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Upper West Fork Hood River Watershed Restoration Action Plan

Mt. Hood National Forest
Hood River Ranger District

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Developed from
West Fork Hood River Watershed Analysis, Hood River Subbasin Plan,
Hood River Watershed Action Plan and Aquatic Habitat Restoration Strategy

September 2012

Mt. Hood National Forest
Hood River Ranger District
Mt. Hood, Oregon

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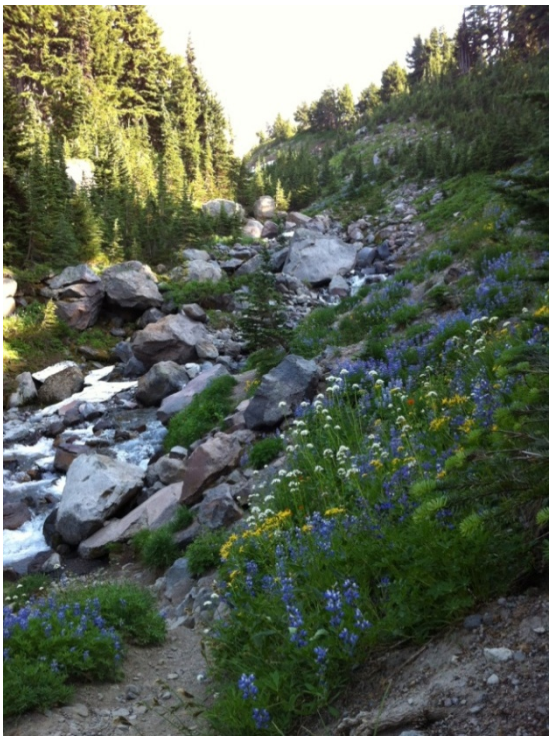
Mt. Hood National Forest

Executive Summary

Restoration of the Upper West Fork Hood River 6th field watershed is a high priority for federal, state, and local agencies, as well as the Confederated Tribes of the Warm Springs Reservation of Oregon and various non-profit organizations. In 2005, a collaborative group of stakeholders in the Hood River Basin convened to prioritize watersheds and restoration actions that would lead to restored watershed processes, improve overall watershed health, and thus help ensure the persistence and restoration of federally listed salmon and steelhead populations. Most of the stakeholders in the basin had already been working together to restore the watershed, focusing on fish habitat quality and quantity, for many years. The effort to prioritize 6th field watersheds in the Hood River Basin and identify critical restoration actions resulted in the publication of "Hood River Basin Aquatic Habitat Restoration Strategy (Shively 2006). This strategy is a companion document to the Hood River Watershed Action Plan first developed by the Hood River Watershed Group in 2002 and later updated (Stampfli 2008).



Out of twelve 6th field watersheds in the Hood River Basin, the Upper West Fork Hood River was ranked seventh. There are several reasons this watershed was chosen as a priority in the Forest Service Watershed Condition Framework program (USDA 2010):

- The West Fork Hood River is the stronghold sub-watershed in the Hood River Basin for spring Chinook salmon and summer steelhead trout.
- The Confederated Tribes of the Warm Springs Reservation of Oregon considers the West Fork Hood River the priority watershed in the basin for salmon and steelhead restoration. They are a willing partner with secure funding.
- Significant progress has been made in regards to restoration in the Upper West Fork Hood River, in part because most of the watershed lies on federal land.

The 2006 Hood River Basin Aquatic Habitat Restoration Strategy was a fundamental step to focus watershed restoration efforts of the basin stakeholders. Multiple entities spend significant amounts of money on an annual basis to improve water quality and quantity, restore aquatic habitat, and improve riparian and upland forest conditions. In the past many of the stakeholders had their own prioritization schemes to guide investments in restoration activities and there was no single, comprehensive basin-wide strategy to guide these efforts. These expenditures, for the most part, were made on a project-by-project, site-by-site basis by each responsible entity, sometimes with little coordination of the timing, sequencing, priority, and geographic focus with other participating entities. With the creation of a collaborative, basin wide strategy, participating entities could now coordinate future investments in aquatic habitat restoration in a

manner that leverages limited resources where they provide the greatest benefits to the long-term recovery and healthy functioning habitat in the Hood River Basin.

The 2012 Upper West Fork Hood River Watershed Restoration Action Plan (WRAP) is an update to the 2006 Hood River Basin Aquatic Habitat Restoration Strategy (Shively 2006) under the guidance of the national 2010 Watershed Condition Framework (WCF) (USDA 2010) – a comprehensive approach for proactively implementing integrated restoration in priority watersheds on national forests and grasslands. The WCF is comparable to the 2006 Hood River Basin Aquatic Habitat Restoration Strategy in that it contains a similar prioritization framework, identification of integrated suites of activities to improve watershed condition, and tracking of progress. The WRAP directly tiers to previous analyses and plans by presenting a specific list of projects, timelines, and costs that restoration specialists, decision makers, and grant writers may use in promoting an interagency approach to improving aquatic resources in the Upper West Fork Hood River 6th field watershed. This 2012 Upper West Fork Hood River WRAP adjusts, updates, and/or adds essential projects to improve the 6th field watershed condition class, which addresses an outcome-based performance measure of progress toward restoring the productivity and resilience of the watershed.

Working with our partners, implementation of the WRAP will result in strategically invested funding in excess of 7 million dollars in the Upper West Fork Hood River watershed over the next five years. This investment is designed to accelerate the recovery of naturally functioning processes in the watershed including large wood recruitment and routing, stream channel and floodplain interactions, erosion control and sediment routing, aquatic organism passage, and water and debris routing. The actions proposed as "Essential Projects" are intended to accomplish these goals by improving riparian health and vigor by restoring flood plain resiliency with coarse woody debris and large wood floodplain structures designed to protect recovering pioneer riparian vegetation during peak flow events. Stream channels and aquatic habitat will be rehabilitated by the addition of large wood in specific locations in and along the West Fork Hood River and Red Hill Creek that would give the most benefit to increasing aquatic habitat diversity and resiliency. In addition, some projects are designed to accelerate the recovery and diversity of riparian forest stands by thinning. A rapid response approach will be used to remove or control invasive plants that are now present in the watershed and a variety of road treatments,

including decommissioning and replacing under-sized culverts will reduce road-related sediment from entering streams. Implementation of these prioritized actions will have the following outcomes and performance based accomplishments:

- Restore natural watershed conditions and processes, including:
  - stream and floodplain function,
  - restore fish passage and thus population connectivity,
  - reduce road density,
  - increase culvert capacity to naturally route water, sediment and debris,
  - control/eradicate invasive plants, and
  - improve upland and riparian forest structure, density, and health
- Improve water quality in the Upper West Fork Hood River and tributaries by reducing sediment delivery from road related impacts.
- Maintain and strengthen partnerships between the MHNF and other watershed stakeholders.
- Provide jobs to local contractors and material suppliers.

Watershed partners support these proposed essential projects and are working with the Mt. Hood National Forest to achieve the anticipated outcome of watershed recovery in the Hood River Basin.

Contents

Background

The Hood River is a tributary to the Columbia River, draining 340 square miles of the northern flank of Mt. Hood. The Hood River enters the Columbia River at the City of Hood River 22 miles upstream from Bonneville Dam. The basin lies entirely within Hood River County, and is largely comprised of public lands – roughly 65 percent of the basin. The remaining land is privately owned (including industrial lands for commercial timber management), and occurs predominantly in the lower elevations (Coccoli 1999). The entire Hood River Basin contains lands ceded to the United States in the Treaty of 1855 between the U.S. and American Indians recognized today as the Confederated Tribes of the Warm Springs Reservation of Oregon (Shively 2006). The Hood River is a 4th field watershed and is divided into three 5th field watersheds: the Hood River Main Stem, West Fork Hood River, and East Fork Hood River. This restoration action plan focuses on the Upper West Fork Hood River 6th field watershed, one of three 6th field watersheds comprising the West Fork Hood River 5th field watershed.

Because much of the existing information, analyses, and restoration planning has occurred at the basin or 5th field watershed scale, much of the following information is tiered directly to those scales. Where possible, information is highlighted that relates solely to the Upper West Fork Hood River.

In the Hood River Basin native or naturally reproducing anadromous fish populations are comprised of spring Chinook salmon (*Oncorhynchus tshawytscha)*, summer and winter steelhead (*Oncorhynchus mykiss*), Pacific lamprey (*Lampetra tridentate*), fall Chinook salmon, and coho salmon (*Oncorhynchus kisutch*). Resident, native fish include bull trout (*Salvelinus confluentus*), rainbow trout (*Oncorhynchus mykiss)*, and cutthroat trout (*Oncorhynchus clarki).* Hood River fish populations have declined markedly in the last several decades. Native Hood River spring Chinook are believed to have become extinct in the early 1970's, along with native coho and fall Chinook. Five of the six anadromous populations (spring and fall Chinook, summer and winter steelhead, and coho) and one resident species (bull trout) have been listed for protection under the federal Endangered Species Act (ESA) (Shively 2006).

The ESA listings helped spur an already proactive and collaborative watershed council, called the Hood River Watershed Group (HRWG), and other federal, state, and tribal stakeholders to redouble their efforts towards watershed restoration and fish population recovery. These entities collectively completed several analyses, plans, and agreements to further conservation and recovery efforts for salmon and steelhead populations in the basin. In chronology, these accomplishments included:

- In 1996, Forest Service staff from the Mt. Hood National Forest (MHNF) completed two watershed analyses encompassing all of federal lands within the basin: 1) West Fork Hood River Watershed Analysis (USDA 1996a) and 2) East Fork Hood River and Middle Fork Hood River Watershed Analyses (USDA 1996b).
- At the direction of the Oregon Watershed Enhancement Board (OWEB), the HRWG and Hood River Soil and Water Conservation District (HRSWD) completed a watershed analysis of the entire basin (Coccoli 1999). Much of the data and information from the two previous Forest Service watershed analyses were incorporated into this assessment. In addition, lands in non-federal ownership were assessed and evaluated much in the same way.
- Completion of a Hood River Basin Total Maximum Daily Load Assessment by the Oregon Department of Environmental Quality (ODEQ 2001). This assessment addressed segments of rivers and streams within the basin that are currently water quality limited or impaired. It provided the foundation for agencies and entities to develop management plans outlining actions to be taken to restore water quality conditions such that they meet current standards for beneficial uses.
- Completion of a fish passage barrier analysis within the MHNF portion of the basin which identified and prioritized road crossing fish/aquatic organism barriers (Asbridge 2002).
- Multi-party negotiations beginning in the late 1990s that led to a 2003 settlement agreement with PacifiCorp to remove the Powerdale Hydroelectric Dam on Oregon's Hood River. The dam removal took place in fall 2010 and the Hood River is now a free-flowing river.
- Building from the 1999 HRWG Hood River Watershed Assessment, the HRWG developed a Watershed Action Plan (originally drafted in 2002, updated by Stampfli in 2008). This plan identified cooperative projects, strategies and priorities to improve watershed health, water quality and fish populations in the Hood River Basin.
- As per direction from the Northwest Power and Conservation Council the Hood River Basin stakeholders, led by the HRSWCD, completed a sub-basin plan (Coccoli 2004) that defined fish and wildlife goals, objectives and strategies for the Hood River Basin. A central component of this plan was the Ecosystem Diagnosis and Treatment (EDT) model that was used to compare current versus historical habitat conditions and identify factors limiting salmon and steelhead production.
- Using all of the documents mentioned above, the MHNF and stakeholders completed a comprehensive, basin-wide Aquatic Habitat Restoration Strategy (Shively 2006). This collaborative effort melded fish presence, water quality and quantity information, and watershed condition information to rank 6th field watersheds for restoration in the Hood River Basin.

The organizations/individuals that contributed to the development of the above actions included:

Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS)
East Fork Irrigation District (EFID)
Farmers Irrigation District (FID)
Hood River County Planning Department

Hood River Soil & Water Conservation District (HRSWCD)
Hood River Watershed Group (HRWG)
Hood River Growers & Shippers Association
Ken Davis (retired MHNF resource assistant)
Ken Galloway (retired Hood River County Forester)
Longview Timber, LLC (formerly called Longview Fiber Co.)
Middle Fork Irrigation District (MFID)
Mobrand Biometrics, Inc.
Mt. Hood National Forest (MHNF)
National Marine Fisheries Service (NMFS)
Oregon Department of Environmental Quality (ODEQ)
Oregon Department of Fish and Wildlife (ODFW)
Oregon Department of Forestry (ODF)
Oregon Department of Transportation (ODOT)
Oregon State University Extension Service
Oregon Water Resources Department (OWRD)
Oregon Watershed Enhancement Board (OWEB)
Port of Hood River
Mike Brunfelt (previous MHNF hydrologist)
Steve Pribyl (retired ODFW fish biologist)
Union Pacific Railroad
U.S. Fish & Wildlife Service (USFWS)

As noted above, prior to 2005 in the Hood River Basin there were many collaborative efforts focused on developing and implementing aquatic habitat restoration strategies and actions. However, up to this point a single basin-wide strategy identifying priority watersheds, limiting factors and priority hilltop-to-valley-bottom restoration actions had not been compiled. In July of 2005, a collaborative stakeholder group comprised of key stakeholders representing fourteen agencies and entities operating within the Hood River Basin convened in a series of meetings and workshops to develop an aquatic habitat restoration strategy for the Hood River Basin. The plan developed by this group would form the foundation of a technically sound strategy for restoring aquatic form and function, focusing on salmon and steelhead habitat, based on the best technical information available and professional judgment. This effort resulted in the publication of the "Hood River Basin Aquatic Habitat Restoration Strategy" published by the MHNF (Shively 2006).

The aquatic habitat restoration strategy developed by the working group focused on protecting the remaining, relatively high quality, productive riverine habitat in the Hood River Basin. Where human activities were degrading aquatic habitat, the next course of action would be to curtail those activities or ameliorate their impacts and allow conditions to recover naturally. In situations requiring long timeframes for recovery, active restoration was encouraged. Watersheds in a more healthy condition are considered priority over those that are more degraded. This philosophy was intended to ensure the maximum benefit for the investment made. At the same time, the group acknowledged that there will be high priority restoration projects located in lower priority watersheds where funding and implementation in the near term is justified. It is the intent, over the long term, that restoration investments are focused on high

priority actions in priority watersheds in order to move the majority of watersheds in the basin with high ecological value more readily towards restored conditions (Shively 2006).

A restoration framework was developed to identify and guide implementation of high priority restoration actions in a manner such that factors limiting fish production and water quality were directly addressed. The results from three separate watershed analyses, two federal and one state, were carefully reviewed to identify the primary and secondary altered watershed processes. Primary altered processes are those watershed processes and functions most greatly affected by past perturbations or existing conditions on the landscape. Watershed processes and functions that may also be altered, but not to as large a magnitude or geographic extent, are categorized as secondary. An understanding of these altered process and functions was important in order for the working group to identify specific restoration actions in specific locations that address the root-causes of watershed condition impairment. Altered watershed processes specific to the Upper West Fork Hood River include:

- Altered flow via timber harvesting, roads, and impervious surfaces
- Altered peak and base flows
- Increase in sediment production (road-related)
- Impeded fish passage (i.e. loss of aquatic connectivity)
- Impeded sediment and woody debris routing
- Lack of in-stream large woody debris (LWD)
- Lack of riparian LWD recruitment (current and future)
- Loss of floodplain connectivity, channel sinuosity, and channelization

A comprehensive limiting factor analysis for Chinook salmon and steelhead populations was completed during the sub basin planning process that concluded in 2004. This limiting factor analysis utilized the Ecosystem Diagnosis and Treatment (EDT) model. Five environmental attributes were found to have the greatest effect on Chinook salmon and steelhead populations: channel stability, flow, habitat diversity, sediment load, and key habitat quantity. While there were additional limiting factors, these five environmental attributes, if addressed through restoration actions, would have the greatest restoration potential benefit for enhancing fish production in the majority of watersheds throughout the basin, including the Upper West Fork Hood River. The working group melded its assessment of altered watershed processes with the various corresponding EDT limiting factors in order to arrive at a single set of restoration actions that addressed both. In most cases altered watershed processes, such as lack of in-stream large wood, resulted in one or more limiting factors: in this case, lack of wood directly contributed to channel stability, habitat diversity, and key habitat quantity. Therefore, restoration actions to address lack of in-stream large wood would then also address the associated limiting factors.

A mix of restoration actions (i.e., fish passage, stream flow restoration, road decommissioning and/or storm-proofing, upland and riparian thinning, addition of in-stream woody debris, etc.) were then identified at the sub-watershed and/or stream reach scales to address both the altered watershed process and corresponding EDT limiting factors. In this manner, on a 6th field watershed-by-watershed basis, priority restoration actions were determined. Restoration actions were prioritized and sequenced to ameliorate the root causes of watershed and aquatic habitat impairment. Specific restoration actions, where known, were identified for specific locations to

improve watershed conditions, water quality and fish production potential. Where unknown, types of restoration actions were identified for further planning and development. Results from the MHNF Roads Analysis completed in 2003 were utilized to estimate the quantity of road mileage in each watershed for restoration activity, including annual road maintenance, road storm-proofing, and road decommissioning. A table of actions was developed for each 6th field watershed in a top-down, watershed approach addressing all of the primary altered watershed processes, followed next by those addressing the remaining secondary altered watershed processes.

The aquatic habitat restoration strategy for the Hood River Basin provides a geographic focus and hierarchical framework for directing future investments (staff time and funding) toward high priority restoration projects addressing watershed function and processes. The goal is to increase the resiliency of watersheds and restore natural dynamic processes influenced by climate change weather extremes such as floods, fire, and debris flows. Specifically, the strategy lays out the following in detail:

- Identifies priority 6th field watersheds in the basin for addressing freshwater habitat restoration needs of Hood River Basin salmon and steelhead populations.
- Establishes the hierarchy, or sequence, in which actions should be pursued in order to achieve maximum resource benefits.
- Describes the factors limiting salmon and steelhead abundance, productivity, spatial distribution, and diversity. Many of these factors also limit water quality.
- Defines specific restoration actions (and types of restoration actions where they are not known site-specifically) in priority watersheds necessary to address limiting factors.
- Provides a gross estimate of the costs associated with planning, designing, implementing, and monitoring high priority restoration actions.

Habitat Restoration Strategy

Current Effort – Upper West Fork Hood River Watershed Restoration Action Plan (WRAP).

The 2012 WRAP is an extension of both the 2006 Hood River Basin Aquatic Restoration Strategy and 2008 Hood River Watershed Action Plan, and was prepared under the guidance of the national 2010 Watershed Condition Framework (WCF) (USDA 2010) – a comprehensive approach for proactively implementing integrated restoration on priority watersheds on National Forests and grasslands. The WCF is comparable to the Region 6 Aquatic and Riparian Conservation Strategy (ARCS) (USDA 2008) components with similar prioritization, identifying integrated suites of activities to improve watershed condition and tracking progress, although it utilizes a model that has a slightly differing watershed condition outcome. This WRAP builds upon, and provides greater detail to, previous planning efforts by presenting a specific list of projects, timelines, and costs that stakeholders, restoration specialists, decision makers, and grant writers may use in promoting a collaborative approach to improving aquatic resources in the Upper West Fork Hood River 6th field watershed. Essential projects are included to improve the sub-watershed condition class, which addresses an outcome-based performance measure of progress toward restoring the productivity and resilience of watersheds and their associated aquatic systems on National Forest lands. The Upper West Fork Hood River WRAP can be

viewed as an operational scaled (6th field HUC) plan which tiers to the broader Hood River Basin Restoration Strategy. This WRAP follows the 2011 WCF transition WRAP report format.

Summary

Watershed Name and HUC

Upper West Fork Hood River (HUC12 number 170701050601)

General Location

The West Fork Hood River is a tributary to the Hood River which flows into the Columbia River 22 miles upstream of Bonneville Dam. The Hood River is made up of three main branches; the East, Middle, and West Forks (Figure 1). The West Fork Hood River is contained within three 6th field sub-watersheds: Upper West Fork Hood River, Lower West Fork Hood River, and Lake Branch (Figure 2). The Upper West Fork 6th field watershed is comprised of the main-stem West Fork and six major tributaries: Elk, McGee, Jones, Ladd, Red Hill, and Marco Creeks, plus a number of smaller tributaries (Figure 2).

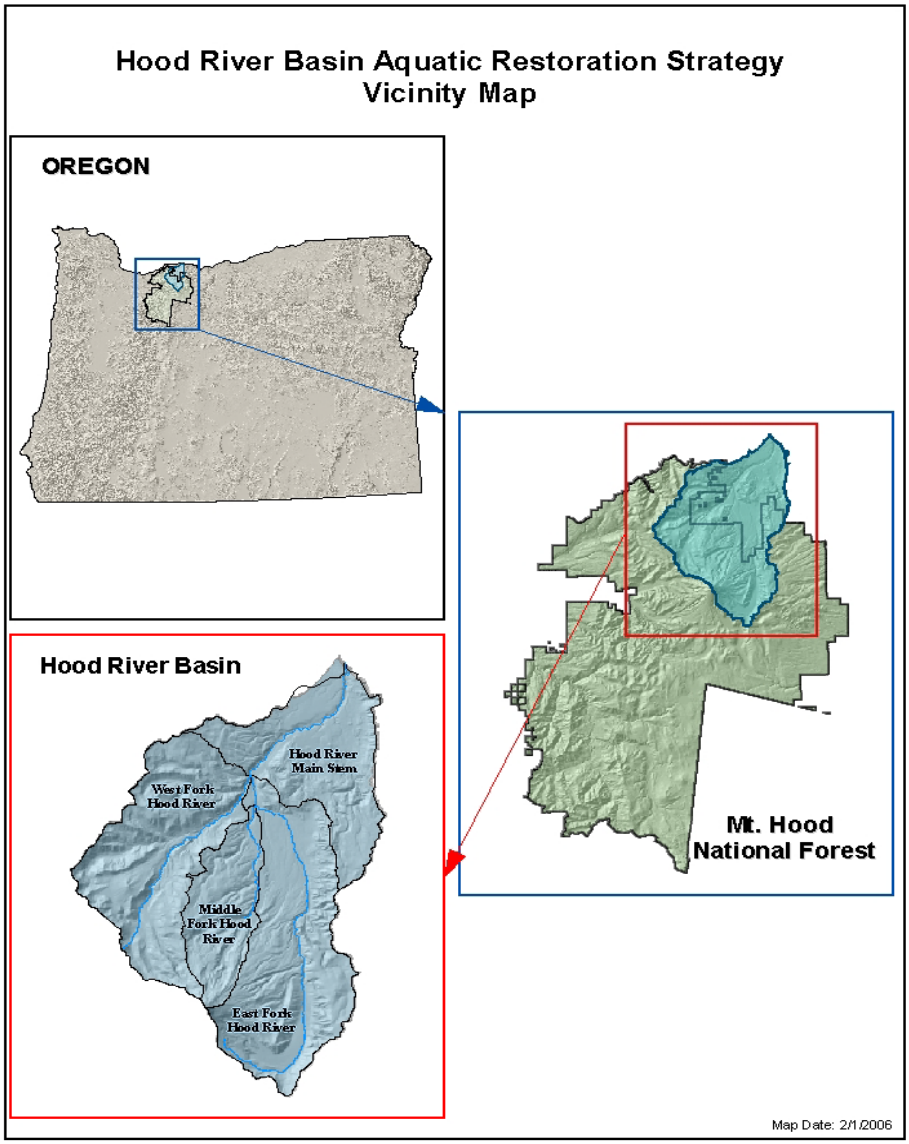


Figure 1. Vicinity map of the Hood River Basin located in north central Oregon.

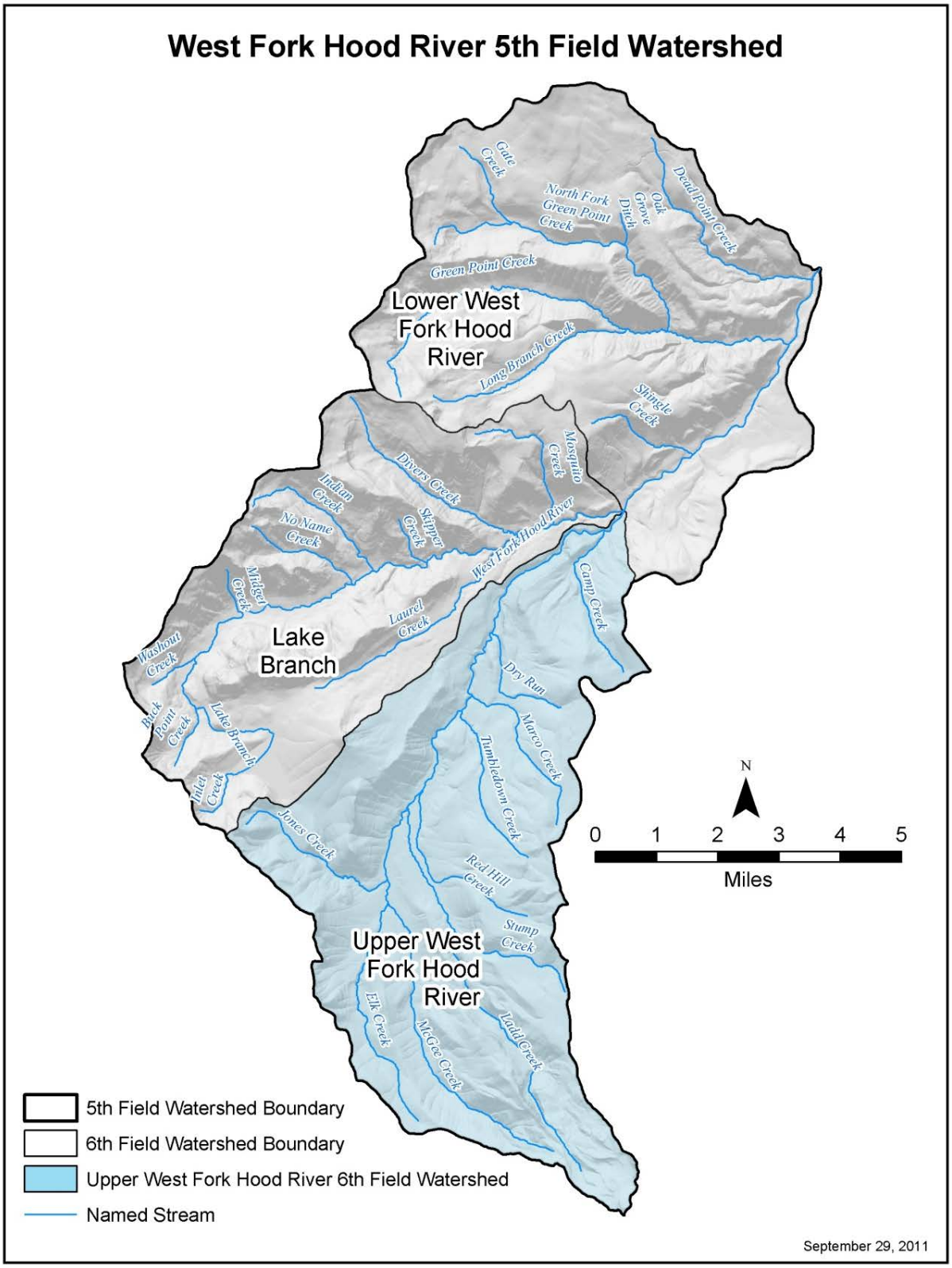


Figure 2. The Hood River 5th Field Watershed including Upper West Fork Hood River 6th Field Watershed.

Total Watershed Area

Total acres: 24,133
National Forest area within watershed: 82 percent

Watershed Characterization

General Physiography

The Hood River is located on the east slope of the Cascade Range, flows north from Mt. Hood and empties into the Columbia River 22 miles above Bonneville Dam. The watershed is bounded on the west by the Cascade Range, on the south by the Sandy and White Rivers and on the east by the Mosier, Mill, Threemile, Rock, and Fifteenmile Creek drainages. Watershed elevations vary from 11,245 feet to 74 feet above sea level. Its headwaters drain into three main tributaries; the East, Middle, and West Forks, which converge to form the Hood River main stem about 12 miles from the Columbia River. The total drainage area is 217,337 acres, or 340 square miles (Coccoli 1999).

The Hood River is a dynamic, glacially influenced system with steep terrain (USDA 1996a). Pleistocene glaciation produced most of the topographic features that form the Hood River valley landscape, while Mt. Hood glacial melt water and Holocene-era floods produced terraces of fluvial clay, silt, sand, gravel, and boulders. Hood River water quality is strongly influenced by Mt. Hood glaciers which are actively eroding and as such, downstream channels are impacted by natural landslides, debris flows, and dam-break floods which originate on the moraines and slopes of Mt. Hood. The transport of glacial flour, or fine ground-up sand and stone, from glacial headwater tributaries during summer melt can dramatically increase water turbidity in downstream areas.

Glacial headwater streams transport large amounts of sediment into the three forks that make up the Hood River, but the glacial influence in the West Fork Hood River is less than that in the East and Middle Forks. This is because only one glacial stream (Ladd Creek) empties into the West Fork Hood River whereas the Middle and East Forks each have two glacial tributaries. At least over the last several decades, Ladd Creek has not been subject to repeated debris flow events as have several of the other glacial streams on Mt. Hood. As result, the West Fork Hood River main stem is in better condition from a fish habitat perspective than either of the other two forks.

The greatest proportion of land cover in the watershed is coniferous forest. Vegetation cover types are variable depending on elevation, longitude, and aspect. Riparian areas are a mix of conifers and deciduous hardwood trees and shrubs.

Land Use

Historically, the watershed was used by Native Americans. They collected camas, bear grass and other plants, hunted deer, elk, and other game, and fished in the tributaries and main forks of the Hood River for salmon, trout, and lamprey. Known houses were located at the Hood River mouth and at nearby sites and temporary camps were set up around the valley to collect and prepare foods (Coccoli 1999). Major trails went from the upper valley to the slopes of Mt. Hood, through prairies and meadows up the West Fork Hood River and over Lolo Pass. Intentional

burning by Native Americans to maintain travel routes and berry patches is well documented with maintained huckleberry fields in meadows around Lost Lake and other places in the basin.

Pioneers passed through the watershed on their way to the Willamette Valley in the mid to late 1800's. Many settled in the lower valley and began planting fruit crops and establishing water-powered sawmills in the mid 1800's. Few settlers chose to settle in the Upper West Fork Hood River, but the watershed was a source of timber for the mills in the lower valley. Both the timber industry and commercial fruit production flourished in the basin and remain important components of the local economy (USDA 1996a). Besides orchards and lumber, tourism has played a role in placing the Hood River valley and surrounding areas on the map, especially in the last few decades (USDA 1996a). The West Fork Hood River 5th field watershed provides a wide variety of primitive types of recreation, such as hiking, hunting, berry picking, and backpacking (Coccoli 1999); there are several trailheads that are frequently used to access Mt. Hood.

National Forest system lands located within the Upper West Fork Hood River 6th field watershed encompass a variety of land designations (Tables 1 and 2; Figure 3). From a MHNF Land and Resource Management Plan (LRMP) perspective most of the watershed is timber emphasis, wilderness, and private land. Specific management direction for each of these land allocations can be found in the LRMP (USDA 1990). In regard to the Northwest Forest Plan (NWFP), the primary land allocations are matrix, congressional reserves, and late successional reserves; these land allocations are overlain by riparian reserve and Tier 1 Key Watershed allocations. Specific management direction for each of these land allocations can be found in the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, i.e. Northwest Forest Plan (USDA and USDI 1994).

Table 1. Mt. Hood National Forest LRMP primary land allocation summary within the Upper West Fork Hood River 6th field watershed.

LRMP Land Allocation	**Acres in Allocation**
Wilderness (A2)	3,620
Special Interest Area (A4)	199
Key Site Riparian (A9)	424
Scenic Viewsheds (B2)	1,511
Deer/Elk Winter Range (B10)	92
Timber Emphasis (C1)	13,072
Bull Run Management Unit (DA2, DC1)	764
Private Land	4,449
Total acres	**24,131***

*Total acres differ slightly from the 24,133 listed above due to GIS discrepancies.

Table 2. Northwest Forest Plan primary land allocations within the Upper West Fork Hood River 6th field watershed.

NWFP Land Allocation	**Acres in Allocation**
Congressional Reserves	3,620
Administrative Withdrawal	300

NWFP Land Allocation	Acres in Allocation
Late Successional Reserves	5,162
Matrix	8,164
Private Land	4,449
Tier 1 Key Watershed	19,696*
Riparian Reserve	5,061*

*Tier 1 Key Watershed and riparian reserve acres overlay other allocations; they are not discrete land allocations.

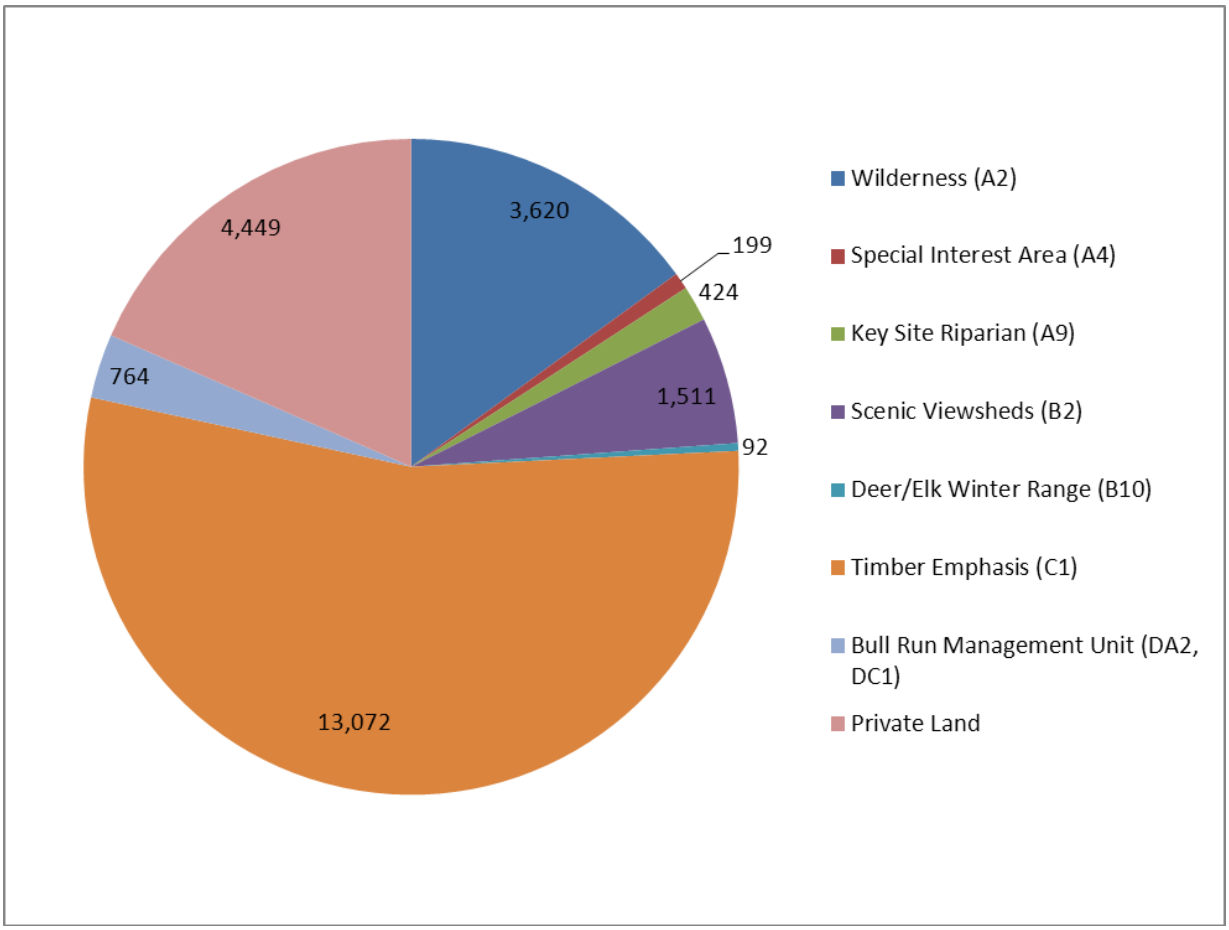


Figure 3. Mt. Hood National Forest LRMP land allocations within the West Fork Hood River 5th field watershed.

General Overview of Concerns

Environmental concerns within the Upper West Fork Hood River 6th field watershed include reduced connectivity between stream channels and floodplains, reduced fish habitat complexity and presence of key life stage habitats, altered riparian forest stand structure and function, human-caused sedimentation, and population connectivity. The following list details specific issues of concern and is followed by a general approach to resolve the issues. Specific project descriptions that address the general restoration approaches can be found in the Specific Project Activities (Essential Projects) section below.

- *Issue of Concern: Lack of stream channel and floodplain large wood*
  Aquatic inventories conducted by the CTWS, ODFW and MHNF indicate a shortage of in-stream and floodplain LWD within Elk, McGee, Jones, Red Hill, Ladd, and Marco Creeks, as well as the West Fork Hood River. These shortages are due to past land management (timber harvest, road and power-line development) exacerbated by natural flooding that has moved wood downstream out of the watershed. One of the largest limiting factors for salmonid production in the Upper West Fork Hood River is the loss of floodplain connectivity from past management practices (Shively 2006). Channelization and large wood removal has led to the incision of the main stem channels and isolation of side channels, which became inaccessible to native fish. Rearing areas for anadromous salmonids have been exponentially reduced leading to an overall decrease in production. The removal of large wood further reduced the habitat complexity of the river, through loss of pool habitats, lack of gravel sorting structures, and reduced flood plain inundation. The lack of LWD has also increase peak flow erosion and decreased channel stability in some reaches.

  Proposed Restorative Action: Large wood addition to stream channels and floodplains
  Many stream reaches have been treated by adding LWD to the channel and floodplain already. However, several key reaches still remain that would benefit from LWD addition at a rate of 125-250 pieces per mile and 30 or more pieces per acre in the floodplain. Three projects have been identified to add large wood to stream channels and floodplains.

- *Issue of Concern: Reduction in riparian large wood recruitment (current and future)*
  Past land management such as timber harvest and fire exclusion has resulted in riparian stand conditions in many areas that are young, dense, and monotypic in terms of species and structure. In other areas timber harvest has resulted in a narrow strip of undisturbed forest along waterways with clear cuts or young stands outside these leave strips. These riparian stands will be unable to naturally contribute abundant LWD for decades and as a result there is a lack of in-stream and floodplain LWD as described above. It is recognized the LWD has a lifespan and that chronic natural recruitment of LWD into the stream is the long term desired condition.

  Proposed Restorative Action: Land acquisition and riparian thinning
  Acquisition of the private land parcel in the watershed would enable the MHNF to manage land consistently across the watershed and, in this case, apply silvicultural prescriptions commensurate with LRMP and NWFP standards and guidelines. This would include prescriptions to improve riparian forest stands in terms of species diversity, stand structure, and resiliency. Riparian thinning is also proposed to reduce stand density, increase resiliency to disease and other disturbance agents, and over time improve species diversity and stand structure. While only two thinning projects are proposed in this plan there are other riparian areas proposed for thinning in the Red Hill Restoration Project (currently in analysis, MHNF).

- *Issue of Concern: Increase in sediment production (road-related)*
  Roads and management-related debris flows account for the majority of anthropogenic fine sediment production in the West Fork Hood River (Coccoli 2004). In addition, the Bonneville Power Administration (BPA) transmission lines transect a large portion of the Upper West Fork Hood River 6th field watershed. BPA access roads are native surface, minimally maintained, and in some places ford creeks instead of using culverts. These roads are a significant sediment source to downstream spawning and rearing areas. Many of the high risk native surface Forest Service roads have been closed or decommissioned, but others are currently in a state where they contribute to the fine sediment load.

  Proposed Restorative Action: Road decommissioning, storm-proofing, closure, and culvert upsizing
  In this plan about 35 miles of road in the Upper West Fork Hood River watershed is proposed for decommissioning, storm-proofing, or closure. The level of treatment depends on whether the road is needed in the future and if so whether it would be open to the public or not. Many of the road treatments are part of the Red Hill Restoration Project and are proposed for treatment after silvicultural treatments are completed. Five culverts in non-fish bearing streams are proposed for replacement with structures that would pass a 100-year flood event

- *Issue of Concern: Impeded fish passage*
  With one exception (FSR 1800 at McGee Creek) the high priority human-caused anadromous fish passage barriers have been remediated in the Upper West Fork Hood River 6th field watershed. There a total of six identified culvert barriers to fish passage remaining in the watershed, five of which are in resident rainbow trout streams. These barriers limit access to spawning and rearing habitat on small streams and also limit fish access to areas that can be important for summer thermal refugia, over-wintering and flood refuge. All of the culverts are perched, set at incorrect grades, or are inadequately sized and therefore do not provide for aquatic organism passage.

  Proposed Restorative Action: Replace culverts with crossings that pass fish and other aquatic organisms
  All six culverts proposed for replacement will be designed to incorporate stream simulation. Most of the crossings would be open bottom pipe arches although one proposal, given the stream size, calls for a bridge. Besides allowing for unimpeded aquatic organism passage, all of the new crossings would be sized to pass a 100-year flood event

Important Ecological Values

Significant ecological values associated with the Upper West Fork Hood River are largely related to anadromous fish production although other values relate to wildlife and human use.

- The Upper West Fork Hood River 6th field watershed contains aquatic threatened and endangered species and designated critical habitat.
- The West Fork Hood River is the highest priority watershed in the Hood River Basin for recovery of threatened spring Chinook salmon and summer steelhead trout.

- The West Fork Hood River provides the highest densities of spawning and rearing habitat for spring Chinook salmon in the basin.
- The Upper West Fork Hood River is home to a variety of wildlife species, such as deer (*Odocoileus hemionus*), elk (*Cervus elaphus spp.*), black bear (*Ursus americanus*), numerous songbirds, and the Northern Spotted Owl (*Strix occidentalis*). Some of these species are culturally important to the CTWS.
- A variety of unique habitats are found in the watershed, including riparian areas, old growth forest, huckleberry fields, wetlands, and subalpine/alpine habitats.

Current Condition Class

- Upper West Fork Watershed Condition Class rating: 2
- Upper West Fork Watershed Condition Score:1.7[1]

Target Condition Class

- Target Condition Class: 1

Key Watershed Issues

Within the Upper West Fork Hood River watershed there are a variety of factors that have led to impacted conditions from both an aquatic and terrestrial perspective (Tables 3 and 4). Because much of the watershed is in federal ownership many of the factors can be readily addressed by the MHNF (Table 3). The projects outlined in the Essential Project Activities section are designed to directly address one or more factors outlined in Table 3.

In the privately owned parcel many of the same indicators are impacted by the same factors as in federal ownership (Table 4). Although we are pursuing some factors (such as large woody debris deficiencies) most others cannot be realistically pursued given differing land management goals and objectives between the federal and private owners. Only when the parcel is acquired by the MHNF can focused and deliberate restorative strides be made that are commensurate with proposed actions of federal lands.

Table 3. Watershed Condition Framework indicators impacted within the Upper West Fork Hood River 6th field watershed with MHNF control to affect.

INDICATOR	FACTORS LEADING TO IMPACTED CONDITION
1.2 Water Quality Problems	Sediment delivery to streams. MHNF roads and BPA access roads causing chronic sediment delivery to stream channels. Undersized culverts contribute to sediment delivery during high flow events. Heavily impacted riparian areas under the BPA powerline corridor which have been converted from mature conifer to hardwoods, shrubs and ground cover, resulting in increased bank erosion and sediment delivery.
3.1 Habitat Fragmentation	Fish passage barrier culverts at stream crossings on FSR 1800 and 1600 result in fragmented fish and other aquatic organism populations.
3.2 Large Woody	Stream channel and floodplain large wood levels are low due to past land

[1] 1.0 to 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

INDICATOR	FACTORS LEADING TO IMPACTED CONDITION
Debris	management (timber harvest, stream clean-out) and floods that have moved wood that was present out of the watershed. Large wood recruitment from riparian stands has been reduced in many areas, including under the BPA powerline. Significant recruitment of trees larger than 20-25 inch diameter breast height (dbh) will take decades to achieve.
3.3 Channel Shape and Function	Lack of stream channel and floodplain large wood has led to decreased sinuosity, modified channel slope, channel incision, reduced floodplain and channel connectivity, lack of floodplain roughness, decreased pool densities, less side channel habitat, and reduced spawning gravel retention.
5.1 Riparian Vegetation	Large wood recruitment both to the stream channel and floodplain from riparian stands has been reduced in many areas, including under the BPA powerline (see 3.2 above). Riparian forest stand conditions in many areas are best described as even aged, overstocked, monotypic forests with little species or structural diversity. These conditions are primarily a result of past land management activities and result in poorer health and less resiliency to natural perturbations. Invasive plant species have invaded riparian areas although most areas away from roads and other human traffic areas are generally devoid of invasive species.
6.2 Road Maintenance	Road maintenance occurs but it is reactive more than proactive due to decreased budgets and workforce. Significant problem areas are usually addressed, but chronic erosion occurs at higher rates than if regular maintenance occurred.
6.3 Road Proximity to Water	In general most roads do not lie within riparian areas adjacent to streams or other water bodies for long distances. Roads cross multiple streams and wet areas usually at right angles. There are a few exceptions, including a section of FSR 1800-100 (needed for access to the BPA powerline) that runs adjacent to the West Fork Hood River for about ¼ mile and FSR 1800 that lies adjacent to McGee Creek for ½ mile.
7.2 Soil Erosion	Soil erosion occurs from a variety of sources within the watershed, exacerbating the naturally high sediment load in Ladd Creek and West Fork Hood River. Notable sources include forest roads, especially native and aggregate surface roads (including those under the BPA powerline), undersized culverts, old landings and rock quarries.
11.1 Terrestrial Invasive Species	Past and present human-related activities have introduced numerous invasive plants to the Upper West Fork Hood River watershed, primarily near roads and in the BPA powerline corridor.
12.1 Forest Health – Insects and Disease	Pockets of insect and disease infested forest are widespread throughout the watershed. Although these change agents are naturally occurring they have been exacerbated in areas due to over stocking and poor stand health.

Table 4. Watershed Condition Framework indicators impacted within the Upper West Fork Hood River 6th field watershed that the MHNF has no control to affect. The following factors are located wholly within private lands in the watershed.

INDICATOR	FACTORS LEADING TO IMPACTED CONDITION
1.2 Water Quality Problems	Sediment delivery to streams primarily from private timber company logging roads and landings. Undersized culverts contribute to sediment delivery during high flow events.
3.1 Habitat Fragmentation	Fish passage barrier culverts on at least one logging road and there may be others once a complete survey is conducted.
3.2 Large Woody Debris	Stream channel and floodplain large wood levels are low due to past land management (timber harvest, stream clean-out) and floods that have moved wood that was present out of the watershed. Large wood recruitment from riparian stands has been reduced in many areas, including under the BPA powerline. Significant recruitment of trees larger than 20-25 inch dbh will take decades.
3.3 Channel Shape and Function	Lack of stream channel and floodplain large wood has led to decreased sinuosity, modified channel slope, channel incision, reduced floodplain and channel connectivity, lack of floodplain roughness, decreased pool densities, less side channel habitat, and reduction of spawning gravel retention.
5.1 Riparian Vegetation	Large wood recruitment both to the stream channel and floodplain from riparian stands has been reduced in many areas (see 3.2 above). Although private timber harvest practices fully meet the Oregon Forest Practices Act many streamside riparian areas are characterized by relatively narrow strips of intact riparian forest bordered by clear cuts or young plantations. Invasive plant species have invaded many areas although most areas away from roads and other human traffic areas are generally devoid of invasive species.
6.2 Road Maintenance	Road maintenance occurs, but the schedule and regularity of such maintenance is unknown. Some roads appear to be in excellent shape whereas others show signs of erosion.
6.3 Road Proximity to Water	Compared to surrounding federal land ownership, more roads in the private parcel lie adjacent to streams and/or within riparian areas.
7.2 Soil Erosion	Soil erosion occurs from a variety of sources within the parcel, exacerbating naturally high sediment loads. Notable sources include logging roads, undersized culverts, and old landings.
11.1 Terrestrial Invasive Species	Past and present human-related activities have introduced numerous invasive plants to the private land parcel within the Upper West Fork Hood River watershed.
12.1 Forest Health – Insects and Disease	Although pockets of insect and disease infested forest likely exist in the parcel they are less prevalent than on surrounding federal land due to more frequent timber harvest.

Watershed Characteristics and Conditions

General Context/Overview of the Watershed

General

The West Fork Hood River originates on the north side of Mt. Hood and along the Cascade crest. The West Fork Hood River and East Fork Hood River join near the town of Dee to form the main stem Hood River. The Upper West Fork encompasses 24,133 acres, of which 82 percent is on the MHNF. Hood River County and Longview Timber, LLC are the other principal landowners. The Upper West Fork Hood River 6th field watershed lies approximately 35 miles east of Portland, 15 miles southwest of Hood River, and 7 miles west of Parkdale. The primary roads into the watershed are FSR 1800 and 1600; only FSR 1800 connects as a through-route across the Cascade crest over Lolo Pass. Other through access is not possible due to the Mt. Hood Wilderness to the south, Bull Run Management Unit and Mark O. Hatfield Wilderness to the west and northwest, and roadless terrain to the north. The majority of the Upper West Fork Hood River watershed lies on the Hood River Ranger District, but a tiny portion north of Lolo Pass lies on the Zigzag Ranger District. This piece of the watershed forms part of the buffer for the Bull Run Management Unit – the City of Portland's municipal water source (Coccoli 1999 and 2004; USDA 1996a).

Climate

The Hood River is located in the transition zone between the west side marine climate and the drier continental climate to the east, but the Upper West Fork Hood River lies almost entirely within the marine climate zone. Annual precipitation in the Upper West Fork Hood River regularly exceeds 100 inches per year and snowfall is heavy at high elevations, occasionally reaching 30 feet (Coccoli 1999). Average daily stream discharge is substantially influenced by rates of snow accumulation and warm season snow and glacial melting. Occasional spikes in the hydrograph during December and January are common from high flows associated with rain-on-snow events. The mean annual flow of the West Fork Hood River near the mouth is 554 cubic feet per second (cfs) and the mean monthly low flow is 157 cfs which typically occurs in September (Coccoli 2004).

Geomorphology

The Hood River Basin is dominated by the 11,245 foot high strato-volocano cone of Mt. Hood formed of lava and pyroclastic flow deposits. Volcanic rock forms ridges and drainages beyond the base of Mt. Hood, and Columbia River basalt is the most widespread rock formation. Pleistocene-era glaciers and Holocene floods shaped the landscape into steep narrow valleys, and terraces of clay, silt, sand, gravel and boulders. In the Upper West Fork Hood River land elevations rise rapidly from approximately 1,500 feet to over 6,000 feet and therefore many streams have high gradient reaches; however, lower tributary reaches and portions of the West Fork Hood River itself are lower gradient (<3 percent) with relatively broad floodplains. Cobble and small boulder substrates dominate most streambeds, but smaller gravel-sized material is abundant. Debris torrents and ice and snow avalanches are not uncommon in the winter months. Alluvial fan deposits at the mouths of the steeper, more constricted streams suggest past debris torrents down these channels (Coccoli 2004).

Fire

Fire has been a moderate influence within the Upper West Fork Hood River watershed. Native Americans used fire as a tool to maintain trail systems over Lolo Pass and to maintain huckleberry fields in other areas (USDA 1996a). More recently, fire suppression has resulted in changes in forest structure and ecology although these alterations are more prevalent in lower elevations primarily outside the Upper West Fork Hood River. In the Upper West Fork Hood River the average fire return interval is 200-300+ years. When they occurred, fires were large (several thousand acres) and driven by strong winds primarily from the west. Several different fire events, all covering large areas, can be detected in the West Fork Hood River watershed based on lookout panoramas and information in timber sale EAs (USDA 1996a).

In August 2011, a lightning storm ignited a fire in the Coe Branch watershed (a tributary to the Middle Fork Hood River) that spread predominantly westward into the headwaters of Ladd and McGee Creeks. Although the total fire size was over 6,200 acres, only about 1,200 acres burned in the Upper West Fork Hood River, almost all of it in Ladd Creek. Fire severity in the Upper West Fork Hood River watershed was a mixture of low to moderate severity (about 900 acres) and the remaining area high severity.

Vegetation

The greatest proportion of forest land in the watershed is made up of conifers. Douglas-fir (*Pseudotsuga menziesii*) is the dominant coniferous species, interspersed with western hemlock (*Tsuga heterophylla*), Pacific Silver fir (*Abies amabilis*), red cedar (*Thuja plicata*), Engelmann spruce (*Picea engelmannii*), grand fir (*Abies grandis*), and noble fir (*Abies procera*) (Coccoli 2004, USDA 1996a). Vegetation cover types are variable depending on elevation, longitude, and aspect.

The West Fork Hood River watershed's current vegetative conditions are comprised of young and mature forests (Table 5). In this respect current conditions are similar to historic conditions (pre-settlement) but the main difference is a significant reduction in old growth compared to the past. Note that the values presented in Table 5 are based on a 12,000 acre planning area within the Upper West Fork Hood River watershed. This planning area excludes the Elk Creek, Jones Creek, and portions of the West Fork Hood River 7th field watersheds, as well as private land. Despite this, the table below is a good representation of current conditions.

Table 5. Current coniferous vegetation conditions compared to historic conditions within the Red Hill Restoration Project area. This project area encompasses 12,000 acres located entirely within the Upper West Fork Hood River 6th field watershed.

Stand Structure	Current Percentage	Historical Percentage
Open	5%	5%
Early Successional	13%	12%
Young	29%	28%
Mature	40%	15%
Old Growth	17%	40%

Aquatic

The Upper West Fork Hood River watershed supports both anadromous and resident species of salmonids, including summer steelhead, spring Chinook salmon, coho salmon, and resident rainbow trout. Habitat conditions for salmonids range from low to high quality within the watershed. Habitat surveys have identified a wide diversity of habitat types, ranging from low gradient, meandering river channels to small, high-gradient, glacier-fed creeks. In some areas within the watershed, fish habitat has been degraded due to current and past land management. Timber harvest and associated stream clean-out removed much of the large wood from the system in the mid to late 20th century and much of the remaining stream channel wood was scoured out during flood events. Water quality, in terms of temperature, chemicals, and even fine sediment, is good in most stream reaches. Some stream sections have high amounts of fine sediment due to natural (glacial) conditions exacerbated by human caused factors such as roads and denuded areas under the BPA powerline.

Special Habitats and Species of Concern

The Upper West Fork Hood River watershed contains known or suspected populations and habitat for several special status aquatic and terrestrial species, all of which are under the umbrella of one or more of the following laws or guidelines: the Endangered Species Act, National Forest Management Act (NFMA), or Forest Service policy (such as the LRMP). Aside from the fish species listed above, the following is a general list of aquatic and terrestrial species known or suspected in the watershed:

- Northern Spotted Owl
- Several other bird species including the Harlequin duck (*Histrionicus histrionicus*)
- Multiple fungi, mosses, and liverworts
- Multiple vascular plants that occupy a wide range of habitat types
- A variety of terrestrial mollusks and insects
- Several aquatic macroinvertebrates including insects and snails

Watershed Conditions

The following watershed condition descriptions are taken largely from the 1996 West Fork Hood River Watershed Analysis (USDA 1996a) and from the Hood River Subbasin Plan for Fish and Wildlife (Coccoli 2004).

Uplands/Hillslope

Changes in Peak/Base Flow

Changes in magnitude and frequency of peak flow events were analyzed in the West Fork Hood River Watershed Analysis (1996a) primarily through the use of the Aggregate Recovery Percentage (ARP) model. The ARP model is a risk prediction model designed to predict the susceptibility of a watershed to sustain damage from winter rain-on-snow events. Risk is predicted solely on the basis of the state of hydrologic recovery of the vegetation in the watershed and does not account for variations in climatic, topographical, or other environmental factors. The lower the hydrologic recovery the greater the risk the watershed will experience increased frequency and magnitude of peak flow events.

The LRMP (1990) uses a vegetation recovery threshold of 65 percent as the minimum recovery standard for a watershed[2]. In other words, in a given watershed if the amount of vegetation considered recovered from hydrologic perspective totals 65 percent or more of the total area then the watershed is considered at least minimally hydrologically recovered and meets standard. This analysis is always subject to professional scrutiny and in some watersheds there may still be a concern based on topography, soils, etc.; this is reflected in the information presented below (Table 6).

Table 6. The Aggregate Recovery Percentage risk ratings for 7th field watersheds that make up the Upper West Fork Hood River 6th field watershed. Data used for the analysis was from 1991.

Name	Acres	ARP	Concern
Camp Creek	1,845	75.5%	OK
Marco Creek	1,290	69.7%	Concern
Tumbledown Creek	1,211	74.9%	Concern
Red Hill Creek	1,873	70.5%	Concern
Ladd Creek	4,110	82.0%	OK
Elk Creek	2,049	79.6%	OK
Jones Creek	2,272	80.8%	OK
McGee Creek	3,444	78.1%	OK
West Fork Hood River	11,408	69.0%	Concern

For the Watershed Analysis the ARP model estimated the state of hydrologic recovery of existing (1991 data) watershed vegetation by 7th field watershed (Table 6). Results indicated the Upper West Fork Hood River watershed has sub-watersheds of concern, but others were hydrologically recovered. The results of this ARP model suggest that the risk of increased peak flows due to the current state of hydrologic recovery of watershed vegetation is a low to moderate concern in the Upper West Fork Hood River watershed. The highest risk is in Marco Creek and main-stem West Fork Hood River (for this analysis West Fork Hood River includes the portion in the Lower West Fork Hood River 6th field watershed).

[2] An area is considered recovered when it is covered with a coniferous forest with a crown closure of 70 percent and an average tree diameter at breast height of eight inches.

Although the base vegetation data used for the analysis is somewhat dated (1991), the values presented above are still applicable given tree growth rates and relative lack of recent forest management activities within federal ownership. Harvest has occurred in the private parcel and as a result the ARP values in Jones Creek, McGee Creek and West Fork Hood River have likely decreased somewhat. In other watersheds the ARP values have likely increased slightly.

Road Density & Location & Drainage Network

The LRMP has a road density threshold of 2.5 mi/mi^2 for wildlife protection and assumes that this goal also protects against adverse hydrologic impacts (Coccoli 1999). In most 7th field watersheds that make up the Upper West Fork Hood River 6th field watershed the road density is below this threshold (Figure 4). Only two 7th field watersheds, Tumbledown and Marco Creeks, exceed the 2.5 mi/mi^2 standard. A total of eight miles of road have been decommissioned to date in these 7th field sub-watersheds.

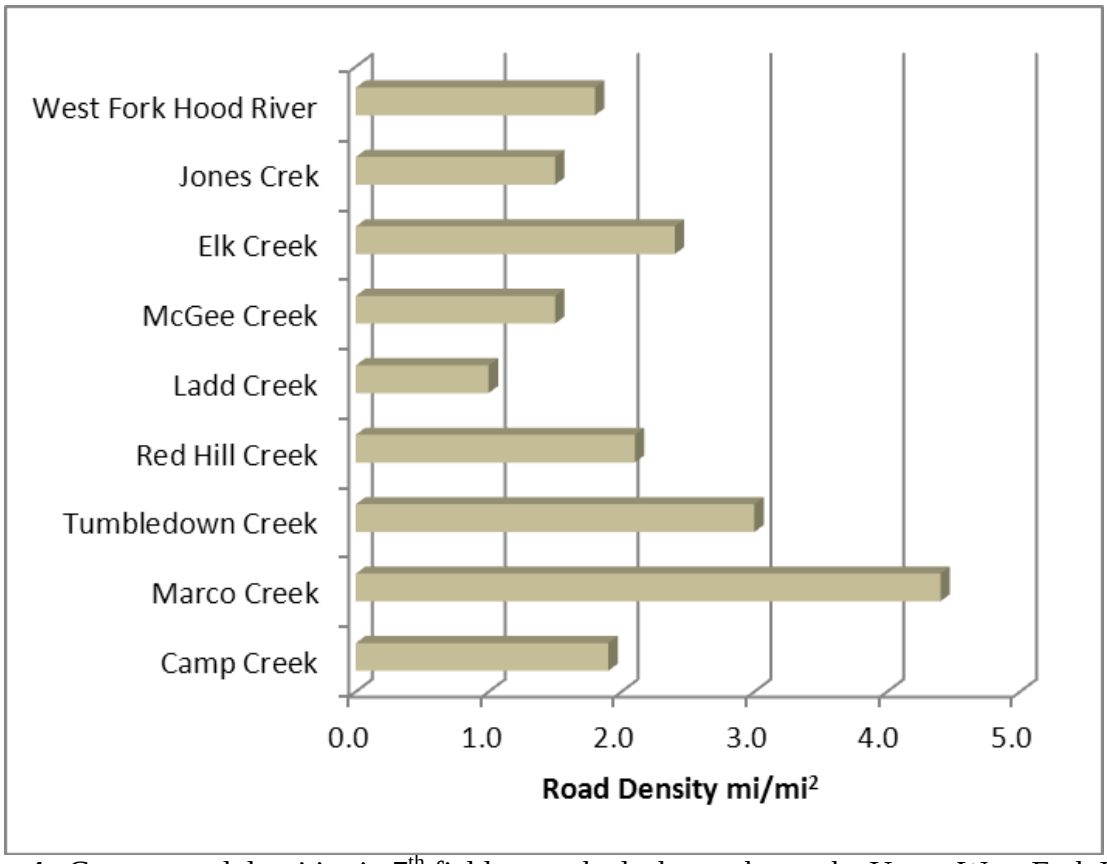


Figure 4. Current road densities in 7th field watersheds that make up the Upper West Fork Hood River 6th field watershed.

Higher road densities in Marco and Tumbledown Creeks are due to FSR 1600 switchbacks that climb through the area. The majority of road surface through both sub-watersheds is comprised of less erosive asphalt material indicating surface erosion is not a major concern despite the high road density. The Forest Service Watershed Erosion Prediction Project (WEPP) Model was run on an example road segment to illustrate different erosion rates for these different road surface types. Local soil types and weather conditions were used in the model run. A 200-foot, high use

native surface section of road generated 274 pounds of eroded material while a paved surface road generated approximately 128 pounds of eroded material for the same section (Kreiter 2012).

Relatively few roads in the watershed run parallel to major streams, but where they do they have the potential to contribute to reduced water quality and habitat degradation via sediment introduction. One such road is FSR 1800 which lies adjacent to McGee Creek for long distances. The other road that lies directly adjacent to a stream is FSR 1800-100, used for maintenance access for the BPA powerline, which parallels the West Fork Hood River for about ¼ mile.

Disturbance History

Since the 1880's, timber management and fire suppression has altered the age, species composition, and structure of native forest stands in the lower and mid-elevation forest while the headwater forests areas remain less altered. The availability of contiguous mature forest habitat has been reduced by harvest-related fragmentation. Standing dead trees and large-diameter downed trees that provide nesting cavities, scanning perches, and insect-feeding substrate for birds and a variety of wildlife is missing from much of the watershed (Coccoli 2004).

Historic timber practices including splash damming and stream clearing had an effect on fish habitat that is still felt today. Symptoms of disturbance are channel incision, fewer pools and pieces of in-stream wood, and less variation in water velocity and substrate size (USDA 1996a). Channel confinement and interference with stream and riparian processes by roads and culverts degrades many miles of stream habitat (Coccoli 2004). Vehicle traffic and year-round trail and backcountry recreation has likely affected wildlife species that are intolerant of human activity (Coccoli 2004).

Invasive plants

Surveys have documented invasive plants such as knotweed (*Centaurea sp)*, scotch broom (*Cytisus scoparius*), Canada thistle (*Cirisium arvense*), St. Johnswort (*Hypericum perforatum*), and orange hawkweed (*Hieracium aurantiacum*) occurring within the Upper West Fork Hood River watershed (USDA 1996a). These and other invasive plants are found primarily where human activity occurs; along roads and especially under the BPA powerlines. Treatment of these infestations using a variety of methods, including herbicides, has been approved in the Final Environmental Impact Statement for Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, Including Forest Plan Amendment Number 16 (USDA 2007).

Riparian Conditions

Riparian Reserves

The Upper West Fork Hood River watershed has moderate down large wood recruitment potential. The entire West Fork Hood River watershed 5th field watershed is well outside the range of historic conditions for late successional old-growth structure stand structure within the riparian reserves. Riparian stands once dominated by mature, multi-story, coniferous forests are now dominated by hardwood/conifer mix type stands (USDA 1996a).

Riparian reserves in most areas largely mirror surrounding upland forests because most streams are small, steep and often in confined V-shaped valleys. For example, the riparian area adjacent to Marco Creek that is subject to frequent inundation and thus contains true riparian dependent plant species only extends about 20-30 feet on either side of the channel for most of its length. As a result the tree species composition, density, and age and stand structure outside this zone is the same as surrounding upland forest. The width of this zone varies by stream and reach however, with large streams such as McGee Creek and the West Fork Hood River having much wider aquatic influence zones. Stream shade provided by existing riparian stands is adequate and is dominated by conifers of various sizes interspersed with hardwood trees and some stringers of old growth sized trees.

Stream Bank Condition

With the exception of the West Fork Hood River, all streams in the Upper West Fork Hood River watershed are characterized by high channel gradient headwaters that normally flatten slightly into moderate gradient, confined reaches downstream. They typically begin as Rosgen "A" channel types in the upper portions of the sub-watersheds and grade into "B3" and "B4" channel types throughout the rest of the area (USDA 1996a; Rosgen 1996; MHNF unpublished data). "A" channels are high gradient channel types that have a very low to extreme sensitivity to disturbance depending on the type of material it has cut down through (Rosgen 1996). They can be a high source of sediment naturally, due to the steep surrounding terrain (especially true in glacial streams such as Ladd Creek). Riparian vegetation has a negligible influence on channel stability. The "B" channels are generally stable and have "low to moderate" sensitivity to human disturbance and riparian vegetation also has a "negligible to moderate" controlling influence on their stability (Rosgen 1996).

Stream surveys conducted in Red Hill Creek, McGee Creek and the West Fork Hood River support the characterization of stable stream banks and channel bed in "B" type channels and fairly stable "A" type channels. Both McGee Creek and the West Fork Hood River had 1.8 percent and 3 percent respectively identified as unstable. The stream survey for Red Hill Creek stated that "Overall, banks were stable with minimal erosion and stream sedimentation (USDA 2002, 1996c)." These conditions also apply to other streams in the watershed.

Floodplain Connectivity

Streams within the Upper West Fork Hood River 6th field watershed have a history of large wood removal, channel cleanout, and timber harvest in riparian areas which has directly or indirectly caused channel incision and a loss of connectivity with surrounding floodplains. This disconnection is widespread though the watershed, but does not affect every stream and reach. Some streams, especially the "A" channel discussed above, have little floodplain interaction

naturally and thus land management has had relatively little effect on this parameter. Sections of other streams, including McGee Creek, Elk Creek, and Red Hill Creek, have become significantly incised. Though there has not been any quantification of length of side channels that have been cut off or reduced or their linkages to wetlands and floodplains, it is believed these processes have been reduced at the 5th field scale (Shively 2006).

Temperature

The Upper West Fork 6th field has no stream segments listed on the Oregon 303 (d) list for temperature and all streams meet the requirements for core cold water habitat for listed salmonids. Water temperature data has been collected by the MHNF using continuous temperature recording data loggers in four streams within the Upper West Fork Hood River 6th field watershed for several years (Table 7 and Figure 5).

Seven day average maximum water temperatures rarely exceeded 14^0 C in any of the streams monitored in the Upper West Fork Hood River 6th field watershed from 1994-2007. The highest 7-day moving average of daily maximum temperature recorded was in McGee Creek in 2003. Jones Creek approached 15^0 C in 2004, but the West Fork Hood River and Red Hill Creek never exceeded 14^0 C.

Table 7. The highest 7-day average maximum stream tempertures recorded in four streams in the Upper West Fork Hood River 6th field watershed from 1994-2007. Data collected by the MHNF. Blanks indicate a data logger was not deployed that year.

Year	West Fork Hood River	Red Hill Creek	McGee Creek	Jones Creek
1994	13.4			
1995	11.7			
1996	13.5			
1997	11.9			
1998	13.4			
1999	12.0	11.4		
2000	13.0	11.5	12.3	
2001	13.8	12.5	12.9	
2002	12.6	11.0	12.1	13.2
2003	13.7		15.0	13.4
2004	13.9		13.3	14.7
2005	14.0		12.5	13.5
2006	13.9			
2007	13.5			

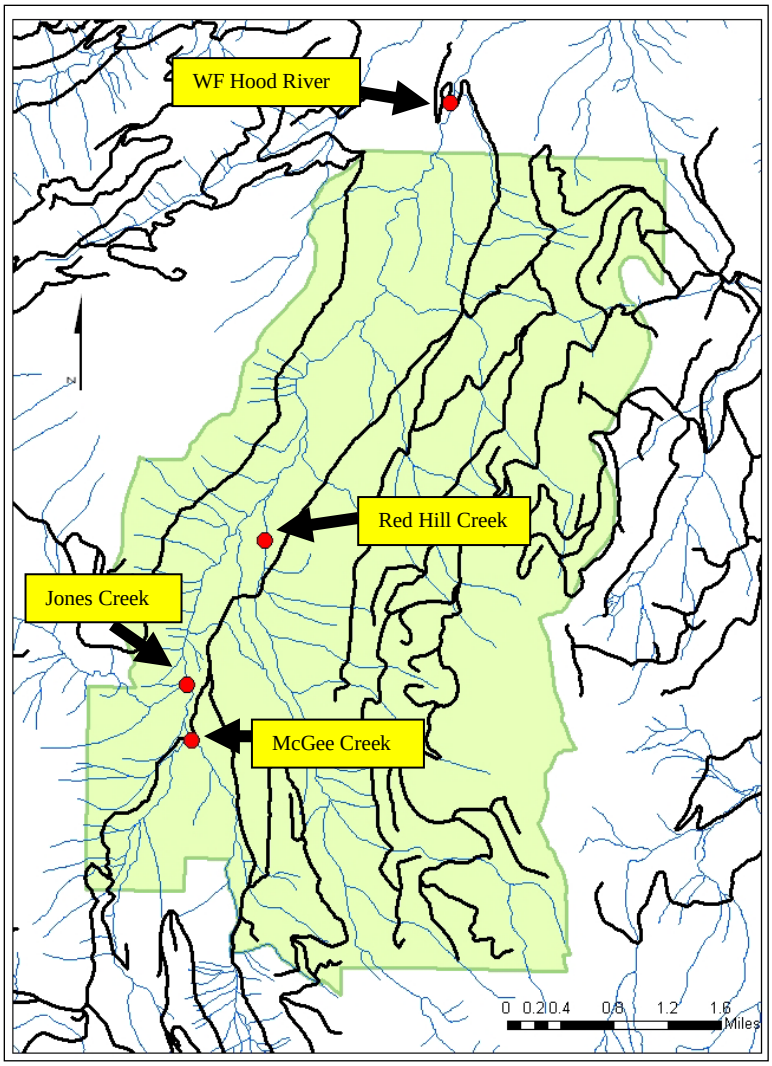


Figure 5. Water temperature monitoring sites located within the Upper West Fork Hood River 6th field watershed. Sites are indicated by red circles and the Red Hill Restoration Project planning area is shown in green.

Sediment and Substrate

Most stream channels in the Upper West Fork Hood River 6th field watershed are dominated by boulder and cobble substrate. Levels of fine sediment were below LRMP standards and recommended West Fork Hood River Watershed Analysis levels in all streams within the watershed (Table 8). McGee Creek and Red Hill Creek generally had fines well below levels of concern except the lowest reach in Red Hill Creek had a relatively high amount of fines less than 6mm. The West Fork Hood River slightly exceeded the levels recommended in the Watershed Analysis, but was at or perhaps below the Forest Plan standard. Stream surveyors combined all sediment less than 2 mm into one category so comparing the values directly with the Forest Plan standard is impossible, however, in the case of the West Fork Hood River the percent fines less than 1 mm would not exceed 20 percent and is likely less than that.

All the streams in the watershed are located near potential anthropogenic sources of fine sediment, including roads, timber harvest units, and denuded/bare soil areas under the BPA

power line corridor. These sources could contribute varying amounts of fine sediment depending on the location. In the West Fork Hood River, the level of fine sediment is also naturally elevated below Ladd Creek (its mouth is at river mile 13.2) due to its glacial source, but it is likely impacted by roads and bare soil areas under the BPA powerline corridor as is the lowest Red Hill Creek reach (USDA 2011c, 2002, 1996a,).

Table 8. The percent of surface fine sediment measured by Wolman pebble counts in streams within the Upper West Hood River 6th field watershed.

Stream	Year Surveyed	River Miles	Percent fines <6mm	Percent fines <2mm
West Fork Hood	2002	8.3 – 13.2	22	20
West Fork Hood	2002	13.2 – 14.0	21	20
McGee Creek	1997	0.0 – 3.3	10	8
Red Hill Creek	2011	0.0 - 0.9	20	9
Red Hill Creek	2011	0.9 - 1.5	4	4
Red Hill Creek	2011	1.5 - 2.4	Bedrock	Bedrock
Marco Creek	2011	0.0 – 1.0	1	1
Marco Creek	2011	1.0 – 2.2	0	1
Jones Creek	2000	0.0 – 1.8	4	2
Jones Creek	2000	1.8 – 2.8	12	7
Elk Creek	2006	0.0 – 1.1	2	0
Elk Creek	2006	1.1 – 1.6	6	2

Chemical Contamination

No point or non-point chemical contamination sources have been identified in the Upper West Fork Hood River 6th field watershed (ODEQ 2001).

Physical Barriers

Inventories of road-related barriers at stream crossings were completed in the MHNF portion of the Hood River Basin in 2001 (Asbridge 2002). Virtually all culverts surveyed were upstream fish passage barriers. Within the Upper West Fork Hood River 6th field watershed the MHNF has replaced one culvert barrier in Red Hill Creek with a bridge on FSR 1800. Other identified barriers still exist including one on McGee Creek and several on Marco, Tumbledown, and Elk Creeks. Other culvert barriers may exist on streams in the private land parcel, but surveys in this area have not been conducted.

Large Wood

Large wood plays an important role in stream ecosystems. Large wood modifies both hydrologic, sediment, and nutrient transport by slowing, storing, and redirecting stream water, sediments, and particulate organic matter (Montgomery et al. 2003). Additionally, large wood enhances stream habitat for fish, other vertebrates, and invertebrates by providing physical cover, enhancing habitat features such as pools, backwaters, and secondary channels, and creating slow velocity refugia. Having adequate levels of large woody debris is critical for healthy streams in forested ecosystems.

The LRMP (USDA 1990) has a standard of 106 pieces of suitable large wood per mile of stream (FW-095). For eastside streams, all pieces of large wood should be at least 35 feet long with 80

percent at least 12 inches in mean diameter, and at least 20 percent of large wood pieces should be over 20 inches in mean diameter. With the exception of McGee Creek in the lower 1.3 miles, none of the stream reaches surveyed in the sub-basin met the standard (Figure 6). The West Fork Hood River, Red Hill Creek and Marco Creek were well below Forest Plan standards; McGee Creek within the MHNF (the Forest boundary is at river mile 1.3) was also below standard, but not to the degree of the West Fork Hood River and Red Hill Creek (USDA 2011b, 2011c, 2002, 1997, 1996a).

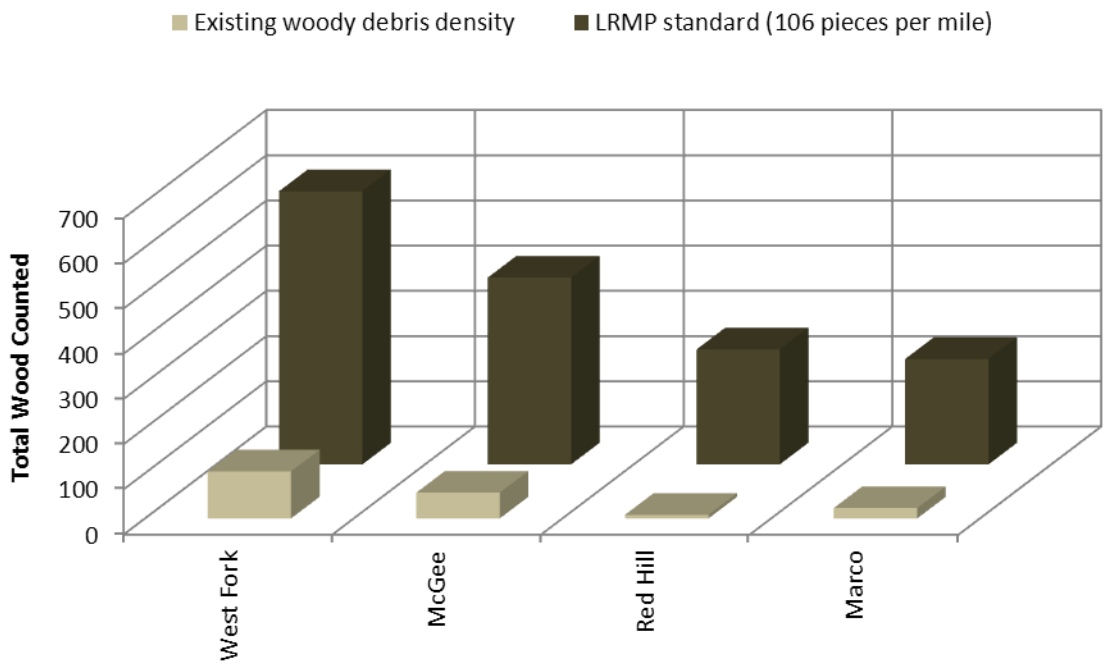


Figure 6. A comparison of existing large in-channel wood density with LRMP standards for four streams within the Upper West Fork Hood River 6th field watershed.

Pool Frequency

Pool habitat is a critical component of healthy stream habitat for salmonid populations. Pool frequency is often related to the occurrence of large wood or other channel obstructions (Montgomery et al. 1995). Pool frequency in streams within the Upper West Fork Hood River watershed is below LRMP standards although the West Fork Hood River approaches the standard (Figure 7) (USDA 2011b, 2011c, 2002, 1997, 1996a). In some streams and reaches the relative lack of pool habitat is a direct result of low levels of large wood, but in other streams the lack of pool habitat is more a function of geomorphology. In these areas it is likely that pool numbers would never meet LRMP standards.

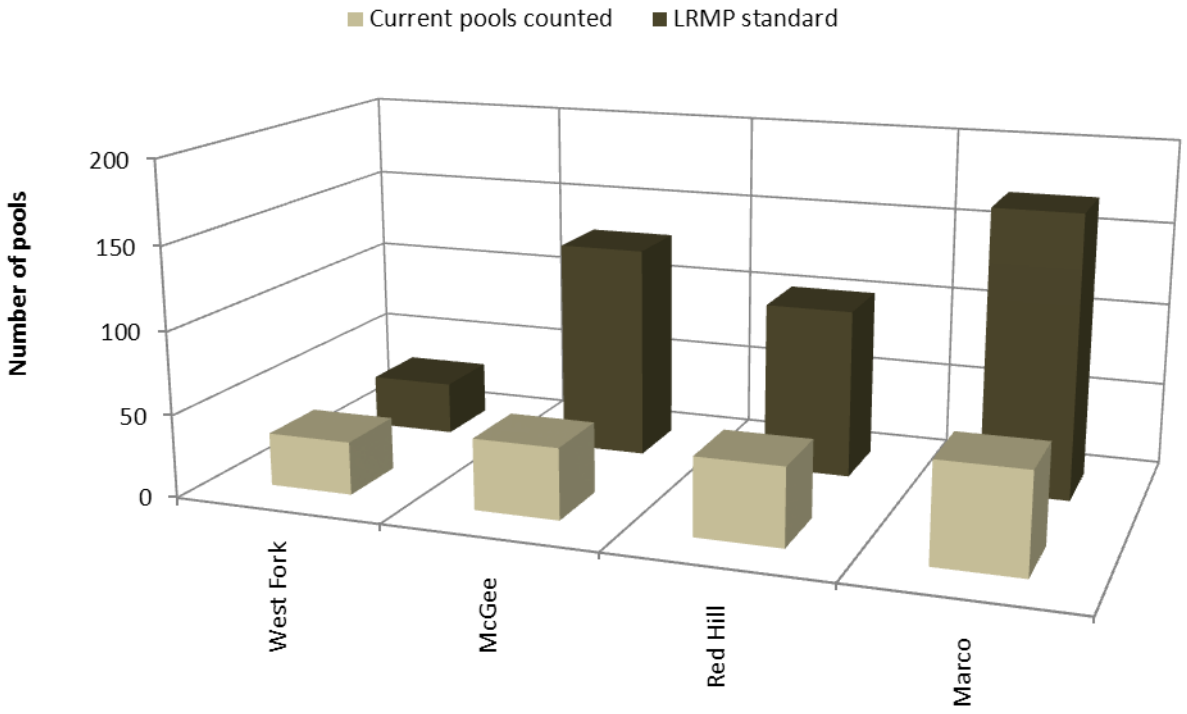


Figure 7. The existing number of pools in four streams within the Upper West Fork Hood River 6th field watershed compared with LRMP standards.

Pool Quality

Pool quality is a subjective measure of their "attractiveness" and suitability for fish and other aquatic fauna. Pools of higher quality are deeper and contain some form of cover for fish. Pools within streams in the Upper West Fork Hood River 6th field watershed did not appear to have reduced volume due to excessive amounts of fine sediment based on field observations conducted as part of the Red Hill Restoration Project. Large wood cover was adequate in McGee Creek, where restoration work in the form of large wood addition has occurred. In the West Fork Hood River, large wood cover is lacking in pools; however pools in the river tend to be very deep (averaging 4.0 to 4.6 feet deep in a 2011 survey conducted as part of a stream restoration project) which is itself a form of cover. Red Hill and Marco Creeks, which are deficient in large wood, did not have much cover in pools (Asbridge 2012).

To meet the LRMP standards, streams should contain one or more primary pools per 5 to7 channel widths in low gradient streams (< 3 percent slope) and one per 3 channel widths in steeper channels (FW-090/091). A primary pool is defined as a pool at least 3 feet deep, which occupies at least half of the low water flow channel. Pools this deep can provide more cover and thus be of higher quality than shallower pools. Pool depth is related to shear stress and sediment input; fine sediment above natural background levels can fill pools and increase bed mobility, resulting in shallower scour depths (Buffington et al. 2002). The number of primary pools per mile in the Upper West Fork Hood River 6th field watershed ranged from 4.6 to 16 and no streams surveyed met the LRMP standard (USDA 2011b, 2011c, 2002, 1997, 1996a).

Off-channel Habitat

The amount of side channel habitat within the West Fork Hood River 6th field watershed is below historic conditions due to disconnection with the floodplain in several streams and reaches as described above. Lower gradient stream reaches with high quality side channel habitat with large wood providing roughness and cover is lacking. In 2002, side channels comprised only 8.3 percent of available habitat in the West Fork Hood River within the MHNF (USDA 2002). In both Red Hill and McGee creeks, side channel habitat was low and surveyors noted that they provided limited fish habitat due to minimal flow at the time of the survey (USDA 1996c, 1997); however, given geomorphic constraints neither of these streams would be expected to have a large amount of side channel habitat and would be restricted to certain areas.

Refugia

Refugia, in the context of fish habitat, are habitats of high importance for one or more life stages of salmonids or other aquatic species. In some cases refugia can apply to one specific habitat or environmental component, such as thermal refugia – areas of cold water where salmonids can escape surrounding or downstream areas of warmer water. Refugia often harbor more fish, or a specific life stage, more than other areas within a stream or watershed. Such areas within the Upper West Fork Hood River 6th field watershed exist, but they have not been specifically delineated or mapped. The lower reaches of McGee Creek and Jones Creek are both important as spawning areas for adult anadromous salmonids and subsequent rearing areas for their offspring and they are focal areas for steelhead and Chinook salmon. The same holds true for the West Fork Hood River above Ladd Creek. Clear, cold water coupled with excellent spawning and rearing habitat (in large part due to past restoration efforts) have combined to create a river reach that is disproportionately utilized by both adult and juvenile salmonids. Other streams within the watershed may have short reaches of important habitat, but there are no other areas that approach the utilization and importance of those described above.

Width/Depth Ratio

Stream channels and floodplains in the Upper West Fork Hood River watershed have been simplified and modified due to past management practices, primarily the removal of large wood. Subsequent channel response has ranged widely depending on the geology and landform of the streams in the basin. As such, there are segments of many streams which tend to have high width to depth ratios. For example the main-stem West Fork Hood River has width to depth ratios that are very high (50:2) in some places. On the other hand, there are multiple segments of that river where width to depth are considered to be properly functioning (11:4). In general, most reaches are within the range of natural condition for this parameter, though ranging towards the lower end of the scale (USDA 2011b, 2011c, 2002, 1997, 1996a).

Limiting Factor Analysis for Anadromous Fish

A Hood River Basin-wide analysis of factors limiting salmonid production was conducted as part of the 2004 Hood River Subbasin planning process using the Ecosystem Diagnosis and Treatment (EDT) model (Coccoli 2004). The following description of EDT is an excerpt from the Mobrand Biometrics website (http://www.mobrand.com/edt.htm):

> "The Ecosystem Diagnosis and Treatment (EDT) is a species habitat-relationship model developed for anadromous and resident salmonids. It has been developed over a number of years primarily by state, tribal, local and private interests in the Pacific Northwest.

> This type of mode links habitat characteristics to biological features of fish and wildlife species. In practice, EDT is a process for assembling and organizing watershed information as a basis for development and implementation of recovery and management plans. It is based on the premise that restoration of specific species will primarily involve restoration of their ecosystems. EDT provides a detailed depiction of the environment and an assessment of that environment with regard to performance of fish and wildlife populations. Environment includes physical habitat features as well as biological interactions such as predation and competition. Reach specific data for 46 parameters are loaded into the model for both existing (Patent) condition and historic (Template) conditions, based on range of natural variation. Model outputs allow for interpretation of variance between existing and historic conditions and cumulative adverse impacts to target juvenile salmonids. Cumulative impacts are tallied as fish move downstream through other reaches to the Columbia River, Pacific Ocean and then as they return as adults."

The Hood River Basin EDT model analysis was populated with available habitat and water quality information and primarily relied on stream survey data from MHNF Level 2 stream surveys, ODFW physical habitat surveys, and CTWS aquatic surveys. Initial analysis was completed by Mobrand Biometrics and the results were reviewed and scrutinized by the Hood River subbasin planning team for accuracy and a "common sense" assessment. For example, initial model runs greatly overestimated fall Chinook salmon abundance and production in the lower watershed so the team worked with Mobrand to adjust model parameters so that results better matched environmental constraints and known/expected population levels. This was required primarily because the Hood River Basin, given its glacial nature and propensity for natural disturbance, was somewhat outside model assumptions that fit well for other watersheds. The team was careful to approach such adjustments in an objective manner and in the end, even if model outputs did not match expected production for a specific species, the team accepted the limiting factor analysis and specific key limiting factors as realistic.

Model outputs included both the relative importance of geographic areas (i.e., streams) for protection and restoration as well as specific limiting factor priorities for restoration (Tables 9 and 10). In EDT, protection and restoration are not mutually exclusive, in fact they are often complimentary because streams important to preserve are classified as such because degradation would have a disproportionately severe impact on a focal species. These same streams often have a high restoration value because a restorative treatment addressing a key limiting factor(s) would result in considerably more benefit than in a lower restoration priority stream. Both the West Fork Hood River and McGee Creek ranked high for restoration and protection for summer steelhead and spring Chinook. These were the only streams modeled in the Upper West Fork Hood River 6th field watershed for spring Chinook. Elk, Jones, and Red Hill Creeks were of lesser importance in regards to steelhead protection/restoration.

Key limiting factors were the same for both summer steelhead and spring Chinook salmon in modeled streams (Tables 9 and 10). Sediment load and key habitat quantity were ranked relatively high from a restoration perspective in virtually all streams (no stream had a limiting factor that rated high, all were medium or low). In the West Fork Hood River, channel stability

was also important. Interestingly, habitat diversity was an important spring Chinook salmon limiting factor for restoration, but not for steelhead.

For reference, EDT definitions of key limiting factors in the Upper West Fork Hood River are outlined below. All limiting factors need to be viewed in the context of a focal species and life stage. Not all limiting factors affect all life stages for a given species in a given stream.

- Channel stability: the susceptibility of a stream channel to bed scour, especially during key life stage periods such as egg incubation and fry colonization.
- Flow: the alteration of both peak and base flows compared to the template (historic) condition and the effect that alteration has on the focal species. In the Upper West Fork Hood River this has more to do with increased magnitude and frequency of peak flows since there are no water withdrawals in the watershed.
- Habitat diversity: the effect that the extent of habitat complexity within a stream reach has on the relative survival or performance of a focal species. Basically, the more diverse the habitat the greater the chance the species will survive and flourish.
- Sediment load: the effect the amount of fine sediment present in, or passing through, a stream reach has on the relative survival or performance of the focal species.
- Key habitat quantity: a key habitat is the primary habitat used by a particular focal species life stage and quantity is expressed as the percent of wetted surface area of the channel. An obvious example is pool tails and cobble/gravel riffles for adult spawning.

Many of the proposed restorative actions outlined later in this document would directly address key limiting factors highlighted by EDT. Large wood addition would directly address channel stability, habitat diversity, and key habitat quantity. Improvements in these areas have been seen in streams already treated with large wood since 2004, namely McGee Creek, Elk Creek, and portions of the West Fork Hood River. Road decommissioning and storm-proofing would address sediment load in all streams by reducing erosion rates from roads in upland and riparian areas. Some restorative actions proposed in this document do not relate specifically to EDT outputs because the EDT modeling focused on anadromous fish bearing stream reaches and even in that context not all anadromous, or potentially anadromous, reaches were considered given the time and expense involved in the modeling. For example, the culverts proposed for replacement in this plan to improve fish passage are, with one exception, located on resident fish bearing streams or reaches. The exception is McGee Creek and in that case the EDT modeling ended at the FSR 1800 crossing thus it was not flagged as a barrier.

Table 9. The relative protection and restoration ranks and key limiting factor restoration priorities (High, Medium, and Low) for summer steelhead trout bearing streams analyzed using the EDT model as part of the 2004 Hood River subbasin planning process. The modeling encompassed the entire range of summer steelhead in the Hood River Basin, but only those streams located within the Upper West Fork Hood River 6th field watershed are included, thus the protection and restoration ranks contain some gaps. If a limiting factor is not assigned a priority it means EDT did not consider it a summer steelhead limiting factor for that stream.

Stream	Protection Rank	Restoration Rank	Limiting Factor Restoration Priority				
			Channel Stability	Flow	Habitat Diversity	Sediment Load	Key Habitat Quantity
West Fork Hood River	2	1	M	L	L	M	M
Red Hill Creek	6	5	L	L	L	M	M
McGee Creek	3	3	L	L	L	M	M
Elk Creek	5	4	L	L	L	M	M
Jones Creek	4	6		L			M

Table 10. The relative protection and restoration ranks and key limiting factor restoration priorities (High, Medium, and Low) for spring Chinook salmon bearing streams analyzed using the EDT model as part of the 2004 Hood River subbasin planning process. The modeling encompassed the entire range of spring Chinook in the Hood River Basin, but only those streams located within the Upper West Fork Hood River 6th field watershed are included, thus the protection and restoration ranks contain some gaps. If a limiting factor is not assigned a priority it means EDT did not consider it a spring Chinook limiting factor for that stream.

Stream	Protection Rank	Restoration Rank	Limiting Factor Restoration Priority				
			Channel Stability	Flow	Habitat Diversity	Sediment Load	Key Habitat Quantity
West Fork Hood River	1	1	M	L	M	M	M
McGee Creek	3	3	L	L	M	M	M

Restoration Goals, Objectives, and Opportunities

Goal Identification and Desired Condition

Goal Identification

The goal of the Upper West Fork Hood River WRAP is to provide an operational scale tool for restoring the watershed by strategically focusing investments on essential watershed improvement projects and conservation practices at the 6th field watershed scale. The WRAP tiers to several existing plans developed by a variety of stakeholders for the Hood River Basin. Two complementary restoration plans, the Hood River Aquatic Habitat Restoration Strategy (USDA 2006) and Hood River Watershed Action Plan (Stampfli 2008), guide participating entities to coordinate future investments in aquatic habitat restoration in a manner that leverages limited resources where they provide the greatest benefits to the long-term recovery and healthy functioning of salmon and steelhead habitat in the basin. The Upper West Fork Hood River WRAP builds on and refines these broader restoration plans. Key river, riparian, and upland areas will be restored to maximize the habitat potential for anadromous fish production. The projects are targeted towards restoring natural watershed processes and population connectivity, leading to a more resilient watershed better able to withstand extreme weather conditions associated with climate change. Restoration work will continue until the essential projects are completed. Project planning and implementation will be integrated with Forest, District and partner priorities (primarily CTWS).

Desired Condition

The desired condition for the Upper West Fork Hood River watershed is a resilient and properly functioning watershed characterized by clean and abundant water, diverse and complex terrestrial, riparian and aquatic habitat conditions, and self-sustaining populations of anadromous and resident fish species.

Objectives

Alignment with National, Regional, and Forest Priorities

The Upper West Fork Hood River WRAP tiers to the West Fork Hood River 5th field Watershed Analysis (USDA 1996a) – prepared per direction under the Aquatic Conservation Strategy (ACS) of the 1994 Northwest Forest Plan (USDA and USDI, 1994). The Hood River Aquatic Habitat Restoration Strategy (Shively 2006) was completed to guide restoration implementation in the priority Hood River Basin per direction under the 2005 R6 Aquatic Restoration Strategy (USDA 2005). The 2005 strategy was later replaced with the 2008 R6 Aquatic Restoration Conservation Strategy (USDA 2008), a foundational regional strategy for incorporation into forest plans.

The 2012 Upper West Fork Hood River WRAP is an update to the Hood River Aquatic Habitat Restoration Strategy (Shively 2006) under the guidance of the national 2010 Watershed Condition Framework (USDA 2010).

Alignment with State or Local Goals

The 2006 Hood River Aquatic Habitat Restoration Strategy was a cohesive, comprehensive, and collaborative approach that built upon the breadth and diversity of existing partnerships, all of

the participating entities in the basin supported the development of the restoration strategy. The aquatic restoration strategy for the Hood River Basin provides a geographic focus and hierarchical framework for directing future investments toward high priority restoration needs.

The strategy:

- Prioritizes 6th field watersheds in the Hood River Basin to address freshwater habitat restoration needs of salmon, steelhead, bull trout, and resident trout populations.
- Establishes a hierarchy, or sequence, in which actions should be pursued in order to focus scarce monetary and personnel resources in target watersheds.
- Describes the factors limiting salmonid abundance, productivity, spatial distribution, and diversity. Many of these same factors also limit water quality.
- Defines specific restoration actions (and types of restoration actions where they are not known site-specifically) in priority watersheds necessary to address limiting factors.

This 2012 WRAP takes information from previous planning efforts, including the 2006 Hood River Aquatic Habitat Restoration Strategy, and adds new information to identify those essential projects needed to improve the watershed condition class. The watershed condition class is an outcome-based performance measure of progress toward restoring the productivity and resilience of the watershed. The Upper West Fork Hood River WRAP can be viewed as the operational scaled (6th field HUC) plan which tiers to the broader Hood River Aquatic Restoration Strategy.

Opportunities

Partnership Involvement

As described in the background section of this document, a strong and productive partnership exists within the Hood River Basin. This coalition of stakeholders has collaborated on funding acquisition and numerous restoration plans and projects furthering conservation and recovery efforts for anadromous and resident fish populations in the basin. Guiding this effort are the complementary restoration strategies (Shively 2006 and Stampfli 2008) that focus and coordinate future investments in aquatic habitat restoration in a manner that leverages limited resources where they provide the greatest benefits to long-term healthy functioning habitat in the basin.

All of the partners are committed to restoration efforts that result in improved watershed function and resiliency. The Upper West Fork Hood River WRAP sharpens focus at a 6th field watershed scale and provides the operational footprint for completing restoration actions that are part of the broader basin-wide planning effort. The Hood River Basin partners meet as needed to coordinate/strategize funding opportunities, plan projects, discuss implementation logistics, and maintain strong working relationships.

Agreements & Funding Partners

Partners working in the Hood River Basin have an existing suite of agreements and funding sources in place and out-year strategies prepared to continue funding watershed restoration projects and partnerships. Some of these instruments include: Challenge Cost Share Agreements, Whole Watershed Restoration Initiative (WWRI), Oregon Watershed Enhancement Board (OWEB), Secure Rural Schools and Community Self-Determination Act (commonly referred to as Payco), USDA appropriated funding in the areas of fish/wildlife/botany (NFWF),

vegetation and watershed management (NFVW), legacy roads (CMLG), and up to 12 entities with internal funding opportunities (see below).

Restoration Planning and Implementation Partners

The following entities will continue to work together in both planning and implementation phases of WRAP execution.

Confederated Tribes of the Warm Springs Reservation of Oregon	www.warmsprings.com
Hood River County	www.co.hood-river.or.us
Hood River Soil and Water Conservation District	www.hoodriverswcd.org
Hood River Watershed Group	www.hoodriverswcd.org/hrwg.htm
Longview Timber, LLC	www.longviewtimber.com
Mt. Hood National Forest	www.fs.fed.us/r6/mthood
National Marine Fisheries Service	www.nmfs.noaa.gov
Northwest Steelheaders	www.sandysteelheaders.org
Oregon Department of Fish and Wildlife	www.dfw.state.or.us
The Freshwater Trust	www.thefreshwatertrust.org
U. S. Fish and Wildlife Service	www.fws.gov
Western Rivers Conservancy	www.westernrivers.org

Outcomes/Output

Performance Measure Accomplishment

- Restore natural watershed conditions and processes, including:
  - stream and floodplain function,
  - restore fish passage and thus population connectivity,
  - reduce road density,
  - increase culvert capacity to naturally route water, sediment and debris,
  - control/eradicate invasive plants, and
  - improve upland and riparian forest structure, density, and health
- Improve water quality in the Upper West Fork Hood River and tributaries by reducing sediment delivery from road related impacts.
- Maintain and strengthen partnerships between the MHNF and other watershed stakeholders.
- Provide jobs to local contractors and material suppliers.

Socioeconomic Considerations

Work to be performed in the Upper West Fork Hood River 6th field watershed will contribute to the local communities' socioeconomic success by:

- Providing jobs to local contractors by implementation of road and in channel work utilizing heavy equipment, such as front loaders, excavators, dump trucks, bull dozers, helicopters, yarders, and log hauling trucks.
- Employing contractors to supply materials not readily available on the forest, such as rock, logs, culverts, tools, and other supplies.

- Hiring engineering firms with expertise in river restoration to design in stream structures appropriate for hydraulic conditions.
- Contracting work involving tree thinning/hauling/invasive species removal and riparian planting work.
- Restoration in the Upper West Fork Hood River 6th field watershed will contribute to ongoing efforts to conserve and restore depressed populations of salmon and steelhead. These species, particularly spring Chinook salmon, are a culturally significant fish for the CTWS and they also provide a fishery that employs local guides and fuels local tackle retailers/manufacturers, and numerous other small businesses that depend at least in part on angling revenue.
- These projects would contribute to the recovery of several species of ESA listed fish, which are part of the heritage of the Pacific Northwest.
- Increasing the socioeconomic value of the forest from a recreational quality perspective, especially if the private parcel is acquired.

Specific Project Activities (Essential Projects)

Background – Past restoration efforts and prioritization process

Past Restoration Efforts

Historically the West Fork Hood River and tributaries, especially McGee Creek, provided high quality spawning and rearing habitat for coho, spring Chinook, summer steelhead, and resident rainbow trout. This 6th field watershed is the key spawning and rearing area for spring Chinook salmon in the Hood River Basin and the West Fork Hood River is the only 5th field watershed that supports summer steelhead trout in the Hood River Basin (Coccoli 2004, Shively 2006).

Numerous stream habitat restoration projects were implemented in the Upper West Fork Hood River watershed over the last 20 years. Project designs have evolved from single logs usually anchored to trees and/or boulders with cable to multiple log structures and finally logjams of various sizes along with large wood placed on the floodplain in anticipation of channel shifts. Streams treated with LWD in the watershed include West Fork Hood River, McGee

Creek, Elk Creek, Jones Creek, and Red Hill Creek. Multiple projects have occurred in the West Fork Hood River as it is the most important spawning and rearing area for anadromous salmonids. Stream response to habitat creation/maintenance has varied depending on the location; in most treated reaches the placed large wood has created excellent spawning and/or rearing habitat and often accumulated additional woody debris, aggraded the channel, and collected spawning gravel. However, in a few areas flood events have caused many of the wood structures to become mobilized and they now provide little habitat benefit. In these areas, many large pieces of wood are now parallel to the flow of the stream. Some project reaches have yet to experience significant high water that would lead to wood accumulation and habitat formation.

Compared to other watersheds, the Upper West Fork Hood River has relatively few anadromous fish passage barriers. One of these, Red Hill Creek at FSR 1800, was remediated in 2011 when a bridge was installed to replace the culvert barrier. The other, McGee Creek at FSR 1800, is currently in the design phase and it is included in this restoration plan as an essential project. Several resident fish/aquatic organism culvert barriers are present in the watershed and they are also included in this plan.

Habitat degradation due to high volumes of fine sediment from roads due to chronic erosion and mass road failures is well documented. Decommissioning roads in the Hood River Basin has been a top priority and eight miles of road have been decommissioned in the Upper West Fork Hood River 6th field watershed alone since the early 1990's. However, many more roads or road segments in the Upper West Fork Hood River have been identified for decommissioning, storm-proofing, or closure. There are also numerous stream crossings within the basin that have undersized culverts requiring replacement with appropriate size culverts.

Prioritizing Watersheds on the Mt. Hood National Forest

The Upper West Fork Hood River 6th field watershed lies within the Hood River Basin, which is a priority watershed for restoration in the Pacific Northwest Region of the USDA Forest Service. Of the twelve sub-watersheds within the Hood River Basin, the Upper West Fork Hood River sub-watershed ranked 7th using a ranking process based on fish species present, water quality/quantity, and watershed condition (Shively 2006). Although other 6th field watersheds in the Hood River Basin ranked higher, there are compelling reasons why the Upper West Fork Hood River was chosen as one of two priority watersheds on the MHNF for implementation under the Watershed Condition Framework (WCF):

- Most of the higher priority 6th field watersheds in the Hood River Basin are primarily in non-federal ownership that would increase the difficulty to implement watershed restoration projects, especially within a five year time frame.
- The West Fork Hood River is the stronghold watershed in the basin for spring Chinook salmon and summer steelhead trout.

- The CTWS considers the West Fork Hood River the priority watershed in the basin for salmon and steelhead restoration. The CTWS is a willing restoration partner with secure funding to contribute towards a variety of projects for the next decade.
- Significant progress has been made in the watershed in terms of restoration projects completed. This progress will help ensure success under the WCF.
- All proposed restoration projects address known limiting factors in the watershed.

For the above reasons the MHNF will implement the WCF restoration actions in this watershed. The Forest Service WCF is designed to proactively implement integrated restoration on priority watersheds and to enhance communication and coordination with partners (USDA 2011a).

Prioritizing essential projects

The goal of the Upper West Fork Hood River watershed restoration action plan is to accelerate recovery of naturally functioning conditions within the watershed to improve long and short-term survival and restore production of juvenile and adult coho salmon, spring Chinook salmon, summer steelhead, and resident rainbow trout. The series of projects proposed as "Essential Projects" (Table 11) are intended to accomplish this goal by focusing primarily on the following watershed restoration areas:

- Purchase of a private land in-holding that contains important anadromous and resident fish bearing streams, including the West Fork Hood River, as well as over 100 acres of riparian forest.
- Improving stream and floodplain function by adding large wood to stream channels and associated floodplains.
- Replacing culvert barriers to fish passage with crossings that not only pass fish and other aquatic fauna, but are sized to route large floods and associated debris.
- Replacing undersized culverts on non-fish bearing streams with crossings that pass large floods and associated debris.
- Reduce chronic erosion and subsequent stream sedimentation by decommissioning, storm-proofing[3], or closing roads.
- Improve riparian forest vegetative species, structural diversity, resiliency, and accelerate tree growth by selective thinning.
- Eradicate or control invasive plant species using rapid response strategies.

Essential Project Activities

Restoration projects in this plan include stream channel and floodplain habitat restoration, fish passage remediation, riparian thinning, undersized culvert replacement, road decommissioning or other improvements, and invasive plant treatment (Table 11, Figures 8 and 9). The stream channel and floodplain habitat restoration includes addition of logjams in primary and secondary channels, re-watering historic side channels, and floodplain large wood addition to increase roughness and erosion resiliency. Connectivity will be restored in several streams by replacing culverts that are migration barriers with crossings that pass fish and other aquatic fauna. Riparian enhancements include thinning overstocked conifer stands and invasive plant removal.

[3] Storm-proofing includes a number of treatments to place a road or road segment in a hydrologically stable condition that is less prone to erosion and/or mass failure. Treatments can include removing culverts, installing waterbars, spot rocking erosion prone areas, out-sloping the road surface, and seeding with grass or other plants.

Undersized culverts will be replaced to pass large floods and debris and limit road-related sediments from entering the streams. Road decommissioning and storm-proofing will reduce road density and chronic soil erosion.

Table 11. Essential project activities. All proposed projects are located in the Upper West Fork Hood River 6th field sub-watershed and most are on federal land. Outputs for fish passage (FC) improvement are miles accessible once the culvert is replaced, for culvert enlargements (SC) the output is distance to the next road crossing downstream. Displayed funding is listed in thousands (1 = $1,000).

Essential Project Number*	Project Name	Project Description	Output or Improvement	Cost
L-1	Purchase of Private In-holding	Purchase 1600 acre Longview Timber, LLC in-holding	1882 ac acquired	3500
LWD-1	West Fork Hood River Large Wood Addition – Marco Reach Phase 2	Add whole trees to primary West Fork Hood River channel in reach previously treated on floodplain	1.0 miles	400
LWD-2	West Fork Hood River Large Wood Addition – Red Hill to Ladd	Add large wood to depositional reach, including side channels and floodplain between Ladd Creek and downstream end of Longview Timber parcel	1.0 miles	350
LWD-3	Red Hill Creek Large Wood Addition	Add large wood to the channel and floodplain in lower one mile of Red Hill Creek	0.9 miles	130
FC-1	Marco Creek Passage Remediation, FSR 1800	Replace existing culvert with a passable crossing	0.7 miles	245
FC-2	Marco Creek Passage Remediation, FSR 1600	Replace adjacent culverts with passable crossings	0.8 miles	135
FC-3	Tumbledown Cr. Passage Remediation, FSR 1800	Replace existing culvert with a passable crossing	0.4 miles	205
FC-4	McGee Creek Passage Remediation, FSR 1800	Replace existing culvert with a passable crossing	2.3 miles	527
FC-5	Elk Creek Passage Remediation, FSR 1800	Replace existing culvert with a passable crossing	0.7 miles	165
FC-6	McGee Creek Tributary Passage Remediation	Replace existing culvert under Longview Timber logging road with a passable crossing	0.15 miles	90
SC-1	Stream Crossing Enlargement, FSR 1340	Replace existing culvert with crossing designed to pass 100-year flood	0.5 miles	37
SC-2	Stream Crossing Enlargement, FSR 1600	Replace existing culvert with crossing designed to pass 100-year flood	0.4 miles	92

Essential Project Number*	Project Name	Project Description	Output or Improvement	Cost
SC-3	Stream Crossing Enlargement, FSR 1800	Replace existing culvert with crossing designed to pass 100-year flood	0.2 miles	132
SC-4	Stream Crossing Enlargement, FSR 1800	Replace existing culvert with crossing designed to pass 100-year flood	200 feet	132
SC-5	Stream Crossing Enlargement, FSR 1800	Replace existing culvert with crossing designed to pass 100-year flood	0.17 miles	132
R-1	FSR 1800-100 Road Relocation Outside WFHR Floodplain	Relocate portion of FSR 1800-100 away from West Fork Hood River flood prone area; decommission old roadbed.	0.3 miles	113
R-2	Red Hill Restoration Project Road Decommissioning/Closure	Close, stormproof, or decommission segments of several roads in the watershed after timber sale activities completed	26 miles	290
R-3	BPA Powerline Road Storm-proofing	Storm-proof roads used to access the powerline for maintenance/repair	9 miles	120
RT-1	McGee Creek Riparian Thinning 1	Thin riparian stand to improve forest health and increase remaining tree growth	24 ac	45
RT-1	McGee Creek Riparian Thinning 2	Thin riparian stand to improve forest health and increase remaining tree growth	27 ac	75
I-1	Invasive Plant Control/Eradication	Treat known and new infestations with a variety of methods	200 ac	135

*L = Land Acquisition, LWD = Large Wood Introduction, FC = Fish Passage Remediation, SC = Stream Crossing (non-fish passage related), R = Road Closure/Decommissioning, RT = Riparian Thinning, I = Invasive Plant Treatment

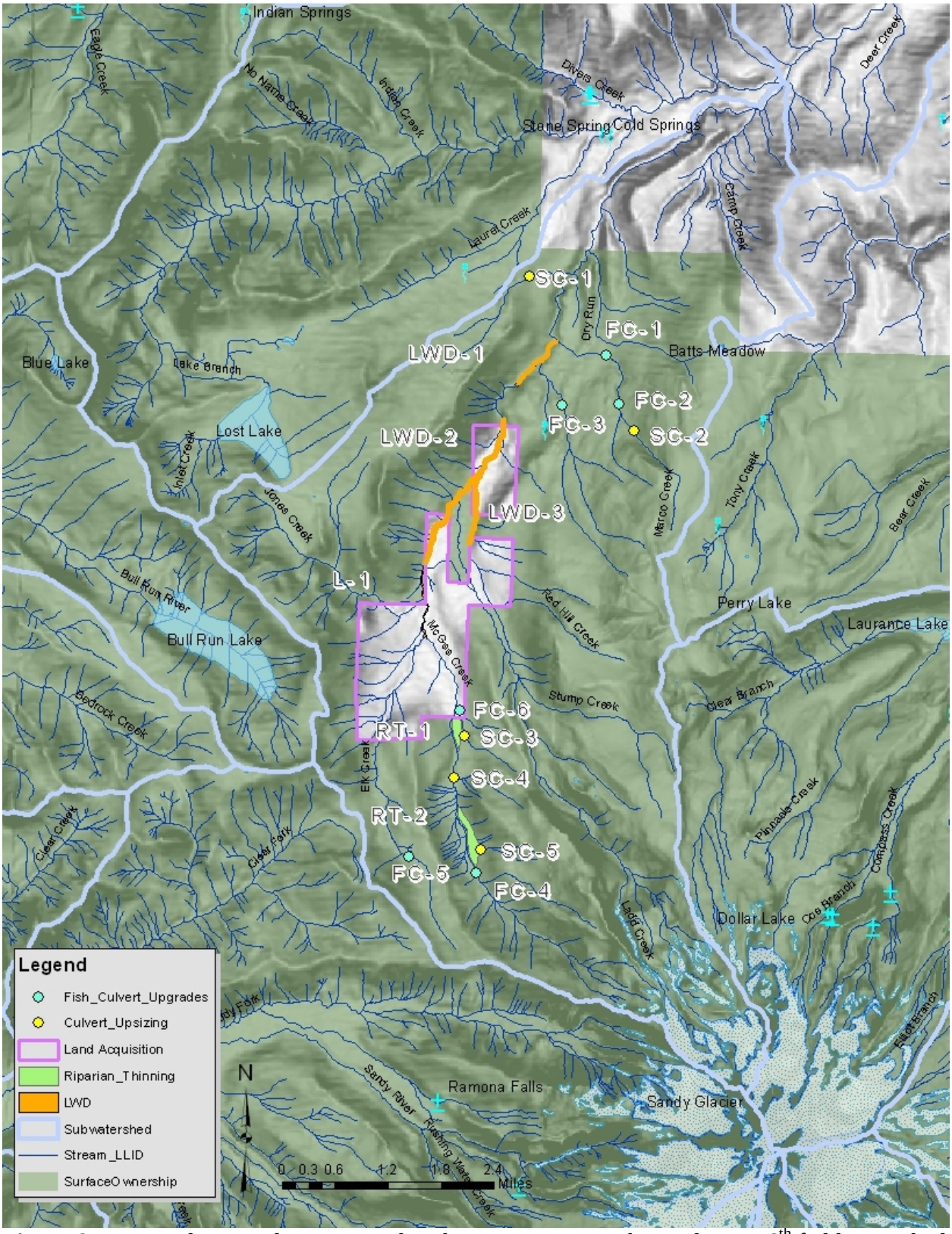


Figure 8. Essential project locations within the Upper West Fork Hood River 6th field watershed that do not involve road decommissioning/storm-proofing/closure. Invasive plant treatment is not displayed as infestations occur in many locations throughout the watershed.

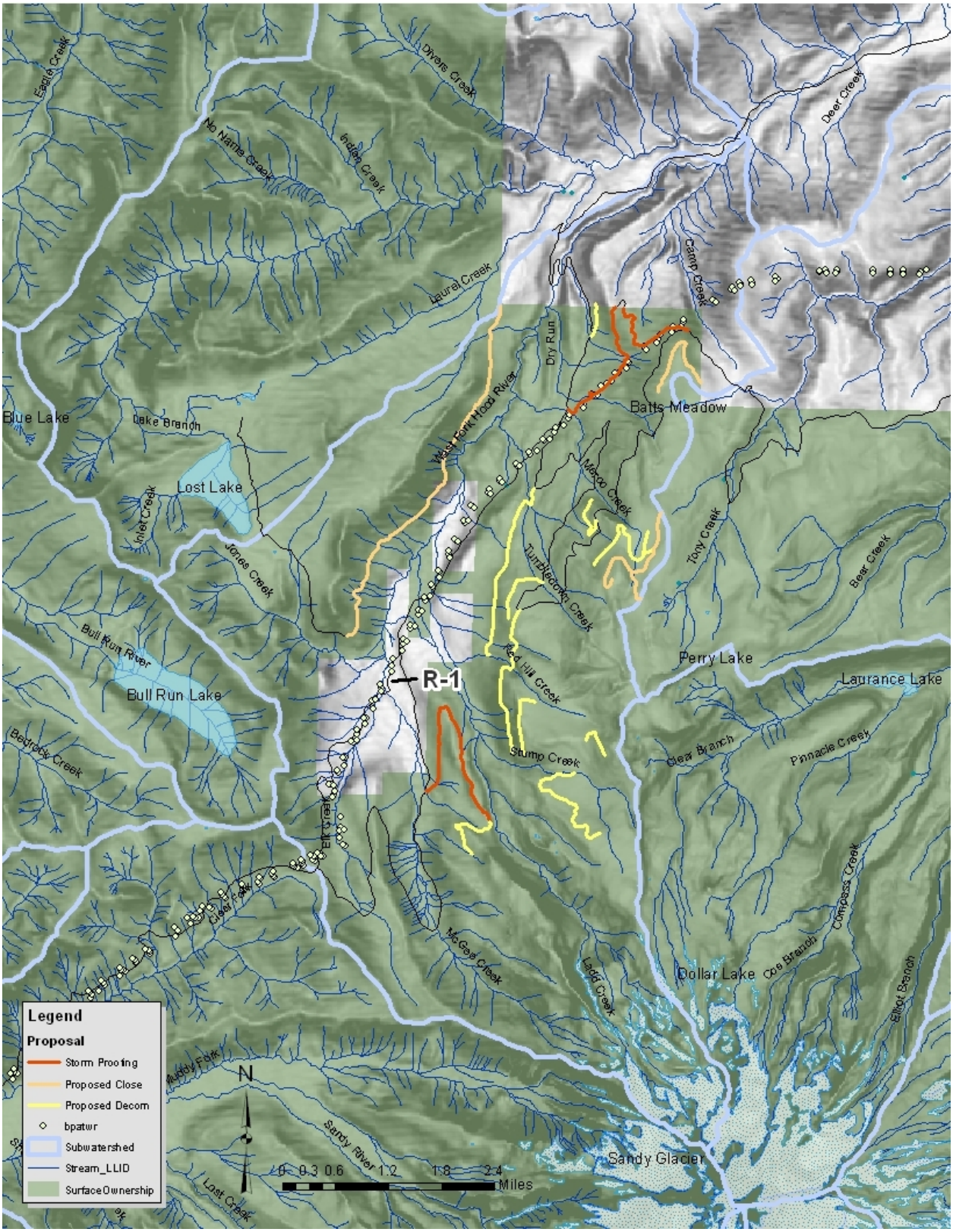


Figure 9. Road decommissioning, road storm-proofing, and road closure locations within the Upper West Fork Hood River 6th field watershed.

Essential Project Descriptions

Essential Project L-1

Project Name: Purchase of Private In-holding

Attribute Addressed: Specific projects unknown, but the following attributes likely addressed once acquisition made - 3.1 Aquatic Habitat – Habitat Fragmentation, 3.2 Aquatic Habitat – LWD, 5.1 Riparian Vegetation Condition, 6.1 Open Road Density, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting, 7.2 Soil Erosion, and 11.1 Invasive species extent and rate of spread.

Project Description: Acquire, through purchase from an intermediary (Western Rivers Conservancy) a 1,882 acre privately owned parcel located entirely within the proclaimed boundary of the MHNF. The parcel is very important as it is the only private land in-holding within the upper West Fork Hood River watershed; it contains over 6 miles of perennial fish bearing stream and 100 acres of riparian area. Note that complete Upper West Fork Hood River watershed restoration cannot be completed without acquisition of this privately owned parcel. Acquisition supports the survival and recovery of several fish species listed as Threatened under the federal Endangered Species Act including Hood River steelhead trout, bull trout, coho salmon, and Chinook salmon. Summer steelhead trout, coho salmon, and spring Chinook salmon all reside in streams located within the parcel, and many stream sections are designated critical habitat for salmon, steelhead, and bull trout (bull trout do not currently occupy the watershed). The West Fork Hood River is one of the few remaining Oregon watersheds to support naturally reproducing summer steelhead in the entire Lower Columbia Steelhead Distinct Population Segment. The property provides high-quality cold water, spawning gravels and woody debris that benefits the fishery resource in the West Fork Hood River and the Hood River mainstem downstream. This land parcel is currently managed for intensive timber production. Once acquired there are a host of potential projects that could be completed ranging from pre-commercial thinning, riparian and upland thinning to improve forest health, road maintenance, road decommissioning, bridge removal (if determined roads no longer needed), invasive plant treatment, culvert replacement, and possibly stream and floodplain restoration. We have a partnership with Longview Timber, LLC and some projects in this plan (LWD-2, LWD-3, FC-6, R-1, and I-1) would be implemented on their property regardless of the land acquisition outcome. Other potential projects that could be completed if the parcel were acquired are not listed in this plan.

Land Ownership: Longview Timber, LLC

Partners Involvement: The primary partner for this project is Western Rivers Conservancy. They have committed to purchase the parcel from Longview Timber, LLC if the Forest Service can obtain the funding from congress to subsequently purchase the parcel from them. The MHNF has submitted this land acquisition proposal to congress (potential funding is through the Land and Water Conservation Act of 1965) every year since 2010 and we plan to continue submissions given its importance for salmon and steelhead recovery.

Timeline: The forest is proposing acquisition in 2 phases: the 1,122 acre southern portion of parcel in 2014 and remainder of parcel in 2015. NEPA is not required for land acquisition but and environmental analysis would be required to pursue most of the potential restoration projects listed above.

Estimated costs and Associated BLI: $3,500,000; LALW

Essential Project LWD-1
Project Name: West Fork Hood River Large Wood Addition - Marco Reach Phase 2
Attribute Addressed: 3.2 Aquatic Habitat – LWD
Project Description: The West Fork Hood River supports steelhead trout, Chinook salmon, and coho salmon, and is also designated critical habitat for bull trout. In certain reaches, including this one, the stream is lacking large wood primarily due to past logging, associated stream clean out, and natural flood events. A project was implemented in a 0.7 section of this reach in 2012 that focused on large wood placement along the channel margin, in the floodplain, and in side channels. Phase 2 would add to this wood by placing whole trees with root wads in the main channel and augmenting previously placed wood on channel margins. Up to 200 whole trees would be added to a 1.0 mile stream reach and associated floodplain using a heavy lift helicopter (likely a Chinook or Skycrane). The goal for this project is to increase the amount of channel and floodplain large wood thereby increasing channel and floodplain roughness, aggrading the channel, increasing channel/floodplain connectivity, and enhancing salmonid spawning and rearing habitat. This project is dependent on finding adequate numbers of suitable sized whole trees with root wads near enough to fly into the reach with a heavy lift helicopter. If a wood source meeting this description cannot be found the project would not be implemented.
Land Ownership: MHNF
Partners Involvement: The primary partner for this project is CTWS, but this type of project has wide ranging support from other basin partners including ODFW, HRSWCD, HRWG, NMFS, and USFWS. CTWS would provide a significant amount of the funding required to implement this project with the remainder obtained from a combination of other sources include Payco, appropriated Forest Service funds, CCS, and WWRI.
Timeline: NEPA analysis is completed for this project. Implementation depends on finding a suitable tree source and then obtaining the necessary funding. Likely implementation would be 2016. Monitoring would occur pre-project, immediately following implementation, and yearly for 5 years thereafter.
Estimated costs and Associated BLI: $400,000; NFWF, Payco, CTWS funding

Essential Project LWD-2
Project Name: West Fork Hood River Large Wood Addition – Red Hill to Ladd
Attribute Addressed: 3.2 Aquatic Habitat - LWD
Project Description: The West Fork Hood River supports steelhead trout, Chinook salmon, and coho salmon, and is also designated critical habitat for bull trout. In certain reaches, including this one, the stream is lacking large wood primarily due to past logging, associated stream clean out, and natural flood events. In this reach, especially in the vicinity of Red Hill Creek, there is a wide floodplain with multiple side channels, but there are signs of channel incision and many side channels do not appear to carry water frequently. The goal for this project is to increase the amount of channel and floodplain large wood thereby increasing channel and floodplain roughness, aggrading the channel, increasing channel/floodplain connectivity, and enhancing salmonid spawning and rearing habitat. Up to 1000 pieces of large wood will be added to a 1.0 mile stream reach and associated floodplain using a helicopter and track excavator and/or articulated excavator (spyder). The focus area is the lower 0.3 miles characterized by a wide floodplain with multiple side channels. Large wood will be transported to the project site via log truck from a variety of sources located elsewhere on the MHNF.

Land Ownership: About 70 percent of the project reach is located on Longview Timber, LLC owned land and the remainder is located on the MHNF.
Partners Involvement: The primary partner for this project is CTWS and they are the project leader in terms of design and implementation. This type of project has wide ranging support from other basin partners including ODFW, HRSWCD, HRWG, NMFS, and USFWS. CTWS would provide a significant amount of the funding required to implement this project with the remainder obtained from a combination of other sources include Payco, appropriated Forest Service funds, CCS, and WWRI.
Timeline: NEPA analysis is underway and will be completed in spring of 2013. Implementation is scheduled for July 2014 or 2015 pending large wood acquisition. Monitoring would occur pre-project, immediately following implementation, and yearly for 5 years thereafter.
Estimated costs and Associated BLI: $350,000; NFWF, Payco, CTWS funding

Essential Project LWD-3
Project Name: Red Hill Creek Large Wood Addition
Attribute Addressed: 3.2 Aquatic Habitat - LWD
Project Description: Red Hill Creek supports steelhead trout, Chinook salmon, and coho salmon, and is also designated critical habitat for bull trout. The stream is lacking large wood primarily due to past logging and stream clean out and as a result the stream has incised, connection with the floodplain has been reduced, and there has been a reduction in suitable spawning and rearing habitat. The goal for this project is to increase the amount of channel and floodplain large wood thereby aggrading the channel, increasing channel/floodplain connectivity, and enhancing spawning and rearing habitat. About 300 pieces of large wood will be added using an articulated excavator (spyder) to the lower 0.9 miles of stream with the focus reach the lowest 0.6 miles. Areas that are lower gradient with some floodplain connectivity will be the target wood placement sites as the anticipated benefits would be greater in these areas. Some pieces of wood will be partially excavated into the stream banks to place them at a lower profile given the relatively confined nature of the channel relative to log length. Large wood will be transported to the project site via log truck from a variety of sources located elsewhere on the MHNF.
Land Ownership: This project reach is located entirely on Longview Timber, LLC owned land.
Partners Involvement: The primary partner for this project is CTWS; in fact they are the project leader in terms of design and implementation. This type of project has wide ranging support from other basin partners including ODFW, HRSWCD, HRWG, NMFS, and USFWS. CTWS is providing the majority of the funding required to implement this project with significant investment from the MHNF. Known or anticipated funding sources include Payco, appropriated Forest Service funds, CCS, and WWRI.
Timeline: NEPA analysis is underway and will be completed in spring of 2013. Implementation is scheduled for July 2013. Monitoring would occur pre-project, immediately following implementation, and yearly for 5 years thereafter.
Estimated costs and Associated BLI: $130,000; NFWF, Payco, CTWS funding

Essential Project FC-1
Project Name: Marco Creek Passage Remediation, FSR 1800

Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing 72 inch diameter culvert is large enough to pass flood flows, but is a barrier to fish passage. The project objective is to install a road crossing structure that provides unimpeded rainbow trout passage and is large enough to pass a 100-year flood including debris. Marco Creek is not an anadromous fish bearing stream. The existing culvert would be removed and disposed of. The replacement would be a bottomless arch or multi-plate pipe arch with perforated baffles; either option would utilize stream simulation. Baffles may be advantageous at this location given the stream gradient (14 percent), but this decision would not be made until the final design phase. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage improvement, the following are key partners in terms of funding acquisition: ODFW, CTWS, HRWG, and HRSWCD. Likely cost share funding sources include Payco (requested for 2013 survey), OWEB, WWRI, and CCS.
Timeline: National Environmental Policy Act (NEPA) analysis is underway for this project and is expected to be completed in the spring of 2013. The Hood River Ranger District is actively pursuing funding to survey the site in 2013. Design would occur in 2014. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $245,000; CMLG

Essential Project FC-2
Project Name: Marco Creek Passage Remediation, FSR 1600
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: This project would replace two culverts that are adjacent to each other, but one carries Marco Creek and the other an unnamed perennial tributary to Marco Creek. The existing Marco Creek crossing is a barrier to fish passage and is undersized. Sedimentation issues have resulted at the site and downstream due to the small size of the culvert and the fact that it is set much flatter than the stream gradient. A similar situation exists at the tributary culvert. The project objective is to install road crossing structures that provide unimpeded rainbow trout passage and are large enough to pass a 100-year flood including debris. Marco Creek is not an anadromous fish bearing stream. Existing culverts would be removed and disposed of. Replacements would be pipe arches utilizing stream simulation. FSR 1600 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage improvement, the following are key partners in terms of funding acquisition: ODFW, CTWS, HRWG, and HRSWCD. Likely cost share funding sources include Payco (requested for 2013 survey), OWEB, WWRI, and CCS.

Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. The Hood River Ranger District is actively pursuing funding to survey the site in 2013. Design would occur in 2014 with construction in 2015. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $135,000; CMLG

Essential Project FC-3
Project Name: Tumbledown Creek Passage Remediation, FSR 1800
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing 30 inch diameter culvert is a barrier to fish passage and is undersized and cannot pass a 100-year flood. The project objective is to install a road crossing structure that provides unimpeded rainbow trout passage and is large enough to pass a 100-year flood including debris. Tumbledown Creek is not an anadromous fish bearing stream. The existing culvert would be removed and disposed of. The replacement would be a bottomless arch or multi-plate pipe arch with perforated baffles; either option would utilize stream simulation. Baffles may be advantageous at this location given the stream gradient (13 percent), but this decision would not be made until the final design phase. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage improvement, the following are key partners in terms of funding acquisition: ODFW, CTWS, HRWG, and HRSWCD. Likely cost share funding sources include Payco (requested for 2013 survey), OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. The Hood River Ranger District is actively pursuing funding to survey the site in 2013. Design would occur in 2016 with construction in 2017. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $205,000; CMLG

Essential Project FC-4
Project Name: McGee Creek Passage Remediation, FSR 1800
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing culvert is a barrier to fish passage and is undersized and cannot pass a 100-year flood. The project objective is to install a road crossing structure that provides anadromous and resident salmonid passage and is large enough to pass a 100-year flood including debris. McGee Creek is an anadromous fish bearing stream and is also bull trout designated critical habitat. The existing culvert would be removed and disposed of. The replacement would be a single span bridge utilizing stream simulation. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF

Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage improvement, the following are key partners in terms of funding acquisition: ODFW, CTWS, HRWG, and HRSWCD. Likely cost share funding sources include CTWS, OWEB, WWRI, and CCS.
Timeline: NEPA analysis for this project has been completed. The MHNF is currently designing the replacement structure and intend to install the new crossing in 2013 pending funding. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $527,000; CMLG

Essential Project FC-5
Project Name: Elk Creek Passage Remediation, FSR 1800
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing 63 inch diameter culvert is a barrier to fish passage, but is large enough pass a 100-year flood. The project objective is to install a road crossing structure that provides unimpeded rainbow trout passage and is large enough to pass a 100-year flood including debris. Elk Creek is not believed to be an anadromous fish bearing stream this high in the drainage although it does support steelhead trout in the lower reaches (about 2 miles downstream). The existing culvert would be removed and disposed of. The replacement would be a bottomless arch utilizing stream simulation. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage improvement, the following are key partners in terms of funding acquisition: ODFW, CTWS, HRWG, and HRSWCD. Likely cost share funding sources include Payco (requested for 2013 survey), CTWS, OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. The Hood River Ranger District is actively pursuing funding to survey the site in 2013. Design would occur in 2015 with construction in 2016. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $165,000; CMLG

Essential Project FC-6
Project Name: McGee Creek Tributary Passage Remediation, Longview Timber private road
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The culvert at this site is a barrier to fish passage and is undersized and cannot pass a 100-year flood event. Sedimentation issues have resulted at the site and downstream due to the small size of the culvert. The project objective is to install a road crossing structure that provides for unimpeded fish passage and is large enough to pass a 100-year flood including debris. Given the location of this tributary in relation to known fish distribution in McGee Creek it is believed this tributary is occupied by both steelhead trout and resident rainbow trout. The existing culvert would be removed and disposed of. A bottomless pipe arch utilizing stream simulation would replace the existing crossing. This road could be

closed during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: Private (Longview Timber, LLC)
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support fish passage remediation, the following are key partners in terms of funding acquisition: CTWS, ODFW, HRWG, and HRSWCD. Likely cost share funding sources include CTWS, OWEB, WWRI, and CCS.
Timeline: National Environmental Policy Act (NEPA) analysis would be completed in 2016. Design would occur in 2016 with construction in 2017. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $90,000; CMLG

Essential Project SC-1
Project Name: Stream Crossing Enlargement, FSR 1340; unnamed tributary to West Fork Hood River
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: There are two side by side culverts at this site: one is a 35x24 inch squash pipe and the other a 24 inch round culvert. The stream is not fish bearing, but neither existing pipe is large enough to carry the 100-year flood, nor is the combined capacity large enough for the 100-year flood. The project objective is to install a road crossing structure that is large enough to pass a 100-year flood including debris. The existing round pipe would be removed and disposed of. The proposal is to place an additional squash pipe of the same size adjacent to the existing to keep the same road profile and reduce needed fill amounts. This road is not a major thoroughfare so it can be closed during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road crossing enlargement, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. Design would occur in 2015 with construction in 2016. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $37,000; CMLG

Essential Project SC-2
Project Name: Stream Crossing Enlargement, FSR 1600; Marco Creek
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing Marco Creek crossing is undersized and cannot pass a 100-year flood event. Sedimentation issues have resulted at the site and downstream due to the small size of the culvert and the fact that it is set much flatter than the stream gradient. The project objective is to install a road crossing structure that is large enough to pass a 100-year flood including debris. Marco Creek is not a fish bearing stream this high in the drainage. The existing culvert would be removed and disposed of. A pipe arch utilizing stream simulation

would replace the existing crossing. FSR 1600 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road crossing enlargement, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. Design would occur in 2016 with construction in 2017. Monitoring completed within one year of project implementation.
Estimated Costs and Associated BLI: $92,000; CMLG

Essential Project SC-3
Project Name: Stream Crossing Enlargement, FSR 1800, unnamed tributary to McGee Creek
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation**,** 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing culvert is undersized and cannot pass a 100-year flood event. This crossing is located about 0.2 miles upstream of FC-6, but given the gradient upstream it is unlikely fish are present above FSR 1800. The project objective is to install a road crossing structure that is large enough to pass a 100-year flood including debris. The existing culvert would be removed and disposed of. A pipe arch utilizing stream simulation would replace the existing crossing. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. It is possible that this project may be implemented at the same time as SC-5 and 6 given their proximity and to save mobilization and other costs. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road crossing enlargement, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. Design would occur in 2014 with construction in 2015. Monitoring completed within one year of project implementation.
Estimated costs and Associated BLI: $132,000; CMLG

Essential Project SC-4
Project Name: Stream Crossing Enlargement, FSR 1800, unnamed tributary to McGee Creek
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing culvert is undersized and cannot pass a 100-year flood event. The project objective is to install a road crossing structure that is large enough to pass a 100-year flood including debris. The existing culvert would be removed and disposed of. A pipe arch utilizing stream simulation would replace the existing crossing. FSR 1800 is major forest

thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. It is possible that this project may be implemented at the same time as SC-5 and 6 given their proximity and to save mobilization and other costs. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road crossing enlargement, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. Design would occur in 2014 with construction in 2015. Monitoring completed within one year of project implementation.
Estimated costs and Associated BLI: $132,000; CMLG

Essential Project SC-5
Project Name: Stream Crossing Enlargement, FSR 1800, unnamed tributary to McGee Creek
Attribute Addressed: 3.1 Aquatic Habitat – Habitat Fragmentation, 6.2 Roads and trails- Road Maintenance, 6.3 Roads and trails- Proximity to water, 6.4 Roads and Trails- Mass wasting
Project Description: The existing culvert is undersized and cannot pass a 100-year flood event. The project objective is to install a road crossing structure that is large enough to pass a 100-year flood including debris. The existing culvert would be removed and disposed of. A pipe arch utilizing stream simulation would replace the existing crossing. FSR 1800 is major forest thoroughfare in the watershed so a temporary bypass travel lane would be built to allow vehicle traffic during construction. It is possible that this project may be implemented at the same time as SC-5 and 6 given their proximity and to save mobilization and other costs. All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (NMFS, in prep.) would be adhered to.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road crossing enlargement, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: NEPA analysis is underway for this project and is expected to be completed in the spring of 2013. Design would occur in 2014 with construction in 2015. Monitoring completed within one year of project implementation.
Estimated costs and Associated BLI: $132,000; CMLG

Essential Project R-1
Project Name: FSR 1800-100 Relocation Outside West Fork Hood River Floodplain
Attribute Addressed: 6.3 Roads-Proximity to Water
Project Description: FSR 1800-100 lies underneath the BPA powerline and the section proposed for relocation (T1S, R8E, Section 25) lies adjacent to the West Fork Hood River within the floodplain. The road is needed as access to the powerline by BPA personnel and it is also used by the public, Longview Timber, LLC, CTWS, and MHNF. To minimize the risk that the West Fork Hood River could avulse into or across the road bed we propose moving it to the east

as far from the active channel as possible. Given the topography, the road may not be able to be moved completely outside the floodplain, but risk of road related sedimentation and channel avulsion into the road would be greatly reduced if moved. A new section of aggregate road, approximately ¼ mile in length, would be constructed to the east of the existing road alignment hugging the toe of the hillslope. Once completed and tied into the existing road near the McGee Creek crossing the existing ¼ mile roadbed would be decommissioned. Once decommissioned the area would be planted with native grass, shrubs, and trees.
Land Ownership: Longview Timber, LLC (the road is a Forest Service road however)
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all the basin partners support road decommissioning, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: Complete NEPA analysis (site specific Decision Memo) in 2013 or 2014 and implement project in 2015. Monitoring would occur each year for five years following project implementation.
Estimated costs and Associated BLI: $113,000; CMLG

Essential Project R-2
Project Name: Red Hill Restoration Project Road Decommissioning/Closure
Attribute Addressed: 6.1 Open Road Density, 6.2 Road Maintenance, 6.3 Road Proximity to Water, 6.4 Mass Wasting, and 7.2 Soil Erosion
Project Description: The Red Hill Restoration Project encompasses a variety of restorative actions within the Upper West Fork Hood River watershed including riparian and upland stand thinning, fuels treatment, road closure, road storm proofing, and road decommissioning. In this project, road closure entails closing the road entrance usually with a gate, but use of boulders, logs, or other structures is possible. Road storm-proofing is placing a road or road segment in "hydrologic storage" by installing waterbars, outsloping, and pulling culverts as needed, but keeping it as part of the Forest Service road network (i.e., it would still be a system road). The road may or may not be closed to traffic. Road decommissioning, on the other hand, would result in removal from the road network and either active or passive decommissioning depending on the situation. Active decommissioning entails complete obliteration of the road surface, restoring the natural slope, and removing all culverts. Passive decommissioning involves obliterating the road entrance to eliminate access with the remainder of the road undergoing some degree of storm proofing as described above. Twelve miles of road are proposed for decommissioning in the Red Hill Restoration Project and 5.6 miles proposed for storm proofing. Year-round closure would be established on 8.4 miles of road.
Land Ownership: MHNF
Partners Involvement: Partner involvement would primarily be for funding acquisition. While all of the basin partners support road closure/decommissioning, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: The NEPA for this project is underway and scheduled for completion in the spring of 2013. Implementation would not occur until after vegetation management activities are concluded in the area so the various road decommissioning/closure actions would be phased in over a several year period likely beginning in 2015 and ending in 2017. Monitoring would occur for 5 years following implementation.

Estimated costs and Associated BLI: $290,000; NFVW, retained receipts

Essential Project R-3
Project Name: BPA Powerline Road Storm-proofing
Attribute Addressed: 6.2 Road Maintenance, 6.3 Road Proximity to Water, 6.4 Mass Wasting, and 7.2 Soil Erosion
Project Description: The BPA power line runs through the Upper West Fork Hood River Watershed for approximately 7.5 miles. Along its entire length there are roads, primarily native surface, to allow BPA crews access for maintenance and repairs. These roads are not meant for public travel and little to no maintenance occurs. This project would storm proof these access roads as defined above except that the roads would not be closed and culverts would not be pulled. Most work would be installing/maintaining water bars, adding pit run rock to minimize erosion in applicable sections, maintain drainage culverts, and add additional drainage culverts if needed. The total length of road in this section of the power line is approximately 9.0 miles.
Land Ownership: MHNF and Longview Timber, LLC
Partners Involvement: Partner involvement would primarily be for funding acquisition. While the basin partners support road maintenance and storm proofing, the following are key partners in terms of funding acquisition: HRWG, and HRSWCD. Likely cost share funding sources include OWEB, WWRI, and CCS.
Timeline: This work is considered road maintenance which does not require NEPA. Implementation would begin in 2014 and conclude in 2017. Monitoring would occur for 5 years following implementation.
Estimated costs and Associated BLI: $120,000; NFVW, retained receipts

Essential Project RT-1
Project Name: McGee Creek Riparian Thinning 1
Attribute Addressed: 5.1 Riparian Vegetation Condition
Project Description: The objectives of the Riparian Thinning 1 project are to increase riparian tree growth rates, increase vegetation species diversity, and improve wildlife habitat by thinning 24 acres of riparian forest. The stand currently has 30-50 year old conifer trees that are over-crowded and lacking structural complexity. The goal is to create a semi- open two-story forest by thinning and removing the smaller diameter trees to improve diameter growth and crown vigor of the remaining trees. In order to minimize the impact of the project a 60 foot no cut buffer along McGee Creek will be retained. To complete work ground based equipment will be used.
Land Ownership: MHNF
Partners Involvement: This project is identified in the Hood River Watershed Action Plan, which was formulated and supported by several groups/agencies including Oregon Department of Fish and Wildlife, Confederated Tribes of Warm Springs, HRWG, Hood River Soil and Water Conservation District, the Forest Service and several local irrigation districts.
Timeline: NEPA has been completed for this project and the silvicultural prescription is complete. Funding has been acquired and implementation is scheduled for 2013. Monitoring would occur immediately following implementation and then again after five years.
Estimated costs and Associated BLI: $45,000, NFWF, NFVW, Payco, retained receipts

Essential Project RT-2
Project Name: McGee Creek Riparian Thinning 2
Attribute Addressed: 5.1 Riparian Vegetation Condition
Project Description: The objectives of the Riparian Thinning 2 project are to increase riparian tree growth rates, increase vegetation species diversity, and improve wildlife habitat by thinning 24 acres of riparian forest. The stand currently has 30-50 year old conifer trees that are over-crowded and lacking structural complexity. The goal is to create a semi- open two-story forest by thinning and removing the smaller diameter trees to improve diameter growth and crown vigor of the remaining trees. In order to minimize the impact of the project a 60 foot no cut buffer along McGee Creek will be retained. The difference between this project and the above (besides location) is that this project would utilize skyline logging.
Land Ownership: MHNF
Partners Involvement: This project is identified in the Hood River Watershed Action Plan, which was formulated and supported by several groups/agencies including Oregon Department of Fish and Wildlife, Confederated Tribes of Warm Springs, HRWG, Hood River Soil and Water Conservation District, the Forest Service and several local irrigation districts.
Timeline: NEPA has been completed for this project and the silvicultural prescription is complete. Project implementation is scheduled for 2014. Monitoring would occur immediately following implementation and then again after five years.
Estimated costs and Associated BLI: $75,000; NFWF, NFVW, retained receipts

Essential Project I-1
Project Name: Invasive Plant Control/Eradication
Attribute Addressed: 11.1 Invasive species extent and rate of spread
Project Description: The objective of invasive plant treatment in the Upper West Fork Hood River watershed is to control population extent and rate of spread and, if possible, eradicate local populations. A variety of treatment methods may occur including hand treatment, mechanical, and chemical. Most treatment would likely be chemical (herbicide) as it offers the best chance for complete control/eradication at the lowest cost. Known populations of invasive plants (such as orange hawkweed under the BPA powerline) would be treated on a regular basis as prescribed by the district botanist. We would utilize an early detection, rapid response strategy to identify and treat new infestations.
Land Ownership: MHNF
Partners Involvement: Treatment of invasive plants is regarded as an important component of any watershed restoration strategy by all the basin partners. The MHNF has an active partnership with Hood River County to treat invasive plants throughout the county regardless of land ownership. Funding obtained by the MHNF would augment Hood River County funding to treat infestations. Likely funding would come from Forest Service appropriated funding, CCS, WWRI, and possibly OWEB.
Timeline: NEPA has been completed for this project and several invasive plant infestations have been identified in the watershed. Project implementation would occur every year from 2013-2017. Monitoring would occur concurrently with treatment to determine subsequent treatment strategy and magnitude, and to identify new populations.
Estimated costs and Associated BLI: $135,000; NFVW, retained receipts

Costs

This section provides a summary of anticipated costs for proposed projects. The anticipated costs are estimates based on the best available information and past restoration experience of practitioners on the MHNF. The proposed land acquisition is the single most expensive action proposed totaling nearly the same as all other projects combined (Figures 10 and 11; Table 12). Aquatic organism passage remediation is the second most expensive project type followed by stream channel and floodplain restoration. Individual projects vary greatly in terms of cost and those variances are due to site location, equipment needed, and materials needed. For example, the Red Hill Creek LWD Addition project is significantly less than the other two LWD addition project proposed. This is because Red Hill Creek is a smaller creek that requires less wood, smaller wood, and can be wholly implemented with ground based equipment as compared to the other projects in the West Fork Hood River.

Implementation costs are the highest cost component of each project although some projects will require significant survey and design funding (Table 13). Implementation costs are primarily related to contracts and materials, but MHNF personnel time is included to administer contracts.

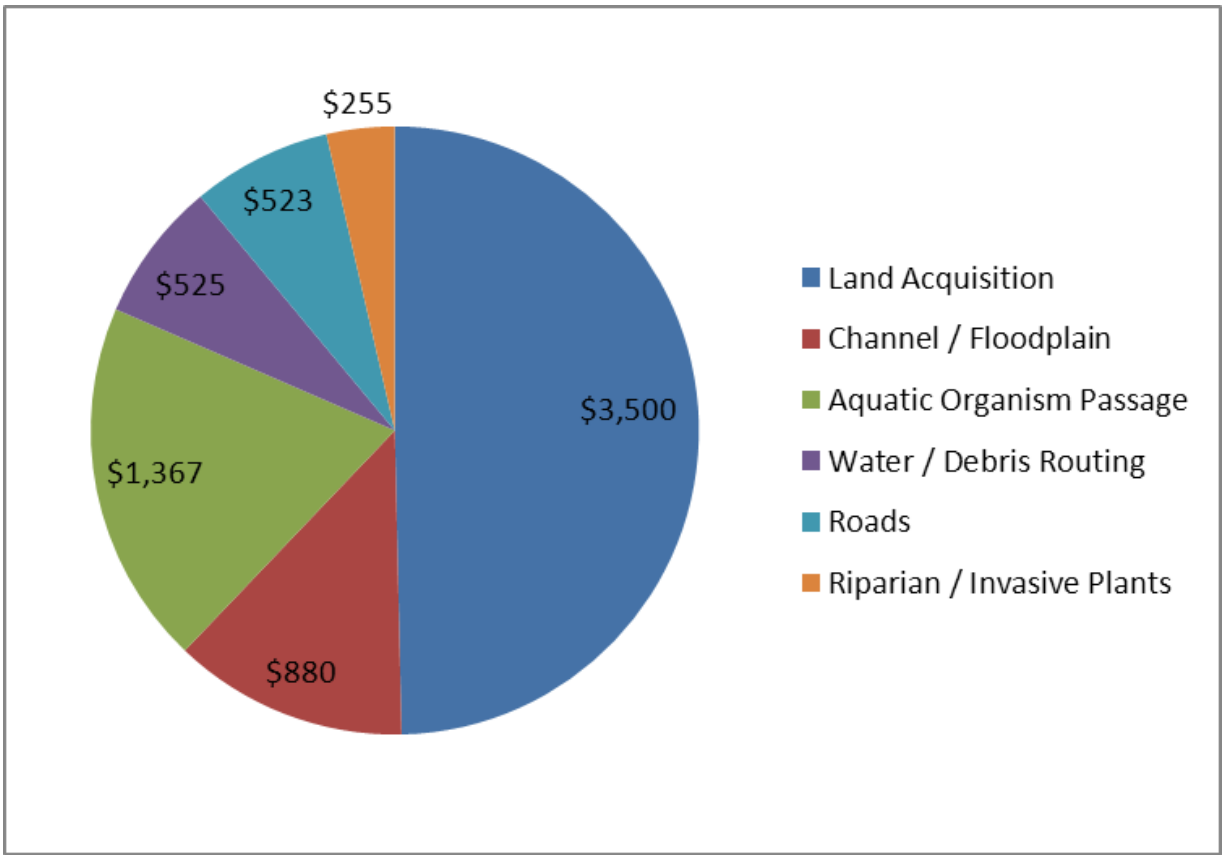


Figure 10. Funding requirements for 2013 to 2017 by project type in the Upper West Fork Hood River 6th field watershed located in the Mt. Hood National Forest. Funding is displayed in thousands; 1 = $1,000.

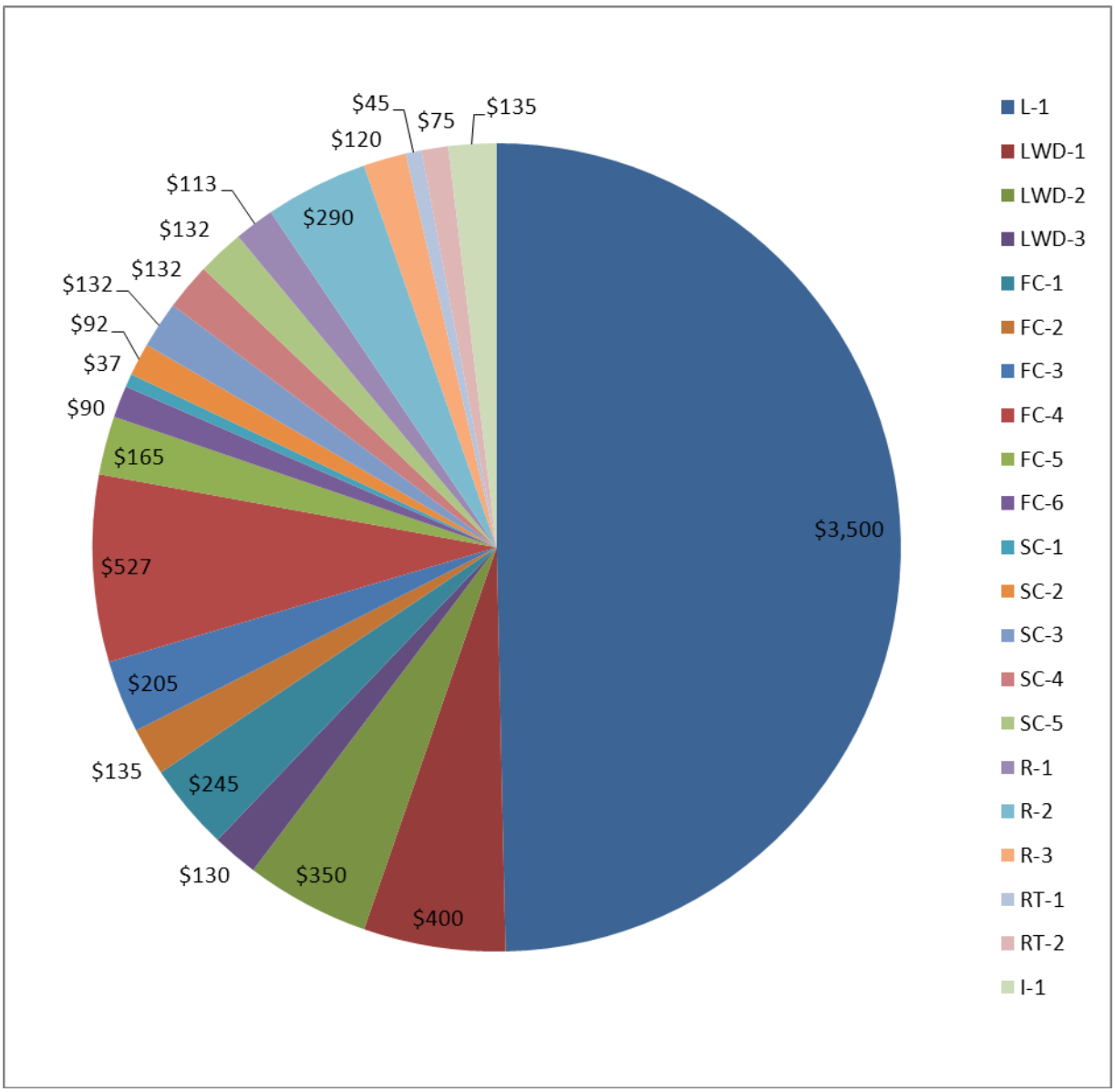


Figure 11. Funding needs for 2013 to 2017 by essential project in the Upper West Fork Hood River 6th field watershed located in the Mt. Hood National Forest. Funding is displayed in thousands; 1 = $1,000.

Table 12. Essential Project funding needs organized by project category. All proposed projects are located within the Mt. Hood National Forest in the Upper West Fork Hood River 6th field watershed. Funding is listed in thousands; 1 = $1,000.

Project Name	Land Acquisition	Channel / Floodplain	Aquatic Organism Passage	Water / Debris Routing	Roads	Riparian / Invasive Plants
Purchase of Private In-holding	3,500					
West Fork Hood River Large Wood Addition – Marco Reach Phase 2		400				
West Fork Hood River Large Wood Addition – Red Hill to Ladd		350				
Red Hill Creek Large Wood Addition		130				
Marco Creek Passage Remediation, FSR 1800			245			
Marco Creek Passage Remediation, FSR 1600			135			
Tumbledown Cr. Passage Remediation, FSR 1800			205			
McGee Creek Passage Remediation, FSR 1800			527			
Elk Creek Passage Remediation, FSR 1800			165			
McGee Creek Tributary Passage Remediation			90			
Stream Crossing Enlargement, FSR 1340				37		
Stream Crossing Enlargement, FSR 1600				92		
Stream Crossing Enlargement, FSR 1800				132		
Stream Crossing Enlargement, FSR 1800				132		
Stream Crossing Enlargement, FSR 1800				132		
FSR 1800-100 Road Relocation Outside WFHR Floodplain					113	
Red Hill Restoration Project Road Decommissioning/Closure					290	
BPA Powerline Road Storm-proofing					120	
McGee Creek Riparian Thinning 1						45
McGee Creek Riparian Thinning 2						75
Invasive Plant Control/Eradication						135
TOTALS	**3,500**	**880**	**1367**	**525**	**523**	**255**

Total funds needed: $7,050,00

Table 13. Estimated Costs to plan, design, implement, and monitor projects in the Upper West Fork Hood River 6th field watershed, Mt. Hood National Forest from 2013 to 2017. Displayed funding is listed in thousands (1 = $1,000).

Project No.	Project Name	Output	Total Cost	Planning and Design		Implementation		Monitoring		Total	
				FS	Partners	FS	Partners	FS	Partners	FS	Partners
L-1	Purchase of Private In-holding	1882 ac	3500	5	5	3490	0	0	0	3495	5
LWD-1	West Fork Hood River Large Wood Addition – Marco Reach Phase 2	1.0 mi	400	25	10	100	230	15	20	140	260
LWD-2	West Fork Hood River Large Wood Addition – Red Hill to Ladd	1.0 mi	350	20	30	75	185	10	30	105	245
LWD-3	Red Hill Creek Large Wood Addition	0.9 mi	130	10	20	30	50	5	15	45	85
FC-1	Marco Creek Passage Remediation, FSR 1800	0.7 mi	245	20		100	120	5		125	120
FC-2	Marco Creek Passage Remediation, FSR 1600	0.8 mi	135	20		30	80	5		55	80
FC-3	Tumbledown Cr. Passage Remediation, FSR 1800	0.4 mi	205	20		60	120	5		85	120
FC-4	McGee Creek Passage Remediation, FSR 1800	2.3 mi	527			300	217	5	5	305	222
FC-5	Elk Creek Passage Remediation, FSR 1800	0.7 mi	165	20		60	80	5		85	80
FC-6	McGee Creek Tributary Passage Remediation	0.15 mi	90	15		20	50	5		40	50
SC-1	Stream Crossing	0.5 mi	37	10		10	15	2		22	15

Project No.	Project Name	Output	Total Cost	Planning and Design		Implementation		Monitoring		Total	
				FS	Partners	FS	Partners	FS	Partners	FS	Partners
	Enlargement, FSR 1340										
SC-2	Stream Crossing Enlargement, FSR 1600	0.4 mi	92	20		20	50	2		42	50
SC-3	Stream Crossing Enlargement, FSR 1800	0.2 mi	132	20		30	80	2		52	80
SC-4	Stream Crossing Enlargement, FSR 1800	200 ft.	132	20		30	80	2		52	80
SC-5	Stream Crossing Enlargement, FSR 1800	0.17 mi	132	20		30	80	2		52	80
R-1	FSR 1800-100 Road Relocation Outside WFHR Floodplain	0.3 mi	113	10		20	80	3		33	80
R-2	Red Hill Restoration Project Road Decommissioning/Closure	26 mi	290	10		75	190	15		100	190
R-3	BPA Powerline Road Storm-proofing	9 mi	120	15		20	70	15		50	70
RT-1	McGee Creek Riparian Thinning 1	24 ac	45	5		10	20	5	5	20	25
RT-2	McGee Creek Riparian Thinning 2	27 ac	75	10		15	40	5	5	30	45
I-1	Invasive Plant Control/Eradication	200 ac	135	5	5	25	75	15	10	45	90
TOTALS			**7050**	**300**	**70**	**4550**	**1912**	**128**	**90**	**4978**	**2072**

Timelines and Project Scheduling

Essential projects in the Upper West Fork Hood River 6th field watershed are anticipated to be completed with adequate funding by 2018. Implementation of some projects will depend upon on funding which in turn depends on partner support and matching funding. As such, the schedule outlined in Table 14 is a best estimate given MHNF and partner priorities, current project status, and anticipated funding. Other projects will take multiple years to complete (such as invasive plant treatment).

Table 14. Estimated project completion date for essential projects in the Upper West Fork Hood River 6th field watershed in the Mt. Hood National Forest. Monitoring may extend beyond dates listed below to measure biological and physical responses of the project treatments.

Project Name	Estimated Completion Date of Essential Projects
Purchase of Private In-holding	2014-2015
West Fork Hood River Large Wood Addition – Marco Reach Phase 2	2016
West Fork Hood River Large Wood Addition – Red Hill to Ladd	2014-2015
Red Hill Creek Large Wood Addition	2013
Marco Creek Passage Remediation, FSR 1800	2014
Marco Creek Passage Remediation, FSR 1600	2015
Tumbledown Cr. Passage Remediation, FSR 1800	2017
McGee Creek Passage Remediation, FSR 1800	2013
Elk Creek Passage Remediation, FSR 1800	2016
McGee Creek Tributary Passage Remediation	2017
Stream Crossing Enlargement, FSR 1340	2016
Stream Crossing Enlargement, FSR 1600	2017
Stream Crossing Enlargement, FSR 1800	2015
Stream Crossing Enlargement, FSR 1800	2015
Stream Crossing Enlargement, FSR 1800	2015
FSR 1800-100 Road Relocation Outside WFHR Floodplain	2015
Red Hill Restoration Project Road Decommissioning/Closure	2015-2017
BPA Powerline Road Storm-proofing	2013-2017
McGee Creek Riparian Thinning 1	2013
McGee Creek Riparian Thinning 2	2014
Invasive Plant Control/Eradication	2013-2017

Table 15. Proposed timelines and scheduling for essential projects. All projects are located within the Mt. Hood National Forest in the Upper West Fork Hood River 6th field watershed. Displayed funding is listed in thousands (1 = $1,000).

Project Number	Project Name	Project Task	Project Implementation Plan											
			2013		2014		2015		2016		2017		Total	
			FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners
L-1	Purchase of Private In-holding	Design	1	1	2	2	2	2					5	5
		Implementation					3490						3490	
		Monitoring												
LWD-1	West Fork Hood River Large Wood Addition – Marco Reach Phase 2	Design			5	5	10	5	10				25	15
		Implementation							100	230			100	230
		Monitoring							5	5	10	15	15	20
LWD-2	West Fork Hood River Large Wood Addition – Red Hill to Ladd	Design	15	20	5	10							20	30
		Implementation			75	185							75	185
		Monitoring					3	10	3	10	4	10	10	30
LWD-3	Red Hill Creek Large Wood Addition	Design	10	20									10	20
		Implementation	30	50									30	50
		Monitoring			2	5			1	5	2	5	5	15
FC-1	Marco Creek Passage Remediation, FSR 1800	Design	15		5								20	
		Implementation			100	120							100	120
		Monitoring					3				2		5	
FC-2	Marco Creek Passage Remediation, FSR 1600	Design	5		10		5						20	
		Implementation					30	80					30	80
		Monitoring							3		2		5	
FC-3	Tumbledown Cr. Passage Remediation, FSR 1800	Design	5						10		5		20	
		Implementation									60	120	60	120
		Monitoring									5		5	
FC-4	McGee Creek Passage Remediation, FSR 1800	Design												
		Implementation	300	217									300	217
		Monitoring			2	2			2	2	1	1	5	5
FC-5	Elk Creek Passage	Design	5				10		5				20	

Project Number	Project Name	Project Task	Project Implementation Plan											
			2013		2014		2015		2016		2017		Total	
			FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners
	Remediation, FSR 1800	Implementation							60	80			60	80
		Monitoring									5		5	
FC-6	McGee Creek Tributary Passage Remediation	Design							10		5		15	
		Implementation									20	50	20	50
		Monitoring									5		5	
SC-1	Stream Crossing Enlargement, FSR 1340	Design					7		3				10	
		Implementation							10	15			10	15
		Monitoring									2		2	
SC-2	Stream Crossing Enlargement, FSR 1600	Design							15		5		20	
		Implementation									20	50	20	50
		Monitoring									2		2	
SC-3	Stream Crossing Enlargement, FSR 1800	Design			15		5						20	
		Implementation					30	80					30	80
		Monitoring							1		1		2	
SC-4	Stream Crossing Enlargement, FSR 1800	Design			15		5						20	
		Implementation					30	80					30	80
		Monitoring							1		1		2	
SC-5	Stream Crossing Enlargement, FSR 1800	Design			15		5						20	
		Implementation					30	80					30	80
		Monitoring							1		1		2	
R-1	FSR 1800-100 Road Relocation Outside WFHR Floodplain	Design			7		3						10	
		Implementation					20	80					20	80
		Monitoring							2		1		3	
R-2	Red Hill Restoration Project Road Decom. / Closure	Design					5		5				10	
		Implementation					25	60	25	60	25	70	75	190
		Monitoring					5		5		5		15	
R-3	BPA Powerline Road Storm-proofing	Design	5		5		5						15	
		Implementation	10	10	10	10		20		20		10	20	70

Project Number	Project Name	Project Task	Project Implementation Plan											
			2013		2014		2015		2016		2017		Total	
			FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners	FS	Partners
		Monitoring			3		3		3		6		15	
RT-1	McGee Creek Riparian Thinning 1	Design	5										5	
		Implementation	10	20									10	20
		Monitoring			2	1			3	1		3	5	5
RT-2	McGee Creek Riparian Thinning 2	Design	7		3								10	
		Implementation			15	40							15	40
		Monitoring					2	2	1	1	2	2	5	5
I-1	Invasive Plant Control/Eradication	Design	2	1	2	1	1	2		1			5	5
		Implementation	10	10	5	25	5	20	5	10		10	25	75
		Monitoring		2	5	2	5	2	2	2	3	2	15	10
TOTALS			**435**	**351**	**308**	**408**	**3744**	**523**	**291**	**447**	**200**	**348**	**4978**	**2072**

Restoration Project Monitoring and Evaluation

Post-project monitoring and evaluation is important to determine the overall success of the essential projects. In the Upper West Fork Hood River the MHNF and CTWS will conduct the majority of the monitoring with some help from other partners (Table 16). Monitoring for all projects will be designed to determine whether project objectives were met. Biological monitoring will be a continuation of existing programs by CTWS and ODFW, including Chinook salmon redd surveys and snorkeling to determine juvenile presence/absence and relative abundance. Biological monitoring will only relate to the three large wood addition projects and it will not be designed to determine whether salmonid populations increase as a result of large wood addition. However, this monitoring should be able to detect whether salmonids use habitat formed by large wood placement.

Most of the physical habitat, road, fish passage, riparian silviculture, and invasive plant surveys would be conducted by MHNF personnel. Monitoring results will determine if the projects were implemented as designed and the level of success based upon whether project objectives were met. For some projects, a subset of areas would be monitored instead of every treated area. An example is road storm-proofing where some roads or road sections may not be monitored.

Table 16. Planned monitoring for essential projects in the Upper West Fork Hood River 6th field watershed within the Mt. Hood National Forest. A description of monitoring parameters follows the table.

Project Name	Parameters to be Monitored	Who Will Monitor	Frequency
Purchase of Private In-holding	NA	NA	NA
West Fork Hood River Large Wood Addition – Marco Reach Phase 2	Photo points, wood counts, redd surveys, snorkel counts	MHNF and CTWS	Pre- and post-project for five years
West Fork Hood River Large Wood Addition – Red Hill to Ladd	Photo points, wood counts, redd surveys, snorkel counts	MHNF and CTWS	Pre- and post-project for five years
Red Hill Creek Large Wood Addition	Photo points, wood counts, redd surveys, snorkel counts	MHNF and CTWS	Pre- and post-project for five years
Marco Creek Passage Remediation, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Marco Creek Passage Remediation, FSR 1600	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Tumbledown Cr. Passage Remediation, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
McGee Creek Passage Remediation, FSR 1800	Implementation, gradient, substrate,	MHNF and partners	Pre-project and immediately post

Project Name	Parameters to be Monitored	Who Will Monitor	Frequency
	bankfull width		project
Elk Creek Passage Remediation, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
McGee Creek Tributary Passage Remediation	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Stream Crossing Enlargement, FSR 1340	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Stream Crossing Enlargement, FSR 1600	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Stream Crossing Enlargement, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Stream Crossing Enlargement, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
Stream Crossing Enlargement, FSR 1800	Implementation, gradient, substrate, bankfull width	MHNF and partners	Pre-project and immediately post project
FSR 1800-100 Road Relocation Outside WFHR Floodplain	Erosion survey, re-vegetation success, photo points	MHNF and partners	Pre- and post-project for five years
Red Hill Restoration Project Road Decommissioning/Closure	Erosion survey, re-vegetation success, photo points	MHNF and partners	Pre- and post-project for five years
BPA Powerline Road Storm-proofing	Erosion survey, re-vegetation success, photo points	MHNF and partners	Pre- and post-project for five years
McGee Creek Riparian Thinning 1	Stand exams	MHNF and partners	Pre-project and 5 years post-project
McGee Creek Riparian Thinning 2	Stand exams	MHNF and partners	Pre-project and 5 years post-project
Invasive Plant Control/Eradication	Infestation specific survival and area covered	MHNF and partners	Yearly for 5 years

Description of monitoring parameters:

- Photo points: Pre- and post-project photos taken from the same location to visually document environmental change due to project implementation.
- Wood counts: Pre- and post-project counts of down wood in the bankfull channel and floodplain. Wood is counted and grouped into sizes that correspond to LRMP standards and guidelines.
- Redd surveys: Yearly surveys where target fish species redds are counted. These surveys are often conducted watershed-wide so redds counted in project implementation areas will be noted separately.
- Snorkel counts: Teams of snorkelers count fish present in standardized reaches to determine presence/absence and relative abundance. These surveys are not accurate enough to be considered a true population estimate.
- Implementation: Answers the question: "Was the project implemented as designed?"
- Gradient: Pre- and post-project stream crossing gradient.
- Substrate: Pre- and post-project stream crossing substrate composition.
- Bankfull width: Pre- and post-project stream crossing bankfull widths.
- Erosion survey: An ocular survey to determine if soil erosion is occurring on closed, storm-proofed, or decommissioned roads. Expressed as a relative percent of total road treated.
- Re-vegetation success: Measure of survival of planted species, usually recorded as a percentage of total area planted or individual plant survival.
- Stand exams: Silvicultural exam that determines tree species present, age structure, size structure (diameter), and height structure. Can also be used, if re-surveyed over time, to track tree growth rates and extent of disease.
- Plant survival: Measure of invasive species survival after treatment, usually expressed as a percentage of treated area. Critical to determine follow-up treatment needs.

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