**USDA Forest Service Watershed Condition Framework**
**DRY CREEK SUBWATERSHED**
**HEADWATERS WIND RIVER SUBWATERSHED**
**RESTORATION ACTION PLAN**
**Gifford Pinchot National Forest, Mount Adams Ranger District**

## Executive Summary

The *Dry Creek and Headwaters Wind River Subwatershed Restoration Action Plan* identifies limiting factors and prioritizes essential projects to restore watershed processes to enhance water quality and fish habitat on the Gifford Pinchot National Forest through implementation of essential projects.

The Headwaters Wind River and Dry Creek subwatersheds were selected as priorities for active restoration based on resource values, feasibility of improving watershed conditions through focused restoration projects, and strong ongoing partnerships:

- High percentage of National Forest System (NFS) ownership;
- Upcoming investment through the Upper Wind Thin project will leverage funds for aquatic restoration;
- Strong history of long-term partnerships, with opportunities to build additional partners;
- Identified in DNR's strategic plan as focus area;
- Yakama Tribal interest in restoration;
- Wild Steelhead gene bank;
- Identified as an EPA Coldwater Refuge; essential projects are designed to build resiliency to the hydrologic impacts of climate change;
- Located within the Key and Focus Wind River Watershed.

Through implementation of essential projects over the next seven years, conditions across both subwatersheds are expected to improve and move from functioning at risk to functioning properly.

## Background

### General Location

The Dry Creek and Headwaters Wind River subwatersheds are located on the Gifford Pinchot National Forest, near Carson, Washington (Figure 1).

The Dry Creek and Headwaters Wind River are the northernmost subwatersheds in the 225 $mi^2$ Wind River Watershed. The 30 mile Wind River originates in the Cascade Range, south of Mount Adams and Mount St. Helens. It flows generally south through the Gifford Pinchot National Forest, joining the Columbia River at river mile 154.5 near Carson, in the Columbia River Gorge. The watershed hierarchy and hydrologic unit names and numbers are shown in Table 1.

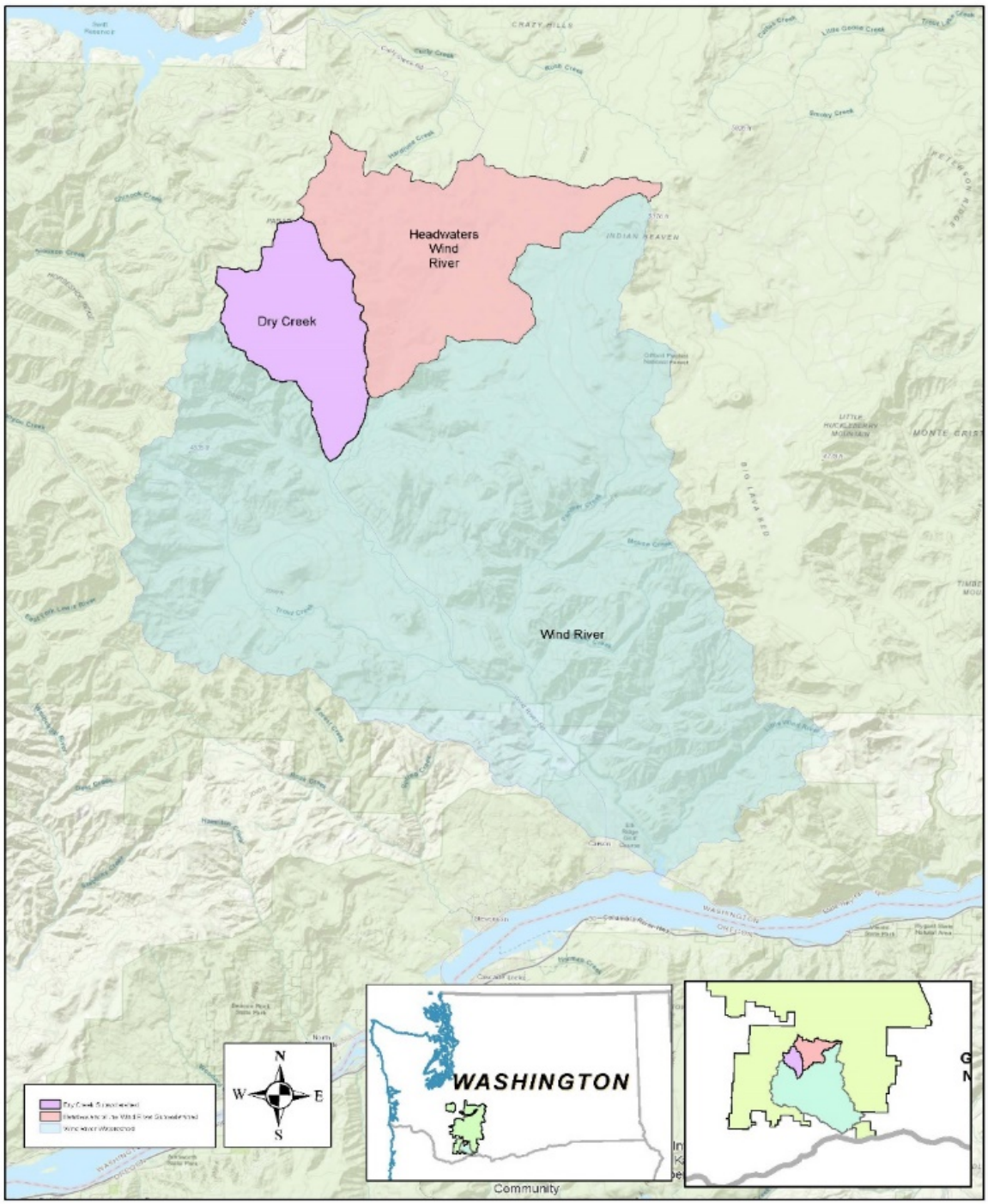



Figure 1. Location of the Dry Creek and Headwaters Wind River subwatersheds on the Gifford Pinchot National Forest

**Table 1: Watershed hierarchy for the Dry Creek and Headwaters Wind River subwatersheds.**

| Basin (HUC 6) | Subbasin (HUC 8) | Watershed (HUC 10) | Subwatersheds (HUC 12) |
|---|---|---|---|
| Middle Columbia (170701) | Middle Columbia- (17070105) | Wind River (1707010510) | Headwaters Wind River (170701051001) |
| | | | Dry Creek (170701051003) |

## Watershed Characterization

The 20,123-acre Headwaters of the Wind River Subwatershed is located about 9 miles north of Carson, Washington. Major streams include Oldman, Proverbial, Paradise, and Juice Creeks. The 9,927-acre Dry Creek Subwatershed of the 143,383-acre Wind River Watershed. Streams in the Dry Creek subwatershed include Big Hollow Creek and Bourbon Creek. There is no private land within either subwatershed (Table 2).

Table 2. Subwatershed acreage and ownership.

| Subwatershed | NFS Land (acres) | Other Ownership (acres) | NFS Land (%) | Total Acres |
|---|---|---|---|---|
| Headwaters Wind River | 20,124 | 0 | 100 | 20,124 |
| Dry Creek | 9,937.9 | 0 | 100 | 9,937.9 |

The temperate maritime climate produces cool, wet winters and hot, dry summers. The watershed has a mean annual precipitation of 110 inches, with the 75% of annual precipitation occurring between November and March (LCFRB 2010). Both rain and snow are common in both subwatersheds during the winter months.

## Physiography

The Wind River watershed is within the south-central portion of the South Cascades geologic province. The province is a complex mosaic of terranes, dominated by extrusive volcanics, resulting from approximately 40 million years of volcanism within the Cascade Volcanic Arc. Modern topography and hydrography are influenced by the location and orientation of faults and folds in the Wind River subbasin. The surficial geology of the Wind River subbasin include intrusive and extrusive volcanics, marine and riverine sedimentary rocks, and unconsolidated alluvium and colluvium.

The Wind River valley rests within the high-relief mountainous landscape of the western Cascade Range. Elevation within the basin ranges from 80 feet at the confluence with the Columbia River to 5,366 feet at Gifford Peak. The contemporary aspect of the valley is governed by regional fault zones that have imposed both hydrographic and topographic influences on the drainage basin for millennia, The steep, timbered drainages of the Wind River watershed are the result of fluvial incision, due to the watershed's relatively low elevation and occurrence within the rain-on-snow climatic zone. However, small alpine glaciers were present during the most recent ice ages, between 20,000 and 9.500 years ago.

The Wind River is unregulated and influenced by the geologic history described previously. The modern channel occupies an alluvial valley floor and is inset beneath landslide deposits, alluvial fans, and gravel terraces corresponding to glacial retreat. As discharge and sediment flux reduced with warming climate during the Holocene, the glacial outwash deposits were incised into and stranded along the valley margins in the upper portion of the watershed.

The Dry Creek subwatershed is characterized by an older, steeper, and more dissected landscape, drained by Dry Creek and Paradise Creek. Steep slopes, incised channels and evidence of mass wasting are common and a larger share of runoff occurs via surface channels. In the Headwaters Wind subwatershed, the broad flats of Oldman Pass form the headwaters of the Wind River. McClellan Meadows and other wetlands, swamps and meadows provide open conditions, some standing water, and are drained by the Wind River and other low gradient tributaries.

**Land Use**

Volcanic activity, mass wasting and wildfire are the most significant disturbance elements, however trends in basin hydrology and sediment supply over the last 150 years have been dominated by human activity on the landscape. Vegetation clearing, road and bridge building, log rafting, and other logging-related activities have resulted in increased sediment supplied to the mainstem Wind River and its tributaries. Sediment is presently contributed to the channel from tributaries, mass-wasting processes, near channel banks, and hillslopes. Tributaries in the basin are highly connected to adjacent hillslopes and prone to flashy discharges following rain-on-snow events, spring snowmelt, and fall storms. Many surveyed streams in the subwatershed have above-average stream sediment levels, with Dry Creek, Youngman Creek, and the Upper Wind River having the highest percentages of fine sediment (LCFRB 2010).

The Wind River Mine, an underground gold mine operation that is currently inactive is located near the south end of the Headwaters Wind River subwatershed. Operations on the mine site have been occurring sporadically over several decades, and have involved miles of underground excavation, water rerouting, milling of ore both on and offsite. Tailings ponds remain onsite but are largely revegetated and not known to present an ongoing water quality problem.

Management of lands within the Dry and Headwaters Wind subwatersheds is guided by the Gifford Pinchot National Forest Land and Resource Management Plan (USDA 1990), as amended by the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (“Northwest Forest Plan” or “NWFP”, USDA and USDI 1994). Management areas under the Northwest Forest Plan are shown in Table 3. In addition to the management areas shown in Table 3, Riparian Reserves overlay underlying management areas adjacent to streams, wetlands, ponds, lakes, and unstable areas. Riparian Reserves are designated to maintain and restore riparian structure and function, and activities within this management area must ensure that riparian values are enhanced or preserved.

**Table 3. Northwest Forest Plan Management Area acreage**

| Management Area | Headwaters Wind River Subwatershed Acres | Dry Creek Subwatershed Acres |
|---|---|---|
| Adaptive Management Area | 0 | 0 |
| Administratively Withdrawn Area | 598 | 147 |
| Congressionally Withdrawn Area | 928 | 20 |
| Late Successional Reserve | 41 | 9,762 |
| Managed Late Successional Area | 0 | 0 |
| Matrix | 18,442 | 8 |
| Other Ownership | 0 | 0 |
| **Total** | **20,009** | **9,937** |

## General Overview of Concerns

The primary factors affecting the proper functioning condition of these subwatersheds include:

- **Simplification and loss of aquatic habitat**, including a lack of deep complex pools, large wood, spawning gravels, and diverse riparian areas;
- **Loss of channel connectivity**, including off-channel habitat, side-channels, oxbows, and wetlands;
- **Loss of floodplain connectivity**. Many streams are incised and floodplains are not inundated during high flows;
- **Roads.** Road densities are moderate in the Dry and HW Wind subwatersheds (1.8 mi/mi$^2$, and 2.0 mi/mi$^2$, respectively), however approximately 10% of the road system is located in close proximity to streams, delivering sediment and altering watershed function;
- **Fragmented habitat**. There are several man-made barriers to aquatic organism passage in both subwatersheds.

## Important Ecological Values and Opportunities

The subbasin historically supported abundant fall Chinook, summer and winter steelhead, chum, and coho. These fish populations are components of Lower Columbia Evolutionarily Significant Units (ESUs) listed as Threatened under the Endangered Species Act (ESA). An estimated 30 - 90% of historical fish habitat has been lost (LCFRB 2015). Historical timber harvest practices, hydropower infrastructure, and rural development have all contributed to the loss of fish habitat in the watershed. Summer steelhead have the largest distribution of the focal species and are found throughout the subbasin, both in the mainstem and tributaries.

The Wind River watershed is designated as a Key Watershed in the Northwest Forest Plan in recognition of its anadromous fish populations and is also a Focus Watershed under the Region 6 Aquatic Restoration Strategy. The Wind is designated and managed as a wild steelhead gene bank by Washington Department of Fish and Wildlife (WDFW); hatchery origin steelhead have not been released in the watershed since 1997. The Wind River has also been recommended as an Intensively Monitored Watershed in the State of Washington.

Water quality in the Wind River is relatively high due to the lack of urbanization and industrial development, and because much of the watershed remains forested. Major tributaries sourced at the base of lava fields contribute cold water that helps sustain cool temperatures, even in the warm summer months. The Wind River is identified as a top coldwater refuge for salmonids in the Columbia River mainstem based on modeled flow, cold water refuge volume, and temperature (EPA 2021, Palmer 2017).

## Climate Vulnerability and Adaptation

Climate change is projected to alter stream temperature, snowpack, and flow regimes of streams in the Dry Creek and Headwaters Wind subwatersheds as well as the larger Wind River watershed with potential consequences to physical watershed processes, infrastructure, Lower Columbia River steelhead, and other native aquatic species. Warmer winter temperatures will generate less snow and more rainfall in winter months. This will mean more rapid runoff of incoming precipitation resulting in changes in the timing and magnitude of peak, and less storage of water in snowpacks into the summer months. Summer streamflows will likely be lower in the coming climate, and as such may be more easily heated.

The Variable Infiltration Capacity (VIC) hydrologic model produced by the Climate Impacts Group and the UW was used by the US Forest Service Rocky Mountain Research station to calculate a set of flow metrics for key flow attributes in the 1:100,000 scale National Hydrograph Dataset comparing historical metrics (1977-2006) with projections for the mid-century (2040) and end of century (2080) (Wenger at al. 2010). This dataset provides spatially explicit predictions of streams that are most vulnerable to decreases in low flows, and increases in bankfull flows to guide potential management actions to build resiliency.

### Low Flows

Projections for decreases in mean August low flows for the 2040s and 2080s are shown in Figure 2. These projections indicate that summer low flows will likely decrease across the Watershed, particularly in the Trapper Creek, Dry Creek, and Headwaters Wind River subwatersheds. The magnitude of decreases in low flow is greater across the Watershed in the 2080s, with the spatial distribution of streams at greatest risk of low flow decreases similar to the 2040 predictions.

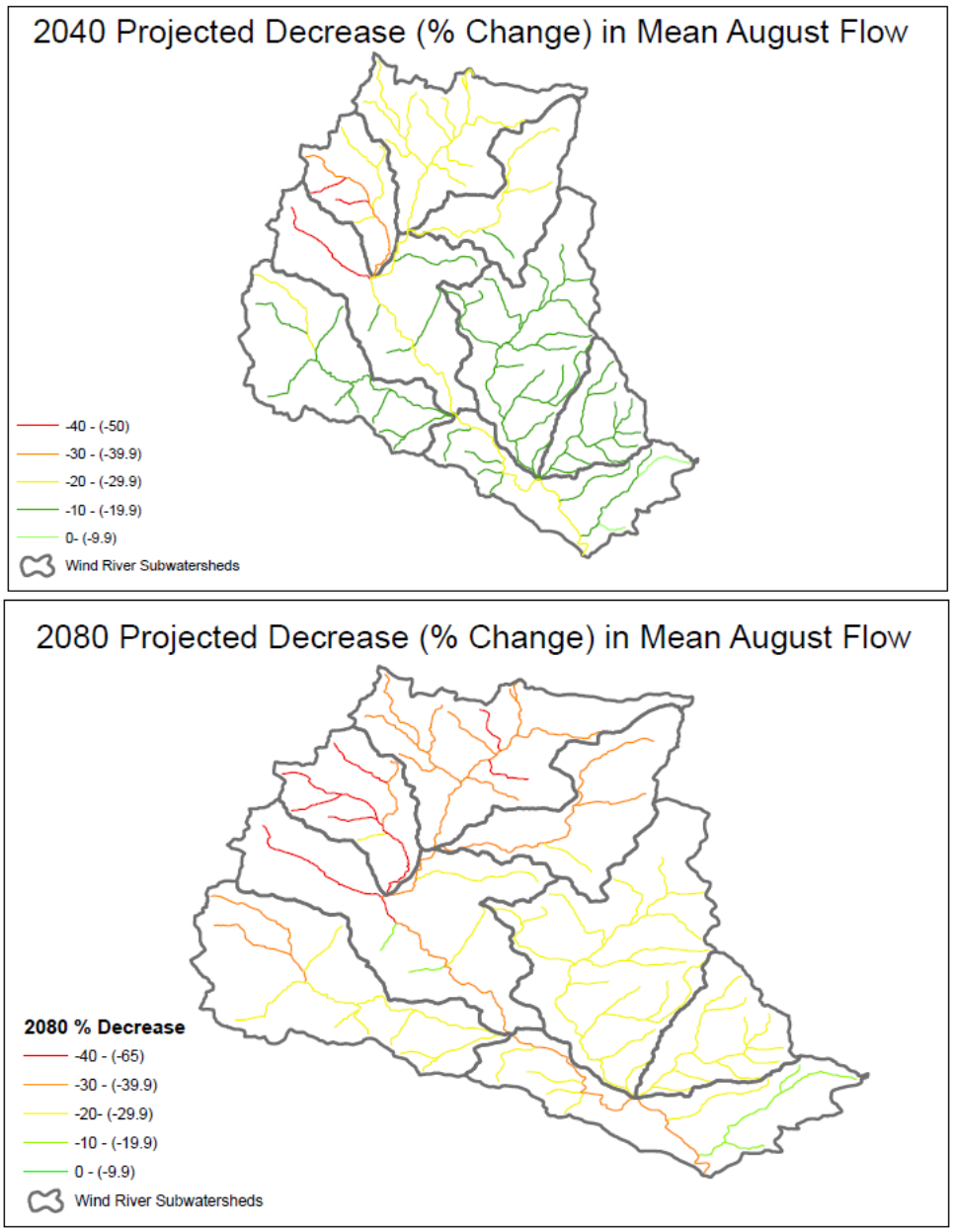
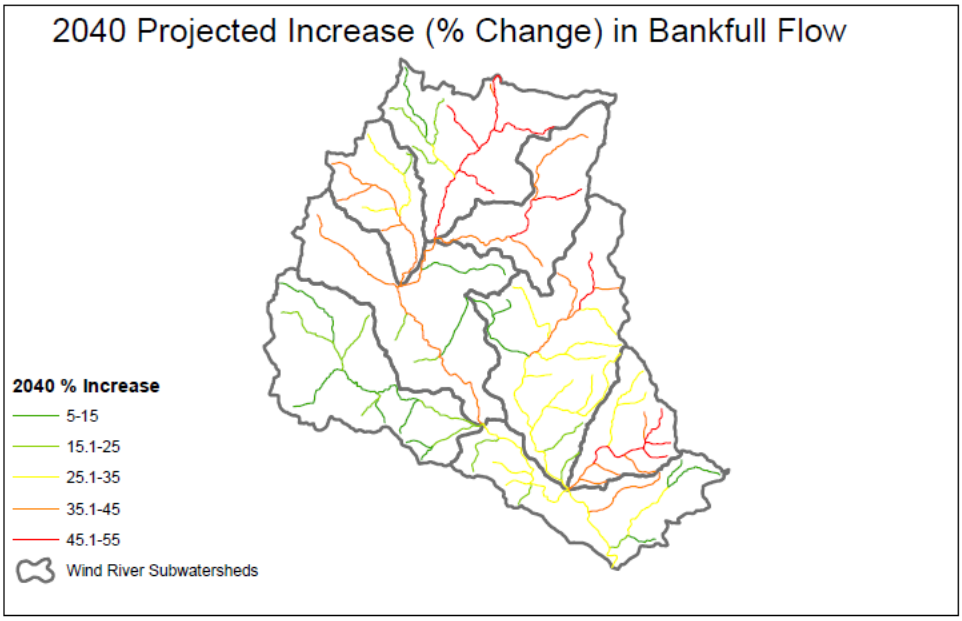



Figure 2. Projected low flow decreases in the Wind River Watershed from the VIC flow-metric project (Wenger at al. 2010).

**Bankfull Flows**

Projected increases in bankfull flows in the Wind River Watershed for the 2040 and 2080s are shown in Figure 3. Peak flow increases in the 2040s are predicted to be greatest in the Trapper, Dry, Headwaters Wind, Falls Creek, and Bear Creek subwatersheds. The magnitude of predicted increases in bankfull flows is greater in the 2080s, following a similar pattern to the 2040s, with with the addition of the Panther Creek subwatershed, which shows a greater increase in flows in the 2080s when compared to the 2040s than other subwatersheds.



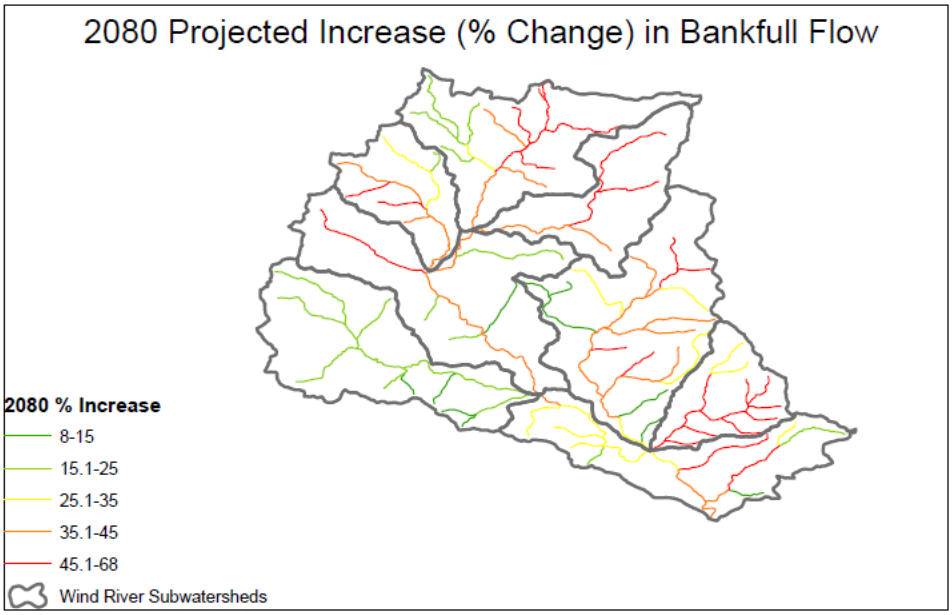




Figure 3. Projected bankful flow increases in the Wind River Watershed from the VIC flow-metric project (Wenger at al. 2010). Note the different scales symbolized for the 2040s and 2080s.

**Stream Temperature**

The map sequence in Figure 4 shows stream temperature warming projections from the NorWeST project which uses existing temperature data and models projected stream temperature changes (% change) under the A1B warming trajectory for the 2040s and 2080's across western states (Isaak et al. 2016). Increases under the 2040 scenario range from 1.1ºC to 1.3 ºC and are highest in the main

stem Wind River and lower subwatersheds. Projected increases for the 2080s are higher, ranging from 1.6ºC to 2.1ºC. Increases are highest in the main stem Wind River and lower subwatersheds, but increases are more widepspread across the Watershed.

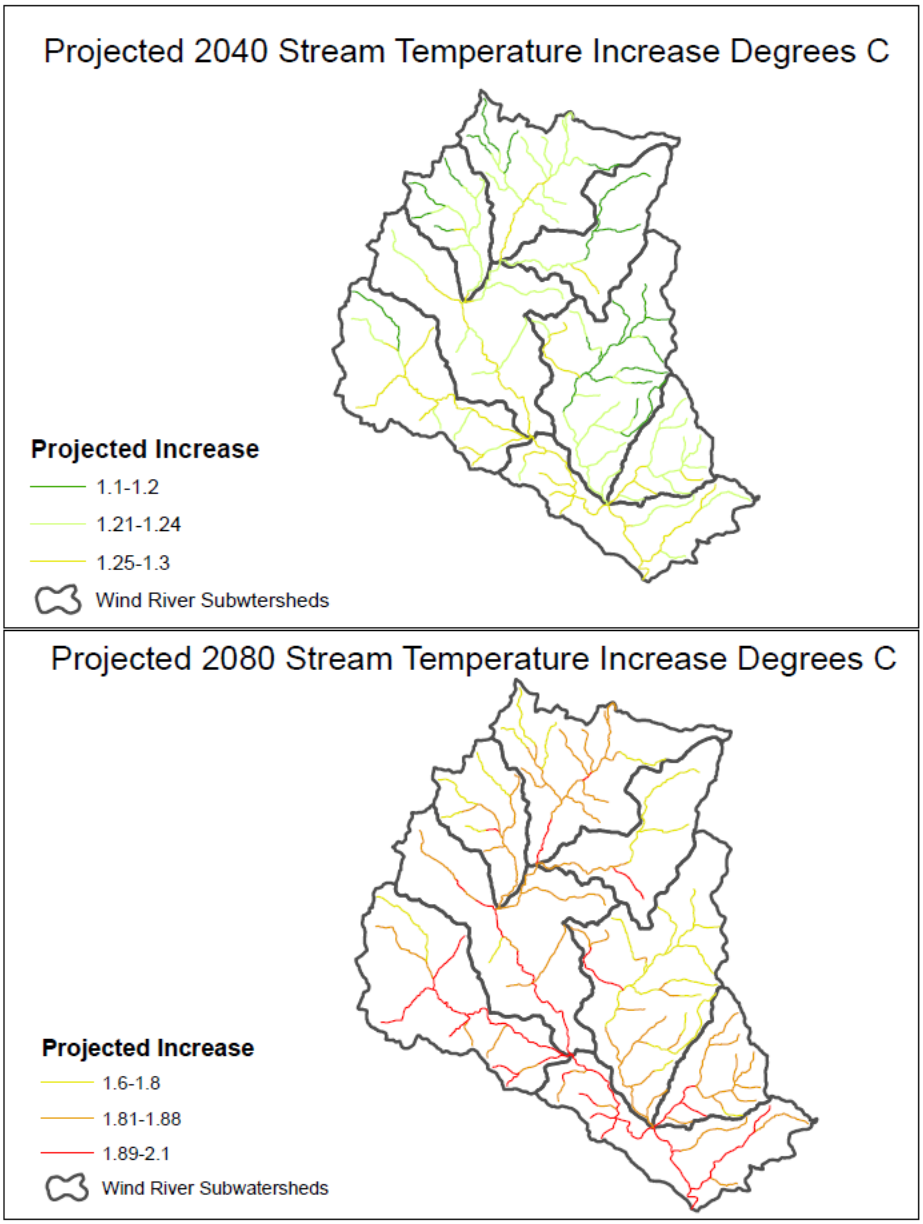



Figure 4. Projected temperature increases in the Wind River Watershed from the NorWeST project (Isaak et al. 2016).

The Gifford Pinchot National Forest completed a climate change vulnerability assessment in October 2019 (Hudec et al.) With respect to watershed stewardship, this analysis focused on

potential thermal impacts to anadromous fish species, emphasizing the need to build aquatic habitat resiliency and connectivity to build resiliency. Key goals include:

- Strategic prioritization or restoration of natural thermal, hydrologic, and wood regimes;
- Management of fluvial connectivity and assisted migration;
- Maintain and diversify aquatic monitoring programs;
- Detection and removal of non-native species.

Essential projects in this WRAP are prioritized in alignment with these goals. Aquatic restoration projects in this WRAP focus on restoration and enhancement of aquatic function to maintain and strengthen resilient aquatic ecosystems that are able to remain functional under climate change stressors. Aquatic restoration projects focus on increasing wood to encourage the formation of deep pool habitat, increasing shade, and reconnecting side channels and floodplains. These improvements allow the stream system to hold water longer, accelerate shade development and other riparian functions, and decrease width to depth ratios of alluvial channels to make them less vulnerable to temperature increases, and more resilient to increases in peak and low flows. This work also focuses on improving the resiliency of the road system—decommissioning roads that are no longer needed for long-term management, closing and stabilizing roads that are needed for long-term management but not in the near-term, relocating roads away from riparian areas where feasible, and upgrading culvert crossings to improve aquatic habitat connectivity and increase hydraulic capacity to reduce future failure risk.

Essential Projects to improve watershed conditions and increase resiliency to the potential impacts of climate change are focused in streams where hydrologic impacts from climate change are projected to be greatest. For example, projected decreases in low flows are expected to be greatest in the Trapper, Dry, and Headwaters Wind River subwatersheds. Stream restoration and infrastructure improvement projects focus efforts to build resiliency to these projected decreases. Increases in bankfull flows are projected to show the greatest increases in the Trapper, Dry, and Headwaters Wind River subwatersheds. Infrastructure improvements proposed in this WRAP will increase the resiliency of the road system to these changes

## Watershed Conditions

The FS Watershed Condition Framework (FS-977, 2011) and Watershed Condition Classification (FS-978, 2011) rated watersheds on 12 Indicators and 24 Attributes. These attributed were in four Process Categories: Aquatic Physical, Aquatic Biological, Terrestrial Physical, and Terrestrial Biological. These 24 Attributes were evaluated to give an overall score/rating of between 1.0 and 3.0 corresponding to a Good, Fair, or Poor overall rating for FS lands. Watershed condition scores.

- **Current Condition Class:** Headwater Wind River: Functioning at Risk (1.7)
  Dry Creek: Functioning at Risk (1.4)
- **Target Condition Class:** Improve to a Functioning Properly

**Table 4. Watershed condition classification for the Dry Creek and Headwaters Wind River subwatersheds.**

| Process Category | Indicator | Attribute | Dry Creek Subwatershed Score | Headwaters Wind River Subwatershed Score | Comments |
|---|---|---|---|---|---|
| **Aquatic Physical** | | | 1.4 | 1.7 | |
| | **Water Quality** | | 1.0 | 1.5 | |
| | | **Impaired Waters** | 1.0 | 1.0 | Dry Creek, and Paradise Creek are listed as "waters of concern" for pH, and sections of the Headwaters Wind River are under an approved TMDL for temperature. |
| | | **Water Quality Problems** | 1.0 | 2.0 | Dispersed recreation sites along the Wind River and tributaries in the Headwaters Wind River subwatershed are the |

| Process Category | Indicator | Attribute | Dry Creek Subwatershed Score | Headwaters Wind River Subwatershed Score | Comments |
|---|---|---|---|---|---|
| | | | | | primary driver of this score. |
| | **Water Quantity** | | 1.0 | 1.0 | |
| | **Aquatic Habitat** | | 2.7 | 2.2 | |
| | | **Habitat Fragmentation** | 2.0 | 2.0 | There are numerous barriers to aquatic organism passage in the Headwaters Wind subwatershed, and one barrier in the Dry Creek subwatershed. |
| | | **Large Woody Debris** | 2.0 | 3.0 | Most streams lack large wood, resulting in poor riparian or aquatic habitat conditions including bank destabilization, and lack of pools and riparian and channel complexity. |
| | | **Channel Shape and Function** | 2.0 | 3.0 | Many reaches are incised and widened with shallow pools and homogenous habitat. Many streams are disconnected from side channels and floodplains. |
| **Aquatic Biological** | | | 1.6 | 1.7 | |
| | **Aquatic Biota** | | 2.0 | 2.0 | |
| | | **Life Form Presence** | 2.0 | 2.0 | |
| | | **Native Species** | 2.0 | 2.0 | Stronghold and genetic reserve for threatened |

| Process Category | Indicator | Attribute | Dry Creek Subwatershed Score | Headwaters Wind River Subwatershed Score | Comments |
|---|---|---|---|---|---|
| | | | | | Lower Columbia River steelhead |
| | | **Exotic and/or Invasive Species** | 2.0 | 2.0 | Brook trout are present in both subwatersheds. |
| | **Riparian Wetland Vegetation** | **Vegetation Condition** | 1.3 | 1.4 | Riparian areas generally lack structural and species diversity with low recruitment potential to provide instream habitat structure and complexity. |
| **Terrestrial Physical** | | | 1.4 | 1.7 | |
| | **Roads and Trails** | | 1.8 | 1.8 | |
| | | **Open Road Density** | 2 | 2 | Road density is 1.8 $mi/mi^2$ in the Dry Creek subwatershed and 2.0 $mi/mi^2$ in the HW Wind subwatershed |
| | | **Road Maintenance** | 2 | 2 | Roads across both subwatersheds do not receive regular maintenance. |
| | | **Proximity to Water** | 2 | 2 | Approximately 10% of the road network is in close proximity to streams |

| Process Category | Indicator | Attribute | Dry Creek Subwatershed Score | Headwaters Wind River Subwatershed Score | Comments |
|---|---|---|---|---|---|
| | | **+Mass Wasting** | 1 | 1 | |
| | **Soils** | | 1.0 | 1.0 | |
| | | **Soil Productivity** | 1.0 | 2.0 | |
| | | **Soil Erosion** | 1.0 | 1.0 | |
| | | **Soil Contamination** | 1.0 | 2.0 | |
| **Terrestrial Biological** | | | 1.5 | 1.8 | |
| | Fire Regime | Fire Condition Class | 2.0 | 2.0 | |
| | **Forest Cover** | **Loss of Forest Cover** | 1.0 | 1.0 | |
| | **Terrestrial Invasive Species** | **Extent and Rate of Spread** | 2.0 | 3.0 | |
| | **Forest Health** | | 1.0 | 1.0 | |
| | | **Insect and Disease** | 1.0 | 1.0 | |
| | | **Ozone** | 1.0 | 1.0 | |
| **Final Score** | | | **1.5** | **1.7** | **Functioning at risk** |

## Restoration Goals, Objectives, and Opportunities

### Restoration Goals

The goal for these subwatersheds is to implement restoration projects to improve self-sustaining watershed functions to move watershed conditions scores from functioning at risk to functioning properly. Implementation of essential projects in this WRAP will continue to build the processes that support a healthy and diverse aquatic and riparian ecosystem that is resilient to large scale disturbance (wildfire, impacts of climate change, and large flood events) through implementation of the following goals:

**Table 5.Restoration goals to improve watershed conditions.**

| **Goal 1: Improve or maintain aquatic physical condition in the Dry Creek and Headwaters Wind River subwatersheds** | | |
|---|---|---|
| **Indicator Improved** | **Objective** | **Essential Projects** |
| Water Quality/Impaired Waters | Improve watershed functions to maintain and improve water temperature. Create resilient watershed conditions to maintain acceptable water temperatures as climate warms. | Culvert replacements and removals, road hydrologic stabilization or decommissioning, large wood placement, stream restoration, and dispersed campsite rehabilitation. |
| Habitat Fragmentation | Improve aquatic organism passage at numerous crossings throughout the subwatersheds through replacement of undersized culverts. | |
| Large Woody Debris | Increase frequency and size of large woody debris to improve hydrologic function, water storage capacity, pool frequency and depth, channel complexity, and floodplain and side channel connectivity. | |
| Channel Shape and Function | Improve channel shape and function in the subwatershed to improve hydrologic function, water quality, floodplain and side channel connectivity, and aquatic habitat. | |
| **Goal 2: Improve or maintain aquatic biological condition in the Dry Creek and Headwaters Wind River subwatersheds** | | |
| **Indicator Improved** | **Objective** | **Essential Projects** |
| Life Form Presence | Improve and maintain habitat for Lower Columbia River Steelhead and other native aquatic species. | Culvert replacements and removals, road hydrologic stabilization or decommissioning, large wood |
| Native Species | Improve and maintain native species presence throughout the subwatershed. | |

| | | |
|---|---|---|
| Riparian Vegetation Condition | Improve riparian habitat condition and function. | placement, stream restoration, and dispersed campsite rehabilitation. |
| **Goal 3: Improve or maintain terrestrial physical condition in the Dry Creek and Headwaters Wind River subwatersheds** | | |
| **Indicator Improved** | **Objective** | **Essential Projects** |
| Open Road Density | Decrease open road density, and reduce hydrologic impacts of closed roads. | Culvert replacements and removals, road hydrologic stabilization or decommissioning. |
| Road Maintenance | Reduce erosion and sedimentation from the road system. Improve long-term road stability and reduce long-term maintenance. | Culvert replacements and removals, road maintenance. |
| Proximity to Water | Reduce erosion and sedimentation from hydrologically connected roads. | Culvert replacements and removals, road hydrologic stabilization or decommissioning. |
| Terrestrial Invasive | Reduce rate of spread | Invasive weed treatment |
| Fire Regime | Improve the reference fire regime of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances | Fuels treatment projects are not included in this WRAP. |

## Alignment with National, Regional, or Forest Priorities

The project goals of reducing the erosion potential, improving aquatic organism passage, improving water quality, increasing long-lived species within the riparian corridor, and improving the understanding of existing conditions and processes is consistent with national, regional, and forest priorities. The Dry Creek and Headwaters of the Wind River subwatersheds activities proposed in this WRAP have been identified as a high priority on the Gifford Pinchot National Forest in alignment with the National Watershed Condition Framework.

## Alignment with State or Local Goals

The Wind River Watershed project is a collaborative restoration and research effort directed toward wild steelhead (Oncorhynchus mykiss) in the Wind River, WA, a state-designated wild steelhead sanctuary. Since the early 1990's a four-agency partnership between

the Forest Service, Washington Department of Fish and Wildlife, U.S. Geological Survey's Columbia River Research Laboratory, and Underwood Conservation District funded by BPA has been conducting habitat restoration, research, monitoring, evaluation, and coordination of activities across the Wind Watershed.

This project is particularly important because: 1) steelhead populations in the watershed declined to perilous levels in the late 1990s; 2) the Lower Columbia Subbasin Plan prioritizes recovery of steelhead populations in the Wind River to "very high" levels of viability; 3) there is no hatchery steelhead program in the watershed and is being managed as a wild steelhead gene bank; 4) the watershed has a high potential for habitat improvement; 5) investments in habitat improvement in the Wind River are likely to be supported and protected over time since much of the watershed is federally owned; 6) the watershed is likely to become increasingly important refugia in the Lower Columbia River as the climate warms; 7) the Wind River Watershed Project has a proven record of completing high quality habitat projects and bringing significant cost share to the table; and 8) a robust VSP monitoring and research program in the watershed provides a quality long-term dataset on steelhead population dynamics and life-histories and is well-placed to produce life-cycle models and assessment of Hemlock Dam removal and other proposed habitat restoration.

Several state agencies, U.S. Fish and Wildlife Service, NOAA the Cowlitz Tribe, Yakima Nation and local collaboratives helped identify limiting factors and essential projects in this WRAP. Many projects and priorities in this WRAP are also identified has priority actions from the Wind River Habitat Restoration Strategy written for the Lower Columbia Fish Recovery Board in 2017.

## Opportunities

**Partnership Involvement**

Partners are expected to play diverse roles in the completion of WRAP projects. For the majority of projects, partner roles include subject-matter expertise, funding, contracting, and grant and labor (paid and volunteer) support. Possible partners include Bonneville Power Association, Skamania County, Underwood Conservation District, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, WA DNR, Yakima Tribe, Wishpush Beaver Working Group, and the South Gifford Pinchot Collaborative.

**Outcomes/Output**

**Performance Measure Accomplishment**

The completion of the restoration plan will result in stream miles improved, watershed acres improved, miles of habitat opened to aquatic organism passage, and crossings opened to passage. In addition, there will be a reduction in the road density in the watershed.

**Socioeconomic Considerations**

Completing the restoration plan will improve and protect the water resources of the Dry Creek and Headwaters of the Wind River subwatersheds. Completion of this restoration plan will help to contribute to the local economy directly by providing contracting work to implement several of the proposed projects. Indirectly, restoration efforts will enhance and continue recreational activities that will contribute to the local economies by providing jobs in the tourism industry. Projects will also provide volunteer opportunities to connect local communities

# Dry Creek Subwatershed Essential Projects

## **Essential Project #1:** Stream Restoration

**Essential Activity #1:** Dry Creek Reach 1 Stream Restoration

- Attribute/Indicator Addressed: Channel shape and function, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition through placement of large woody debris and re-vegetation of riparian areas.
- Project Description: Restore approximately 4.5 miles of stream channel through installation of grade control structures, construction of log jams, and floodplain and side channel reconnection.
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, WA DNR, Yakima Tribe
- Estimated costs: $450,000
- Schedule: Planning ongoing; implementation: 2021-2024

**Essential Activity #2:** Dry Creek Reach 2 Big Hollow, and Tributary Stream Restoration

- Attribute/Indicator Addressed: Channel shape and function, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition through placement of large woody debris and re-vegetation of riparian areas.
- Project Description: Restore approximately 4.5 miles of stream channel through installation of grade control structures, construction of log jams, and floodplain and side channel reconnection.
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, WA DNR, Yakima Tribe
- Estimated costs: $450,000
- Schedule: Planning ongoing; implementation: 2021-2024

## **Essential Project #2** Road Decommissioning and Hydrologic Stabilization

**Essential Activity #1:** Road Decommissioning and Closure-Stabilization

- Attribute/Indicator Addressed: Habitat fragmentation, water quality and quantity, native species life form presence, channel shape and function, riparian vegetation condition, open road density, road maintenance, and road proximity to water
- Project Description: Decommissioning of un-needed roads, and hydrologic stabilization (close stabilization) of closed roads needed for future management. Proposed roads and treatments shown in Table 6.
- Partners: Stewardship, KV, DNR
- Estimated costs: $350,000
- Schedule: Planning completed in Upper Wind EA; Implementation 2023-2024

**Table 6. Proposed road decommissioning and close stabilize treatments in the Dry Creek subwatershed.**

| Road Number | Proposal | Miles |
|---|---|---|
| 3000151 | Decommission | 0.4 |
| 5800224 | Decommission | 1.5 |
| 6000064 | Decommission | 0.9 |
| 6400201 | Decommission | 1.15 |
| 6401218 | Decommission | 0.7 |
| 5800221 | Close – stabilize | 1.1 |

## **Essential Project #3:** Aquatic Organism Passage Culvert Replacement

**Essential Project #1:** Replacement of Fish Barrier Culvert on Dry Creek and 64 Road

- Attribute/Indicator Addressed: Habitat fragmentation, water quality, native species life form presence
- Project Description: Fish barriers have been identified for replacement. Culverts: Dry Creek (Road 64)
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Yakima Tribe

- Estimated costs: $450,000
- Schedule: Planning 2021-2025; implementation: 2023 or 2024

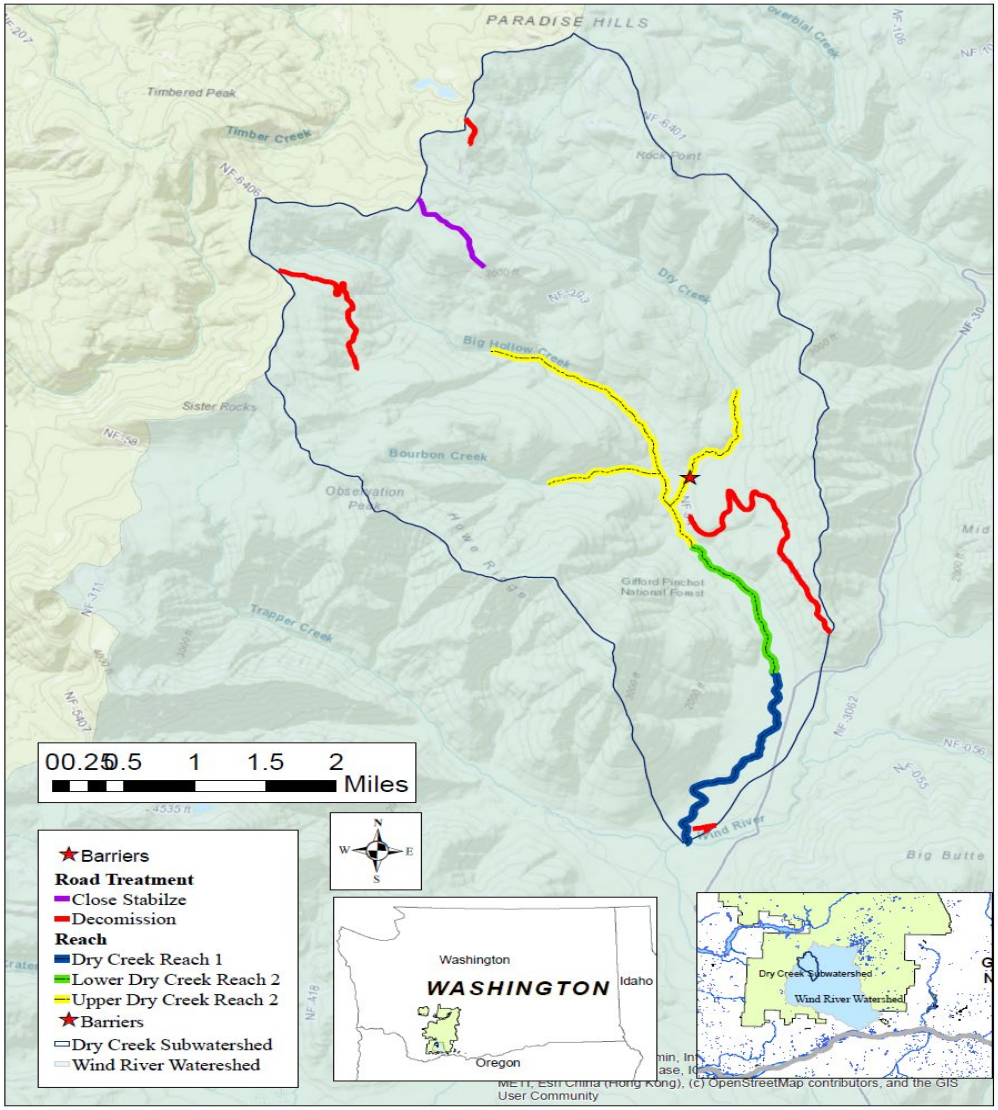


Figure 5. Essential projects in the Dry Creek Subwatershed.

**Table 7. Dry Creek Essential Project timeline, description, and cost.**

| Essential Activity | Reach, Project Location | Project Type | Products, Outcomes: Miles Improved or other Metrics | Trees Needed (#) | Estimated Funding Needed for Completion | Design (D)/ Permitting (P)/ Implementation (I) Year | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FY21 | FY22 | FY23 | FY24 |
| Dry Creek Reach 1 Stream Restoration | Dry Creek Reach 1 | Stream Restoration | 1.0 miles of stream restoration. Improving fish spawning and rearing habitat. | 500 | $100,000.00 | **D** | **D/P** | **I** | **I** |
| Dry Creek Stream Restoration Reach 2 | Reach 2, Big Hollow and tributary | Stream Restoration | 3.5 miles of stream restoration. Improving fish spawning and rearing habitat. | 1500 | $350,000.00 | **D** | **D/P** | **I** | **I** |
| Dry AOP 64 Road | 6400 Road Crossing | AOP Culvert Replacement | 0.9 of miles of habitat opened | N/A | $450,000.00 | | **D/P** | **I** | **I** |
| Road closures and decommissioning | See table 6 | Decommissioning and close stabilization | 4.7 miles of road decommissioned; 1.1 mile of road close stabilized | N/A | $350,000 | | **D/P** | **I** | **I** |

# Headwaters Wind River Subwatershed Essential Projects

## **Essential Project #1:** Stream Restoration

**Essential Activity 1:** Oldman and Youngman Creek Stream Restoration

- Attribute/Indicator Addressed: Channel shape and function, large woody debris, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition
- Project Description: Restoration of 2 miles of stream channel through wood placement of large wood.
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Yakima Tribe, Stewardship, KV, DNR
- Estimated costs: $40,000
- Schedule: Planning 2026; Implementation: 2027-2028

**Essential Activity #2:** Upper Wind River Stream Restoration Mining Reach

- Attribute/Indicator Addressed: Channel shape and function, large woody debris, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition
- Project Description: Restoration of 3 miles of stream channel through wood placement of large wood
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Yakima Tribe, Stewardship, KV, DNR
- Estimated costs: $400,000
- Schedule: Planning 2025; Implementation: 2026-2028

**Essential Activity #3:** Upper Wind River Stream Restoration Above Mining Reach

- Attribute/Indicator Addressed: Channel shape and function, large woody debris, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition
- Project Description: Restoration of 2.5 miles of stream channel through wood placement of large wood
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Yakima Tribe, Stewardship, KV, DNR
- Estimated costs: $250,000
- Schedule: Planning 2023-2024; Implementation: 2025-2026

**Essential Activity #4:** Paradise Creek Stream Restoration

- Attribute/Indicator Addressed: Channel shape and function, large woody debris, flow characteristics, habitat fragmentation, native species life form presence, and riparian vegetation condition
- Project Description: Restoration of 1.5 miles of stream channel through wood placement of large wood
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Yakima Tribe, Stewardship, KV, DNR
- Estimated costs: $80,000
- Schedule: Planning 2021-2023; Implementation: 2024

## **Essential Project #2** Road Reconstruction, Decommissioning, and Hydrologic Stabilization

**Essential Activity #1:** Forest Road 3000102 Reconstruction

- Attribute/Indicator Addressed: Habitat fragmentation, water quality and quantity, native species life form presence, channel shape and function, riparian vegetation condition, open road density, road maintenance, and road proximity to water
- Project Description: Reconstruction of the 1.75-mile 3000102 Road to reduce hydrologic impacts, and remove 3 passage barriers. The project would replace 3 culverts on tributaries to Oldman Creek with passable crossings, opening 1.6 miles of habitat.
- Partners: BPA, Salmon Recovery Board, WA DNR, Mid-Columbia Fisheries Enhancement Group, Stewardship, KV,
- Estimated costs: $600,000
- Schedule: Planning 2023; implementation 2024-2025

**Essential Activity #2:** Road Decommissioning and Closure-Stabilization

- Attribute/Indicator Addressed: Habitat fragmentation, water quality and quantity, native species life form presence, channel shape and function, riparian vegetation condition, open road density, road maintenance, and road proximity to water
- Project Description: Decommissioning of un-needed roads, and hydrologic stabilization (close stabilization) of closed roads needed for future management. Proposed roads and treatments shown in Table 8.
- Partners: Stewardship, KV, DNR
- Estimated costs: $750,000
- Schedule: Planning Completed in Upper Wind EA; Implementation 2023-2028

**Table 8. Proposed road decommissioning and close stabilize treatments.**

| Road Number | Proposal | Miles |
|---|---|---|
| 3000101 | Close – stabilize | 1.2 |
| 3053030 | Close – stabilize | 0.4 |
| 3100108 | Close – stabilize | 0.5 |
| 3100109 | Close – stabilize | 1.0 |
| 3100110 | Close – stabilize | 0.8 |
| 3100169 | Close – stabilize | 0.7 |
| 6500120 | Close – stabilize | 0.9 |
| 6507130 | Close – stabilize | 0.6 |
| 6700123 | Close – stabilize | 1.0 |
| 6700159 | Close – stabilize | 0.3 |
| 6701606 | Close – stabilize | 0.3 |
| 6707602 | Close – stabilize | 0.2 |
| 3100112 | Decommission | 0.3 |
| 6500166 | Decommission | 0.2 |
| 6701604 | Decommission | 0.3 |
| Unclassified Miner's Road | Decommission | 0.4 |

## **Essential Project #3:** Aquatic Organism Passage Culvert Replacement

**Essential Activity #1:** Oldman Creek Aquatic Organism Passage Improvement

- Attribute/Indicator Addressed: Habitat fragmentation, water quality and quantity, native species life form presence, channel shape and function, road maintenance
- Project Description: Replacement of a barrier culvert on Oldman Creek on the 30 Road
- Partners: BPA, Salmon Recovery Board, Mid-Columbia Fisheries Enhancement Group, Skamania County
- Estimated costs: $350,000
- Schedule: Planning 2025; implementation: 2026-20227

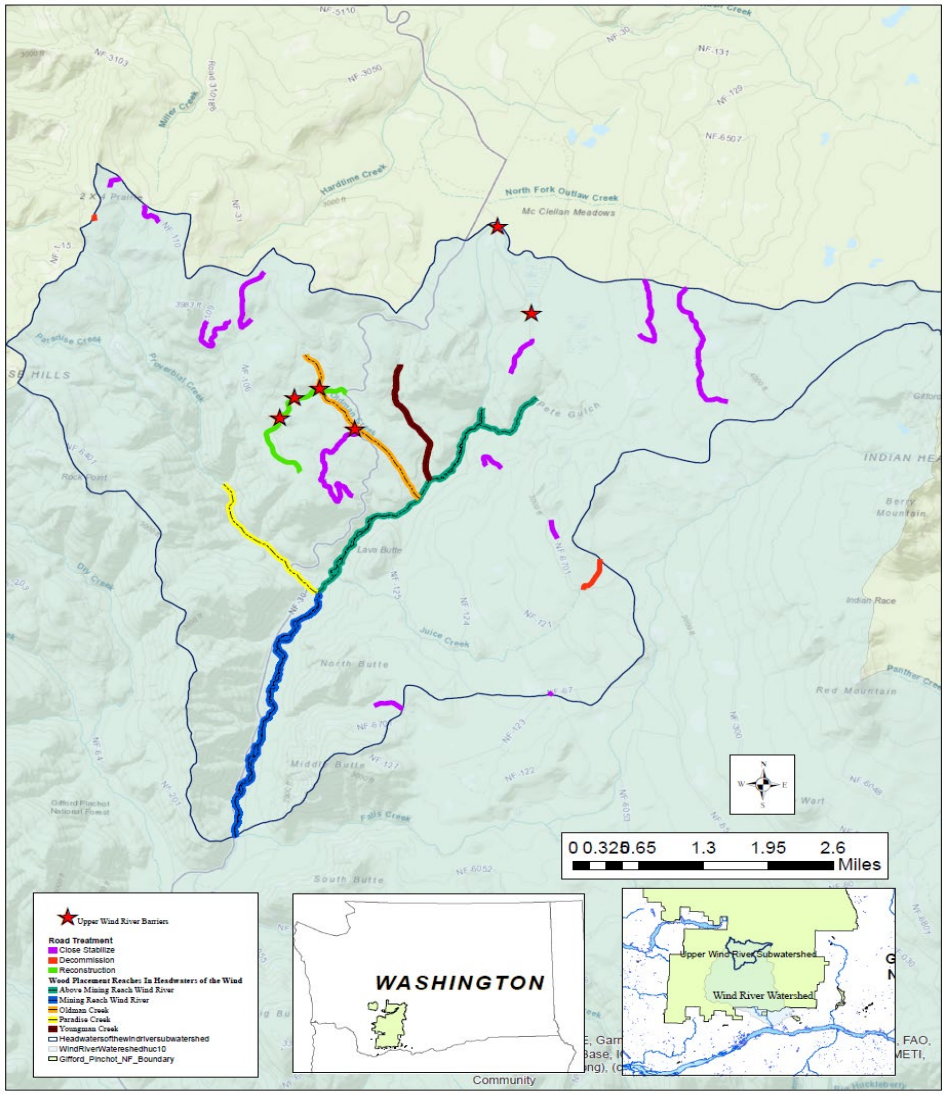


Figure 6. Essential projects in the Headwaters of the Wind River Subwatershed.

**Table 9. Headwaters Wind River Essential Projects description, timeline, and costs.**

| Essential Activity | Reach, Project Location | Project Type | Products, Outcomes: Miles Improved or other Metrics | Trees Needed (#) | Estimated Funding Needed for Completion | Design (D)/ Permitting (P)/ Implementation (I) Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FY21 | FY22 | FY23 | FY24 | FY25 | FY26 | FY27 | FY28 |
| Oldman Creek AOP | 30 road AOP | AOP Culvert Replacement | 1.15 miles added for fish habitat connectivity | N/A | $350,000.00 | | | | | D | I | I | |
| 3000-102 Reconstruction Oldman Creek Tributaries AOPs | 1.75 miles of reconstructions on the 3000-102 Road including 3 AOP culverts | Road reconstruction and 3 AOPs | 1.6 miles added for fish habitat connectivity; 1.75 miles of road reconstructed | N/A | $600,000 | | | D | I | I | | | |
| Oldman Creek and Youngman Creek Stream Restoration | Wind to 3000-106 | Stream Restoration | 2 miles of stream restoration. Improving fish spawning and rearing habitat. | 1000 | $40,000.00 | | | | | | D | I | I |
| 3000101 spur ford crossing and Decom | Wind River RM 24.5 | Road hydro-stabilize | 0.55 miles of hydro-stabilized road, improving sediment added to streams. | N/A | $20,000.00 | | | D | D | I | I | I | |
| Upper Wind River Stream Restoration, Mining Reach | (W18-24) | Stream Restoration | 3 miles of stream restoration. Improving fish spawning and rearing habitat. | 3000 | $400,000.00 | | | | | D | I | I | I |
| Upper Wind River Stream Restoration, above Mining Reach | Paradise to Pete's Gulch | Stream Restoration | 2.5 miles of stream restoration. Improving fish spawning and rearing habitat. | 2500 | $250,000.00 | | | D | D | I | I | | |
| Paradise Creek Stream Restoration | (P1-P3) | Stream Restoration | 1.5 miles of stream restoration. Improving fish spawning and rearing habitat. | 1500 | $80,000.00 | D | D | D/I | I | | | | |
| Road closures and decommissioning | See table 8 | Decommissioning and close stabilization | 7.9 miles of road closure and stabilization; 0.8 miles of road | N/A | $750,000 | | | I | I | I | I | I | I |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | decommissioning, and 0.4 miles of unclassified road removal | | | | | | | | | | |

## Estimated Timelines, Project Scheduling, and Costs

**Table 10. Dry Creek Subwatershed Essential Project cost estimates.**

| FY | Task | FS Cost | Partner Cost |
|---|---|---|---|
| 2022-2024 | Dry AOP 64 Road | $112,500 | $337,500 |
| 2021-2024 | Dry Creek Stream Restoration Reach 1 | $25,000 | $75,000 |
| 2021-2024 | Dry Creek Stream Restoration Reach 2 | $87,500 | $262,500 |
| 2023-2024 | Dry Creek Decommissioning and Close Stabilization | $350,000 | n/a |
| | Total by contributor | $575,000 | $675,000 |
| | | **Total** | **1,250,000** |

**Table 11. Headwaters Wind Subwatershed Essential Project cost estimates.**

| FY | Task | FS Cost | Partner Cost |
|---|---|---|---|
| 2025-2027 | Oldman Creek AOP | $87,500 | $262,500 |
| 2023-2025 | 3000102 Reconstruction and 3 AOPs on Oldman Creek | $600,000 | n/a |
| 2027-2028 | Oldman Creek and Youngman Creek Stream Restoration | $40,000.00 | n/a |

| | | | |
|---|---|---|---|
| 2025-2028 | Upper Wind River Stream Restoration, Mining Reach | $40,000.00 | $360,000 |
| 2023-2026 | Upper Wind River Stream Restoration, above Mining Reach | $25,000.00 | 200,000 |
| 2021-2024 | Paradise Creek Stream Restoration | $20,000 | 60,000 |
| 2023-2028 | HW Wind Decommissioning and Close Stabilization | $750,000 | n/a |
| | Total by contributor | $1,562,500 | $882,500 |
| | | **Total** | **$2,445,000** |

**Restoration Project Monitoring and Evaluation**

**a. The forest will monitor:**

- Effectiveness and implementation of BMPs during and after project implementation.
- Stream habitat parameters through the Region 6 stream survey protocol.
- Additional monitoring will be identified as projects are planned and implemented.

**b. Monitoring will be done in cooperation with:**

- South Gifford Pinchot Collaborative Group
- Other partners identified as projects are planned

## References

EPA. 2021. Columbia River Coldwater Refuges Plan (EPA-910-R-21-001). https://www.epa.gov/sites/production/files/2021-01/documents/columbia-river-cwr-plan-final-2021.pdf. 216 pp.

Hudec, J.L. Halofsky, J.E., Peterson, D.L., and Ho, J.J., eds. 2019. Climate change vulnerability and adaptation in southwest Washington. Gen. Tech. Rep. PNW-GTR-977. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 249 p.

Isaak, D.J.; Wenger, S.J.; Peterson, E.E.; Ver Hoef, J.M.; Hostetler, S.W.; Luce, C.H.; Dunham, J.B.; Kershner, J.L.; Roper, B.B.; Nagel, D.E.; Chandler, G.L.; Wollrab, S.P.; Parkes, S.L.; Horan, D.L. 2016. NorWeST modeled summer stream temperature scenarios for the western U.S. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2016-0033.

LCFRB. 2004, 2010. Lower Columbia Salmon Recovery Plan and Fish and Wildlife Subbasin Plan; Volume II – Subbasin Plan: Chapter J- Wind. 2004. Kelso, WA.

Palmer, John. 2017. Cold Water Fish Refuges. The Water Report, US EPA Region 10. (https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST/downloads/publications/17Water-Report-Newsletter-164_NorWeST-Columbia-River-coldwater-refugia.pdf)

USDA Forest Service. 1990. Gifford Pinchot National Forest Land and Resource Management Plan, as amended.

USDA Forest Service, USDI Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl. Portland, Oregon.

Wenger, S.J., C.H. Luce, A.F. Hamlet, D.J Isaak, and H.M Neville. 2010. Macroscale hydrologic modeling of ecologically relevant flow metrics. Water Resources Research 46: W09513.

**Reviewing Official**: Eric Veach, Forest Supervisor, Gifford Pinchot National Forest

**Reviewing Official Signature:** ERIC VEACH Digitally signed by ERIC VEACH Date: 2021.12.03 10:17:17 -08'00' **Date**_____

The Forest/Unit Supervisor's signature signifies:

- approval of the priority watershed
- the validity of the planned essential projects
- verification that all watershed condition class attribute ratings in the WCATT database for this watershed accurately reflect the assessment results.

**Forest Contact Information**: Kate Day, kate.day@usda.gov, Joshua Jones joshua.d.jones@usda.gov

**Preparers**: Kate Day, Watershed Program Manager, Forest Headquarters; Joshua Jones, Fish Program Manager, Forest Headquarters; Greg Robertson, Fish Biologist, Mt Adams Ranger District

**Reviewers**: Erin Black, District Ranger, Mount Adams Ranger District; Bengt Coffin, Hydrologist, Mt Adams Ranger District; Dave Olson, Natural Resources Staff Officer, Forest Headquarters