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Pacific Northwest Region Aquatics

Watershed Condition Framework

FY2016 Watershed Restoration Action Plan

Pacific Northwest Region
Gifford Pinchot National Forest
Mt. Adams Ranger District

WIND RIVER WATERSHED

(5th field #1707010510)

SUBWATERSHEDS

Trout Creek (#170701051005)
Trapper Creek-Wind River (#170701051004)

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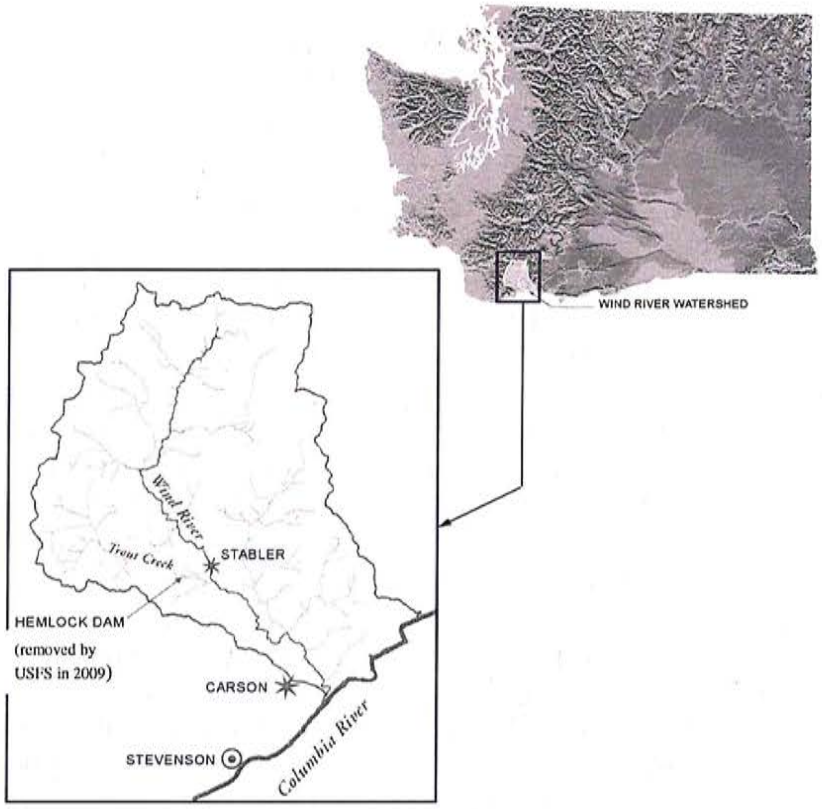
Executive Summary

This executive summary provides an overview of the Wind River Watershed Restoration Action Plan (WRAP) for the Gifford Pinchot National Forest (GPNF). This is a living document. At this initial stage, this WRAP is focused on the top two priority subwatersheds: Trout Creek and Trapper Creek-Wind River. There will be future additions to this WRAP as the remaining subwatersheds are analyzed for restoration opportunities. The key points discussed below are described in further detail in this action plan.

- The Wind River 5th field watershed (HUC #1707010510) is located in southwest Washington in the Lower Columbia River basin and has seven 6th field subwatersheds within the GPNF boundaries. The eighth subwatershed, Little Wind River-Wind River, is administered by the Columbia River Gorge National Scenic Area, not the Gifford Pinchot National Forest, so this will not be discussed further in this document. Estimated funding needs for high priority projects at the Wind River watershed-level have not yet been tallied but funding needs for the top two priority subwatersheds are estimated to be $2,507,000.

- The Trout Creek (priority #1) and Trapper Creek-Wind River (priority #2) subwatersheds have ***priority subwatershed*** status due to the following reasons:
  - Key issues in the Trout Creek subwatershed are: instream fine sediment levels and sources, high surface water temperature, and salmonid habitat fragmentation and simplification;
  - Key issues in the Trapper Creek-Wind River subwatershed are salmonid habitat simplification due to the presence of a recreational residence tract along the lower two miles of mainstem Trapper Creek. The majority of this subwatershed is designated as a Wilderness and stream and riparian conditions are considered to be optimal for fish.
  - These are focal subwatersheds within a watershed that is a wild steelhead trout stronghold, a genetic reserve for Lower Columbia River (LCR) steelhead trout, and an "Intensively Monitored Watershed", by designation and recognition through advocacy groups and local, state, and federal agencies;
  - LCR steelhead trout and LCR Chinook salmon occupy many stream miles and are listed as *threatened* under the Endangered Species Act; these subwatersheds are of special importance due to the high productivity of the LCR steelhead documented here relative to other subwatersheds in the Wind River;
  - Designation of Critical Habitat for LCR steelhead and LCR Chinook, Proposed Critical Habitat for LCR coho, as well as Essential Fish Habitat for Chinook in these subwatersheds; these subwatersheds are of special importance due to their current and potential quantity and quality of LCR steelhead spawning, rearing, and foraging habitats;
  - Extensive instream and riparian restoration has already been implemented;

Figure 1. Vicinity and Location Map for the Wind River 5th Field Watershed



federal designations (i.e. focus watershed, Intensively Monitored Watershed, LCR steelhead genetic reserve, Key Watershed).

Climate change and subsequent warming may cause warmer streams in the Columbia River Basin to approach and, in some reaches exceed lethal summer temperatures for salmonids. If adjacent low elevation watersheds develop or continue to experience warming surface waters, the Wind River watershed has the potential to become an important refuge for LCR steelhead and LCR Chinook because streams and riparian areas in nearly 90% of the drainage are on Forest Service lands that provide protections through Riparian Reserves and broader Aquatic Conservation Strategy Objectives. In extreme climate cycles, this watershed could become an important area to conserve salmonid gene pools and to repopulate adjacent habitats, particularly in the case of steelhead trout.

Several streams in the Wind River watershed, including the middle and lower reaches of Trout Creek, currently experience warm stream temperatures which exceed the Washington State Department of Ecology (WDOE) standard. These streams have received a Total Maximum Daily Load (TMDL) from the Washington Department of Ecology that restricts activities that would lead to further increases in stream water temperature. Continuing to implement watershed restoration projects in the Wind River watershed is essential for reducing excessively high temperatures in those streams that currently exceed state standards, and for maintaining cold waters where they currently exist. Maintaining, and hopefully expanding, the cold water refugia vital to these salmonids' survival, particularly in the highly-productive Trout Creek and Trapper Creek-Wind River subwatersheds, is becoming increasingly important in the face of climate change.

Planning Efforts for Restoration

This WRAP tiers to the Wind River Watershed Analyses (USDA 1996 and 2001). In addition to these two Watershed Analyses and other national, regional, and Forest guidance, this WRAP incorporates specific information from:

- *Gifford Pinchot National Forest Aquatic Restoration Plan*, USDA Forest Service, 2010.
- *Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan-Wind River,* Lower Columbia Fish Recovery Board, 2001 and 2010.
- *Status of the Resource – 2011 Report*, "Status of the Fish and Wildlife Resource in the Columbia River Basin Project" developed by the Columbia Basin Fish and Wildlife Authority under funding by the Bonneville Power Administration, 2012.
- *Gifford Pinchot National Forest Roads Analysis,* USDA Forest Service, 2002.
- *Roads Analysis for Forest Service Roads in the Wind River Watershed*, USDA Forest Service, 2001.
- *Gifford Pinchot National Forest – Wind River Watershed Water Quality Restoration Plan*, USDA Forest Service, 2002.
- *Draft Fish Passage through Road Crossings Assessment – Gifford Pinchot National Forest, FY2001*, USDA Forest Service, 2002.

1. SUMMARY *based on the Wind River Watershed Analyses, 1st and 2nd iterations (USDA 1996, 2001)*

a. Watershed & Hydrological Unit Classification (HUC)

The 5th field Wind River Watershed contains seven 6th field subwatersheds, listed here:

Table 1. Subwatersheds within the Wind River watershed

Name	HUC
Trout Creek	170701051005
Trapper Creek-Wind River	170701051004
Panther Creek	170701051006
Headwaters Wind River	170701051001
Falls Creek	170701051002
Dry Creek	170701051003
Bear Creek	170701051007

b. General Location

The Wind River watershed is located in southwestern Washington in the Lower Columbia River basin (Figure 1). The mainstem originates in McClellan Meadows in the western Cascades on the Gifford Pinchot National Forest (Mt. Adams Ranger District) and enters Bonneville Reservoir at River Mile (RM) 154.5. Trout Creek and Trapper Creek are major tributaries and drain portions of the western and northwestern Wind River watershed. The largest tributary, Panther Creek, enters at RM 4.3 and drains 18% (26,466 acres) from the eastern portion of the watershed. The largest population centers adjacent to the Wind River are the towns of Carson, located at RM 2, and Stabler, located at RM 7.

c. Total Watershed Area

The Wind River watershed is a fifth order stream, 143,504 acres in size, and drains approximately 224 sq. mi. of Skamania County over a distance of about 31 miles.

d. Watershed Characterization

i. General Physiography

The U.S. Forest Service manages 88% of the Wind River Watershed, with small portions in private (9%) and state (3%) ownership (Figure 2). The headwaters of the Wind River mainstem are located approximately 20 miles north of the town of Carson, Washington at McClellan Meadows. The watershed is oriented northwest to southeast with elevations ranging from 80-3,900 ft. Topography varies within the watershed. It is generally steep in the northwest and southeast portions of the watershed, gentle in the northeast/McClellan Meadows area, and bench-like in the Trout Creek Flats and middle portions of the Wind River watershed area.

ii. Land Use

The watershed was a prime location for timber harvest from productive conifer forests since the early 20th century and it continues to provide some timber harvest opportunities on federal and state lands. The private lands downstream of the USFS

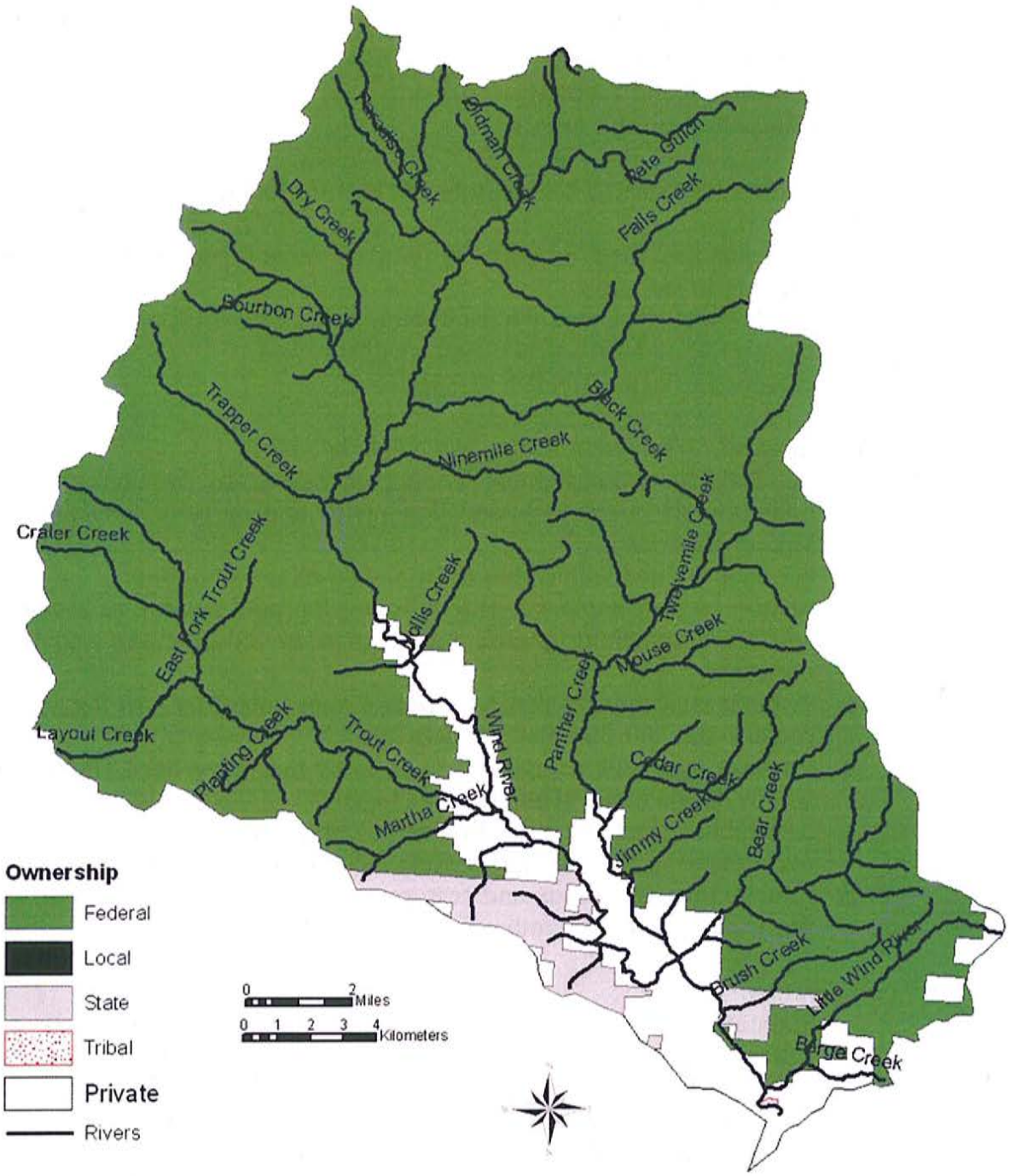


Figure 2. Land ownership and major streams within the Wind River watershed

- *Grants and Agreement*:
  - Continue to work with partner agencies, organizations and advocacy groups using cooperative agreements and grants to recover riparian and aquatic habitats on private lands.

iv. Important Ecological Values

The Wind River watershed is designated as a Key Watershed in the Northwest Forest Plan in recognition of its anadromous fish populations. While there are numerous anadromous fish species, Evolutionary-Significant Units (ESU), and Distinct Population Segments (DPS) in the lower Wind River below Shipherd Falls, only federally-listed summer steelhead (Lower Columbia River DPS) and fall Chinook salmon (Lower Columbia River ESU) occur within the USFS-managed portion of the Wind River. Additionally, portions of the Wind River watershed have been designated as Critical Habitat for steelhead, Critical Habitat for Chinook, and Essential Fish Habitat for Chinook.

The Wind River watershed has been identified as one of the top three priority watersheds on the Gifford Pinchot National Forest for watershed restoration, and the U.S. Forest Service-Pacific Northwest Region has also identified it as one of the priority basins for watershed restoration, due to its importance to LCR steelhead productivity. The National Power and Conservation Council (NPCC) identified the Wind River watershed as one of twelve major NPCC subbasins in the Washington portion of the Lower Columbia Region, and the *Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan* identified the summer run steelhead of the Wind River watershed as a primary population contributing to the overall LCR steelhead viability.

v. Current and Target Condition Classes

Background Information on the WCF

The current and target condition classes for the Trapper Creek-Wind River and Trout Creek subwatersheds were derived from the 2010 Watershed Condition Framework process. The WCF is a national, comprehensive approach mandated by the U.S. Forest Service for all National Forests and Grasslands to proactively implement integrated restoration on watersheds that they have identified as priorities for restoration. This prioritization is the result of a nationally consistent approach for classifying watershed condition using a comprehensive set of 12 indicators that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed and subwatershed condition. The 12 indicators are: (1) water quality, (2) water quantity, (3) aquatic habitat, (4) aquatic biota, (5) riparian/wetland vegetation, (6) roads and trails, (7) soils, (8) fire regime or wildfire, (9) forest cover, (10) rangeland vegetation, (11) terrestrial invasive species, and (12) forest health.

Condition classes for each subwatershed on the Gifford Pinchot National Forest were derived from the analysis of these 12 indicators by U.S. Forest Service resource specialists. Based on data and professional judgment, the specialists determined the condition of each subwatershed using the Forest Service Manual (USDA Forest Service 2004, FSM 2521.1) and Watershed Condition Framework direction for how to describe the three classes of watershed condition:

Properly" condition class are: instream large wood supplementation, side-channel creation, fish passage barrier removals, road repair, road stabilizations and closures, riparian tree planting, and invasive plant removal.

Table 2. Current and Target Condition Classes

Subwatershed	Current Condition Class Numerical Value*	Current Condition Class *(includes all ownership)*	Target Condition Class *(includes all ownership)*
Trout Creek	1.9	Functioning at Risk	Functioning Properly
Trapper Creek-Wind River	1.8	Functioning at Risk	Functioning Properly

* <=1.66 equates to *Functioning Properly*
> 1.66 to 2.33 equates to *Functioning at Risk*
2.33 to 3.0 equates to *Impaired or Functioning at Unacceptable Risk*

e. Key Watershed Issues

i. *Attributes/Indicators that the USFS can Affect Directly*

See Table 3 for the rationale behind the Watershed Condition Framework ratings given to the Trout Creek and Trapper Creek-Wind River subwatersheds.

Table 3. Attributes/Indicators that the USFS can Affect Directly

Attributes/ Indicators*	Subwatershed	Reason For Rating
1.2 Water Quality Problems	Trout Creek Trapper Creek-Wind River	*High summer stream temperature* – Past land use impacts associated with timber harvest, road construction, and stream cleanouts have caused channel widening and straightening, as well as reduced stream shade, in the Trout Creek subwatershed. The Water Quality Management Plan / TMDL for the Wind River Watershed listed stream reaches in Trout Creek and in the Trapper Creek-Wind River as "water quality limited" for temperature. The WQMP states the primary mechanism for improving stream temperature in Wind River is increased stream shading.
3.1. Aquatic Habitat: Habitat Fragmentation; 3.2. Aquatic Habitat: Large Woody Debris; 3.3. Aquatic Habitat: Channel Shape and Function; and 5.1. Riparian: Vegetation Condition	Trout Creek Trapper Creek-Wind River	*Habitat Simplification – Lack of pool-rearing habitat, spawning habitat, and channel complexity* – Pools are infrequent and of low quality at many stream reaches due to: past timber harvest in riparian areas and wood delivery zones, stream cleanouts in past decades, channel straightening after flood events, and road development causing chronic sediment delivery, particularly in the Trout Creek subwatershed. Large wood is deficient in many stream reaches and the ability of the wood to form log jams has been reduced by channel widening. *Lack of off-channel habitat* – Stream channels have been modified from past timber harvest and road construction management activities, as well as from channel modifications associated with private land ownership in the Middle Wind River and with the Government Mineral Springs recreational residences adjacent to lower Trapper Creek. Channelizing and straightening the channels has caused streams to down-cut and abandon the floodplain where side channel habitat is created. *Excessive bank erosion* – Past timber harvest, road construction, and stream cleanout actions, along with current private landownership and recreational residences have altered the channel and floodplain. In some areas this has led to excessive bank erosion, increased sedimentation, and simplified habitat.
4.3 Aquatic Biota: Exotic and/or Invasive Species	Trout Creek Trapper Creek-Wind River	*Invasive fish species* (brook trout) exist within the Trout Creek subwatershed and in Tyee Creek in the Trapper Creek-Wind River subwatershed.
6.1 Roads: Open Road Density 6.2 Roads: Maintenance	Trout Creek Trapper Creek-Wind River	*Fine Sediment in Stream Channels* – Fine sediment is prevalent in cobble interspace habitat in some stream reaches degrading spawning gravels and causing water quality impairment, namely in the Trout Creek Flats area and in the middle reaches of the Wind River, which are part of the Trapper Creek-Wind River subwatershed. The primary causes of this are the roads located within riparian areas, a lack of adequate road maintenance, and a moderate to high density of roads near streams. The road system contributes to habitat degradation from fine sediment in several ways: road-related slope failures, chronic sediment delivery, and road drainage problems as identified in the 1996 and 2001 Watershed Analyses. Peak flows may

National Fish Hatchery at river mile 18 (upstream of the Panther Creek confluence). Panther Creek is an important contributor of streamflow throughout the year, and maintains strong flow through summer months which helps to keep the lower Wind River cool. High flows will average over 2,000 cfs in December and January. The flood of record on the Wind River occurred in February 1996, and was estimated to peak at 54,000 cfs at the Wind River gage near Shipherd Falls (USDA 1996).

iii. Geomorphology

The northwest portion of the watershed is steep and the northeast portion is relatively flat including some large meadows in the Falls Creek drainage. Trout Creek, a major tributary to the west, has a broad alluvial bench (Trout Creek Flats) in the upper central portion of the Wind River watershed. A broad alluvial valley extends along several miles of the middle mainstem of the Wind River before entering into a steep V-shaped canyon in the lower stream reach. The lower southeast portion of the Wind River watershed is quite steep. Shipherd Falls, actually a set of four 10-15 foot falls, is located at approximately river mile 2 and, historically, it blocked all anadromous fish except for steelhead until it was laddered in the 1950s to enable hatchery fish to ascend these falls.

The Wind River's geologic history consists of volcanic activity combined with more recent glacial and alluvial processes. The older basalt flows date back 12 to 25 million years, while the more recent flows emanating from Trout Creek Hill are as recent as 300,000 years old. The older material, which makes up most of the watershed including the middle reaches of the Wind River, is the most susceptible to erosion due to weathering into finer material. Relatively recent glacial activity contributed glacial sediments and has shaped river valleys. Alluvial deposits from the massive Bretz Floods, which originated from eastern Washington during the late Pleistocene, have resulted in highly erodible soils in the lower Wind River watershed near the confluence with the Columbia River.

iv. Fisheries

Listed salmon and steelhead species are the focal species of the Wind River watershed (LCFRB 2010). In the portion of the Wind River watershed that is managed by the Gifford Pinchot National Forest, the focal fish species are the LCR steelhead trout and the LCR Chinook salmon. Both LCR steelhead and LCR Chinook are federally-listed as *threatened* under the Endangered Species Act. In addition, portions of the Wind River watershed, including in the Trout Creek and Trapper Creek-Wind River subwatersheds, are federally-designated as Critical Habitat for steelhead and Critical Habitat for Chinook (Endangered Species Act), as well as Essential Fish Habitat for Chinook (Magnuson-Stevens Act).

LCR steelhead are the only native anadromous fish species above Shipherd Falls on the lower Wind River. However, LCR Chinook are present in the Wind River watershed above Shipherd Falls because of the fish ladder built in the 1950s at Shipherd Falls which allows returning chinook adults upstream passage to the Carson National Fish Hatchery on the middle mainstem Wind River. The restoration actions proposed in this Watershed Restoration Action Plan will primarily focus on LCR steelhead due to their status as native anadromous fish. Nevertheless, the restoration actions proposed for steelhead will also

expansion, (3) the establishment of a dense road system, particularly in close proximity to streams, and (4) channel modifications and floodplain disconnection. Altered habitat conditions have increased predation and competition with introduced (i.e. brook trout) and hatchery fish (i.e. spring Chinook) is thought to have further reduced productivity.

Wind River steelhead populations will need to be restored to a high level of viability to meet regional recovery objectives (LCFRB 2010). This means that the populations are productive, abundant, exhibit multiple life history strategies, and utilize significant portions of the Wind River watershed. Although federal, state, county, and private entities have actively addressed the various threats to steelhead during the past two decades, much remains to be done, particularly since no single threat is responsible for their decline. Therefore, all threats and limiting factors must be reduced if recovery is to be achieved (LCFRB 2010).

Table 5. Status of focal steelhead populations in the USFS-managed portion of the Wind River watershed (LCFRB 2010)

Species	Population	Recovery Priority[1]	Viability		Improve-ment[4]	Abundance		
			Status[2]	Object.[3]		Historic[5]	Current[6]	Target[7]
Winter Steelhead	Upper Gorge	Stabilizing	L	L	0%[8]	n/a[9]	200	200
Summer Steelhead	Wind	Primary	H	VH	0%[8]	n/a[9]	1,000	1,000

1 Primary, Contributing, and Stabilizing designations reflect the relative contribution of a population to major population group recovery goals.
2 Baseline viability is based on Technical Recovery Team viability rating approach.
3 Viability objective is based on the scenario contribution.
4 Improvement is the relative increase in population production required to reach prescribed viability goal
5 Historical population size inferred from presumed habitat conditions using Ecosystem Diagnosis and Treatment (EDT) Model and NMFS back-of-envelope calculations.
6 Approximate current annual range in number of naturally-produced fish returning to the watershed.
7 Abundance target were estimated by population viability simulations based on viability goals.
8 Improvement increments are based on abundance and productivity, however, this population will require improvements in spatial structure or diversity to meet recovery objectives.
9 Historical abundance and recovery goal information is not available at this time due to a lack of information regarding population dynamics.

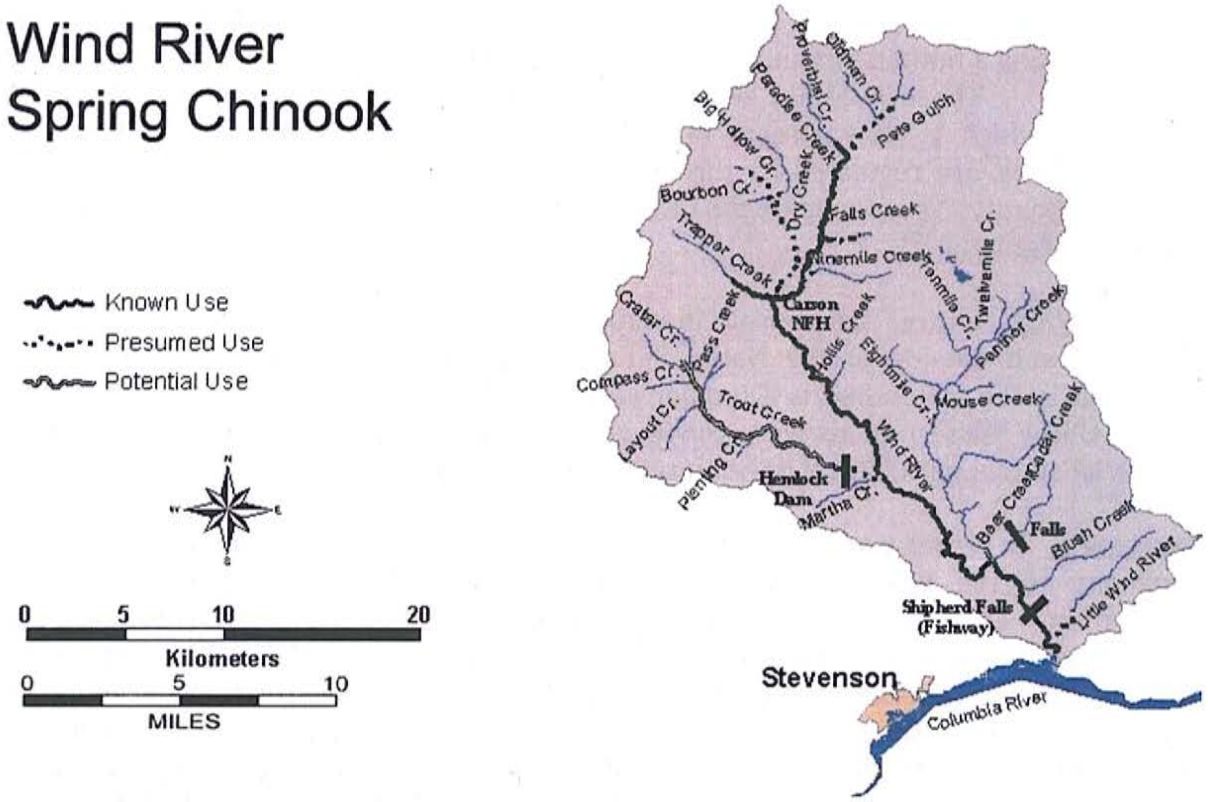


Figure 5. Distribution of LCR Chinook (spring) in the Wind River watershed (LCFRB 2010)

v. Current Land Use

Current land uses within the Wind River watershed, including in the Trout Creek subwatershed and in the middle Wind River area of the Trapper Creek-Wind River subwatershed, are dominated by forestry and recreation, but include residential development and small industry and agriculture. Forest Service lands within the Wind River drainage include a mix of Matrix (timber production emphasis), Late Successional Reserves, Experimental Forest and Wilderness management areas. Riparian Reserves are located along all aquatic features within these designated areas. Other land uses in the watershed include:

Urban/Residential. Carson, Washington is located approximately two miles from the mouth of the river and Stabler, Washington is approximately three miles further upstream. There are individual dwellings throughout the first 12 miles of the river, with the majority located in the middle reaches of the Wind River (in the Trapper Creek-Wind River subwatershed). There are also some private dwellings along the lower two miles of Trout Creek (in the Trout Creek subwatershed), and there are a number of vacation cabins are located near Government Mineral Springs along Trapper Creek (in the Trapper Creek-Wind

stands of forest in excess of 300 years in age remain, predominantly within areas draining into Trout Creek and Dry Creek (USDA 1996).

The 2001 Wind River Watershed Analysis (USDA 2001) identified the seral stage percentages of the watershed as:

- 22% Late-Successional (trees > 21" dbh with multiple canopy layers): 31,816 acres
- 47% Mid-Successional (trees > 21" dbh with a single canopy layer, and stands between 9 and 21" dbh): 67,628 acres
- 24% Early successional (trees zero to 9" dbh): 34, 118 acres
- 7% Non-forest: 9887 acres

ii. Riparian Conditions

Riparian Reserve land totals 38,863 acres within the LSR and 8,817 acres within the Matrix (Table 6). Current acreages of the "large tree" seral stage are lower than the desired future condition (Figure 6).

Table 6. Current and desired vegetation conditions in Riparian Reserves (USDA 2001)

Vegetation Class	Current Conditions (ac)	Current %	Desired Future Conditions (ac)	DFC %
Non-forest	4,130	10.7	4,130	10.7
Seed/Sap/Pole	7,782	20.0	1,699	04.3
Small Tree	14,187	36.5	3,886	10.0
Large Tree	12,764	32.8	29,148	75.0
	38,863		**38,863**	

As stated in the Wind River Watershed Analyses (USDA 1996, 2001), the desired future condition for vegetation within the Riparian Reserve is a stable late-successional stand of trees. Under stable conditions, up to 75% of the area would be maintained in large trees. Stand disturbances resulting from fire, flood, insects, disease, storms, and landslides would be at a low level estimated as 14.3% in the early and mid-successional classes of the desired future condition. The 10.7% of non-forest will remain the same on Forest lands and remain the same or increase slightly on lands outside the Forest boundary.

About 16,384 acres of young stands (seedlings, saplings, poles, and small trees) currently exist in Riparian Reserves, which is higher than the level of the desired future condition. These stands are plantations composed of seedlings, saplings, poles, and trees less than 21 inches in diameter. According to the Wind River Watershed Analyses (USDA 1996, 2001)m large tree sizes can be achieved in approximately 100 to 120 years. For stands to develop late-successional attributes (multiple layers, trees over 30 inched in diameter, large snags, and large down logs), 200 years or more are required. Management actions can be taken to accelerate the development of the young stands toward late-successional. The most important and beneficial action is the control of stand density in young stands. Stands that are overstocked do not develop large tree characteristics and become susceptible to reduced vigor and growth and losses from insects and diseases. Due to high stand

years. As stated in the Wind River Watershed Analyses (USDA 1996, 2001), and based on the National Marine Fisheries Service (NMFS) criteria for stream temperature (50-57*F = Properly Functioning, 57-64*F = Functioning at Risk, >64*F = Not Properly Functioning), as well as the State of Washington water quality standard for maximum stream temperature (16°C or below), the Trout Creek and Trapper Creek-Wind River are categorized as Not Properly Functioning for migration and rearing.

Elevated Sediment and Turbidity: Sediment production, transport, and deposition are natural processes that provide streams with a source of substrate and nutrients, and the sediment regime and composition determines the quantity and quality of aquatic habitat. However, when streams or watersheds are disturbed by human activity, as has occurred in the past in major portions of the Trout Creek and Trapper Creek-Wind River subwatersheds, excess sediment delivered to the streams can cause a shift which can directly and indirectly affect aquatic organisms by altering water quality, incubation, larval development, and juvenile rearing habitat. The majority of fine sediment within the alluvial valleys of these two subwatersheds, often referred to as the "Trout Creek Flats" and the "Wind River Flats", originates from upper hillslope sources, upstream channel erosion, and local mass wasting. Trout Creek 6th field subwatershed has one of the highest turbidity levels and potential for sediment delivery, but sediment sources appear to be from a combination of natural- and human-induced causes. Based on the NMFS criteria for substrate/sediment and turbidity (<10% fines (<1.6mm) and/or Turbidity <20 NTU = Properly Functioning; 10-17% fines and/or 20-30 NTU = Functioning at Risk; >17% fines and or >30 NTU = Not Properly Functioning), baseline conditions for sediment and substrate in the Trapper Creek-Wind River and Trout Creek subwatersheds are rated as Not Properly Functioning. However, it is important to note that Trapper Creek drainage, with its headwaters in the Wilderness, is actually rated as Properly Functioning for sediment and turbidity. However, the poor conditions in the remainder of this subwatershed reduce its status to Not Properly Functioning.

Habitat Simplification (Lack of pool-rearing and -holding habitat, spawning habitat, channel complexity, side-channel habitat, and degraded channel structure and stability): Large woody material (LWM) has been defined by the USFS-Region 6 Level II Stream Survey Protocol as wood (trees) that are >12" in diameter and >50' in length. Large wood within a stream has both physical and biotic impacts on salmonid streams. The physical effect LWM has on streams includes: changes in stability of stream banks and channels, storage of sediment, dissipation of stream energy, and alteration of channel flows (Bryant, 1983). Past stream clean-outs and riparian timber harvest have negatively impacted LWM within the majority of subwatersheds within the Wind River, including the Trout Creek and Trapper Creek-Wind River 6th field subwatersheds. Many stream channels lack the structure and habitat types to adequately support anadromous fish. Past splash-dam logging and riparian timber harvests have increased channel instability and decreased the availability of instream wood. Additionally, the Government Mineral Springs Recreational Residence Tract ("GMS"), with cabins on both sides of the mainstem Trapper Creek and throughout its adjacent riparian area, has significantly altered the stream channel, streambanks, and riparian areas in the lower two river miles of Trapper Creek, as well as

b. Objectives

i. Align with National, Regional, and Agency Priorities

Essential projects were developed based on information in watershed analysis (USDA 1996, 2001), roads analysis (USDA 2001, 2002) the Wind River Water Quality Restoration Plan (USDA 2002) and the Watershed Condition Framework (USDA 2011). This GPNF Aquatic Restoration Plan, developed under the Pacific Northwest Region Aquatic Restoration Strategy, identifies the Wind River watershed as one of the Forest's top priority watersheds for restoration. The Trout Creek and Trapper Creek-Wind River subwatersheds were chosen as priority within the Wind River watershed for restoration.

ii. Align with State and Local Goals

The Mt. Adams Ranger District will be working with partners to ensure that the essential projects detailed in this WRAP align with their own fisheries and habitat improvement goals for this area. These partners include: Washington Department of Fish and Wildlife (WDFW), Underwood Conservation District (UCD), the Yakama Nation Fisheries Program (YN), U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries (NOAA), Mid-Columbia Fisheries Enhancement Group (MCFEG), Ecotrust, American Rivers, and the Gifford Pinchot Task Force. Additionally, the objectives outlined in this WRAP align with the goals and objectives of the 2011 *Status of the Resource Report* developed by the Columbia Basin Fish and Wildlife authority (BPA 2012) and the Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan-Wind River (LCFRB 2010).

c. Opportunities

i. Partnership Involvement

Partnerships are essential for the implementation of this WRAP. Many long standing partnerships exist focusing on restoration in the Wind River Watershed. The GPNF has worked with Underwood Conservation District (UCD) to develop watershed improvement projects in the Wind River since the early 1990's, and since 1998 has been involved in a watershed-scale restoration and monitoring effort funded by Bonneville Power Administration, and involving UCD, Washington Department of Fish and Wildlife, and U.S.G.S. Columbia River Research Lab. The Forest Service has also developed and led an effort to provide field-based aquatic habitat monitoring and education to local schools, with support from U.S. Fish and Wildlife Service, UCD, U.S. Army Corps of Engineers, and Columbia Gorge Ecology Institute. Other partners have contributed cash, labor and in-kind support to habitat work and monitoring in the Wind River, including Mid-Columbia Fisheries Enhancement Group, Yakama Nation, University of Washington, Gifford Pinchot Task Force, Skamania County, and others. Broad networks of partners will provide support, linkage to the community, and access to additional funding sources not readily accessible to the GPNF. Below are partnership opportunities:

Agreements & Funding

- Memoranda of Understanding (MOU) and Challenge Cost Share Agreements with agencies and organizations are an excellent means for accomplishing mutually beneficial projects and would be considered as part of a suite of funding opportunities to be pursued for future restoration in the Wind River watershed.
- Continued partnerships with BPA, Ecotrust, American Rivers, MCFEG, Yakama

- Restoring a treaty right, as well as a subsistence need, for native peoples of the Columbia River basin by contributing to the recovery of a greatly reduced steelhead harvest;
- Improving water quality in the Wind River by improving riparian forest health and providing more shade to surface waters, as well as through a decrease in sediment delivery in the watershed and healthier water in which to recreate;
- Providing jobs, volunteer opportunities, and specialized experience to local contractors and students;
- Providing educational opportunities for other private landowners and the general public to learn about watershed restoration through projects occurring in their local ecosystems;
- Increasing community pride and ownership in their public lands;
- Strengthening the partnership between the USFS and other federal, state, county, city, tribal, and non-profit agencies, as well as private landowners, who have a stake in the Wind River watershed.

d. Specific Project Activities (Essential Projects)

i. Background - Past Restoration Efforts & Prioritization Process

Past Restoration Efforts

Past restoration in the watershed includes:

- road closures and decommissioning,
- culvert replacements for fish passage,
- culvert-to-bridge projects for fish passage,
- fish habitat enhancement (eg., large wood structure placements),
- streambank stabilization,
- riparian planting and thinning,
- invasive weed removal,
- reconnecting historic side-channels,
- dam removals.

Approximately $5 million was spent from the 1990 to 2012 on these instream and riparian projects, mostly in the Trout Creek subwatershed because of its importance for wild steelhead production. These projects evolved from early instream boulder placements to, more recently, placing very large conifer wood pieces with helicopters and creating large wood structures with excavators. Other recent projects included the removal of Hemlock Dam in 2009, the Martha Creek Dam removal in 2012, and the multi-year Upper Trout Creek Stream Restoration and Riparian Thinning Project completed in 2008.

The Trout Creek subwatershed has been a focus of restoration for fisheries agencies and organizations working in the Gifford Pinchot National Forest because of its high priority fish habitat and production importance, as well as its water quality issues. See Figure 7 and Table 7 for further details regarding stream restoration actions undertaken in the Wind River watershed since 1991.

Table 7. Restoration Projects Implemented in the Wind River Watershed (1991-2015) (*work completed in the Trout Creek and Trapper Creek-Wind River subwatersheds is highlighted in blue*)

Project Type	Project Name	Subwatershed	Year
Dam Removal	Martha Creek Dam Removal	Trout	2012
	Hemlock Dam Removal	Trout	2009
	Maidenhair Dam Removal	Trapper-Wind	2009
Fish Passage Improvement	Layout Creek Fish Passage - Bridge	Trout	2014
	Oldman Creek Culvert Removal	Upper Wind	2011
	Youngman Creek Culvert Removal	Upper Wind	2011
	Crater Creek Tributary Culvert Replacement	Trout	2011
	Mouse Creek Fish Passage - Bridge	Panther	2006
	Trout Creek Fish Passage - Bridge	Trout	2004
	Trout Creek Tributary Fish Passage - Bridge	Trout	2004
	Pass Creek Fish Passage - Bridge	Trout	2000
	Traveling Screen/Exclosure	Trout	1997
	Trout Creek Fish Ladder Auxiliary Flow	Trout	1997
	Trout Creek Fish Ladder	Trout	1996
Carcass Analogs	Watershed Nutrient Enhancement	Multiple (including Trout & Trapper-Wind)	2005-2006
Riparian/ Channel Work	Middle Wind Habitat Restoration	Trapper-Wind	2006-2007
	Upper Trout Creek Restoration	Trout	2005-2007
	Dispersed Site Rehabilitation	Upper Wind	2005-2006
	Mining Reach	Upper Wind	1999-2002
Channel Work	Mining Reach	Upper Wind	2000
	Dry Creek	Dry	2000
	Middle Reach	Trapper-Wind	2000
	Lower Trout Creek Flats	Trout	1999
	Stabler Cut Bank	Lower Wind	1999
	Trout/Compass confluence	Trout	1998
	PCT Bridge Protection	Trapper-Wind	1998
	McNee	Trout	1998
	Panther Creek Channel Repair	Panther	1998
	Stabler Cut Bank	Trapper-Wind	1998
	Hatchery Reach	Trapper-Wind	1997
	Layout Creek Structure Renovation	Trout	1997
	Trout Creek Instream Phase I	Trout	1996
	Little Soda Springs	Trapper-Wind	1993
	Little Soda Springs	Trapper-Wind	1991
Bank Stabilization	Panther Creek Bank Stabilization	Panther	2000
	Panther Creek Bank Stabilization	Panther	1997
	Trout/Layout Soil Bio-Engineer	Trout	1994
Riparian Planting	Layout Creek Hardwood Planting	Trout	2015
	Layout Creek Hardwood Planting	Trout	2014
	Oldman and Youngman Creeks Planting	Upper Wind	2011
	Trout and Layout Creeks Planting	Trout	2011
	Hemlock Pump Site Planting	Trout	2011
	Hemlock Dam Removal Site Planting	Trout	2010-2012
	Road 6801 Stabilization Site Planting	Panther	2010
	GMS Cabin & Culvert Removal Site Planting	Trapper-Wind	2010
	Mouse Creek/Road 65 Bridge Planting	Lower Wind	2010
	Trout and Layout Creeks Planting	Trout	2010
	Trout and Layout Creeks Planting	Trout	2009
	Trout and Layout Creeks Planting	Trout	2008
	Trout and Crater Creeks Planting	Trout	2007
	Trout and Layout Creeks Planting	Trout	2006
	Upper Trout, Planting, Layout, Compass, and Crater Creeks Planting	Trout	2003
	Mining Reach Planting	Upper Wind	2000
	8-Mile Creek Planting	Panther	1998
	Panther Creek Trib. Slide Restoration	Panther	1998
	9-Mile Creek Slide Restoration	Lower Wind	1997
	9-Mile Creek Slide Restoration	Lower Wind	1997

second priority subwatershed for restoration, primarily due to their importance to LCR steelhead.

Prioritizing Essential Projects
This plan prioritizes essential restoration projects within the Trout Creek and Trapper Creek-Wind River subwatersheds for the improvement and recovery of water quality, fish habitat, and riparian forest conditions. Active restoration includes a suite of projects associated with watershed restoration, such as: road upgrades and closures, invasive weed removal, riparian planting, upland thinning, and instream habitat improvement. Passive restoration includes activities such as allowing for vegetation recovery and growth and substantive input by fish biologists and hydrologists during project planning to ensure the watershed remains on a recovery path.

Watershed limitations vary among the subwatersheds of the Wind River, but high instream temperatures, lack of spawning, rearing, and migration/holding habitats, degraded riparian conditions, and road-related sediment are the primary aquatic habitat degradation factors within the Trout Creek (Priority 1) and Trapper Creek-Wind River (Priority 2) subwatersheds.

Essential projects identified for implementation in Trout and Trapper/Middle Wind subwatersheds in this 5-year planning horizon include: fish passage improvements, large wood placement, road closures and decommissioning, riparian thinning, planting, and invasive weed removal, nutrient enhancement, beaver reintroductions, dispersed campsite rehabilitation, developed campground modification, and berm, gabion, and riprap removal.

ii. Essential Project Activities
Essential projects directly address one or more of the limiting habitat factors for fisheries. The essential projects are designed to decrease summer water temperature, reduce sediment inputs, and restore a stable pattern, dimension, and profile to streams within the first priority subwatershed, Trout Creek, and the second priority subwatershed, Trapper Creek-Wind River. The projects will increase stream length and complexity, spawning and summer/winter rearing and feeding/holding habitats, riparian canopy cover, and restore floodplain connectivity. Restoration projects are listed in Tables 8 and 9.

Project Description	Watershed Condition Indicator Addressed	Recovery Plan Habitat Measure Addressed (LCFRB 2010)	Location	Proposed Timeline* and Projected Target	Total Cost (estimated) and BLI**
Construct log complexes in gullied channel segments to improve aquatic habitat and habitat for Corydalis, a rare plant	Large woody debris, streambank stability, channel geometry	Restore floodplain function and channel migration processes. Restore channel structure and stability.	Compass Creek (RM 0.0 - 1.0); Crater Creek (RM 0.0 - 1.5); Pass Creek (RM 0.0-1.5)	2017-2020 Target: 4.0 miles instream restoration	(combined with previous project) NFWF/VW
Decommission roads and restore appropriate drainage	Habitat fragmentation, road density, drainage density, proximity to streams, soil erosion	Restore degraded hillslopes. Restore channel structure and stability.	FR 42-420 (MP 0.0 – 0.3) FR4309-415 (MP 0.0 - 1.9) FR 4309 (MP 0.0 - 2.2) FR4309-600 (MP 0.0 - 0.1) FR 33-407 (MP 0.0 - 0.6) FR 33-409 (MP 0.0 -0.9) FR 33-410 (MP 0.0 - 0.1) FR 33-620 (MP 0.0 - 0.2) FR 33-602 (MP 0.0 - 0.2)	2018-2020 Target: 6.5 miles road decomm.	$134,000 CMLG
Upgrade existing culvert	Habitat Fragmentation, AOP	Address passage issues	Trout Trib at Forest Road 4309 (MP 1.0)	2015-16 Target: 0.2 miles habitat opened	$110,000 CMLG
Upgrade existing culvert	Habitat Fragmentation, AOP	Address passage issues	Trout Creek trib at Forest Road 4309-415 (MP 0.8)	2019-2020 Target: 1.0 miles habitat opened	$81,000 CMLG
Upgrade existing culvert	Habitat Fragmentation, AOP	Address passage issues	Trout Creek trib at Forest Road 4200 (MP 4.3)	2019-2020 Target: 1.0 miles habitat opened	$81,000 CMLG
Non-native fish removal	Ecological interactions, invasives, competition, predation	Address competition and predation issues	Trout, Planting, Martha, Layout, Compass, Crater, Pass, East Fork Creeks	2019-2020 (& annually) Target: 10 miles of instream habitat improved for	$32,000 NFWF

Construct large wood complexes along stream and floodplain	Large woody debris, streambank stability, channel geometry	Restore floodplain function and channel migration processes. Restore channel structure and stability	Wind River (RM 17.0 – 19.5)	2018-2020 Target: 2.5 miles stream restored	$320,000 NFWF
Thin and underplant riparian forest, rehab damaged riparian landings, construct wood complexes, control weeds along Ninemile Creek	Riparian vegetation condition, native species, invasives	Restore riparian conditions	Ninemile Creek (RM 0.0 – 1.5)	2019-2020 Target: 36 acres riparian forest restored	$100,000 NFVW
Upgrade existing culvert	Habitat Fragmentation AOP	Address passage issues	Trapper Creek trib at FR 5401	2019-2020 Target: 1.0 miles habitat opened	$80,000 CMLG
Decommission roads and restore appropriate drainage	Habitat fragmentation, road density, drainage density, proximity to streams, soil erosion	Restore degraded hillslopes. Restore channel structure and stability	FR6063-039 (MP 0.95 – 1.36) FR60-078 (MP 0.0 – 0.61) FR60-088 (MP 0.0 – 0.75) FR60-089 (MP 0.0 – 0.54)	2019-2020 Target: 2.3 miles road decomm.	$130,000 CMLG
Remove steel plate berm along Wind River and replace with fish-friendly bank protection	Large woody debris, streambank stability, channel geometry	Restore channel structure and stability	Wind River (RM 17.3)	2019-2020 Target: 0.1 miles stream restored	$160,000 NFWF
Replace culvert with bridge	Habitat Fragmentation AOP	Address passage issues	Dry Creek at FR64	2019-2020 Target: .75 miles habitat access improved	$430,000 CMLG

** Actual timelines will be subject to funding availability. Proposed timeline includes post-project monitoring. Internal and external partnerships/ funding sources will be sought on all listed projects.*
*** Total Cost includes 5% for monitoring*

e. Costs

See Table 10 and Figures 8 and 9 for the estimated total funds needed for essential restoration in the two priority subwatersheds:

Table 10. Essential Project Funding Needs by Project Category

6th Field Watersheds	Restoration Type			Total Funding Needs by 6th Field Watershed
	Roads/AOP	Instream	Riparian	
Trout Creek: *priority 1*	370,000	574,000	133,000	1,077,000
Trapper Creek-Wind River: *priority 2*	640,000	600,000	130,000	1,370,000
TOTAL Funding Needs	**1,010,000**	**1,174,000**	**263,000**	**2,447,000**

Table 11. Timelines and Project Scheduling: 5-Year Plan for Completing Essential Projects in Trout Creek

Sequence	Project Name	Project Phase	Project Cost by Year				
			2016	2017	2018	2019	2020
1	Culvert Upgrade – Trout Trib at Forest Road 4309	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.	(completed 2015)				
		Implementation: contract admin, contract cost, materials, mitigation, erosion control	$80,000 (work begins in 2015)				
		Monitoring		$			
2	Hemlock Tree Planting	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.	(completed 2015)				
		Implementation: contract admin, contract cost, materials, mitigation, erosion control	$3,000				
		Monitoring					
3	Lower Trout Creek Large Wood Supplementation	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.	(completed 2015)				
		Implementation: contract admin, contract cost, materials, mitigation, erosion control	$180,000				
		Monitoring		$			
4	Remove concrete and steel structures remaining in Trout Creek associated with past water systems	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.		$10,000			
		Implementation: contract admin, contract cost, materials, mitigation, erosion control			$10,000		
		Monitoring				$	
5	Trout Creek Road Decommission	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.			$20,000		
		Implementation: contract admin, contract cost, materials, mitigation, erosion control				$110,000	
		Monitoring					$
6	Trout/Martha/ Layout Creek Wetland Enhancement	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.		$15,000			
		Implementation: contract admin, contract cost, materials, mitigation, erosion control			$75,000		
		Monitoring				$	$
7	Upper Trout Creek Riparian Enhancement and Invasives Control	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.		$10,000			

Table 12. Timelines and Project Scheduling: 5-Year Plan for Completing Essential Projects in Trapper Creek-Wind River

Priority	Project Name	Project Phase	Project Cost by Year				
			2016	2017	2018	2019	2020
1	Trapper Creek Tributary Dam-- Fish Passage Improvement	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.	$5,000				
		Implementation: contract admin, contract cost, materials, mitigation, erosion control		$5,000			
		Monitoring		$	$		
2	Trapper / Wind Riparian Site Rehabilitation	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.		$10,000			
		Implementation: contract admin, contract cost, materials, mitigation, erosion control			$20,000		
		Monitoring				$	
3	Trapper Creek Side Channel Activation	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.			$20,000		
		Implementation: contract admin, contract cost, materials, mitigation, erosion control				$30,000	
		Monitoring				$	$
4	Trapper Creek Channel Improvement	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.		$20,000			
		Implementation: contract admin, contract cost, materials, mitigation, erosion control			$40,000		
		Monitoring				$	
5	Wind River Large Wood Supplementation	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.			$20,000		
		Implementation: contract admin, contract cost, materials, mitigation, erosion control				$300,000	
		Monitoring				$	$
6	Ninemile Creek Channel and Riparian Improvement	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.				$20,000	
		Implementation: contract admin, contract cost, materials, mitigation, erosion control					$80,000
		Monitoring					$
7	Trapper Creek Tributary Culvert Upgrade – Road 5401	**Planning and Design**: grant writing, field survey, design, NEPA, permits, consultations, contract prep.				$10,000	

4. RESTORATION PROJECT MONITORING AND EVALUATION

Performance will be measured by conducting monitoring immediately after completion of each project (implementation monitoring). This will be followed by longer term effectiveness monitoring that will determine how well the project contributed to the desired condition. Habitat parameters that will, based on funding, include: stream temperature, stream channel geomorphology, stream substrate composition, riparian vegetation composition, and invasive plant presence and distribution. With continued assistance from WDFW and USGS, biological monitoring will measure the response of adult and juvenile salmon to the habitat changes, including changes in densities of spawners and smolt production in the project area. However, it is important to note that all monitoring will be contingent on availability of funds.

Table 13. Project Monitoring and Evaluation

Project Activity	Parameters to be Monitored*	Who will monitor?	Frequency**
Restore channel and floodplain form and function	Channel surveys (cross sections, longitudinal profile, pebble counts, LWD and pool counts), photo points	USFS & Project Partners	Post project and after major flood event
Completion of channel restoration / large wood placement	Channel surveys (cross sections, longitudinal profile, pebble counts, LWD and pool counts), photo points	USFS & Project Partners	Post project and at intervals suitable to developing trend.
Removal / replacement of fish barriers	Longitudinal profile at barrier removal to confirm passage, fish presence/absence	USFS & Project Partners	Post project
Decommissioning / stabilization of roads	Channel surveys at culvert removal sites, photo points	USFS & Project Partners	Post project and five years
Riparian Thinning	Measurement of canopy cover and density, invasive weed presence / absence, stream temperature (long-term)	USFS & Project Partners	Post project and five years
Riparian Planting	Survival and stocking surveys, vegetation and invasive weed presence / absence, photo points.	USFS & Project Partners	Post project and five years
Invasive Species Removal	Pre and post mapping	USFS & Project Partners	Post project and five years

***Description of Parameters –**

Photo Points: Determines visual change in amount of habitat and vegetation planted through pre and post project photos.

Spawning and Habitat Surveys: Inventories fish habitat and salmonid spawners.

Level 2 Stream Surveys (cross sections, longitudinal profile, pebble counts, sediment surveys and channel geometry): Determines change in physical stream characteristics (hydrologic and geomorphic) and shows effectiveness in maintaining stream meander pattern, dimension, and profile.

Large Wood Surveys: Quantifies large wood in the project reach.

Stream Temperature: Measures stream temperature over time.

Soil Infiltration and/or Plant Survival (decommissioned roads): Determines if the decommissioned roads are incorporated into the surrounding landscape over time.

Vegetation Presence / Absence, Survival, and Stocking Surveys: Determines success of planting and subsequent need for re-planting.

Noxious Weeds (Presence/Absence): Determines if disturbed areas are revegetated with riparian species appropriate to the site.

****Based on funding**

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