varying levels of development, not included with this document, but will be refined during each of the 5-year terms previous. The Potlatch Group will continually identify and develop project actions to include in subsequent Potlatch Implementation Plans.

Geomorphic Analysis and Assessment of the Potlatch River Watershed

Project: Title: Geomorphic Analysis and Assessment of 3 Potlatch River Subwatersheds (aka Bob's Project)

Description: The results from this project will facilitate the strategic development of Implementation Plans by the Potlatch Group for the periods 2023-2027 and 2028-2032. This project will retain a specialist to conduct a geomorphic analysis and assessment of the three Tier I priority subwatersheds in the Potlatch River. Work on this project will be conducted in consultation with Potlatch Group participants and will use protocols selected to suit the data available and outcomes directed by the Potlatch Group. Products from the geomorphic analysis will be used to identify priority areas for treatment and to develop Implementation Plans for the 2023-2028 and 2029-2032 time frames.

Lead Agency: Idaho OSC
Location: Tier I subwatersheds

Big Bear Creek	46.618144, -116.645915
Corral Creek	46.765652, -116.492637
EF Potlatch River	46.798503, -116.426847

Proposed Schedule:

Concept Development: Complete
Funding Allocation: PCSRF Round #21 + BPA + In-kind staff
Analysis and Assessment: 2019 –2020

Projects in Tier I Streams

Big Bear Creek

I. Limiting Factor: Passage

Treatment Strategy: Longitudinal Connectivity

Project: Title: Big Bear Falls Passage Restoration

Description: Evaluate the potential to restore passage at the Big Bear Falls barrier; assess all variables affecting potential project, including support for project (stakeholders and community), funding potential, agency relationship variables, treatment design alternatives, environmental compliance requirements, and out-year planning schedule, etc. This is a complex project that will require extensive planning, design, coordination, collaboration, consultation, and permitting.

Lead Agency: IDFG
Location: Latitude 46.69456, Longitude -116.65724

Proposed Schedule:

<u>Concept Development:</u> 2019
<u>Planning and Design:</u> 2020-2021
<u>Design Funding Allocation-final:</u> 2019-2021
<u>Construction Funding:</u> 2022 estimate
<u>Construction:</u> 2022-2023 estimate
<u>Maintenance:</u> 2023-2025 estimate

II. Limiting Factors: Low flow / Flow timing
Habitat Complexity

Treatment Strategy: Instream channel treatment. Restore lateral and vertical connectivity to restore hydrologic functions in wetlands. Riparian vegetation restoration.

Project: Title: West Fork Big Bear Mason Meadow II

Description: Restore 14 acres of wetland by restoring connectivity of stream with floodplain and wetland; divert flow from incised ditch into 0.46 miles of historic channel; improve channel morphology. Restore the native plant community by revegetating the floodplain, wetland, and construction area using native species.

Lead Agency: Latah SWCD
Location: Latitude 46.806181, Longitude -116.650111

Proposed Schedule:

<u>Concept Development:</u> Complete
<u>Planning and Design:</u> 2018
<u>Funding Engineering Allocation:</u> 2018 (PCSRF Round #20 + BPA)
<u>Funding Construction Allocation:</u> 2018 (PCSRF Round #21 + CWA319)
<u>Construction:</u> 2020
<u>Maintenance:</u> 2021-2022

III. Limiting Factor: Habitat Complexity

Treatment strategy: Instream channel treatment: increase sediment sorting and restore pool complexity. Restore lateral and vertical connectivity with floodplain.

Project: Title: Schwartz Creek large woody debris enhancement

Description: Increase habitat complexity, floodplain connectivity, sediment heterogeneity, and pool formation by strategically falling standing snags to interact with the floodplain and perennial channel.

Lead Agency: IDL

Location: TBD

Proposed Schedule: 2018-2023

Concept Development Ongoing. Quantitative surveys of standing wildlife habitat (snags) to identify source material for habitat enhancements. Identification of fire crew (saw training). Approval through various channels of IDL.

Planning and Design: Fall 2018 – identify which trees to use as fish habitat and how to fell them to reach the stream

Funding Allocation: IDL contributing salaries, large woody debris for fish habitat

Construction: Summer 2019

Maintenance: Summer 2020-2023. Timber might be rearranged after one spring snowmelt flood to maximize the benefit of felled logs.

Little Bear Creek

I. Limiting Factors: Passage

Treatment Strategy: Longitudinal Connectivity

Project: Title: State Highway 8 Culvert at Big Meadow Creek

Description: Replacement of culvert is not economically feasible and is not a project in ITD State Transportation Improvement Plan currently. This project will improve fish passage through the culvert to improve passage until culvert replacement is possible. Inside the 170-foot-long concrete lined culvert, 19 baffles will be installed, and three rock weirs will be constructed on the downstream side of the culvert for grade control.

Lead Agency: IDFG

Location: Latitude 46.733050, Longitude -116.75654

Proposed Schedule:

Concept Development: 2015

Planning and Design: 2016

Funding Allocation: 2017 (PCSRF Round #19 + BPA)

Construction: 2018 Completed August 2018

Maintenance: 2019 IDFG

Project: Title: County Culvert Replacements in Big Meadow Creek

Description: Restore passage into 6 miles of Big Meadow Creek by replacement of 3 county culverts upstream of the SH 8 culvert passage improvement project.

Lead Agency: IDFG

Location: Latitude 46.77384, Longitude -116.79095

Latitude 46.75993, Longitude -116.76999
Latitude 46.7473, Longitude -116.76218

Proposed Schedule:

Concept Development: 2015
Planning and Design: 2016
Funding Allocation: 2016 (PCSRF Round #18 + BPA)
Construction: 2017-2018 All three culverts completed
Maintenance: 2019

II. Limiting Factors: Flow

Project: Title: Flow Augmentation from Big Meadow Creek Reservoir

Description: This project will augment stream summer baseflow by water releases from the City of Troy Big Meadow Creek Reservoir into Big Meadow Creek, which flows into the West Fork Little Bear Creek. Augmentation will improve instream habitat conditions for steelhead by improving summer baseflow and reduce water temperatures from the point of water release downstream. The project will also increase Dissolved Oxygen levels to meet state water quality standards where affected by effluents from the Troy Wastewater Treatment Plant.

Lead Agency: OSC & City of Troy
Location: 46.803979, -116.811084

Proposed Schedule: 2019-2029

Concept Development: 2019, in coordination with the DEQ and City of Troy updating the INPDES permit for the Troy Wastewater Treatment Plant.

Planning and Design: 2019-2020

Funding Allocation: 2019-2020, in coordination with technical team assisting City of Troy (IDEQ, IDFG, OSC, UI, and IDWR for possible funding via the Columbia Basin Water Transaction Program, Pacific Coastal Salmon Recovery Fund, and Idaho 319 Program.

Construction/Implementation: 2020
Maintenance: 2020 -20XX City of Troy

Corral Creek

I. Limiting Factors: Low flow / Flow timing
Instream Complexity

Treatment Strategy: Restore lateral and vertical connectivity to restore wetland hydrologic functions. Restore instream channel complexity. Riparian vegetation restoration.

Project: Title: Upper Tee Meadow Restoration

Description: Restore a total of 28.5 acres within the riparian/wetland project area by restoring connectivity of stream with 16.4 acres of floodplain and wetland; redirect flow from incised ditch into 1.1 miles of historic channel; improve channel morphology including 14 excavated pools and installing 22 structures; and restore 8.9 acres of native plant community.

Lead Agency: Latah SWCD
Location: Latitude 46.843842, Longitude -116.503988

Proposed Schedule:

Concept Development: Completed
Planning and Design: 2018-2019
Funding Allocation: 2018 (PCSRF Round #20 + BPA)
Construction: 2019
Maintenance: 2020-2023

Project: Title: Habitat treatment: Vassar, Smith, Wet, Bronson, and Tee meadows

Description: Passive restoration treatment to improve lateral and vertical stream connectivity with meadows.

Lead Agency: Latah SWCD w/ USFS
Location: Vassar, Smith, Wet, Bronson, and Tee meadows

Proposed Schedule:

Concept Development: Complete
Planning and Design: Complete
Funding Allocation: Funded (CWA §319)
Construction: 2018, 2019
Maintenance: 2019 through 2021

East Fork Potlatch River

I. Limiting Factors: Instream Habitat Complexity
Low Winter Water Temperatures

Treatment Strategy: Instream channel treatment: Install large woody debris in stream to increase channel-forming processes, and improve winter habitat. Lateral and vertical connectivity. Riparian vegetation restoration.

Project: Title: EF Potlatch lower mainstem (mouth to Bobs) treatment

Description: Install large woody debris in 15 miles of stream within five years to improve channel forming processes and increase winter rearing habitat temperatures.

Lead Agency: IDFG
Location: TBD

Proposed Schedule:

Concept Development: 2018-2022
Planning and Design: 2018-2022
Funding Allocation: 2018-2022
Construction: 2018-2022

Maintenance: 2018-2025

Project: Title: Dammerman EF Potlatch Mainstem Restoration

Description: Install 12 large woody debris structures in 0.94 miles of stream, reconnect 2.3 acres of floodplain to improve channel-forming processes, and to raise winter rearing habitat temperatures.

Lead Agency: IDFG

Location: Latitude 46.849438, Longitude -116.373043

Proposed Schedule:

Concept Development: 2018
Planning and Design: 2018 Complete
Funding Allocation: 2018 (PCSRF Round #20 + BPA)
Construction: 2019
Maintenance: 2020

Project: Title: Two-Mile Meadow Restoration

Description: Reconnect 2.24 miles of channel with 65 acres of floodplain/wetland; install instream channel treatments; improve flow by improving groundwater recharge and wetland rehydration; restore wetland/meadow/riparian vegetation; rehabilitate areas disturbed during construction.

Lead Agency: Latah SWCD w/ USFS

Location: Latitude 46.800797, Longitude -116.409768

Proposed Schedule:

Concept Development: Complete
Planning and Design: Complete
Funding Allocation: Funded (PCSRF Rd#19, BPA, CWA §319, USFS)
Construction: 2018 through 2020 (5 beavers translocated to site 9/2018)
Maintenance: 2019 through 2023

Project: Title: Fry Creek Restoration

Description: Passive restoration treatment to reconnect stream with floodplain and to improve habitat complexity: willow planting, beaver dam analog (BDA) installation, and beaver translocation. Large wood debris jams (log jumbles), if needed in subsequent stage.

Lead Agency: IDL

Location: TBD

Proposed Schedule:

Summer 2018: Willow planting, BDA installation (17) and beaver translocation in summer 2018 (none). Repeat summer 2019. Large woody debris jams (if needed) summer 2020.

Concept Development: Stage 1 design completed spring 2018. Adaptive Management Approach precludes additional conceptual development until results of first stage (willows, BDAs, and beavers) is complete.
Planning and Design: Completed for Stage 1 spring 2018. Additional planning and design as needed based on results of Stage 1 PCSRF Round #21 E/D funding + IDL staff time.
Funding Allocation: IDL salaries, slash/large wood, willows, sedges/rushes for replanting. Latah SWCD contributed design for Stage 2, and 4 days BDA construction in 2018 (17 done).
Construction: 2018 and ongoing as needed.
Maintenance: If beaver translocation is successful, maintenance will not be required.

Project Title: Stowers

Description: Install instream structures, 9 acres of floodplain reconnection, 0.5 miles stream treated to improve channel-forming processes and to raise winter-rearing water temperatures and restore 0.7 miles of side channels.

Lead Agency: IDFG
Location: 46.843964, -116.381836

Proposed Schedule:

Concept Development: 2019
Planning and Design: 2020
Funding Allocation: 2021
Construction: 2022-2023
Maintenance: 2023-2024

Project Title: Stout

Description: Same as Stowers: Install instream structures, reconnect floodplain to improve channel-forming processes and to raise winter-rearing habitat temperatures. Landowner has expressed an interest in allowing restoration work to occur. No cattle fencing allowed. A preliminary site visit has occurred.

Lead Agency: IDFG
Location:

Proposed Schedule:

Concept Development: 2019
Planning and Design: 2020
Funding Allocation: 2021
Construction: 2022-2023
Maintenance: 2022-2024

II. Limiting Factor: Sediment

Treatment Strategy: Upland erosion and sediment source reduction through installation of road construction and maintenance and timber harvest Best Management Practices.

Project: Title: Focused FPA effort with Individual Timber Sales
Description: Explore sources for sediment focus opportunity for voluntary treatment of sensitive road segments that may not be required under Idaho Forest Practices Act.
Lead Agency: IDL
Location:

Proposed Schedule:
<u>Concept Development:</u>
<u>Planning and Design:</u>
<u>Funding Allocation:</u>
<u>Construction:</u>
<u>Maintenance:</u>

<u>Projects in Tier II Streams</u>

<u>Brush, Hog Meadow, and Little Boulder Creeks</u>

I. Limiting Factors: Low flow
Floodplain/incised stream
Habitat complexity

Treatment Strategy: Instream channel treatment. Restore lateral and vertical connectivity to restore wetland hydrologic functions, and Riparian vegetation restoration.

Project: Title: Erickson Meadow (Hog Meadow Creek)
Description: Passive restoration treatment to improve lateral and vertical stream connectivity with meadows by installing beaver dam analogues.
Lead Agency: Latah SWCD
Location: 46.846630, -116.460667

Proposed Schedule:
Concept Development: Complete
Planning and Design: Complete
Funding Allocation: Funded
Construction: 2017, 2018, 2019
Maintenance: 2019, 2020

<u>Upper Potlatch – Nat Brown Creek</u>

I. Limiting Factors: Water Temperature and Sediment
Habitat complexity

Treatment Strategy: Instream channel treatment. Restore lateral and vertical connectivity to restore wetland hydrologic functions. Riparian vegetation restoration. Upland erosion and sediment source reduction through installation of livestock management, road construction and maintenance, timber harvest Best Management Practices.

Project: Title: Nat Brown Meadow Restoration

Description: Treatment to improve lateral and vertical stream connectivity with meadow. Align livestock management across management boundaries. Project partners are Potlatch Group participants.

Lead Agencies: Nez Perce-Clearwater National Forests and Idaho Department of Lands.

Location: 46.909299, -116.377662

Proposed Schedule:

<u>Concept Development:</u> 2018
<u>Planning and Design:</u> 2019
<u>Funding Allocation:</u> 2019
<u>Construction:</u> 2020
<u>Maintenance:</u> 2020- 2023

<u>Upper Potlatch – Cougar Creek</u>

Project: Title: Cougar Meadow

Description: Improve lateral and vertical stream connectivity.

Lead Agency: Nez Perce-Clearwater National Forests

Location: 46.913778, -116.462838

Proposed Schedule:

<u>Concept Development:</u>
<u>Planning and Design:</u>
<u>Funding Allocation:</u>
<u>Construction:</u>
<u>Maintenance:</u>

<u>Steelhead Monitoring and Evaluation</u>

<u>Project:</u> Title: Potlatch River Steelhead Monitoring and Evaluation (PRSME) Project.

Description: Project will continue the umbrella watershed monitoring effort within the Potlatch River that has been ongoing since 2003. Previous work has been funded through Pacific Coastal Salmon Recovery Funds and National Marine Fisheries Service's Intensively Monitored Watershed Funds. The framework of the Potlatch River Steelhead Monitoring and Evaluation project provides the following: 1) data on Potlatch River steelhead production and productivity on multiple scales (index drainages to individual stream reaches); 2) a monitoring component for the numerous habitat restoration projects currently being implemented; 3) an effective and efficient method for identifying additional high priority and high reward habitat restoration projects in the Potlatch River; and 4) valuable monitoring in Lower Clearwater River mainstem population, Clearwater Major Population Group (MPG), and

Snake River Distinct Population Segment (DPS). Limiting factors and Potlatch River steelhead population metrics identified through the Potlatch River Steelhead Monitoring and Evaluation project inform recovery actions identified in the 2017 Recovery Plan. The Potlatch River Steelhead Monitoring and Evaluation project is conducted by Idaho Department of Fish and Wildlife personnel and represents the monitoring and evaluation component of the 2019 Amendment. The monitoring is intended to be long-term and is conducted annually.

Lead Agency: IDFG
Location: Multiple sites throughout Tier I subwatersheds

Habitat Protection Projects

July 2019 – Currently there are no protection/conservation easement projects planned.

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Fact Sheet Links:

- USDA Northwest Climate Hub: https://www.climatehubs.oce.usda.gov/northwest
- USDA Northwest Climate Hub Join Mailing List: https://docs.google.com/forms/d/e/1FAIpQLScClsDg0OdxeyjPIzkUgxNs9BFq_LnzCDRBw6SNB0ZAqcue7A/viewform?c=0&w=1
- Wheaton, J. M. and N. Bouwes. Fluvial Habitats Center at Utah State University (homepage). http://etal.joewheaton.org
  - Beaver Restoration Assessment Tool (BRAT) http://etal.joewheaton.org/brat-2018-2019.html brat tool 2017-1018
  - BRAT fact sheet (2013): http://etal.usu.edu/Downloads/FactSheets/FactSheet_ETAL_BRAT_2Sided.pdf
- Wheaton et al other information: http://etal.joewheaton.org/fhc-factsheets-posters

Appendix A – Table III

Table III. Summary of restoration action types and their ability to ameliorate climate change effects on peak flow, low flow, stream temperature, or to increase salmon population resilience

Category	Common techniques	Ameliorates temperature increase	Ameliorates base flow decrease	Ameliorates peak flow increase	Increases salmon resilience
Longitudinal connectivity (barrier removal)					
	Removal or breaching of dam	●	●	○	●
	Barrier or culvert replacement/removal	○	○	○	●
Lateral connectivity (floodplain reconnection)					
	Levee removal	●	○	●	●
	Reconnection of floodplain features (e.g. channels, ponds)	●	○	●	●
	Creation of new floodplain habitats	●	○	●	●
Vertical connectivity (incised channel restoration)					
	Reintroduce beaver (dams increase sediment storage)	●	●	●	●
	Remove cattle (restored vegetation stores sediment)	●	●	●	○
	Install grade controls	●	●	●	○
Stream flow regimes					
	Restoration of natural flood regime	●	●	○	◒
	Reduce water withdrawals, restore summer baseflow	●	●	○	○
	Reduce upland grazing	○	◒	◒	○
	Disconnect road drainage from streams	○	○	●	○
	Natural drainage systems, retention ponds, other urban stormwater techniques	○	◒	●	○
Erosion and sediment delivery					
	Road resurfacing	○	○	○	○
	Landslide hazard reduction (sidecast removal, fill removal)	○	○	○	○
	Reduced cropland erosion (e.g. no-till seeding)	○	○	○	○
	Reduced grazing (e.g. fencing livestock away from streams)	◒	○	○	○
Riparian functions					
	Grazing removal, fencing, controlled grazing	●	○	○	○
	Planting (trees, other vegetation)	●	○	○	○
	Thinning or removal of understory	○	○	○	○
	Remove non-native plants	◒	◒	○	○
Instream rehabilitation					
	Re-meandering of straightened stream, channel realignment	◒	○	○	◒
	Addition of log structures, log jams	◒	○	○	○
	Boulder weirs and boulders	◒			
	Brush bundles, cover structures	○	○	○	○
	Gravel addition	○	○	○	○
Nutrient enrichment					
	Addition of organic and inorganic nutrients	○	○	○	○

Actions are grouped by major processes or functions they attempt to restore: connectivity (longitudinal, lateral and vertical), watershed-scale processes (stream flow and erosion regimes), riparian processes, instream rehabilitation, and nutrient enrichment. Filled circles indicate positive effect, empty circles indicate no effect, and partially filled circles indicate context-dependent effects. See text for supporting citations.

From: Beechie, T. 2013. Restoring Salmon Habitat for a Changing Climate. River Restoration Application 29: 939–960. Published online 3 July 2012 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rra.2590

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Appendix B – Excerpts from Dansart 2017 (Rev. 2018)

Changes in Racetrack Meadow Water Storage (WY 2013 vs WY 2016), p. 11

Assuming that the water table wells represent a meadow area of about 5.9 acres and a 20% water holding capacity for silt loam soils; there is about 300,000 gallons, or 0.9 acre-feet of additional water stored within the saturated zone of the unconfined meadow aquifer, on average, due to the Racetrack project implementation. Visual observations indicate that an additional 4 to 5 acres is also positively altered by the project so this is considered a very conservative estimate. Ponded water stored would likely result in double the annual estimate.

Estimates of seasonal increases in meadow unconfined aquifer water storage:

- Hydrated period: Water levels are relatively stable (December to June)
  - 1.22 Acre Feet more water stored in meadow aquifer on average
- Discharge period: Water levels are dropping (June and July)
  - 0.81 Acre Feet more water stored in meadow aquifer on average
- Dry period (August and September)
  - Relatively little change. Meadow is largely dehydrated; channel is dry
- Recharge period: Water levels are rising (October and November)
  - 1.43 Acre Feet more water stored in meadow aquifer on average

Estimates of increased ponded water storage:

- Hydrated period: Water levels are relatively stable (December to June)
  - 2.6 Acre Feet more ponded water stored on average
- Discharge period: Water levels are dropping (June and July)
  - 1.3 Acre Feet more ponded water stored on average
- Dry period (August and September)
  - 0.5 Acre Feet. Meadow is largely dehydrated; channel is dry
- Recharge period: Water levels are rising (October and November)
  - 1.0 Acre Feet more ponded water stored on average; during November of 2016 (WY 2017) ditch plugs filled completely for an estimated 2.6 Acre Feet of ponded water stored.

<u>Racetrack Project Summary No Flow Periods; Total Days</u>, PPT. 2017

7/10/10 to 11/27/10: 140 days
7/10/11 to 12/28/11: 171 days
7/13/12 to 11/17/12: 127 days

Project Implementation Sept/Oct 2013
7/13/13 to 11/6/13: 116 days
7/27/14 to 11/27/14: 123 days

Flow has lasted 9 to 34 days longer into the summer since project construction; start date of recharge controlled by other factors.

Faux Beaver Dam installation 2015
7/22/15 to 11/21/15: 122 days

Real Beaver Dams appear summer 2016
8/10/16 to 10/20/16: 71 days
8/16/17 to 10/12/17 57 days

SVAP (2017) and Associated Measurements, p. 12-14

A post-implementation Stream Visual Assessment Protocol survey (SVAP) for the current Racetrack Meadow Reach of Corral Creek was conducted on June 27th, 2017; the stream reach examined is the historic channel reconnected to Corral Creek by the 2013 restoration project. The straightened ditch that previously drained the Racetrack Meadow was plugged to create wetland cells. Although the historic riparian zone is in an ephemeral stage of recovery, the field examination showed multiple improvements when compared to previously existing conditions.

SVAP surveys (2005 & 2012) conducted for the Racetrack Reach showed some improvement in overall condition score (5.0 [Poor] to 6.4 [Fair]); this was believed to be due largely to the exclusion of livestock prior to the 2012 survey. Although the overall condition score had improved between the two surveys, channel condition and bank stability scores had dropped drastically. The estimated erosion rate had increased significantly, from 22 tons/mi to 161 tons/mi annually accelerating the broadening of the existing overwide channel. The channel had cut to basalt bedrock and evidence of a new floodplain was starting to build in the entrenched channel; the meadow surface had begun a transition from floodplain to a new terrace (Figure 14). Entrenchment likely reduced the flood prone area and residence time of floodwaters upon the meadow surface; the result was diminished meadow hydration. Without restoration, the water storage capacity of the meadow would continue to decay.

The 2017 SVAP survey conducted for the reconnected historic channel reach resulted in an overall condition score of 7.84 (Good) with upgraded conditions recorded in several categories. Temporary degradation of conditions in several categories was noted; progress is expected as the historic channel is reclaimed, and riparian zone recovers over time. Pre- and post-project implementation changes observed are noted in Figures 12 and 13 below.

Some of the more significant changes observed:

The reconnected reach is a Rosgen C6 class channel trending toward an E4 class typical of meadow systems; it replaces a straight, severely entrenched ditch. Sinuosity increase, width/depth and entrenchment ratios indicate marked improvement in channel condition.

Flood prone area currently encompasses almost all of Racetrack Meadow compared to the diminished zone noted in 2012. On April 11, 2017 flood debris observed in Racetrack Meadow was chest high near the upper end of project, waist high mid-meadow, ankle high at the meadow outlet. This indicates almost immediate dispersion of channel floodwaters across the meadow surface with an associated reduction in the hydraulic energy of downstream flow. Flooding begins at the head of the meadow; rather than further downstream as pre-implementation observations suggested. Water level data tends to support this supposition.

Although some minimal erosion is expected and desired to re-establish historic channel sinuosity and flush silt from channel substrate, excessive erosion is largely eliminated.

The dominant current channel substrates are gravel and silt; this contrasts with the cobble/gravel substrate that blanketed the bedrock bottom of the abandoned channel reach.

Considerably more gravel is now visible in the present-day channel than in previous years; the amount and coarseness of gravel within the channel diminishes moving downstream thru the reach. Silt is expected to be flushed from the re-connected historic channel over time resulting in a gravel and cobble dominated stream bottom.

Excess silt within the reclaimed channel is likely responsible for the changes in macroinvertebrates observed. Stonefly, Caddis and Mayfly were observed during 2012. Dragonfly and Caddis dominated 2017 observations. Numbers and diversity should increase as habitat recovers and silt is flushed from the reconnected channel in the future.

Although rainbow trout were observed during both the 2012 and 2017 surveys, fish cover, water clarity, and canopy cover scored slightly higher in the current reach. Conversely, the nutrient enrichment score declined because about 20% of the reach had abundant floating algae (which helped increase the fish cover score).

Channel Condition Changes (June 2012 vs June 2017)

The 2017 survey indicated improvements in almost every category; this is reflected by changes in channel condition and bank stability that result in a rise from the worst (1) to best (10) possible condition scores. The temporary channel substrate degradation is discussed above. Changes noted with comments are tabulated in the following figure.

Racetrack Meadow June SVAP Comparision					Channel Condition
2012 (Abandoned Channel) vs 2017 (Reconnected Historic Channel)					
Category	**2012**	**2017**	Change	*Abandoned Channel*	*Reconnected Channel*
Overall Score	6.4	7.84		Fair	Good
Channel Type (Rosgen)	NA	C6	↑	Severely altered reach shares traits of both "D" and "F" types	Trending toward E4 Type
Bankfull Width (ft)	60.5	19.5	↑	Overwide	Greatly Reduced
Bankfull Max Depth (ft)	2.7	2.1	↔		Slight Decrease
Bankfull Mean Depth (ft)	1.8	1.5	↔		Slight Decrease
Flood Prone Width (ft)	282	400 +	↑	Parts of Meadow	Almost entire meadow
Sinuosity	1.04	1.32	↑	Almost no sinuosity	C-level; 1.5 is E-level
Entrenchment Ratio (Wfpa/Wbkf)	4.6	20	↑	Entrenched	Little entrechment; better sinousity
Width/Depth Ratio (Wbkf/Dbkf)	34	13.6	↑	Very High	C-level; almost E-level
Dominant Substrate	Cobble & Gravel	Silt & Gravel	↓ temp ↗ future	Channel cut to basalt bedrock	Silt gradually being washed from aggraded historic channel. Higher gravel ratio upstream
Est. Bank Erosion Rate [(tons/year)/mile]	161	NA	↑	Very High	Very little erosion; historic channel re-establishment
Channel Condition Score	1	10	↑	Entire Reach Channelized and actively widening	Reconnected historic channel
Bank Stability Score	1	10	↑	Unstable banks. Actively widening channel at bedrock elevation	Channel is shallow; banks are low; some minimal erosion expected and desireable to restore sinuousity of historic channel

<u>Riparian Zone Changes (June 2012 vs June 2017)</u>

The 2017 survey reflected improvements in most categories. Degradation that was observed in several categories is considered temporary with long-term advances expected; this is discussed above and remarks made in the table below. Changes noted with comments are tabulated in the following figure.

Racetrack Meadow June SVAP Comparision **Riparian Zone Condition**

2012 (Abandoned Channel) vs 2017 (Reconnected Historic Channel)

Category	**2012**	**2017**	Change	*Abandoned Channel*	*Reconnected Channel*
Overall Score	6.4	7.84		Fair	Good
Riparian Zone Score	1	9	↑	Riparian vegetation sparse	Has needed vegetative components but needs time to fully recover
Hydrologic Alteration Score	7	10	↑	Overwidened and incised to bedrock. Building entrenched floodplain, but meadow (new terrace) flooding likely to occur on a regular basis because vertical channel erosion limited.	Floodplain low; Flooding every year
Flood Prone Width (ft)	282	400 +	↑	Parts of Meadow	Almost entire meadow
Canopy Cover Score	1	3	↑	Less than 20% shaded water surface	Should improve as vegetation matures
Water Appearance Score	7	10	↑	Generally Clear; Occasionally cloudy	Clear for entire reach
Nutrient Enrichment Score	8	5	↓ temp	Cattle are excluded from the riparian zone	Approx. 20% of reach has abundant floating algae
Instream Fish Cover Score	7	8	↑		Should improve with riparian zone maturation
Fish Observed	RBT	RBT	↔	Fry abundant; parr common	Fry abundant; parr common
Amphibians/Reptiles	Spotted Frogs	Toads, Frogs, Snakes	↑		Egg masses common
Dominant Substrate	Cobble & Gravel	Silt & Gravel	↓ temp future ↗	Channel cut to basalt bedrock	Silt gradually being washed from aggraded historic channel. Higher gravel ratio on upper end of reach
Invertebrate Habitat Score	9	9	↔	Good	Should get better
Macroinvertebrate Score	12	6	↓ temp future ↗	Stone, Caddis, Mayfly Dominant	Numbers and diversity should increase with improved habitat and decreased silt
Macroinvertebrates	Stone, Caddis, Mayfly Dominant	Dragonfly and Caddis Dominant	↓ temp future ↗		Populations should improve as restoration matures

Racetrack Water Table Well #1 vs Surface Water Site #1 vs Precipitation Nov 4, 2011 to Nov 28, 2016