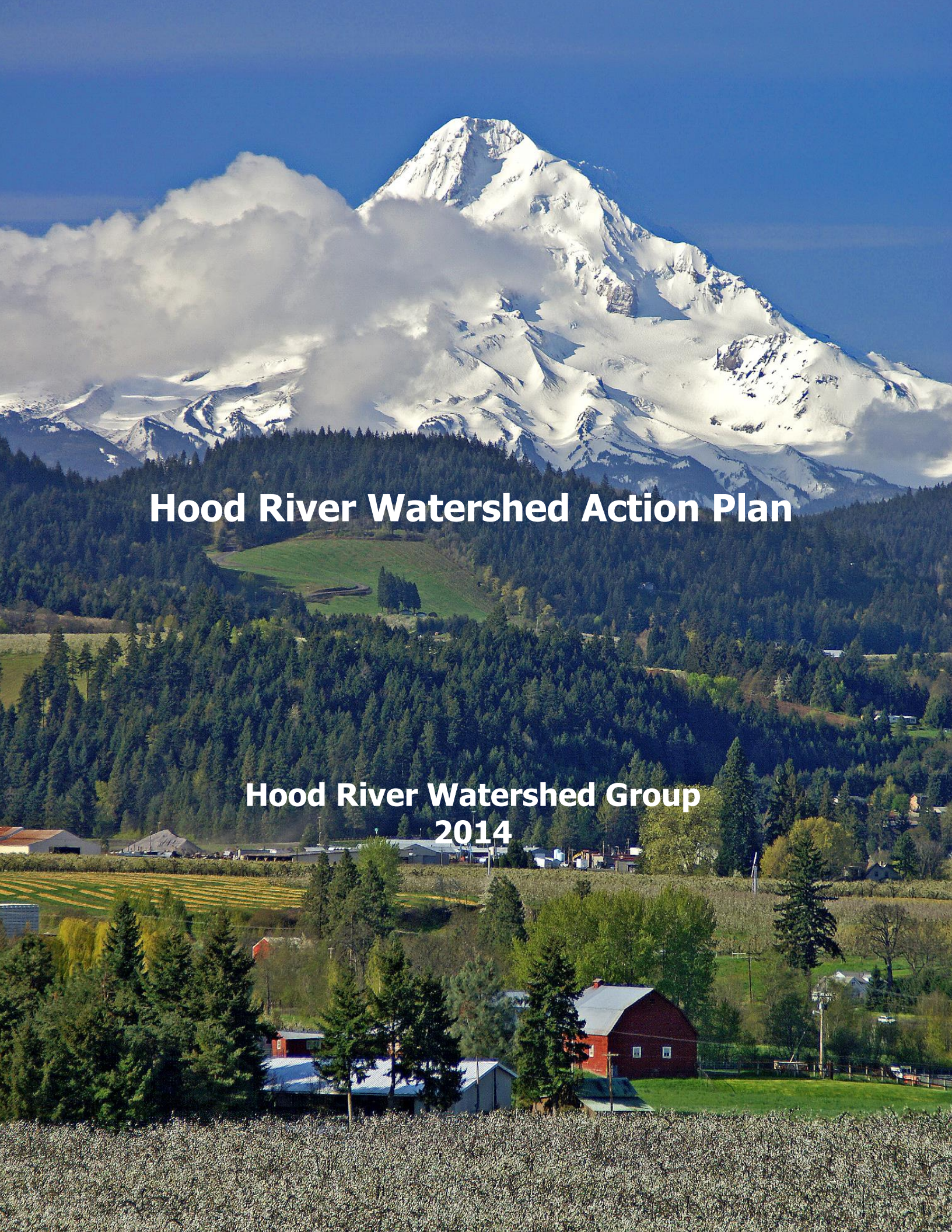

Hood River Watershed Action Plan

Hood River Watershed Group
2014

Hood River Watershed Action Plan

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Chapter 1. Introduction

The 2014 Hood River Watershed Action Plan identifies and prioritizes projects and strategies to improve watershed health, water quality, and fish populations in the Hood River watershed of the lower Columbia River Basin. The original Watershed Action Plan was developed in 2002 (Coccoli). Since that time, Hood River Watershed Group partners have completed over 100 significant watershed restoration projects, in addition to numerous watershed education, planning, monitoring, and assessment activities.[1]

The Action Plan was developed by the Hood River Watershed Group (HRWG), a forum of irrigation and water districts, farmers, foresters, businesses, urban and rural residents, and local, state, tribal, and federal government. The HRWG was formed in 1993. Its purpose is to sustain and improve the watershed through education, cooperation and stewardship.

The Watershed Action Plan builds on local watershed restoration efforts started in the 1980s on the National Forest, Hood River County and private lands. The original Action Plan was developed to guide restoration activities for a period of five years, and was based on recommendations in the 1999 Hood River Watershed Assessment (Coccoli, 1999). The 2008 Action Plan (Stampfli, 2008) incorporated new data and priorities from subsequent planning documents, including the Hood River Subbasin Plan for Fish and Wildlife (Coccoli, 2004) and the Hood River Basin Aquatic Habitat Restoration Strategy (Shively, 2006). The 2014 Action Plan update describes a suite of new projects to be implemented over the next several years.

The Action Plan helps address requirements of the federal Endangered Species Act, and Clean Water Act. It also supports and complements federal, state, and tribal fish recovery plans for the Hood River and lower Columbia River. In addition, the Plan benefits Hood River Valley residents by promoting watershed health and sustainable resource use. A specific goal of the plan is to support economically sustainable and environmentally sound agriculture and forestry practices, while preserving a high quality of life in the Hood River valley for future generations.

The Hood River Watershed Action Plan was prepared with financial and technical assistance from the Oregon Watershed Enhancement Board (OWEB), the Confederated Tribes of the Warm Springs Reservation (CTWS), East Fork Irrigation District (EFID), Farmers Irrigation District (FID), Middle Fork Irrigation District (MFID), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Environmental Quality (DEQ), Hood River Soil and Water Conservation District (SWCD), and United States Forest Service (USFS).

[1] A list and description of projects completed between 2008 and 2013 is included in **Appendix 3**. See the 2002 and 2008 Action Plans for a description of projects completed between 2000 and 2007.

Chapter 2. Background

The Action Plan is based on the results of several assessments and plans, including:

- Hood River Watershed Assessment (Coccoli, 1999)
- Western Hood River Subbasin Total Maximum Daily Load (Oregon Department of Environmental Quality, 2001)
- Hood River Subbasin Plan for Fish and Wildlife (Coccoli, 2004)
- Hood River Basin Aquatic Habitat Restoration Strategy (Shively, 2006)
- Upper West Fork Hood River Watershed Restoration Action Plan (Asbridge, Arendt, & Powers, 2012)
- Hood River Agricultural Water Quality Management Area Plan (Hood River Local Advisory Committee/ODA & SWCD, 2012)
- WY-KAN-USH-MI WA-KISH-WIT. The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes. (CRITFC, 2013)

The Watershed Assessment evaluated current watershed conditions, historic conditions, physical and biological constraints, and the needs and opportunities for restoration and protection. The Western Hood River Subbasin Total Maximum Daily Load (TMDL) established a TMDL for temperature for streams in the Hood River watershed that were documented to have maximum daily temperatures above state temperature standards. These standards were developed to provide adequate temperatures for salmonid rearing and spawning, as well as other beneficial uses. The resulting Water Quality Management Plan focused on establishing and protecting riparian area vegetation, temperature control in permitted discharges, and temperature control relative to flow management below dams.

The Hood River Subbasin Plan for Fish and Wildlife built upon the Watershed Assessment and incorporated the entire 2002 Watershed Action Plan as part of its management plan for the watershed. It contains an evaluation of current and historic biological and physical conditions, an inventory of existing fish and wildlife programs and measures, and a management plan outlining measurable biological objectives and prioritized strategies to meet those objectives.

The Hood River Basin Aquatic Habitat Restoration Strategy (AHRS) was developed by the USFS and a collaborating group of local stakeholders. Its intent was to build upon previous planning efforts, especially the Subbasin Plan, to guide stakeholders in prioritizing 6th field watersheds and restoration strategies. The Technical Advisory Committee prioritized 6th field watersheds based on number of fish species present, water quality and quantity, and watershed condition. Both the Subbasin Plan and AHRS identified and evaluated altered watershed processes and limiting factors. The AHRS also identified restoration actions in each 6th field watershed to address the limiting factors.

The Upper West Fork Hood River Watershed Restoration Action Plan (WRAP) is an update to the AHRS. The USFS used USDA's 2010 Watershed Condition Framework approach to

identify a specific list of projects, with timelines and costs, to improve aquatic resources in the upper West Fork Hood River. Most of the projects listed in the WRAP are included in the HRWG 2014 Action Plan.

The Hood River Agricultural Water Quality Management Area Plan provides guidance and strategies to reduce water pollution from agricultural lands. The Plan includes recommended management practices to improve stream temperatures, reduce pesticide concentrations, prevent pollutants from entering waterways, and increase stream flows.

Wy-Kan-Ush-Mi Wa-Kish-Wit provides a framework for restoring anadromous fish stocks, specifically salmon, Pacific lamprey, and white sturgeon in areas upriver of Bonneville Dam. The plan's geographic scope extends wherever these fish migrate and throughout the Columbia River Basin wherever activities occur that directly affect them. The plan, published in 1995 identifies several watershed restoration strategies for the Hood River basin. The plan will be updated in 2014.

The Watershed Action Plan is consistent with and helps support implementation of several other plans that address state, regional, and federal requirements for aquatic or terrestrial species recovery, water quality protection or ecosystem health. These include:

- Northwest Forest Plan (U.S. Department of Agriculture, 1994)
- Draft ESA Recovery Plan for Hood River Bull Trout (U.S. Fish & Wildlife Service, 2005)
- Oregon Conservation Strategy (Oregon Department of Fish &Wildlife, 2006)
- Lower Columbia River Conservation & Recovery Plan for Oregon Populations of Salmon & Steelhead (Oregon Department of Fish & Wildlife, 2010)
- ESA Recovery Plan for Lower Columbia Steelhead (National Marine Fisheries Service, 2013)

An important distinction is that the Action Plan is a voluntary, community-based plan approved by all HRWG members.

Watershed Characteristics and Limiting Factors

The 339-square mile Hood River Basin originates on the eastern side of the Cascade Range in Oregon. Its rivers flow north from the 11,245 foot peak of Mt. Hood, to the Columbia River at an elevation of 74 feet. The dramatic change in elevation is reflected in steep gradient streams with coarse streambed material and glacial-silt laden water. Approximately 75% of the watershed is forestland, with two-thirds being USFS and the remaining third split between County and private timber land. Seven percent of the watershed is orchard land and the remaining 18% is a mixture of rural residential and urban land (Coccoli, 1999).

Human disturbance throughout the Hood River basin has partially degraded and limited aquatic habitat productivity. Activities such as road building, logging, irrigation and municipal water withdrawals, agriculture, and development have contributed to passage barriers, low instream flows, lack of habitat complexity, and impaired water quality. These

and other impacts outside of the watershed (e.g., ocean conditions, dams on the Columbia R.) affect native fish populations and ecosystem functions. Native terrestrial species have also been affected in the Hood River basin by road building, housing development, agriculture, and other activities that have created migratory barriers, loss of nesting areas, and seasonal or permanent loss of habitat (Coccoli, 2004).

Fish Populations and Key Limiting Factors

The Hood River watershed has a high diversity of anadromous and resident fish species, including winter and summer steelhead, spring and fall Chinook, coho, coastal cutthroat trout, bull trout, rainbow trout, brook lamprey, and Pacific lamprey. Most of these fish populations are thought to be much lower than historical abundance. Bull trout were federally listed as threatened throughout their range in 1998 under the Endangered Species Act. In addition, steelhead, Chinook, and coho were listed as threatened in 1998, 1999, and 2005, respectively, for the Lower Columbia Distinct Population Segment. Coastal cutthroat trout are listed as a species of concern by the State of Oregon.

The Ecosystem Diagnostic and Treatment (EDT) Model, developed for the Hood River Subbasin Plan, identified five primary limiting factors to anadromous salmonid production (Coccoli, 2004). These were streamflow, habitat diversity, key habitat quantity, channel stability, and sediment load. The Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (LCRCRP) also identified low streamflow and impaired habitat diversity as primary limiting factors to recovery. Secondary limiting factors included altered hydrology due to low-head hydro diversions and upslope land uses, excessive fine sediment due to roads, elevated water temperature from impaired riparian conditions or streamflow, and instream pesticide levels (ODFW, 2010). These limiting factors, as well as fish passage barriers, are described below.

Streamflow

The hydrology of the Hood River basin is characterized by highly variable stream flows and rapid runoff caused by the watershed's steep gradient and rain on snow events. Mt. Hood glaciers and snowmelt are a significant source of summer base stream flows. During typical summer and fall periods, stream flows are naturally low. In some stream reaches, diversions for agricultural and other use can withdraw 40% of the average natural flow of the Hood River from July to September (Coccoli, 2004). This can impair aquatic habitat quantity and quality, as well as fish passage. Major diversions are located on the East Fork Hood River, main stem Hood River, Coe Branch, Eliot Branch, Clear Branch, West Fork Hood River, and upper Dog River. **Figure 1** shows average monthly diversions for agricultural use by the five major irrigation districts in the watershed. Instream water rights are established at seven locations but are reliably met at only two of these sites. These rights are held in trust by the state for public benefits including recreation, pollution control, and fish and wildlife. Because of their priority date, instream water rights are junior to most other water rights in the watershed. As a result, the flow restoration measures in this plan rely on voluntary efforts by irrigators and other water users.

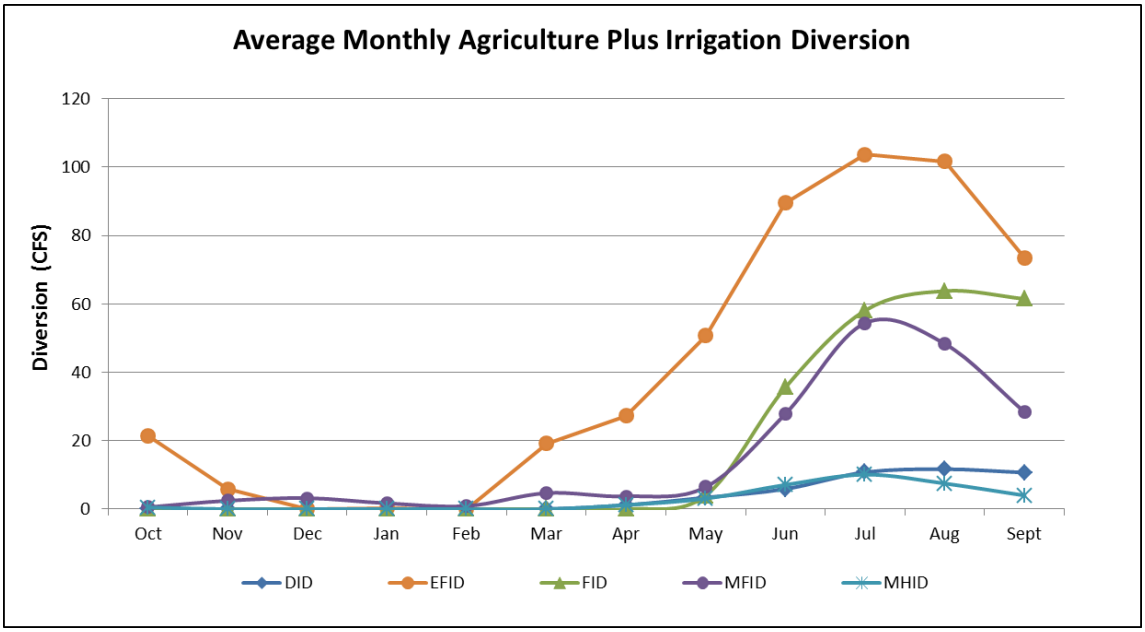

Figure 1. Average monthly irrigation plus agricultural (i.e., spray and frost) diversion for irrigation districts in the Hood River Basin. (Graph courtesy of Niklas Christensen, Watershed Professionals Network, 2014)

Since the mid-1960s, local irrigation districts have been improving their delivery systems by replacing old leaky pipe, converting open canals to pressurized pipelines, and installing pressure reducing stations. In the last 20 years they have collectively installed or replaced over 115 miles of pipeline and eliminated the use of streams for irrigation water conveyance on over 20 stream-miles. Some irrigation districts have also installed pressure reducing stations, which prevent wasted water, pre-mature nozzle wear, and overland runoff caused by excessive water pressure. All of these actions have improved operation and maintenance efficiency, conserved significant amounts of water, and improved water quality and fish habitat. It is estimated that at least 22 miles of open, unlined canals and over 60 end spills still remain (Christensen, 2013). Several irrigation districts are continuing to install pressure reducing stations and pressurized lateral and main lines.

According to recent surveys or estimates by irrigation district managers, an estimated 59% (approximately 12,000 acres) of agricultural land is irrigated with low efficiency irrigation systems. This includes hand and wheel lines and solid-set impact sprinklers (Christensen, 2013). Those who have converted to solid-set rotator or micro-sprinkler systems can achieve up to 70% water savings. As an example, orchardists on Lenz Creek collaborated with the SWCD and NRCS to upgrade their irrigation system with solid-set micro-sprinklers. They also installed soil moisture sensors at depths of 12", 18", and 24" at several locations around the orchard. The sensors were a critical component to conserving water, as it allowed them to optimize the amount of water they applied. Prior to the upgrade they used approximately 1 million gallons/summer on a 10-acre orchard. A post-installation flow meter documented their new water use at 374,000 gallons/summer. In addition, their labor cost was reduced by $2,200/year, they observed improved fruit quality, and virtually eliminated erosion caused by

over-watering (Kathy Kahler, personal communication). This example underscores the need for continuing to upgrade orchards to high-efficiency systems. The combination of delivery system and on-farm irrigation upgrades has the potential to conserve millions of gallons of water. A portion of these savings have and will continue to be an important element of streamflow restoration in the Hood River Watershed.

Habitat Diversity and Key Habitat Quantity

Habitat diversity is a function of stream gradient, channel confinement, riparian conditions, and amounts of large woody debris (LWD). Reduction in flood plain and instream LWD is a primary reason for loss of habitat diversity. LWD increases stream channel complexity by trapping gravel, creating shallow lateral habitats and side channels, and creating scour pools. It also provides cover from predators and is an important part of the food chain. Key habitat quantity is the amount of primary habitat used by a fish species at a given life stage. As an example, key habitats for adult spawning are pool tails and small cobble riffles. For age 0 and 1 rearing, pools and glides are key habitat. Both habitat diversity and key habitat quantity are estimated to be lower than historic conditions, which is likely due to historic riparian timber harvests, stream "clean-outs", and splash dams (Coccoli, 2004). Over the past few decades, USFS and CTWS have implemented numerous large wood projects in an effort to increase habitat complexity, restore hydrologic processes, and support native aquatic species.

Riparian Conditions: Riparian conditions are an integral element of stream habitat diversity and also influence stream temperature. Shade and LWD recruitment potential have been assessed at various times and locations in the watershed. In 1999, Nelson (2000) and Salminen (1999a) assessed riparian conditions along 170 miles of streams within the lower portions of the mainstem Hood River, East Fork Hood River, and Middle Fork Hood River sub-basins using aerial photos and spot field verification. They found that shade levels were high along 51%, medium along 21%, and low along 28% of total stream length.[2] Oregon DEQ also evaluated riparian vegetation as part of their TMDL temperature model development for the mainstem Hood River, East Fork Hood River (note: upstream end of model was ~2 miles upstream of EFID diversion) and Neal Creek. The model predicted that daily stream temperatures in the East Fork Hood River, main stem Hood River, and Neal Creek could be reduced by improving riparian shade (DEQ, 2001). Nelson and Salminen also found that LWD recruitment (i.e., supply of big trees with the potential to fall into streams) was unsatisfactory along 64% of the stream length assessed in the lower Hood River and its tributaries, compared to 54% in the East Fork and Middle Fork watersheds. A similar assessment in Bear, Tony, Trout, Middle Fork, Lower East Fork, Baldwin, Emil and Evans drainages found comparable results.

Recently, CTWS commissioned studies of effective stream shade on the West Fork and East Fork Hood Rivers. The West Fork Hood River study found that current effective shade values are very high within the watershed, with the exception of stream reaches adjacent to recent harvest units, underneath power lines, and along the lower portions of the mainstem West Fork where the active channel is wide and aspect and topography are not favorable for

[2] High shade = >70%, Medium shade= 40 – 70%, Low shade = <40%

providing shade (Heider, Salminen, & Brown, 2010). Similarly, the East Fork study found that current effective shade values are very high within the watershed, with the exception of the mainstem East Fork, recently-disturbed glacial headwater streams, and some of the plateau tributaries (Salminen, 2013).

Channel Stability and Confinement

Channel instability is a normal state in the Hood River Basin, and is mostly due to the watershed's steep gradient, flashy hydrograph, and glacial influence. This can impact fish production by disrupting spawning beds during egg incubation and washing juveniles downstream. Past management activities (e.g., road building, timber harvest) have likely led to increased channel instability and loss of large woody debris has made stream channels less resilient to flood events (Coccoli, 2004).

River channelization, road and bridge fills, and bank armoring activities have confined some waterways, thus eliminating the water's access to floodplains and its ability to form new or additional channels. Channel confinement also results in shorter and steeper stream channels, higher water velocities, down-cutting, reduced flood water retention, decreased aquifer recharge, higher peak flows and property damage. Many streams in the Hood River valley illustrate these effects. An assessment done in 2000 found that roads and railroads were the most common stream channel modification affecting a total stream length of 21 miles (Coccoli, 2004).

Sediment Load

Natural sediment sources include glacial runoff, landslides, and debris flows originating from the slopes of Mt. Hood. Landslides and debris torrents are relatively frequent in Newton, McGee, Ladd, Coe, Eliot, Polallie and Clark drainages and their contributing watersheds. Turbidity and sediment inputs from human activities include: a) runoff from forest roads and recreation use areas, b) irrigation water inter-basin conveyance, c) flushing from settling basins, d) irrigation overflows and return flows, e) exposed soils in livestock areas adjacent to streams, f) winter sanding of roads and parking lots and g) landslides from forestry practices or irrigation ditch failures (Coccoli, 1999).

Unnaturally high levels of fine sediment create problems for native salmonids in a number of ways. The interstitial spaces in spawning beds can be plugged by fine sediment, which decreases egg survival. Similarly, large substrate can be embedded by fines, which reduces overwintering habitat for juveniles (Coccoli, 2004).

Water Quality

Pesticides/Toxics: Pesticides are used in orchards, residential / commercial properties, forests, roadways, railways, and power line corridors. As part of developing their TMDL for the basin, DEQ initiated a pesticide monitoring program in 1999. Initial results showed chlorpyrifos and azinphos methyl (i.e., Lorsban and Guthion) levels above state instream criteria in Neal, Indian and Lenz Creek. These insecticides potentially interfere with normal hormone function in salmonids and alter species composition and abundance of aquatic

macroinvertebrates. Currently Lenz, Neal, and Indian Creek are on the 303(d) list of impaired waters for chlorpyrifos. Monitoring over the past decade has shown that organophosphate concentrations and detection frequency have declined. Since 2009, DEQ began analyzing for approximately 100 pesticides or pesticide degradation products. With the increase in number of pesticide analytes, more have been detected. In general, results show that a few herbicides (e.g., simazine, diuron) are found in 60%-80% of samples at levels well below EPA aquatic life benchmarks (DEQ, unpublished data). However, some pesticides, while not causing toxicity alone, may make other pesticides (particularly organophosphates) more potent and deleterious. In addition, most samples contain mixtures of pesticides. The combined effects of chronic or acute exposure to these mixtures on salmonids and their prey are unknown (Temple and Johnson, 2011).

A number of additional chemicals, including arsenic, beryllium, copper, iron and manganese, found on the current 303(d) list for streams or stream reaches in the Hood River Basin are shown in **Appendix 2**. The beryllium and iron listings occur throughout the watershed, including relatively undisturbed areas such as Dog River and West Fork Hood River. These may be naturally occurring. Lenz and Neal Creeks have the most listings of the streams evaluated.

Temperature: Several stream segments in the Hood River Basin were listed on the 1998 or 2002 303(d) list as not meeting state water quality standards for temperature. These included Clear Branch Cr. (mouth to Laurence Lake), Hood River (Powderdale Powerhouse to E. Fork Hood R.), Middle Fork Hood River (mouth to Clear Branch Cr.), East Fork Hood River, West Fork Hood River, Indian Cr., Lake Branch (RM 10 to Lost Lake), Neal Cr. (mouth to East/West Fork confluence), and Whiskey Creek. A TMDL and Water Quality Management Plan (WQMP) for temperature were completed in 2001 (DEQ). Once the TMDL was approved by EPA, these segments were removed from future 303(d) lists. This delisting does not necessarily mean that temperature standards are now being met, but rather that there is a plan in place to improve temperature conditions over time. Ongoing temperature monitoring will track future temperature changes. The WQMP identified flow and riparian condition restoration projects intended to help lower stream temperatures.

Nutrients and Bacteria**:** Elevated nitrogen and phosphorus concentrations have been found in Baldwin, Graham, Odell, McGuire, Neal, Lenz, Trout, Wishart, Whiskey and Indian creeks (HRSWCD, 2001 and Coccoli, 1999). Bacteria contamination has been measured in many of the same creeks (Fitch, 2001). Indian Creek was listed for *E. coli* in 2010. Not enough data have been collected for other sites to be evaluated for 303(d) listing purposes.

Fish Passage Barriers and Screens

Road culverts, water diversions, and dams can impede the migration and movement of fish and other aquatic species. Upstream passage barriers typically occur at dams and culverts where the vertical drop impedes jumping or swimming over it. They also occur at undersized and/or steep culverts in which water velocities exceed the swimming or crawling ability of aquatic species. Downstream passage barriers occur where water drops have been artificially increased and can cause injury or death to downstream migrating aquatic life (e.g., juvenile

fish). Downstream migration barriers also occur at unscreened water diversions, where fish and other organisms can be drawn into pipelines or irrigation canals resulting in stranding, impingement, and death. Significant progress has been made over the past 10 years in remedying fish passage barriers and insufficient screening on streams with anadromous fish. Numerous barriers still exist on streams containing resident trout. One new area of concern regards Pacific lamprey ammocoetes, which are able to pass through current fish screens. Since the removal of the Powerdale Dam, Pacific lamprey have been recolonizing the basin (CTWS, unpublished data).

Wetland Conditions

A total of 783 wetlands covering 1,950 acres were identified in the basin by the 1981 National Wetland Inventory (NWI). Of these, 23% are riverine (i.e., associated with rivers), 21% are lacustrine (i.e., associated with lakes), and 56% are palustrine (e.g., marshes, wet meadows, swamps). Historically, wetlands have been drained for agriculture and other land uses. Data about the extent of wetland loss is unavailable and not taken into account by the NWI (Salminen, 1999b). Wet meadows that are considered special habitats in the Mt. Hood Forest Plan include Elk Meadow and Horsethief Meadow. Outside of federal lands, the most significant wetland habitat is a sizable complex of forested and emergent wetlands located at a former river bend along the Hood River near RM 2.5 (Coccoli, 2004). A wetlands inventory and functional assessment on lands within the City of Hood River's Urban Growth Boundary identified several small wetlands (Wetlands Consulting, 2003).

Terrestrial Habitat

The quality and extent of native terrestrial habitats in the valley has diminished during the last 150 years (Coccoli, 2004). Agriculture, residential areas, parks, commercial uses and roads now dominate more than 15,000 acres of the landscape. Low elevation conifer / hardwood forests and meadow complexes have been replaced with highly managed landscapes. Plant communities have been altered by suppression of natural fire regimes, and non-native plants and animals have invaded native communities. The altered landscape has lost high-quality cover, migration routes, food supplies and other factors needed by bird, mammal, amphibian, reptile and invertebrate populations. Portions of the watershed under 2,500 feet in elevation have been particularly impacted. Other forest attributes altered by development include the density of damaged live trees, standing dead trees, and large downed trees, all of which provide food, shelter and habitat for birds and other wildlife. The winter range of large migratory animals has been diminished by human development and in the Hood River Valley half of the remaining deer and elk winter range is on private land.

Chapter 3. Goals & Strategies

As stated in the Hood River Subbasin Plan for Fish and Wildlife, the overall vision for the basin is:

> ***"a watershed where water is abundant, cool, and clean; where natural systems that create and sustain fish and wildlife and their habitat are respected; and where a healthy economy is compatible with healthy native fish and wildlife populations."***

To that end, several conservation principles guide the HRWG's approach to restoration and conservation. These are: 1) Where feasible, protect aquatic and terrestrial habitats that are in good condition. An excellent example of this is the Powerdale Lands Transfer, which permanently protected 400 acres along the mainstem Hood River where the Powerdale Dam was removed in 2010; 2) Restore aquatic and terrestrial habitats that are currently in degraded condition but with potential to support high-quality fish and wildlife habitat; 3) Educate and increase public awareness about watershed issues and best management practices for improved stewardship; 4) Conduct watershed monitoring that evaluates the effectiveness of restoration efforts and tracks changes in watershed conditions; and 5) Conduct watershed planning that incorporates perspectives from a diversity of stakeholders and utilizes the best available science.

Goals

Action Plan **goals** include:

1) Improve the long-term viability of native fish and other aquatic species in the basin.
2) Protect and improve basin stream flows to meet the needs of aquatic species and humans.
3) Improve water quality in the basin by reducing artificial contamination to protect human health, aquatic life and other beneficial water uses.
4) Re-establish fish passage at stream-road crossings or other artificial barriers.
5) Protect and restore complex aquatic habitats through measures that support adequate instream habitat complexity, channel/floodplain connectivity, healthy riparian plant communities, and hydrologic functions associated with uplands, wetlands, and riparian areas.
6) Protect and enhance a variety of terrestrial habitats, with an emphasis on conserving populations of native plants, invertebrates, amphibians, reptiles, birds and mammals.
7) Prevent the spread of invasive plants and animals.
8) Promote natural resource stewardship (e.g., promote environmentally and economically sustainable agricultural practices) in the watershed by working with individuals, educators, governments, and other organizations to expand watershed education and technical assistance opportunities.

Strategies

Stream Flow

The HRWG will continue using a voluntary approach to promote water conservation and increase stream flows. The group will focus on projects that increase water system and end-use efficiencies in agricultural and residential settings. Projects that result in permanent water savings at the original point of diversion are the highest priority.

Key strategies include:

- Upgrading irrigation system components (e.g., soil moisture sensors, micro-sprinklers)
- Upgrading irrigation delivery systems by piping open ditches and canals
- Moderating excessive irrigation water pressures
- Transferring of conserved water to an instream right
- Monitoring project results to evaluate impact on stream flow
- Development of a basin-wide Water Conservation Plan

Water Quality

Two specific strategies intended to remedy elevated stream temperatures in the basin are:

- Increase/improve streamside vegetation buffers to optimal widths
- Maintain and restore adequate summer stream flows through water conservation education, irrigation improvement projects, and conveyance efficiency projects

Elevated levels of pesticides and other toxins will be addressed with several specific strategies.

- Support Oregon State University's Mid-Columbia Agricultural Research and Extension Center's education and research on chemical application, irrigation, and other orchard BMPs that improve water quality and fruit production.
- Continue to monitor pesticides within the basin's waterways to assess whether pesticide concentrations in surface waters are adversely affecting aquatic life.
- Install storm drain markers in urban areas.
- Educate urban and rural residents on fate of pollutants (e.g., oil, pesticides) entering storm drains and best management practices for home and yard maintenance.

Watershed strategies aimed at reducing the introduction of fine, artificially generated sediment into the basin's waterways are as follows:

- Improve road design, road management and road maintenance (including gating, permanent closure and restoration) on all land ownerships.
- Eliminate use of streams to convey irrigation water.
- Pipe open ditches and canals to eliminate the threat of landslides and return flows carrying silt to streams.
- Exclude livestock from riparian areas

Reduction in levels of excess nutrients (nitrogen and phosphorus) and bacteria will be accomplished using these key strategies:

- Promote livestock and pasture best management practices through education, technical assistance and project implementation.
- Implement projects with landowners, conduct education activities and promote BMPs designed to control pollution of ground and surface waters caused by domestic animal, residential housing and artificial fertilizers.

Fish Passage

Factors used to determine the priority ranking of fish passage barriers will include:

- Position in the stream network. The farther downstream a barrier is, the higher its priority compared to another barrier on the same stream.
- Whether a threatened species or sensitive population is affected.
- The potential number and diversity of species affected.
- The quality and amount of habitat above the barrier.
- Whether the barrier is within a priority watershed area.
- Proportion of stream flow diverted (for screening projects only). This affects the number of fish likely to encounter the diversion.

Stream & Riparian Habitat

Protection of existing high quality stream and riparian habitats is a key strategy. This may be accomplished through voluntary land acquisitions or conservation easements. In restoring degraded habitat, efforts should be directed at bolstering natural processes (e.g., upland hydrology, channel-forming flows, stream-floodplain interaction) that sustain habitat. Specific restoration strategies include:

- Placement of large wood in stream channels and their floodplain
- Restoring optimal riparian zone plant composition, width, and complexity
- Reconnecting stream channels with floodplains and off-channel habitats
- Increasing the input of organic material/nutrients (e.g., large wood, salmon carcasses)
- Reducing the occurrence of non-native plant and animal species
- Restoring functional hydrologic regimes and sediment transport

Terrestrial Habitat

The Hood River Subbasin Plan lists a vision, biological objectives and strategies aimed at enhancing populations of "focal species," including the northern spotted owl, black-tailed deer, elk, lark sparrow, Clark's nutcracker and western gray squirrel. **Appendix 1** includes a list of rare or ecologically significant wildlife species that may be considered when developing projects intended to benefit upland wildlife and plant communities.

Terrestrial habitat enhancement should target threatened, endangered, and/or sensitive plant and wildlife species and culturally important plants and animals for CTWS members. Specific strategies will include:

- Seeking voluntary protection of important habitats to reduce the effects of land development and fragmentation
- Protecting big game winter ranges
- Maintaining or creating functional wildlife corridors
- Conducting permanent and seasonal closure of roads and trails
- Controlling off-road motorized vehicles
- Managing forests to include a diversity of stand age, vegetation layers, and species; maintain optimal levels of standing and downed dead wood
- Preventing the spread of invasive plants and animals into high value habitats
- Protecting and enhancing low elevation Oregon white oak communities, high elevation white bark pine and aspen communities, and bottomland hardwood stands
- Managing higher elevation forest stands for huckleberries where ecologically appropriate

Specific strategies prescribed by the Oregon Conservation Strategy (ODFW, 2006) and the Subbasin Plans "Priority 1 Habitat Protection and Restoration Strategies" (Coccoli, 2004) will also be considered.

Funding Sources

A cooperative partnership approach has been and will continue to be used to help fund Action Plan measures. Watershed Group partners have worked successfully together to obtain grants and other funding from the CTWS, OWEB, NRCS, USFS, Bureau of Reclamation, EcoTrust, and others for watershed projects. This approach depends on continued cooperation and collaboration in the local community and availability of funding.

Chapter 4. Proposed Actions

This chapter describes specific projects that Hood River Watershed Group partners are targeting for implementation during the next several years. Projects are listed under five Action Plan elements, including: 1) Aquatic Habitat Restoration and Conservation, 2) Terrestrial Habitat Restoration and Conservation, 3) Monitoring and Assessment, 4) Watershed Planning, and 5) Watershed Education and Technical Assistance.

2014 Watershed Action Plan Update Process

Development of the 2014 Action Plan began in fall 2012 with solicitation of new project ideas from watershed partners. Project solicitation included posters, press releases and requests for project ideas during monthly Watershed Group meetings. HRWG staff and key partners ranked projects as high, medium, or low. The primary factors considered in project ranking were number/type of limiting factors the project addresses, extent to which project compliments past or future restoration projects, technical merit, cost benefit ratio, and readiness to proceed. High priority projects will be pursued first. However, opportunities to implement lower priority projects may present themselves before funding or landowner permission is secured for high priority projects.

Table 4.1 Lead Entity and Partner Organization Acronyms & Abbreviations

BOR	Bureau of Reclamation
CGCC	Columbia Gorge Community College
CGFG	Columbia Gorge Fruit Growers
CLT	Columbia Land Trust
County	Hood River County
CTWS	Confederated Tribes of the Warm Springs Reservation
DEQ	Oregon Department of Environmental Quality
DID	Dee Irrigation District
EFID	East Fork Irrigation District
FID	Farmers Irrigation District
HRVHS	Hood River Valley High School
ICS	Indian Creek Stewards (includes local residents & school groups, CGCC, City)
ODOT	Oregon Department of Transportation
OSU-MCAREC	Oregon State University Mid-Columbia Agricultural & Research Extension Center
MFID	Middle Fork Irrigation District
NRCS	Natural Resource Conservation Service
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish & Wildlife
OWRD	Oregon Water Resources Department
Port	Port of Hood River
SWCD	Hood River Soil & Water Conservation District
USGS	United States Geological Survey
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service
WRC	Western Rivers Conservancy

Element 1: Aquatic Habitat Restoration and Conservation Projects

#	Project Name	Lead	Page
AH-1	Orchard Spray Buffer Riparian Planting Project	CGFG	17
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AH-25	Stream Crossing Enlargements- USFS Roads 1340, 1600, 1800	USFS	32
AH-26	McGee Cr. Tributary Fish Passage Remediation	USFS	32
AH-27	McGee Cr. Fish Passage Remediation-USFS Road 1800	USFS	33
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AH-29	Tumbledown Cr. Fish Passage Remediation-USFS Road 1800	USFS	34
AH-30	BPA Powerline Road Storm-proofing	USFS	34
AH-31	Red Hill Restoration: Road Decommissioning	USFS	35
AH-32	Upper Neal Cr. Fish Passage/Culvert Replacement	USFS	36
AH-33	East Fork Hood River Trail Relocation	USFS	36
AH-34	Upper West Fork Hood River Private In-holding Purchase	WRC	37

Figure. 2. Installation of willow and dogwood cuttings along a waterway adjacent to orchard land.

AH-1. Orchard Spray Buffer Riparian Planting Project (*High Priority)*

Lead Entity/Partners: CGFG/CTWS, HRWG, OSU/MCAREC, orchardists

General Location: Surface waters that lead to fish bearing streams in Hood River Watershed

Background: Some streams and agricultural waterways in the Hood River Watershed lack sufficient riparian cover. In addition, pesticides have been detected in some streams. Beginning in 2008, CGFG and CTWS developed a program to establish riparian buffer zones along waterways bordering orchards. Increased riparian vegetation is intended to provide filtration of surface runoff and spray drift interception.

Objective: Decrease pesticide levels in surface waters of the Hood River Watershed

Proposed Actions and Schedule: In 2014, partners intend to plant approximately 1 mile of orchard streams and 3 acres of riparian area with approximately 2,400 cuttings and 100 bare root plants. Future stream reaches and acreage are to be determined. Monitoring will be conducted by CGFG and will include photo points, visual estimates of percent vegetation survival, vegetation growth rate, and percent canopy closure in years one, three and five. A 20% survival rate at year five and 100% canopy closure will be considered a success. This project will be ongoing as funding permits.

Project Cost: ~$6,000/year (plus in-kind from CGFG, HRWG, OSU/MCAREC)

AH-2. Powerdale Corridor Riparian & Floodplain Restoration *(High Priority)*

Lead Entities/Partners: CLT & County/ HRWG, CTWS, ODFW, Mt. Hood Railroad, USFS

General Location: Mouth to RM 4.0 of Hood River

Background: The floodplain and riparian areas along the Powerdale corridor have been significantly altered by the construction of the Mt. Hood Railroad and Powerdale Dam. Dam and pipeline decommissioning in 2010 also disturbed riparian vegetation, particularly near the former dam site. Juvenile Chinook, coho and steelhead have lost access to important off-channel wetland complexes and much of the floodplain is now constrained. An example is the currently isolated wetland floodplain complex on the east side at RM 1.0, which includes two small emergent wetlands and 20 acres of mixed hardwood floodplain forest. Decreased floodplain-river interaction has also resulted in lost nutrients from spawning salmon carcasses, flood storage, sediment accretion, and instream habitat diversity.

Objectives: 1) Enhance access to and availability of off-channel rearing habitat for Chinook, coho, and steelhead, 2) Improve habitat for waterfowl, native amphibians, and song birds, 3) Increase floodplain and side channel storage capacity, and 4) Improve riparian zone conditions along mainstem Hood River.

Proposed Actions and Schedule: Potential actions include construction of perennial and/or seasonal side channels, increasing hydrologic connectivity between Hood River and its floodplain, relocating a segment of the railroad or installing larger culverts under the existing railroad tracks, removing parts of the remaining water pipeline between the old dam site and powerhouse, removing the old powerhouse building and underlying fill, and restoring riparian zone conditions along the Hood River. A summary and evaluation of restoration alternatives for increasing hydrologic connectivity near river mile 1 was completed by Interfluve in 2013 for Columbia River Crossing (*Hood River-River Mile 1 Habitat Restoration Alternatives Evaluation*).

Implementation and funding for hydrologic restoration projects are currently being discussed by the Powerdale Lands Advisory Committee. The schedule for planting and riparian habitat enhancement is 2014-2015.

Project Cost: ~$1.3 to 2.1 million for RM1 hydrologic restoration; ~$130,000 for riparian re-vegetation and invasive species control

AH-3. Water Quality & Fish Habitat Protection at W. Fork-BPA Crossing *(High Priority)*

Lead Entity/ Partners: CTWS/ BPA, HRWG

General Location: West Fork Hood River

Background: BPA's powerline vegetation management strategy relies heavily on herbicide use. Vegetation control at their powerline crossing of the W. Fork Hood River had killed most of the trees and shrubs, causing streambank destabilization and reduced instream complexity. These factors impact summer steelhead, coho and spring Chinook.

Objectives: 1) Protect water quality, 2) Protect instream habitat, 3) Reduce fine sediment loading to streams

Proposed Actions and Schedule: CTWS will continue to manage riparian vegetation along the West Fork Hood River underneath the powerline corridor. Specific methods are to manually cut riparian shrubs and trees to no more than four feet in height to reduce fire danger beneath the power lines. This will be done in June or July of every year.

Project Cost: $1,500 annually

AH-4. East Fork Hood River Habitat Complexity Restoration *(High Priority)*

Lead Entity/ Partners: CTWS/ USFS, County, HRWG, private landowners.

General Location: East Fork Hood River and tributaries

Background: Lack of habitat complexity has been identified in several planning documents as a key limiting factor in the East Fork Hood River (EFHR). At a watershed scale, 17 miles of the EFHR and its tributaries have been identified in the USFS Hood River Aquatic Restoration Strategy (Shively 2006) as in need of LWD. Riparian vegetation and shade have also been reduced, resulting in higher water temperatures and reduced large woody debris recruitment potential. Adult and juvenile Chinook salmon, steelhead, coho, and resident trout are the target salmonids in the EFHR.

Objectives: 1) Increase the amount of floodplain LWD to 30 pieces per acre, 2) Increase the amount of in channel LWD to 150-200 pieces per mile, 3) Collect, sort and store spawning gravel (30-40 mm) for Chinook salmon and steelhead trout, 4) Increase floodplain connectivity, 5) Increase low and high water refugia, 6) Increase cover, and 7) Increase area and frequency of pools

Proposed Actions and Schedule: These projects will improve habitat complexity on federal and private lands through large wood additions (LWD) and riparian restoration. Project reaches and treatments will be selected by CTWS and USFS fish biologists using stream habitat survey data, shade analyses, and intrinsic potential analyses for the EFHR. High priority streams include clear water tributaries. Many streams in the East Fork are glacially influenced and prone to rain on snow events. Placing large wood in streams and the floodplain will add roughness elements that will decrease the impact of large flows and improve floodplain connectivity.

Placement of the LWD will be completed using a trackhoe, articulated backhoe (Spyder), or helicopter. USFS will provide logs when available. Additional funds will be required to purchase and haul logs. Pre and post project monitoring will be conducted using methods outlined in the Forest Service Stream Inventory-Pacific Northwest Region 6, 2009 ~Version 2.9 protocol and the Oregon Department of Fish and Wildlife- Methods for Stream Habitat Surveys, Aquatic Inventories Project, Version 12. Project planning will begin in 2014. Project implementation is contingent on landowner approval and is anticipated to occur in 2018.

Project Cost: TBD

AH-5. Red Hill Creek Large Wood Addition (*High Priority*)

Lead Entity /Partners: CTWS/ USFS, County, HRWG, Weyerhaeuser

General Location: West Fork Hood River

Background: Red Hill Creek supports steelhead trout, Chinook salmon, and coho salmon, and is also designated critical habitat for bull trout. The stream lacks sufficient amounts of large wood, primarily due to past logging and stream clean outs. As a result, the channel has incised, decreasing floodplain connectivity and suitable spawning and rearing habitat.

Objectives: 1) Increase the amount of channel and floodplain large wood, 2) Aggrade stream channel, 3) Increase channel/floodplain connectivity, 4) Enhance spawning and rearing habitat

Proposed Actions and Schedule: About 300 pieces of large wood will be added using an articulated excavator to the lower 0.6 miles of stream. Areas that are lower gradient with some floodplain connectivity will be the targeted, 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 Mt. Hood National Forest. NEPA analysis is complete. Monitoring will occur pre-project, immediately following implementation, and yearly for 5 years thereafter. Implementation is scheduled for July 2015 pending large wood acquisition and landowner approval.

Project Cost: $130,000

Figure 3. Installation of large wood structures on W. Fork Hood River in 2007.

AH-6. W. Fork Hood River Large Wood Addition- Dry Run Bridge Reach (*High Priority*)

Lead Entity/ Partners: CTWS/ USFS, Weyerhaeuser, HRWG

General Location: West Fork Hood River (RM 8.2-8.6)

Background: The West Fork Hood River contains spawning and rearing habitat for spring Chinook and summer steelhead. ODFW stream surveys indicate a shortage of LWD within the West Fork Hood River primarily due to past land management practices. This has led to reduced gravel storage, poor pool development, reduced channel habitat quality, and lost floodplain connectivity. The lack of large wood also increases peak flow erosion and decreases channel stability.

Objectives: 1) Increase the amount of in-channel LWD (average size 40' x 20" dbh) to 150 - 200 pieces per mile and floodplain LWD to 30 pieces per acre, 2) Collect, sort and store spawning gravel of appropriate size (6 - 102mm) instream for Chinook and steelhead, 3) Maintain or improve connection between channel and floodplain.

Proposed Actions and Schedule: Approximately 180 logs and whole trees will be added to 6 acres of floodplain and an additional 100 logs and whole trees added to the stream channel. Given the proximity to Dry Run Bridge, much of the in-channel wood and some of the floodplain wood will be anchored. Project implementation is anticipated for 2017 pending large wood acquisition and landowner approval.

Project Cost: $150,000

AH-7. West Fork Hood River Large Wood Addition – Red Hill Cr. Area (*High Priority)*

Lead Entity/Partners: CTWS/ USFS, County, Weyerhaeuser, HRWG

General Location: West Fork Hood River near Red Hill Creek confluence

Background: 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.

Objectives: 1) Increase channel and floodplain large wood volume, 2) Aggrade channel, 3) Increase channel/floodplain connectivity, 4) Enhance salmonid spawning and rearing habitat

Proposed Actions and Schedule: Up to 1000 pieces of large wood will be added to a 0.5 mile stream reach and associated floodplain using a helicopter and track excavator and/or articulated excavator (spyder). The focus area is 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. NEPA analysis is complete. Implementation is scheduled for July 2016 pending large wood acquisition and landowner approval.

Project Cost: $360,000

AH-8. Lake Branch Large Wood Addition- No-Name Creek to Raker Pit Reach (*High Priority*)

Lead Entity/ Partners: CTWS/USFS, HRWG

General Location: Lake Branch (RM 1.3 to 3.6)

Background: Lake Branch provides spawning and rearing habitat for ESA-listed summer steelhead, spring Chinook, and non-listed rainbow. Past forest management practices have decreased the amount of instream and floodplain large wood below desired levels, and have reduced natural recruitment of large wood into Lake Branch. This has led to a decrease in channel and floodplain connectivity and slowed development of habitat favorable to salmonids.

Objectives: 1) Increase the amount of in-channel LWD (average size 40' x 20" dbh) to 150 - 200 pieces per mile and floodplain LWD to 30 pieces per acre, 2) Collect, sort and store spawning gravel of appropriate size (6 - 102mm) instream for steelhead, 3) Maintain or improve connection between channel and floodplain.

Proposed Actions and Schedule: This project will result in approximately 20 logjams in Lake Branch, and additional large woody debris placements along the stream margin and floodplain. In total, approximately 1,000 pieces of large wood will be placed in and along Lake Branch from No Name Creek upstream approximately 1 mile. Flood plain roughness will be increased over 55 acres. Project implementation is scheduled for 2014.

Project Cost: $150,000

AH-9. Small Scale Restoration Initiative (*High*)

Lead Entity/Partners: CTWS/ HRWG, SWCD

General Location: Surface waters on private lands in the Hood River Basin.

Background: The Small Scale Restoration Initiative (SSRI) is a voluntary conservation program in the Hood River watershed that provides financial and technical assistance to landowners with streams located on their property. Much of the lower elevation lands within the Hood River Watershed are privately owned. Within these lands are a network of streams that provide crucial spawning and rearing habitat for salmonids. Through SSRI, the CTWS works with landowners to implement conservation practices to enhance water quality and improve fish habitat on their property.

Objectives: 1) Improve water quality, 2) Protect and improve aquatic habitats, 3) Protect and improve riparian habitats, 3) Promote stream bank stabilization, and 4) Educate the general public on the conservation of Hood River natural resources.

Proposed Actions and Schedule: The CTWS is currently accepting applications for future projects. Typical actions include assistance with: riparian planting , livestock exclusion fencing, water conservation, irrigation screen upgrades, erosion control, streambank stabilization, stream crossing improvements, beaver control, and similar aquatic projects.

Project Cost: Up to $5,000/project (plus in-kind from CTWS and others).

AH-10. Dee Irrigation District Distribution Piping (*High Priority*)

Lead Entity/ Partners: DID/CTWS, HRWG

General Location: Dee Irrigation District

Background: Natural stream flows in the Hood River basin are over appropriated during late summer and fall. Reduced instream flow is a primary limiting factor for salmonid production in the basin. DID's current distribution system includes 25 pumps, sections of open canal that leak, and overflows. These elements lead to an estimated water loss of 2 cfs.

Objectives: 1) Increase late summer streamflow in West Fork Hood River for steelhead and spring Chinook, 2) Increase available stream habitat in summer, 3) Improve fish passage at DID point of diversion.

Proposed Actions and Schedule: Preliminary designs for piping the DID distribution system were completed in 2010. Final designs for piping the DID distribution system will be completed by 2017. Implementation is scheduled for 2018 pending funding. An estimated 2 cfs will be conserved by this project through elimination of overflows and open canal leakage. Plans include consolidating 25 existing pumps used to distribute irrigation water into a single pump. This will also result in energy conservation. After project completion, flow monitoring will be conducted within the DID system to evaluate effectiveness. The DID has signed an MOA with the CTWS whereby they have agreed to convert all water savings into an instream water right for the West Fork Hood River.

Project Cost: TBD

AH-11. Christopher Pipeline Project- Phase 1 (*High Priority*)

Lead Entity/ Partners: EFID/ CTWS, HRWG

General Location: East Fork Hood River

Background: Up to 75% of the East Fork Hood River is diverted for irrigation during late summer and fall. Instream water rights (100 cfs in July-September; 150 cfs in October – June) are typically not met during this period. Reduced instream flow has been identified as the primary limiting factor for salmonid production in the basin. High water temperatures (21° C) have been measured in this reach, which are a result of low flows, air temperature, and loss of stream shading. Measures to prevent water loss within the delivery system benefit both fish and irrigators. Christopher Ditch loses water through leakage and an overflow that spills turbid East Fork water into the otherwise clear flowing Neal Creek.

Objectives: 1) Increase summer stream flow in East Fork Hood River, 2) Reduce overflows into Neal Creek, 3) Reduce turbidity in Neal Creek.

Proposed Actions and Schedule: EFID will pipe a 4000 foot irrigation lateral canal (i.e. Christopher ditch), which leads off of the EFID main canal in Phase I of this project. Current water users adjacent to the new pipeline will be connected in the first phase. Water savings from reductions in seepage and removing the end spill on this ditch are estimated between 0.4 and 0.5 cfs. The second phase of this project will connect the remaining Christopher Ditch users, as well as irrigators using water from the Central Lateral operational

spill. Monitoring will be a combination of East Fork Flow monitoring at the EFID diversion and water quality sampling for turbidity in West Fork Neal Creek. Project implementation will occur in 2014-16.

Project Cost: TBD

AH-12. East Fork Irrigation District Telemetry System (*High Priority*)

Lead Entity Partners: EFID/CTWS

General Location: East Fork Diversion

Background: Currently, the EFID system does not divert water based on demand. This can result in more water being diverted than is necessary, which results in "end spills" and wasted water.

Objectives: 1) Match water diversion with water demand, 2) Increase summer stream flows in East Fork Hood River

Proposed Actions and Schedule: Install a telemetry system, which will detect irrigation demand at the upper end of the Central Canal and relay that information remotely to EFID's diversion. The new Obermeyer weir will be programmed to automatically adjust its height to provide the amount of water needed at any given time. This project is expected to be complete by 2016, pending funding. Flow monitoring will be conducted within the EFID system to evaluate effectiveness.

Total Project Cost: TBD

AH-13. Farmers Irrigation District Sediment Management Facilities (*High Priority*)

Lead Entity: FID

General Location: FID Farmers Canal/Pipeline

Background: Improving on-farm irrigation efficiency has the potential to conserve significant amounts of water, protect surface and ground water quality, reduce farming costs, and improve crop quality. Typical water savings for converting from high-flow sprinklers to micro-sprinklers, accompanied by the use of soil moisture sensors and individual totalizing flow meters, are over 50%. Micro-sprinklers, subterranean drip systems, and totalizing meters only operate well with clean water. FID's proposed sediment management facilities aim to significantly reduce sediment levels so that its patrons can install and realistically maintain micro-sprinklers or install under-ground drip systems.

Objectives: 1) Reduce irrigation water sediment levels to accommodate use of micro-sprinklers, subterranean drip systems, and totalizing meters, 2) Increase stream flow in Hood River and other tributaries in summer months

Proposed Actions and Schedule: This project is currently in design phase and proposed actions are dependent on engineering recommendations and feasibility analysis. Permitting & Construction are being targeted for 2015-2016 or as funding allows.

Project Cost: $1.2 million

AH-14. Green Point Pipeline Project (*High Priority*)

Lead Entity/Partners: FID/HRWG, CTWS

General Location: Green Point and Deadpoint Creek canyons

Background: Low stream flows in late summer and fall in Green Point Creek below FID's diversion and the West Fork Hood River impact summer steelhead, spring Chinook, and other fish species. Summer steelhead distribution is limited to the West Fork Hood River and it is one of the weakest native stocks in the basin. Increased summer flow would benefit summer steelhead as well as spring Chinook migration, spawning and rearing.

The existing Green Point main pipeline, currently 26 years past its life expectancy, has significant leakage. Preliminary estimates are 2-3 cfs.

Objectives: 1) Increase stream flow in Green Point Creek and West Fork Hood River, 2) Increase summer steelhead production, 3) Foster more reliable irrigation service to FID's upper and middle districts, 4) Eliminate chronic erosion on hillsides above Green Point and Deadpoint Creeks, and 5) Significantly reduce risk of catastrophic sediment transport event into Deadpoint Creek and West Fork Hood River.

Proposed Actions and Schedule: FID will measure water loss along the pipeline between 2014 and 2015. Funding will then be sought to replace the leaking pipe. Pending negotiation and funding opportunities, water conserved as a result of this project could be dedicated to enhanced minimum instream flows.

Project Cost: Approximately $2 million

AH-15. Kingsley Reservoir Improvement and Ditch Cr. Restoration (*Medium Priority*)

Lead entity/ Partners: FID/County, HRWG

General Location: Upper and Lower Kingsley Reservoirs and Ditch Creek

Background: The Kingsley reservoirs provide water to patrons in FID's upper and middle districts. The capacity of the upper and lower reservoirs has decreased due to sedimentation. Frequently, water is limited in late summer by low reservoir levels. This is a problem for irrigators, and causes high water temperature and low dissolved oxygen in the reservoir and downstream Ditch Creek. In addition, the area around the lower reservoir has been degraded by uncontrolled and excessive Off-highway Vehicles (OHV) use. This is causing sedimentation and habitat degradation to Ditch Creek, which supports a population of cutthroat.

Objectives: 1) Restore 0.5 mile of stream & approximately 12 acres of, wetland, riparian, and forestland habitat, 2) Improve water quality in Ditch Creek (temperature, turbidity), 3) Improve FID irrigation water delivery and maintenance efficiency, 4) Reduce current resource degradation by OHVs around the reservoir and Ditch Cr.

Proposed Actions and Schedule: The upper reservoir's capacity would be increased by raising the current dam elevation ~1.0 foot and by excavating the southern portion of the reservoir. These actions would increase the upper reservoir's storage capacity to 1,125 ac-ft, which would provide an additional 2 cfs for 30 days in late summer. This would also allow

for removal of the lower reservoir and restoration of the historic stream channels, wetlands, and forestland. (The land that is currently submerged would revert to County forestland.) Ditch Creek's historic channel and riparian area would be restored by channel construction and large wood placement. Historic upland areas would be returned to forest and grassland vegetation. OHV and vehicle use would be restricted with road closures and placement of logs, boulders, and berms. Pending negotiation and funding opportunities, FID could maintain a minimum flow in Ditch Creek below the reservoir. Project implementation schedule TBD.

Project Cost: Approximately $1.6 million

AH-16. Evans Cr. -Hutson Drive Culvert Replacement (*High Priority*)

Lead Entity/Partners: County/ CTWS, HRWG, MFID

General Location: RM 2.5 Evans Cr.

Background: Existing four-foot and six-foot round culverts at RM 2.5 on Evans Creek, a tributary to the East Fork Hood River, are velocity and depth barriers to fish passage and are undersized for 50-year design flood. Evans Creek provides spawning and rearing habitat for steelhead, coho salmon, and cutthroat trout.

Objectives: 1) Provide fish passage to 1.3 miles of steelhead, coho salmon, and cutthroat trout habitat, 2) Road crossing structure designed to pass a 100-year flood

Proposed Actions and Schedule: Secure County right of way easements and landowner agreements with private property owners within the project area. Remove existing 4 foot and 6 foot diameter culverts and gabion baskets. Install new 264" x 132" plate arch (91' long) at Hutson Dr. crossing. Construct new stream channel, including installation of six grade control structures (i.e., rock weirs). Site restoration will include riparian planting, grass seeding, and placement of coarse woody debris on channel margins. Pending funding, implementation would occur in 2016.

Project Cost: $633,000

AH-17. Odell Creek Hydroelectric Project Decommissioning (*High Priority*)

Lead Entity/ Partners: HRWG/ Private landowner, Hydro-plant operator, ODFW, CTWS

General Location: Mouth of Odell Creek

Background: Odell Creek is a non-glacial tributary of the lower Hood River, which has the potential to support winter steelhead, as well as populations of resident rainbow trout and coastal cutthroat trout. The Odell Creek Hydroelectric Project was established in 1984 as a private electric generation facility. The 12-foot high concrete dam includes a fish ladder and screen that do not meet current standards. Other impacts of the hydroelectric facility and dam include increased stream temperatures, altered sediment transport processes, and depleted stream flow in the 880-foot bypass reach. A recently completed economic evaluation of the project showed that the revenues generated by future hydro-power income would not cover the cost of operations, maintenance, and debt service incurred from upgrade costs.

Objectives: 1) Unimpeded fish passage for steelhead, cutthroat trout, and rainbow trout to 4.5 miles of upstream habitat, 2) Increased streamflow in bypass reach, 3) Normal sediment transport

Proposed Actions and Schedule: The proposed action is to remove the dam, pipeline, and powerhouse and restore the streambed, floodplain and riparian area. A new, smaller diversion structure will need to be constructed to accommodate an existing irrigation water right for 30 acres of adjacent orchard land. The hydropower water right will be converted to an instream flow right held by the State of Oregon. The decommissioning design will be completed 2014-2015 and implementation 2015-2016.

Project Cost: $300,000

AH-18. Indian Creek Urban Riparian Enhancement (*Medium Priority*)

Lead Entities/ Partners: HRWG & ICS/ Columbia Gorge Community College, Hood River Valley High School, City of Hood River, County, Hood River Valley Parks & Recreation

General Location: Urban portion of Indian Creek

Background: Indian Creek is a small but heavily populated drainage on the lower west side of the Hood River valley. Urban development within the City of Hood River and the County occupies 15% of the sub-watershed. Land use for the remaining 85% is agricultural and rural residential. The DEQ and local groups have documented a number of water quality concerns, including temperature exceedances (2002 TMDL), pesticides (current 303(d) list), *E. coli* (current 303(d) list), nitrogen, and phosphorus. A variety of agencies and stakeholders have been working to improve riparian shade and water quality in Indian Creek over the past 10 years.

Objectives: 1) Improve riparian habitat diversity, 2) Increase shade, 3) Decrease stream temperatures, 4) Decrease anthropogenic pollutants entering surface waters

Proposed Actions and Schedule: HRWG and ICS will work with partners to implement riparian restoration projects within Indian Creek's urban corridor. Depending on the site, this may include removal of non-native invasive plant species and establishment of native riparian vegetation. Implementation is ongoing as funds become available. (Riparian enhancement on agricultural and rural residential lands within the Indian Creek subwatershed is described in the Orchard Spray Buffer Riparian Planting Project and Agricultural Irrigation Efficiency and Water Quality Improvement Projects on pages 16 and 28, respectively.)

Project Cost: TBD

AH-19. Clear Branch Dam Fish Passage, Flow & Temperature Improvement *(High Priority*)

Lead entity/ Partners: MFID/ USFS, HRWG, USFWS, ODFW, DEQ, CTWS, NMFS

General Location: Clear Branch Dam

Background: Clear Branch Dam blocks upstream fish passage and downstream passage is limited to times in winter or spring when the reservoir spills. The primary fish species affected are bull trout, winter steelhead, cutthroat trout and resident rainbow trout. The core population of the Hood River bull trout recovery unit is located above the dam. Downstream water temperatures and stream flow are a potential concern. The current minimum allowable stream flow in Clear Branch Creek below the dam is 3 cfs, which Clear Branch can reach during late summer. Stream temperatures may at times exceed limits required for bull trout spawning and rearing (i.e., 50˚F).

The Adaptive Management Group (i.e., partners listed above) is currently developing recommendations for capital improvement projects and management strategies to be implemented by MFID. These may include 1) providing fish passage at Clear Branch Dam, 2) reducing stream temperatures and improving stream flows on Clear Branch Creek below the dam, 3) improving lake levels at Laurance Lake, and 4) constructing a pipeline from the existing Coe Branch diversion to MFID's existing settling basin. The Coe Branch pipeline project would allow MFID to remove sediment from Coe Branch water using its existing settling basin, thereby allowing Coe Branch water to be utilized in summer months. Water diverted from Coe Branch in the summer would decrease the amount diverted from Clear Branch.

Objectives: 1) Provide upstream and downstream fish passage over the dam, 2) Increase stream flows downstream of Clear Branch Dam, 3) Improve water temperatures downstream of Clear Branch Dam, 4) Keep Laurance Lake as full as possible throughout the year while meeting MFID and fish habitat goals, and 5) Enable MFID to efficiently provide irrigation water to their patrons

Proposed Actions and Schedule: Actions will focus on 1) the Adaptive Management Group finalizing recommendations to MFID and 2) USFS, USFWS, and NMFS conducting NEPA review of MFID proposed actions and management strategies. Additional monitoring or evaluation of stream temperatures may be recommended to facilitate NEPA review. If this is the case, HRWG will work with MFID to accomplish stream temperature and flow monitoring. MFID and partners may pursue funding for projects that improve fish passage, lake levels, and stream flows and summer temperatures on Clear Branch Creek. These projects are pending recommendations by the Adaptive Management Group and approval by USFS.

Project Cost: TBD

AH-20. Substrate Supplementation below Clear Branch Dam (*High Priority*)

Lead Entity/ Partners: MFID/USFS, ODFW

General Location: Clear Branch Creek below dam

Background: Clear Branch Dam interrupts natural sediment routing to lower Clear Branch Cr. and Middle Fork Hood River. Gravel supply is low in this reach, which reduces salmonid spawning and rearing habitat. ESA-listed winter steelhead and bull trout are present.

Objectives: 1) Increase suitable bull trout and winter steelhead spawning habitat in the 2,900 foot reach of Clear Branch below the dam, 2) Mimic the amount of sediment inflows above the dam.

Proposed Actions and Schedule: Place up to 170 cubic yards annually of coarse substrate (approx. ½ " – 6" diameter gravel/cobble) below the spillway of Clear Branch Dam using a conveyered aggregate delivery system and excavator. MFID will place the material at the direction of USFS. ODFW and USFS will monitor bull trout, steelhead and spring Chinook spawning in the project reach below the dam, and assess movement and loss of gravel. Implementation will take place from 2013-2018.

Project Cost: $40,000 (plus implementation oversight & monitoring assistance from USFS)

AH-21. Coe Branch Channel Roughening and Fish Passage Protection (*High Priority*)

Lead Entity/ Partners: MFID/ USFS, ODFW

General Location: MFID Diversion on Coe Branch

Background: In 2009, MFID implemented a Coe Branch Diversion project in partnership with CTWS and USFS. The project included removing the concrete/gabion basket retaining wall and concrete dam that spanned Coe Branch and replacing it with a new diversion structure and Farmers Conservation Alliance fish screen. The stream channel was restored by installing cross vanes to stabilize the streambed and adding LWD to the stream bank.

Since the implementation of the original project, the channel has incised making fish passage upstream difficult or impossible and jeopardizing water flow into the diversion inlet.

Objectives: 1) Restore fish passage, 2) Protect channel stability and instream habitat quality, 3) Protect inlet of Coe Branch diversion and fish screen.

Proposed Actions and Schedule: Construct a roughened channel through the reach adjacent to the diversion. Specifically, place large boulders below the existing boulder weirs to create a steep riffle that is passable to fish. The spaces between the boulders would be filled with smaller boulders, cobble and gravel. Rock placement would occur with a large track mounted excavator. The project is scheduled for implementation in 2014.

Project Cost: ~$50,000

AH-22. Meadows Creek Culvert Replacement Project (*High Priority*)

Lead Entity/ Partners: ODOT/ Fed. Hwy. Administration, USFS, HRWG

General Location: Meadows Creek at Hwy. 35 & Teacup Rd.

Background: Two culverts on Meadows Creek, at Hwy. 35 and Teacup Rd., are upstream fish passage barriers and are not adequately sized to carry 100-year flood flows. Coastal cutthroat trout are present above and below each culvert site. Meadows Creek and the E. Fork Hood River are designated as critical habitat for winter steelhead. The replacement of these two culverts would create 2.9 miles of contiguous high quality habitat for cutthroat trout and potentially winter steelhead. Replacing both culverts with larger crossings would also enhance stream and floodplain function during flood events, as well as minimize potential damage to Highway 35 and Teacup Rd.

Objectives: 1) Unimpeded fish passage, 2) Road crossing structure that is large enough to pass a 100-year flood

Proposed Actions and Schedule: The culverts would be replaced with either concrete box culverts or bottomless arches. The culverts would be large enough to accommodate the 100-year flood flow, including debris such as rocks and logs. The culverts would be countersunk to allow construction of a continuous natural streambed through each structure at a channel gradient that matches Meadows Creek up and downstream. NEPA analysis is complete for both sites. Project implementation schedule is dependent on funding acquisition.

Project Cost: ~ $ 1,000,000

AH-23. Hood River Delta Habitat Improvement (*Medium Priority*)

Lead Entity/ Partners: Port of Hood River/ HRWG, ODFW, USFWS, CTWS

General Location: Mouth of Hood River & Waterfront

Background: The Hood River delta at its confluence with the Columbia River was historically an alluvial fan with vegetated islands, multiple channels, and a cottonwood riparian forest. Following completion of Bonneville Dam in 1937, average elevation of the Columbia River was significantly raised, inundating many of the historic features. Subsequently the area was filled and stream banks armored to allow for a variety of commercial and public infrastructure. This pattern of development has been widespread along the Columbia River, resulting in a significant lack of off-channel refuge and rearing for migrating juvenile salmon.

Objectives: 1) Increase shallow water habitat for juvenile salmonid refuge and rearing, 2) Improve riparian zone conditions

Proposed Actions and Schedule: This project is in the planning stage. Restoration concepts that have been proposed include 1) modifications to the Spit Road separating the Hood River and Basin to improve hydrology and riparian/floodplain habitat, 2) creation of shallow water habitat along shorelines, 3) re-vegetating the shore with native species, and 4) allowing fallen and washed up trees to decompose in place

Project Cost: TBD

AH-24. Agricultural Irrigation Efficiency and Water Quality Improvement (*High Priority*)

Leads/Partners: SWCD, NRCS, CGFG, CTWS, FID, MFID / EFID, HRWG, OSU-MCAREC

General Location: Basin-wide

Background: Low stream flows caused by irrigation withdrawals reduce fish habitat and passage. Many irrigators are still using hand lines as opposed to solid set lines and micro-sprinklers that, when combined with soil moisture sensors and careful monitoring, can conserve significant amounts of water. Excessive water line pressure in some areas also wastes water and prematurely wears out nozzles.

Water quality is impaired by stream temperatures, pesticides, *E. coli*, and nutrients in a number of streams. Elevated stream temperatures and pesticide levels can reduce the viability of salmon and trout. High *E. coli* levels are a human contact risk. High nutrient levels increase biological oxygen demand, which lowers available dissolved oxygen (DO). Salmon and trout are particularly sensitive to low DO levels. Common causes of increased thermal loading and pollutants include lack of shade, insufficient vegetated buffers along streams, unrestricted livestock access to streams, and poorly managed livestock operations.

Objectives: 1) Increase on-farm water conservation, 2) Reduce delivery-line water pressures to optimal levels, 3) Increase summer stream flows, 4) Improve water quality to achieve compliance with state temperature, *E. coli* and pesticide standards

Proposed Actions and Schedule: These projects are ongoing and primarily consist of: 1) Improving irrigation efficiency, 2) Excluding livestock from waterways, 3) Improving riparian conditions by increasing native plant cover and diversity, and 4) Improving pasture and livestock management. The SWCD, CGFG, and NRCS will work with landowners to improve on-farm irrigation systems, increase streamside vegetated buffers, and/or implement livestock management BMPs (e.g., riparian fencing, guttered outbuildings, manure storage facilities). (See Small Scale Restoration Initiative project for CTWS actions.) MFID plans to install four pressure reducing stations in the next several years and will provide cost-share of up to $20,000/year towards installation of micro-sprinkler or drip irrigation systems on private agricultural lands within their district. FID will continue their sprinkler exchange program, which provides free micro-sprinkler heads in exchange for old, high volume sprinkler heads.

Project Cost: At least $ 93,000/year (MFID to be determined, OWEB small grants=$50 k/yr., Private landowners= $13 k/yr., NRCS to be determined)

AH-25. Stream Crossing Enlargements- USFS Roads 1340, 1600, & 1800 (*High Priority*)
(Upper West Fork Watershed Restoration Action Plan (UWFWRAP): Projects SC1 – SC5)

Lead Entity/ Partners: USFS/ HRWG

Locations: Road 1340 crossing of unnamed tributary to W. Fork Hood River, Road 1600 crossing of Marco Cr., Road 1800 crossings of Elk Cr. and several unnamed tributaries of McGee Cr.

Background: All of these stream crossings are undersized culverts that do not pass the 100-year flood event. This prevents natural transport of sediment and wood through the culverts and leads to road-related sediments entering the streams. In extreme events, undersized culverts can lead to catastrophic road failure. The affected stream reaches for these crossing enlargements are non-fish bearing, or in the case of Elk Creek, have a natural barrier downstream.

Objectives: 1) Road crossing structures that are large enough to pass a 100-year flood including debris, 2) Reduce fine sediment load during large flood events, and 3) Minimize or eliminate the risk of catastrophic road failure.

Proposed Actions and Schedule: At Road 1340, there are two adjacent road culverts. One is a 35" x 24" squash pipe and the other a 24" round pipe. The round pipe will be removed and replaced with another 35" x 24" squash pipe. This approach will maintain the existing road profile and reduce needed fill amounts. The combined capacity of the new and old culverts will be sufficient to pass a 100-year event. This road is not a major thoroughfare so it can be closed during construction. Design is planned for 2014, with construction in 2015.

The culvert at Road 1600 and culverts on Road 1800 will be replaced with appropriately-sized stream simulation pipe arches. These roads are major Mt. Hood National Forest (MHNF) thoroughfares, so temporary bypass travel lanes will be built to allow vehicle traffic during construction. Road 1600 design and construction phases are planned for 2015 - 2016. Road 1800 design and construction phases are planned for 2016 - 2017.

All project design criteria outlined in the 2013-2018 Aquatic Restoration Biological Opinion (ARBO) will be followed. NEPA analysis is complete. Monitoring will be completed within one year of project implementation.

Project Cost: Road 1340 = $37,000, Road 1600 = $92,000, Road 1800 = $500,000

AH-26. McGee Cr. Tributary Fish Passage Remediation (*Medium Priority*) (UWFWRAP-FC6)

Lead Entity /Partners: USFS/HRWG, Weyerhaeuser

General Location: McGee Cr. Tributary at Weyerhaeuser road crossing

Background: The culvert at this site is undersized, creating a barrier to fish passage and the inability to pass a 100-year flood event. Sedimentation has occurred at and downstream of the site due to the small size of the culvert. Based on known fish distribution in McGee Creek, it is believed this tributary is occupied by both steelhead trout and resident rainbow trout.

Objectives: 1) Unimpeded fish passage, 2) Road crossing structure that is large enough to pass a 100-year flood including debris, 3) Reduced fine sediment load during large flood events

Proposed Actions and Schedule: The existing culvert will be replaced with a stream-simulation, bottomless pipe arch. This road can be closed during construction. All project design criteria outlined in the 2013-2018 ARBO will be followed. NEPA analysis is complete, with design and construction phases planned for 2016 – 2017, pending landowner approval. Monitoring will completed within one year of project implementation.

Project Cost: $90,000

AH-27. McGee Cr. Fish Passage Remediation-FSR 1800 (*High Priority*) (UWFWRAP-FC4)

Lead Entity/ Partners: USFS/HRWG

General Location: McGee Creek at FSR 1800

Background: The culvert at this site is undersized, creating a barrier to fish passage and the inability to pass a 100-year flood event. McGee Creek is an anadromous fish bearing stream and is also designated critical habitat for bull trout.

Objectives: 1) Unimpeded fish passage for anadromous and resident salmonids, 2) Road crossing structure that is large enough to pass a 100-year flood including debris, 3) Reduced fine sediment load during large flood events

Proposed Actions and Schedule: The existing culvert will be replaced with a single span bridge. Stream channel restoration will utilize stream simulation techniques. FSR 1800 is a major MHNF thoroughfare so a temporary bypass travel lane will be built to allow vehicle traffic during construction. All project design criteria outlined in the 2013-2018 ARBO will be followed. NEPA analysis is complete. USFS is currently designing the replacement structure and intends to install the new crossing in 2015 pending funding. Monitoring will be completed within one year of project implementation.

Project Cost: $625,000

AH-28. Marco Cr. Fish Passage Remediation-USFS Road 1600 & 1800 (*High Priority*) (UWF WRAP-FC2 & FC1)

Lead Entity/ Partners: USFS/HRWG

Location: Marco Creek at Roads 1600 & 1800

Background: There are three undersized culverts at two separate Road 1600 crossings. At the lower crossing there are two side by side culverts: one carries Marco Cr. and the other an unnamed perennial tributary to Marco Cr. All three crossings are barriers to fish passage and have caused sedimentation at and downstream of the site. At Road 1800, the existing 72 inch diameter culvert is large enough to pass flood flows, but is a barrier to fish passage. Marco Cr. supports rainbow trout and other resident aquatic species.

Objectives: 1) Unimpeded fish passage for rainbow trout, 2) Road crossing structures that are large enough to pass a 100-year flood including debris, 3) Reduced fine sediment load during large flood events

Proposed Actions and Schedule: The existing Road 1600 culverts will be replaced with stream simulation pipe arches. The Road 1800 culvert will be replaced with a bottomless arch or multi-plate pipe arch. Either option would utilize stream simulation. Road 1600 and 1800 are major MHNF thoroughfares, so temporary bypass travel lanes will be built. All project design criteria outlined in the 2013-2018 ARBO will be followed. NEPA analysis is complete. Road 1600 design and construction phases are planned for 2016 - 2017. Road 1800 design and construction phases are planned for 2013 – 2015. Monitoring will be completed within one year of project implementation.

Project Cost: Road 1600 = $500,000, Road 1800 = $400,000

AH-29. Tumbledown Cr. Fish Passage Remediation-FSR 1800 (*Medium Priority*) (UWFWRAP-FC3)

Lead Entity/ Partners: USFS/HRWG

Location: Tumbledown Creek at FSR 1800

Background: The existing 30-inch diameter culvert is undersized, creating a barrier to fish passage and the inability to pass a 100-year flood event. Tumbledown Creek supports rainbow trout and other resident aquatic species.

Objectives: a) Unimpeded fish passage for rainbow trout, b) Road crossing structure that is large enough to pass a 100-year flood including debris, c) Reduced fine sediment load during large flood events

Proposed Actions and Schedule: The existing culvert will be replaced with a bottomless arch or multi-plate pipe arch. 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.) will be followed. NEPA analysis is complete. Design and construction are planned for 2016 - 2017. Monitoring will be completed within one year of project implementation.

Project Cost: $350,000

AH-30. BPA Powerline Road Storm-proofing (*High Priority*) (UWFWRAP-R3)

Lead Entity/ Partners: USFS/BPA

General Location: BPA power line corridor within upper West Fork Hood River

Background: 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 largely unmaintained roads are a chronic source of sediment delivery to streams during high flow events.

Objective: Reduce fine sediment load to streams during high flow events

Proposed Actions and Schedule: This project would storm proof these access roads by installing and 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 miles. 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.

Project Cost: $120,000

AH-31. Red Hill Restoration: Road Decommissioning/Closure (*High Priority*)
(UWFWRAPR2)

Lead Entity/ Partners: USFS/ HRWG

General Location: Upper West Fork Hood River Watershed

Background: Under-maintained or poorly designed roads are a chronic source of sediment delivery to streams during high flow events.

Objective: Reduce fine sediment load to streams during high flow events

Proposed Actions and Schedule: 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. For this project roads will usually be closed with a gate, but may also be blocked with boulders, logs, or other structures. Road storm-proofing will include the installation of waterbars, outsloping, and pulling culverts as needed, but will keep the road as part of the USFS road network. The road may or may not be closed to traffic. Road decommissioning, will 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 and 5.6 miles are proposed for storm proofing. Year-round closure would be established on 8.4 miles of road. NEPA analysis is complete. Implementation will occur after vegetation management activities are concluded in the area. 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.

Project Cost: $290,000

AH-32. Upper Neal Cr. Fish Passage/Culvert Replacement *(Medium Priority)*

Lead Entities: USFS/HRWG

General Location: Headwaters of Neal Creek, 1710 road

Background: The existing culvert is a fish passage barrier and is also undersized and does not pass larger flood flows.

Objectives: 1) Unimpeded passage for fish and other aquatic species, 2) Road crossing structure that is large enough to pass a 100-year flood including debris.

Proposed Actions & Schedule: The site survey and design for this crossing is complete. Implementation scheduling will depend upon available funding since this crossing is not located in the priority restoration watershed on the Hood River Ranger District (Upper WFHR). Ideally implementation would occur within the next 5 years. NEPA analysis is complete.

Project Cost: $200,000

AH-33. East Fork Hood River Trail Relocation *(Low Priority)*

Lead Entity/Partners: USFS/HRWG

General Location: East Fork Hood River between Tamanawas Falls Trailhead and old Robinhood Campground

Background: Repeated floods of the East Fork Hood River have removed trail bridges and caused sections of the trail to be destroyed. Water is currently running directly down the trail tread. Recreational use is contributing to the rate of erosion. This project would relocate the trail above the high water mark.

Objectives: 1) Reduce trail and user related erosion and sedimentation into the East Fork Hood River.

Proposed Actions & Schedule: NEPA is complete. Implementation of the trail relocation (approximately ¼ mile of trail 500' further away from the East Fork of Hood River) would occur pending funding, likely in 2015 or 2016.

Project Cost: $15,000

AH-34. Upper West Fork Hood River Private In-holding Purchase (*High Priority*)
(UWFWRAP L-1)

Lead Entities: USFS & WRC

General Location: Upper West Fork Hood River Watershed

Background: This parcel is the only private 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. Summer steelhead, coho, and spring Chinook 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 and rearing habitat and supplies woody debris to the West Fork and mainstem Hood River. This land parcel is currently managed for intensive timber production. If acquired, there are a host of potential projects that could be completed, including pre-commercial, 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.

Objective: Acquire the 1,882 acre private inholding located within the MHNF boundary

Proposed Actions and Schedule: Western Rivers Conservancy plans to purchase the parcel from Weyerhaeuser, pending their agreement, 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 they plan to continue submissions given its importance for salmon and steelhead recovery. USFS is proposing acquisition in two phases (i.e., 1,122 acre southern portion of parcel in 2014, remainder of parcel in 2015).

Project Cost: $3.5 million

Element 2: Terrestrial Habitat Restoration and Conservation Projects

#	Project Name	Lead	Page
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TH-2	Oak Habitat Enhancement	TBD	38
TH-3	Invasive Plant Control/Eradication on USFS Lands	USFS	39
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TH-5	Meadow Enhancement	USFS	40
TH-6	Enhancement & Restoration of Huckleberry Areas	USFS	40

TH-1. Early Detection Rapid Response Weed Abatement (*Medium Priority*)

Lead Entity/ Partners: SWCD/Columbia Gorge Cooperative Weed Management Area partners, ODA

General Location: Basin-wide

Background: The EDRR Program is a cooperative effort to prevent the establishment of new invasive plant species. Early detection is far more effective and less costly than eradicating invasive species once they become established.

Objectives: Prevent the establishment of new invasive plant species

Proposed Actions and Schedule: Monitor and report observations of any EDRR species to the respective Oregon and Washington state databases. Follow-up treatment will be implemented by CGCWMA partners. Ongoing.

Project Cost: $20,000/year

TH-2. Oak Habitat Enhancement (*Medium Priority*)

Potential Partners: Private landowners, HRWG, CLT, County, USFS

General Location: Middle Mountain & east-side of Hood River Valley; below 1,500 feet

Background: The extent of oak savanna and woodlands has declined in the watershed during the past 100 years due to fire suppression and active conversion to conifers. Species that depend on oak habitat for all or part of their life cycle include Western gray squirrel and acorn woodpecker. Two important areas in the watershed include Middle Mountain and the basin's eastern edge (e.g., Surveyor's Ridge, Whiskey Creek, Neal Creek).

Objectives: Restore structure and ecological function to oak savanna and woodlands.

Proposed Actions: Primary actions will include thinning or removal of conifers and release of legacy oaks.

Project Cost: TBD

TH-3. Invasive Plant Control/Eradication on USFS Lands (*High Priority*) (UWF WRAP-I1)

Lead Entity/ Partners: USFS/ County

General Location: Upper West Fork Hood River Watershed

Background: Surveys have documented invasive plants such as knapweed (*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.

Objectives: Control invasive plant species extent and rate of spread and, if possible, eradicate local populations

Proposed Actions and Schedule: Treatment methods may include hand pulling, mechanical, and chemical. Most treatment will likely be chemical (herbicide) as it offers the best chance for complete control/eradication at the lowest cost. Known populations of invasive plants (e.g., orange hawkweed under the BPA powerline) will be treated on a regular basis. USFS will utilize an early detection, rapid response strategy to identify and treat new infestations. NEPA is complete for this project and several invasive plant infestations have been identified in the watershed. Project implementation will occur every year from 2013-2017. Monitoring will occur concurrently with treatment to determine subsequent treatment strategy and magnitude, and to identify new populations.
Project Cost: $135,000

TH-4. Aspen Woodland Regeneration (*Medium Priority*)

Project Lead/Partners: USFS/private landowners, HRWG, ODFW, County

General Location: Basin-wide

Background: The extent of aspen woodlands has declined in the watershed during the past 100 years. This is mainly due to fire suppression, conifer encroachment, and agricultural and rural development.

Objective: Increase the extent and health of aspen stands in the Watershed

Proposed Actions: Primary actions would include conifer removal, replanting of aspen, and installation of game fences to eliminate grazing pressure while young aspen are becoming established.

Project Cost: TBD

TH-5. Meadow Enhancement *(Medium Priority)*

Project Lead/Partners: USFS/private landowners, HRWG, ODFW

General Location: Basin-wide

Background: The extent of meadows has declined in the watershed during the past 100 years due to fire suppression activities. Conifer encroachment into meadow habitat has led to a reduction in size, available forage, and natural edge habitat.

Objective: Increase the size and extent of meadows.

Proposed Actions: The primary action is the introduction of fire into meadows to kill conifers and release plants that are suppressed by overgrowth of vegetation. An alternative to burning is thinning trees along meadow edges.

Project Cost: TBD

TH-6. Enhancement and Restoration of Huckleberry Areas *(Medium Priority)*

Project Lead/Partners: USFS/CTWS, Mt. Hood Meadows, Hood River Stewardship Committee

General Location: Mid-elevation zones in the watershed; Clearings & open pockets in Pacific-silver fir dominated stands

Background: For thousands of years, Native Americans have gathered huckleberries in the mountains of the Pacific Northwest. To this day, berry picking, eating, and preserving is an important part of tribal culture and a significant indigenous food. Fire suppression and possibly other decreases in disturbance have diminished huckleberry fields. The USFS and others are researching the most effective ways to enhance huckleberry areas. Thinning trees in and around existing huckleberry fields has been successful. Prescribed burning has not shown positive results in this area.

Objective: Increase the quality and extent of huckleberry areas

Proposed Actions: Create up to 5-acre gaps in and around existing berry areas. 30% canopy cover will be maintained. Trees will be thinned with ground equipment and transported off site by helicopter. A moderate amount of ground disturbance is desirable to stimulate growth of huckleberry rhizomes.

Project Cost: TBD

Element 3: Monitoring & Assessment

#	Project Name	Lead	Page
M-1	Pesticide Stewardship Partnership	Multiple	41
M-2	Stream Temperature Monitoring	Multiple	42
M-3	Groundwater Monitoring	HRWG & OWRD	42
M-4	Streamflow Monitoring	CTWS & ODFW	43
M-5	Baseline Water Quality Monitoring	Columbia Riverkeeper	43
M-6	Riparian Conditions Assessment	SWCD	44

M1. Pesticide Stewardship Partnership (*High Priority*)

Partners: SWCD, HRWG, CTWS, DEQ, ODA, OSU Extension

General Location: Neal Cr., Lenz Cr., Odell Cr.

Background: The Hood River Pesticide Stewardship Partnership (PSP) is a collaborative project of the DEQ, OSU-MCAREC, CTWS, CGFG, HRWG, and the SWCD. Key components of the PSP are 1) monitoring for pesticides in surface waters, 2) identifying streams with elevated pesticide concentrations or high number of detections, 3) collaborating to implement voluntary best management practices, and 4) follow-up monitoring to determine improvements over time. The PSP monitors for over 100 insecticides, herbicides, and fungicides that are typically used in orchards, right of ways, and forest management.

Objectives: 1) Assess presence and concentration of existing and new pesticides, 2) Provide feedback to partners implementing BMPs and Integrated Pest Management, 3) Document trends in stream pesticide levels

Proposed Actions and Schedule: The PSP will continue pesticide monitoring in selected streams. Recent sampling has focusued on Neal, Odell, and Lenz Creeks. As new pesticides come into use, water samples may be tested for additional pesticides in consultation with local experts. Grab samples will be collected approximately 12 times per year during months of peak pesticide use in orchards (March – June & September). Other sampling times may be added to capture potential impact of herbicides used for forest management. Samples will be sent to the DEQ laboratory for analysis. DEQ and CTWS will also deploy POCIS and SPMD[3] samplers at a number of locations, including some streams where grab samples are not collected. These samplers can remain in the stream for up to two months and will be deployed year round. Continous monitoring can detect pesticides that may be missed by grab samples. In addition, SPMD samplers can detect hydrophobic compounds.

Project Cost: $30,000/year

[3] Polar Organic Chemical Integrative Sampler, Semi-permeable Membrane Device

M-2. Stream Temperature Monitoring (*High Priority*)

Partners: MFID, FID, HRWG, CTWS, DEQ, USFS, ODFW

General Location: Basin wide

Background: A number of stream reaches in the basin were listed on the Oregon Department of Environmental Quality's 1998 303(d) list for not meeting instream temperature criteria for bull trout or salmonid spawning (see **Appendix 2**). Several Watershed Group Partners are measuring water temperature to evaluate changes to stream temperature over time and anthropogenic impacts to stream temperature.

Objectives: 1) Evaluate changes to stream temperature, 2) Evaluate influence of irrigation diversions on stream temperatures, 3) Evaluate influence of Laurance Lake on stream temperatures, 4) Document baseline stream temperatures (where prior data do not exist), 5) Evaluate effect of restoration or management practices on stream temperature

Proposed Actions and Schedule: Temperature probes are installed during the summer and year round. Probes record hourly temperature throughout the deployment period. Anticipated monitoring locations for the next two to three years include Clear Branch Creek above and below Laurance Lake, Pinnacle Creek, Coe Branch, Elliot Branch, Middle Fork Hood River (several locations), mainstem Hood River (several locations), West Fork Hood River (several locations), East Fork Hood River, Rogers Creek, Lake Branch, Neal Creek, and Odell Creek.

Project Cost: ~$25,000/year

M-3. Groundwater Monitoring (*High Priority*)

Lead Entity/Partners: HRWG & OWRD /County

General Location: Basin wide

Background: Insufficient information exists on ground water in the Hood River Watershed. In recent years, wells have been tapped for irrigation use late in the irrigation season. Water quantity and quality (e.g., sediment) concerns could cause more irrigators to turn to groundwater in the future. A clear understanding is needed of the connection between surface- and groundwater and potential impact of climate change on groundwater recharge.

Objectives: 1) Increase understanding of existing groundwater resources, 2) Provide additional data for Hood River Basin ground water model

Proposed Actions and Schedule: County staff will recruit at least 40 additional well owners, by January 2014, to participate in the ground water monitoring network. County, HRWG, and OWRD will conduct quarterly monitoring for at least 3 years to build a groundwater model that can more accurately predict future groundwater availability.

Project Cost: ~ $11,000/year

M-4. Streamflow Monitoring *(High Priority)*

Lead/Partners: ODFW, CTWS/HRWG, OWRD, MFID, USGS, Mt. Hood Meadows

Background: Low instream flows are a limiting factor in a number of areas throughout the Hood River watershed. Low flows are known to reduce available wetted habitat for spawning and rearing, and can impede fish passage. Efforts are ongoing to understand the effect of streamflow on stream temperature and smolt production in the Hood River Watershed.

Objectives: 1) Measure baseline streamflow, 2) Determine the relationship between streamflow and smolt production, 3) Measure changes in streamflow resulting from management practices.

Proposed Actions and Schedule: This is an ongoing project. Instantaneous stream flow will be measured periodically throughout the year and rating curves developed for individual sites. Continuing sites include lower and upper East Fork, lower Middle Fork, upper West Fork, Rogers Cr., Odell Cr., and Neal Cr. A map of current and past streamflow monitoring sites will be developed to facilitate collaboration/resource sharing and identification of streamflow data gaps. Other sites will be monitored as data gaps are identified and time/funding allows.

Project Cost: ~$25,000

M-5. Baseline Water Quality Monitoring *(High Priority)*

Lead/Partners: Columbia Riverkeeper/DEQ, CGCC, volunteers

Background: Columbia Riverkeeper (CRK) began collecting baseline water quality data at 26 sites in the Columbia River Basin in 2006. CRK's program aims to collect long-term, baseline data in order to detect trends in water quality and identify where water quality is not meeting instream standards for the protection of human health and aquatic species. Parameters include conductivity, pH, turbidity, dissolved oxygen, temperature, and *E. coli*. Sites selected for *E. coli* sampling typically have high recreational use.

Objectives: 1) Evaluate progress towards restoring and maintaining the chemical, physical, and biological integrity of the Nation's water, 2) Use water quality data to help identify solutions to water quality problems

Proposed Actions and Schedule: Several sites will continue to be monitored in the Hood River Watershed. These include the mouth of Hood River, Hood River at Tucker Bridge, Indian Creek, and the Hood River waterfront swim beach. Sampling ranges from weekly to monthly and varies by season.

Project Cost: ~$12,500/year

M-6. Riparian Conditions Assessment *(High Priority)*

Lead/Partners: SWCD/ODA, CGFG, CTWS

Background: The SWCD is the Local Management Agency for the Hood River Agricultural Water Quality Management Area (AWQMA) and receives funding from ODA to assist agricultural landowners in their efforts to protect and improve water quality. In 2012, ODA directed SWCDs around the state to target part of their time and resources on Focus Areas to evaluate and document Oregon's efforts to achieve the state's goals for protecting and improving water quality. Due to cost, most SWCDs (including the HRSWCD) are using riparian conditions as a surrogate measure of water quality. In 2012, the HRSWCD developed a prioritized list of agricultural sub-watersheds in Hood River County and began work on the Indian Creek sub-watershed as its first Focus Area by assessing riparian vegetation conditions. Once assessed, those landowners with impaired stream reaches are contacted and offered technical assistance to improve riparian conditions on their land. The HRSWCD is coordinating this work with the ongoing CGFG orchard spray buffer project (AH-1) but the HRSWCD scope is larger as it includes non-orchard agricultural lands and non-agricultural lands with agricultural activities.

Objectives: 1) Document riparian conditions on agricultural lands over time and at two year intervals, 2) Conduct outreach on AWQMA BMPs followed by technical assistance and project implementation (reported under AH-24), and 3) Provide assessment data to ODA and other partners.

Proposed Actions and Schedule: The riparian conditions in the Neal Creek Focus Area will be assessed in spring 2014, 2016, and so on. Riparian conditions in the Indian Creek Focus Area will be assessed in summer 2015, 2017 and so on. Subsequent Focus Area sub-watersheds will be addressed in the following order: Whiskey Creek, McGuire Creek, Odell Creek, Evans Creek, Baldwin Creek, Graham Creek, Wishart Creek, Trout Creek, and Tieman Creek.

Project Cost: $12,500 per year

Element 4: Watershed Planning

#	Project Name	Lead	Page
WP-1	East Fork Irrigation District Master Plan	EFID	45
WP-2	W. Fork Hood River Riparian Management Plan	CTWS	45
WP-3	Hood River Water Conservation Strategy	HRWG	46
WP-4	Restoration Projects Geospatial Database & Map	HRWG	47
WP-5	Powerdale Lands Public Access and Trail Planning	CLT	47

WP-1. East Fork Irrigation District Master Plan (*High Priority*)

Lead Entity/Partners: EFID/ CTWS

General Location: Lower East Fork Hood River

Background: Natural stream flows in the Hood River basin are over-appropriated during the fall low flow period. As a result, reduced stream flow has been identified as the primary limiting factor for salmonid production in the basin in multiple planning documents. Of the three forks of the Hood River, the East Fork is the most impacted by summer/fall low flows. The EFID is the largest irrigation district in the Hood River valley and exercises water rights of 127 cfs at their point of diversion on the East Fork. During peak use, the EFID may divert up to 75% of available flow, resulting in diminished flow and reduced fish habitat downstream. Current EFID irrigation practices result in the loss of irrigation water through inefficient system operations, overflows in the distribution system, and open canal leakage.

Objective: Identify key projects to improve water conservation, water quality, and stream flows

Proposed Actions and Schedule: CTWS will continue to cost share with EFID to develop a Water Conservation Implementation Plan. The Plan will be developed in three phases. Phase 1 is in process and includes an inventory of the entire EFID irrigation system. Phase 2 will include a Management Plan for the EFID that will identify operational measures and procedures to reduce water loss. During Phase 3 a list of water conservation projects will be identified for implementation. The Plan will be completed by 2016.

Project Cost: $100,000

WP-2. W. Fork Hood River Riparian Management Plan (*High Priority*)

Lead Entity/Partners: CTWS/ODF, USFS, County, private landowners

General Location: West Fork Hood River

Background: The West Fork Hood River holds spawning and rearing habitat for ESA-listed summer steelhead and spring Chinook. Lack of instream large wood, possibly due to past land use practices, has been identified as a limiting factor in the production of salmonids in the West Fork Hood River. Significant effort is currently being put into placement of LWD

into the West Fork Hood River. It is recognized that LWD has a lifespan and that natural recruitment of large wood into the stream is the long term desired condition.

Objectives: a) Increase volume and type of LWD recruitment during the next 150 years, b) Increase riparian habitat diversity

Proposed Actions and Schedule: Develop site-specific treatment prescriptions targeting enhancement of the West Fork Hood River riparian corridor. CTWS will work with the County, Oregon Department of Forestry, USFS, and major timber land owners to adopt the key findings of this plan into existing or new riparian management plans. The approach will be to "customize" riparian zones to provide greater protection to reaches with more hydrological importance and reduce protection in less sensitive reaches with the end result of no net loss of timber volume to the land owner. Additionally there will be prescriptions to convert some riparian hardwood stand to conifers to promote long term LWD recruitment. It is hoped that this information can be utilized to influence riparian management so that the benefits realized by the large wood investment in the West Fork can be maintained. This project is ongoing

Project Cost: TBD

WP-3. Hood River Water Conservation Strategy (*High Priority*)

Lead Entity/Partners: HRWG/County, MFID, EFID, FID, ODFW, CTWS, Bureau of Reclamation, Oregon Water Resources Department

General Location: Hood River Watershed

Background: Since the mid-1960s, total annual water yield has trended downward and, over the past 20 years, the basin has experienced more extreme variations in quantity of snowpack and timing of snowmelt. Expectations are that fluctuations in timing and quantity of precipitation in the Hood River Basin will continue to cause flooding/debris flow issues, and that fluctuation in snowpack on Mt. Hood will cause shortages of available water late in the irrigation season. Hood River ESA-listed fish runs are also critically dependent on adequate stream flow levels. Low stream flow caused by current rates of surface water diversion is a significant limiting factor for salmon, trout and other aquatic species. Cooperative, scientifically-based planning is critical to identifying solutions for providing water to both fish and humans into the future.

Objectives: 1) Increase knowledge of current information on future water supply issues and conservation opportunities, 2) Prioritize strategies to improve stream flow, 3) Develop project concepts to achieve water conservation goals, 4) Develop monitoring strategy to evaluate Water Conservation Strategy progress

Proposed Actions and Schedule: HRWG will hire consultant to help identify, evaluate, and prioritize actions that Watershed Group partners can take to improve long-term reliability of water supply and restore/protect instream flows for threatened native fish. This work will build off of the completed Water Planning Study (Christensen, 2014) and Water Resources Model (Bureau of Reclamation, 2014). HRWG will host several public meetings to

disseminate the results of the Study and Model. This project will culminate in the creation of a Water Conservation Strategy that identifies the best strategies for improving and protecting stream flows, water quality and habitat, as well as steps for implementing and funding projects. Project implementation will be from January 2014 through December 2015.

Project Cost: $100,000

WP-4. Restoration Projects Map *(High Priority)*

Lead Entity/Partners: HRWG/CTWS, USFS, SWCD

General Location: Basin-wide

Background: A current, comprehensive map of completed restoration projects in the Hood River Watershed does not exist. Over 100 restoration and capital improvement projects have been implemented over the past 25 years.

Objectives: 1) Create a shared understanding of the scope and magnitude of restoration projects completed in the Hood River Watershed, 2) Help identify new or complementary projects

Proposed Actions and Schedule: 1) Collect all available historical project information from agency/organization personnel, past reports, and existing databases. 2) Create geospatial database of projects, including date of project, project type, location, ecological benefits/metrics, project lead, project partners, cost, funding sources, and project location. 3) Import data into a GIS for final mapping. Final project data may also be imported to online visualization tools, such as Google Maps. Schedule: January – April 2014

Project Cost: $3,600

WP-5. Powerdale Lands Public Access and Trail Planning *(High Priority)*

Lead Entity/Partners: CLT/County, CTWS, Hood River Valley Parks & Recreation, HRWG, ICS, Mt. Hood Railroad, National Park Service, ODFW, and neighboring landowners

General Location: Powerdale Corridor

Background: The Powerdale Lands along the lower Hood River have long drawn local residents for fishing, swimming, and hiking. However, most people who visit the Powerdale Lands have to use dangerous and illegal access routes to reach the river, due to the Mount Hood Railroad tracks running along the east side of the river and steep terrain. There are many unsanctioned entry points to the Powerdale Lands that entail trespass on private property. Finally, the Indian Creek and Columbia River Waterfront trails are both disconnected from a potential Hood River trail route because of the tracks and railroad yard.

Objectives: Identify solutions to: 1) Provide safe, legal access to the river and through the Powerdale corridor, 2) Improve day-use facilities to improve visitors' experience and reduce human impacts on the property, 3) Improve public access to water resources including the Hood River, Indian Creek, and the Columbia River waterfront.

Proposed Actions and Schedule: CLT received a technical assistance grant from the National Park Service to develop a community-based Trails Plan for the Powerdale Corridor.

Other partners include the County, Powerdale Lands Advisory Committee members, and private landowners in the Powerdale Corridor. Potential solutions will be presented at community meetings and negotiated with Mt. Hood Railroad and other private property owners. Recommended actions will be consistent with the primary Conservation Easement management goal of protecting the existing fish and wildlife habitat, while allowing for habitat restoration and enhancement. Proposed schedule for planning is 2014-2015.

Project Cost: ~$25,000

Element 5: Watershed Education & Technical Assistance

The primary goals of watershed education and technical assistance are to increase public awareness of watershed conditions and promote conservation practices and a stewardship ethic within the community. Consistent public education, dialogue, and broad community involvement are essential to achieving these goals.

#	Project Name	Lead	Page
E-1	Pesticide Management Outreach	OSU-MCAREC	49
E-2	Salmon, Streams & Science in the Classroom	CTWS	50
E-3	Watershed Education & Technical Assistance	HRWG & SWCD	50

E-1. Pesticide Management Outreach (*High Priority*)

Lead/Partners: OSU-MCAREC/ CGFG

Background: Pears, apples, and cherries have many potential diseases and insect and mite pests. Historically, orchard pest management was heavily reliant on chemical controls. Some of these pesticides have potential acute or chronic effects on fish and/or aquatic invertebrates. Between 1999 and 2003, water quality testing conducted by DEQ and OSU showed levels of organophosphate insecticides in several streams to be in violation of state water quality standards. In response, CGFG developed a Best Management Practices (BMP) handbook for orchard pesticide application, DEQ initiated a Pesticide Stewardship Partnership Program, and OSU-MCAREC, and CGFG conducted BMP outreach efforts to orchardists.

Objectives: 1) Increase use of BMPs for pesticide application and management, 2) Increase use of Integrated Pest Management practices, 2) Reduce pesticide concentrations and number of detections in the Hood River and its tributaries, 3) Maintain grower profitability

Proposed Actions and Schedule: This is an ongoing project. The primary actions include: 1) Outreach on BMPs for orchard pesticide use, 2) Promoting additional area wide codling moth sites, 3) CGFG's Backyard Fruit Tree and Seedling Cherry Removal programs to help remove unmanaged fruit trees that can host pests such as codling moth, cherry fruit fly, and spotted wing drosophila, 4) CORE Pesticide Trainings, and 5) Spanish-language Pesticide Applicator Trainings. CGFG will continue to provide up to date information on their website and newsletters on BMPs, pest infestations, and links to weather station data (i.e., IFPnet, OSU IPCC). New efforts include improving sprayer technology and developing better monitoring tools for natural enemies of fruit pests. (Evaluating biological control insects allows orchardists to know whether chemical controls are necessary.)

Project Cost: Under existing OSU-MCAREC program

E-2. Salmon, Streams & Science in the Classroom *(High Priority)*

Lead/Partners: CTWS/HRWG, SWCD, USFWS, ODFW

Background: Beginning in 2010, CTWS designed and executed an environmental education program to reach underserved 4th and 5th grade students in the Upper Hood River Valley. The program focuses on the salmon lifecycle, watershed health, and tribal culture. Similar programs were available to schools along the Columbia River (namely through the USFWS program), however these programs were not readily available to students in the upper Hood River valley.

Objectives: Introduce 4th and 5th grade students in the Upper Hood River Valley to: 1) salmon anatomy, life history, and biology, 2) tribal presence, resource usage, and culture in the Hood River basin, and 3) watershed health, conservation, and the interconnectedness of nature.

Proposed Actions and Schedule: Every fall CTWS staff, with the assistance of partners and volunteers, hosts a field day (Salmon Days) at the Parkdale Fish Facility for 4th and 5th grade students from Parkdale Elementary and Mid-Valley Elementary. The field day includes stations on the salmon lifecycle, hatchery rearing, stream and riparian habitat, salmon food sources, tribal culture, and hydropower production. This field trip is followed up by three visits to each classroom focusing on watershed health and pollution sources, the tribal importance of salmon, and salmon anatomy. In addition, each class raises Chinook or steelhead from eggs to fry in their classroom while observing the developmental stages of the fish.

Project Cost: Under existing program budgets

E-3. Watershed Education & Technical Assistance (*High Priority*)

Lead Entities/Partners: HRWG & SWCD/ Columbia Gorge Community College, Columbia Gorge Ecology Institute, CTWS, EFID, FID, Hood River County School District Community Education, Hood River Valley High School, Horizon Christian School, ICS, Khlare House, Master Gardeners, MFID, OSU-MCAREC, Salmon Watch

Background: For the past 20 years, the HRWG and SWCD have provided educational presentations and networking forums to foster cooperation and stewardship among landowners, irrigation districts, tribes, and government agencies. This has promoted local solutions to endangered species and natural resource concerns and initiated over 100 collaborative restoration and enhancement projects. HRWG partners also conduct or collaborate on additional watershed science and environmental education projects.

Objectives: 1) Increased community understanding of watershed conditions and species, 2) Increase watershed stewardship, 3) Continued collaboration among Watershed Group partners

Proposed Actions and Schedule: These ongoing activities implemented by HRWG staff, SWCD staff, and partners will include: 1) Monthly Watershed Group meeting presentations on watershed conditions, status of species, and project results, 2)"Field Series" classes on watershed natural history, 3) Monthly ICS meetings/work parties, 4) Targeted outreach and stewardship meetings with Neal Cr. landowners, 4) ODA riparian zone assessments and

targeted outreach to streamside landowners, 5) BMP Workshops (pasture/livestock management, irrigation efficiency, noxious weed management, xeriscaping & native plants), 6) Annual native plant sale, 7) Website updates, 8) Quarterly E-news and Annual Report, 9) Hood River County Fair information booth, and 10) Activities to engage the urban community (e.g., installation of storm drain markers, urban water conservation)

Total Project Cost: TBD

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Acronyms

BMP	best management practice
BPA	Bonneville Power Administration
cfs	cubic feet per second
ESA	Endangered Species Act
LiDAR	Light Detection and Ranging
LWD	large woody debris
MHNF	Mt. Hood National Forest
NFWF	National Fish & Wildlife Foundation
ORV	off road vehicle
ODA	Oregon Department of Agriculture
OWEB	Oregon Watershed Enhancement Board
RM	river mile
TBD	To be determined
TMDL	Total Maximum Daily Load

Appendix 1. Significant Species in the Hood River Basin

Protected Species

Aquatic Species			
Species (Run)	*Status:*	*Listing Date:*	*Watershed Distribution:*
Bull trout	Threatened (Federal & State)	1998	Middle Fork Hood River (HR), lower East Fork HR, West Fork HR, mainstem HR
Steelhead (summer)	Threatened (Federal & State)	1998	West Fork, mainstem HR, Lake Branch Cr.
Steelhead (winter)	Threatened (Federal & State)	1998	East Fork HR, Middle Fork HR, mainstem HR
Chinook (spring)	Threatened (Federal & State)	1999	East Fork HR, mainstem HR, Middle Fork HR, West Fork HR, Lake Branch Cr.
Chinook (fall)	Threatened (Federal & State)	1999	Mainstem HR
Coho	Threatened (Federal); Endangered (State)	2005	Middle Fork HR, East Fork HR, West Fork HR, mainstem HR, Neal Cr.
Terrestrial Species			
Species	*Status:*	*Listing Date:*	*Watershed Distribution:*
Northern spotted owl	Threatened (Federal, critical habitat designated)	1990	Basin-wide where large blocks of mixed-conifer forests with old-growth structural characteristics exist.
Wolverine	Threatened (State)		Present in 1980 (current presence unknown)

Rare or Ecologically Significant Species

Aquatic Species			
Run / Species	*Occurrence:*	*Comments:*	*Watershed Distribution:*
Resident / coastal cutthroat trout	Common		Basin wide
Anadromous / coastal cutthroat trout	Rare	Anadromous form nearly extinct	Lower HR (additional distribution unknown)
Rainbow trout	Common		Basin wide
Pacific lamprey	Rare	Starting to colonize above former Powerdale Dam	Lower HR, expanding into East Fork and West Fork HR

Sculpin (multiple species)	Common		Present, distribution widespread
Mountain whitefish	Common		Present, distribution unknown
Bridge-lipped sucker	Common		Present, distribution unknown
Large-scale sucker	Common		Present, distribution unknown
Long nose dace	Common		Present, distribution unknown
Spotted dace	Common		Present, distribution unknown
Leopard dace	Unknown		Present, distribution unknown
Terrestrial Species			
Species	*Occurrence:*	*Comments:*	*6th Field Watershed Presence:*
Amphibians			
Cascades frog	Common	above 2600 ft	Present, distribution unknown
Larch Mountain salamander	Uncommon	Restricted distribution, candidate for listing, found in talus slopes	Mainstem HR, lower West Fork HR
Oregon slender salamander	Rare		Present, distribution unknown
Oregon spotted frog	Rare	Noted at Camas Prairie	Present, distribution unknown.
Tailed Frog	Uncommon	Probably East Fork Hood River and swift-moving cold streams	Present, distribution unknown
Western toad	Uncommon		Basin-wide
Reptiles			
Painted turtle	Common	Lower elevation watersheds	Present, distribution unknown
Western pond turtle	Rare		Present, distribution unknown
Mammals			
Fisher	Rare		Distribution unknown
Long-eared myotis	Unknown		Basin-wide
Long-legged myotis	Unknown		Basin-wide
American (Pine) martin	Uncommon	Second & old growth forests at higher elevations	Present, distribution unknown (USFS management indicator species)
Red tree vole	Rare		Present, distribution unknown
Silver-haired bat	Common		Present, distribution unknown
Western grey squirrel	Common		Basin-wide within oak habitats

Birds			
Bald eagle	Common		Basin-wide
Black-backed woodpecker	Uncommon	Distribution related to insect outbreaks and fire	Distribution unknown
Flammulated owl	Unknown	If they occur, probably on eastside in pine-oak forest	Distribution unknown
Harlequin duck	Uncommon	Seen in swift-moving rivers such as the East Fork Hood River	Distribution unknown
Lewis' woodpecker	Uncommon	Seen in white oak forests	Basin-wide
Northern goshawk	Uncommon		Present, distribution unknown
Northern pygmy owl	Uncommon		Basin-wide
Peregrine falcon	Uncommon	Nests in cliffs	Present, distribution unknown
Pileated woodpecker	Uncommon	Have large ranges	Basin-wide
Purple martin	Uncommon	Found near water, lakes, Columbia River	Present, distribution unknown
Western bluebird	Uncommon	Found in clearings and open fields	Basin-wide

Appendix 2. Hood River Watershed 303(d) Listings

Waterbody Name	Boundaries	Year	Parameter	Current Status
Clear Branch Hood River	Mouth to Laurence Lake	2002	Temperature (bull trout)	TMDL Plan Approved by EPA. De-listed 2002.
Cold Spring Creek	Mouth to Rivermile 4.7	2010	Biological Criteria	Water Quality Limited (303d)
Dog River	Mouth to Headwaters	2004	Beryllium, Iron	Water Quality Limited (303d).
Evans Creek	Mouth to Rivermile 8.0	2004	Beryllium, Copper, Iron	Water Quality Limited (303d).
		2010	Biological Criteria	Water Quality Limited (303d)
Hood River	PacifiCorp Powerhouse to East Fork Hood River	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.
		2004	Copper	Water Quality Limited (303d).
	Mouth to East Fork Hood River	2004	Beryllium, Iron	Water Quality Limited (303d).
		2010	Thallium	Water Quality Limited (303d).
Hood River, East Fork	Mouth to Headwaters	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.
		2004	Beryllium, Copper, Iron	Water Quality Limited (303d).
		2010	Biological Criteria, Thallium	Water Quality Limited (303d).
Hood River, Middle Fork	Mouth to Clear Branch	2002	Temperature (bull trout)	TMDL Plan Approved by EPA. De-listed 2002.
		2004	Beryllium, Iron	Water Quality Limited (303d).
		2010	Biological Criteria	Water Quality Limited (303d).
Tributary to Middle Fork Hood River	Mouth to Rivermile 1.4	2010	Biological Criteria	Water Quality Limited (303d).
Hood River, West Fork	Mouth to Headwaters	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.
		2004	Beryllium	Water Quality Limited (303d).
		2010	pH	Water Quality Limited (303d).
	Mouth to Lake Branch	2010	Thallium	Water Quality Limited (303d).
Indian Creek	Mouth to Headwaters	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.
		2004	Chlorpyrifos	Water Quality Limited (303d).
		2010	*E. coli* (fall,	Water Quality

			winter, spring, summer)	Limited (303d).
Tributary #1 to Indian Creek	Mouth	2010	*E. coli* (fall, winter, spring)	Water Quality Limited (303d).
Tributary #2 to Indian Creek	Mouth	2010	*E. coli* (fall, winter, spring)	Water Quality Limited (303d).
Lake Branch	Mouth to Lost Lake	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.
Lenz Creek	Mouth to Rivermile 1.5	2004	Arsenic, Beryllium, Chlorpyrifos, Iron, Manganese, pH	Water Quality Limited (303d).
		2010	Biological Criteria, Guthion	Water Quality Limited (303d).
McGuire Creek	Mouth to Rivermile 0.9 (Headwaters	2010	Guthion	Water Quality Limited (303d).
Mitchell Creek	Mouth to Headwaters	2004	Zinc	Water Quality Limited (303d).
Neal Creek	Mouth to East Fork/West Fork Confluence	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002
		2004	Arsenic, Beryllium, Chlorpyrifos, Guthion, Iron, Manganese	Water Quality Limited (303d).
		2010	Biological Criteria, Dissolved Oxygen (spawning)	Water Quality Limited (303d).
Neal Creek, East Fork	Mouth to Headwaters	2004	Beryllium, Iron	Water Quality Limited (303d).
Neal Creek, West Fork	Mouth to Headwaters	2010	Dissolved Oxygen (spawning)	Water Quality Limited (303d).
Tributary to Polallie Creek	Mouth to Rivermile 2.7	2010	Biological Criteria	Water Quality Limited (303d).
Unnamed drainage	Near Fir Mountain Rd. & Neal Cr./Hwy. 35 crossing	2010	Guthion	Water Quality Limited (303d).
Whiskey Creek	Mouth to Headwaters	2002	Temperature (rearing)	TMDL Plan Approved by EPA. De-listed 2002.

Appendix 3. Completed Projects: 2008 – 2013

Aquatic and Terrestrial Habitat Restoration & Conservation

Thirty-five major aquatic and terrestrial habitat restoration projects were completed between 2008 and 2013. Some of these projects are ongoing, but have completion dates listed as 2013 for the purpose of assessing cost to date and assigning a map/project number. In these cases, ongoing is noted in parentheses in the project description. In addition, two projects were completed in 2007 but are described here since they were not documented in the 2008 Action Plan. Although most projects were completed at a single site or along a single corridor, some projects included multiple locations and/or project elements. For example, the "Robinhood Creek Whole Watershed Restoration project" included the removal of 3 fish passage barriers, placement of 620 logs in the stream and floodplain, storm-proofing 8 miles of road, thinning 37 acres of riparian forest, and eradicating invasive plants along 3 miles of decommissioned road. Altogether the 35 completed projects include:

- 16 fish passage barriers removed
- 3 fish-friendly irrigation diversion screens installed
- 2,820 pieces of large wood placed along approximately 4.25 stream miles
- 4.9 cfs of instream water rights protected with Conserved Water Agreements
- 33 acres of riparian zone enhanced
- 8.6 miles of road decommissioned
- 740+ acres of on-farm irrigation efficiency upgrades

Project locations are shown on the "Hood River Watershed Projects" map on page 65 using the map numbers listed in the first column of **Table A3.1**. The first two digits of each number usually represent the year it was completed (i.e., 08= 2008). Location information for two projects (i.e., 12-04 & 13-10) was not available for mapping. In addition, project 13-08 includes over 25 locations that are shown individually with the "Irrigation Efficiency" project symbol, however, the number is shown only once near the center of the map.

Monitoring and Assessment

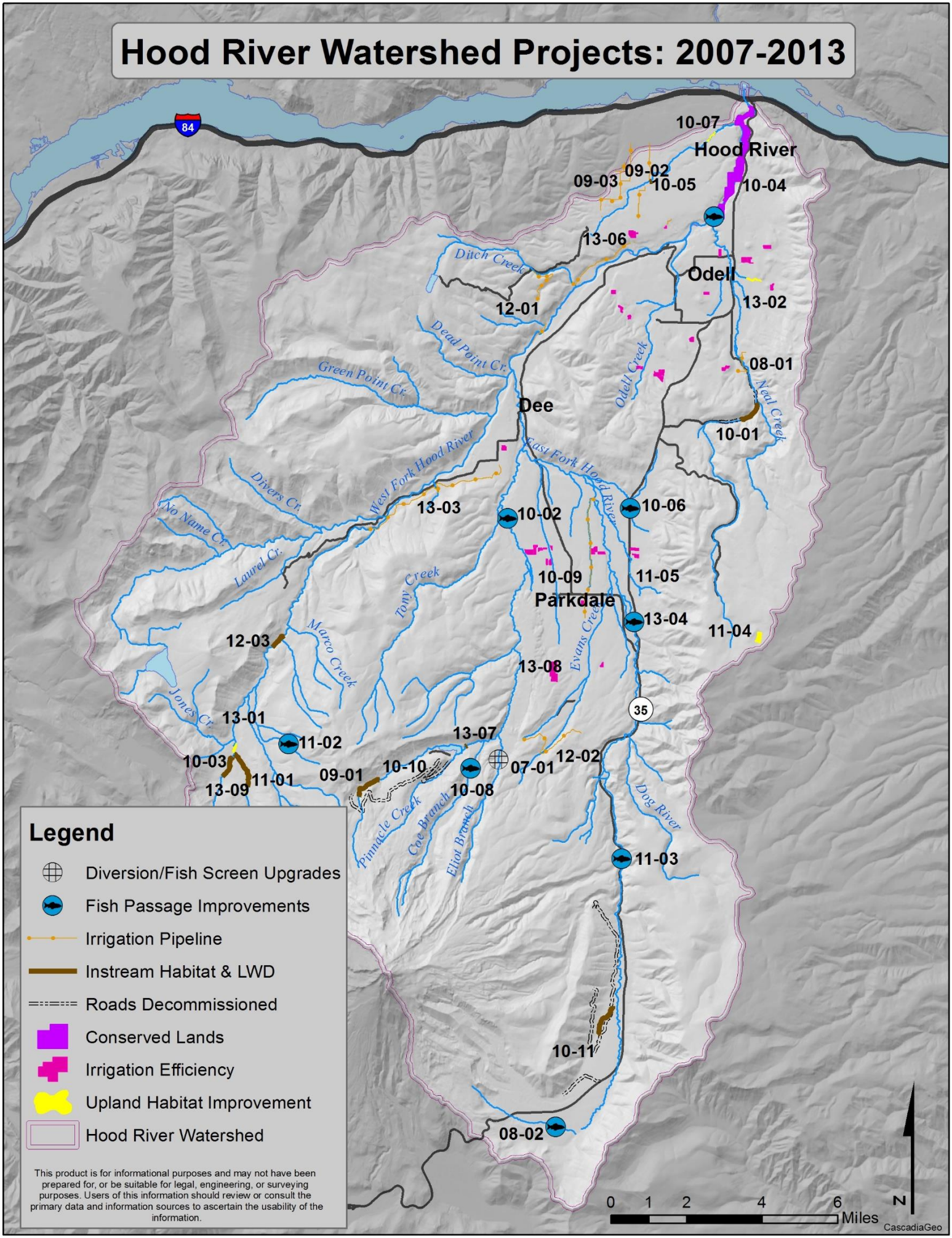
Nine major monitoring and assessment projects were completed between 2008 and 2013. These are listed in **Table A3.2** with descriptions starting on page 80. Project types include water quality monitoring, project effectiveness monitoring, and a water conservation assessment.

Planning and Education/Outreach

Six major planning projects and education/outreach programs were conducted between 2008 and 2013. These are listed in **Table A3.3** with descriptions starting on page 84. These projects range from restoration planning to the many education and outreach efforts conducted by the HRWG, SWCD, CTWS, and OSU-MCAREC.

Table A3.1. Aquatic & Terrestrial Habitat Restoration & Conservation Projects

Map/ Project #	Project Name	Lead	Previous Action Plan #	Priority
07-01	Eliot Branch Diversion Replacement	MFID	AP-9-08	Medium
08-01	Central Canal Pipeline	EFID	AP-2-08	High
08-02	Meadows Cr. Fish Passage Restoration	USFS	AP-9-08	Medium
09-01	Upper Clear Branch LWD	USFS	AH-1-08	High
09-02	Beren's Bend Indian Creek Restoration	FID	WQ-7-08	High
09-03	FID Lower District Pressurization Project	FID	SF-2-08	High
10-01	Neal Creek Riparian & Instream Habitat Enhancement	CTWS & SWCD	AH-15-08	Medium
10-02	Middle Fork Falls Fish Passage	CTWS	AP-9-08	Medium
10-03	Elk Creek Large Wood Placement	CTWS		
10-04	Powerdale Dam Removal & Lands Transfer	PacifiCorp	AP-1-08	High
10-05	Indian Creek Corridor Piping Project	FID	SF-2-08	High
10-06	Graham Creek Bridge Replacement	HRWG	AP-9-08	Medium
10-07	Indian Creek Riparian & Instream Habitat Enhancement	HRWG	WQ-9-08	High
10-08	Coe Branch Dam Removal & Diversion Upgrade	MFID	AP-3-08	High
10-09	Emil Creek Water Quality Improvement	MFID	WQ-1-08	High
10-10	USFS Rd. 2840 Decommissioning	USFS	WQ-4-08	High
10-11	Robinhood Creek Whole Watershed Restoration	USFS	AH-3-08	High
10-12	Deadpoint Fish Screen	FID	AP-9-08	Medium
11-01	McGee Creek Stream & Floodplain Restoration	CTWS & USFS	AH-11-08	Medium
11-02	Red Hill Creek Fish Passage	USFS	AP-9-08	Medium
11-03	Hwy. 35 Polallie Creek Culvert & Flood Resiliency Improvements	USFS & ODOT	AP-10-08	Medium
11-04	Neal Creek Aspen Regeneration	USFS	TH-5-08	Medium
11-05	Tieman Creek Livestock Crossing & Fencing		WQ-2-08	High
12-01	Lowline Canal Pipeline Project	FID	SF-2-08	High
12-02	Glacier Ditch Pipeline Phase 3	MFID	SF-4-08	Medium
12-03	Large Wood Placement: West Fork Hood River at Marco Creek	USFS	AH-6-08	High
12-04 N.A.	Orchard Spray Buffer Riparian Planting Project	CGFG	WQ-2-08	High
13-01	Water Quality & Fish Habitat Protection at West Fork-BPA Crossing	CTWS	WQ-6-08	High
13-02	Small Scale Restoration Initiative	CTWS	WQ-2-08	High
13-03	Dee Irrigation District Pipeline & Passage	DID	AP-8-08	Medium
13-04	East Fork Diversion Upgrade & Fish Passage Project	EFID	AP-7-08	High
13-06	Famers Canal Pipeline-Phase 1	FID	SF-2-08	High
13-07	Substrate Augmentation on Clear Branch Creek	MFID	AH-9-08	Medium
13-08 *multiple sites*	Agricultural Irrigation Efficiency & Water Quality Improvement Projects	SWCD	WQ-2-08	High
13-09	McGee Creek Riparian Thinning	USFS	None	n/a
13-10 N.A.	Early Detection Rapid Response project	SWCD	None	n/a


Hood River Watershed Projects: 2007-2013
84
10-07
Hood River
09-03
09-02
10-05
10-04
13-06
Ditch Creek
Odell
12-01
13-02
Dead Point Cr.
Green Point Cr.
Odell Creek
08-01
Dee
Neal Creek
10-01
West Fork Hood River
East Fork Hood River
Divers Cr.
No Name Cr.
13-03
10-02
10-06
Laurel Cr.
Tony Creek
10-09
11-05
Parkdale
13-04
11-04
12-03
Marco Creek
Evans Creek
13-08
Jones Cr.
35
13-01
11-02
13-07
10-03
10-10
07-01
12-02
11-01
09-01
13-09
10-08
Pinnacle Creek
Coe Branch
Eliot Branch
Dog River
11-03
10-11
08-02
Legend
Diversion/Fish Screen Upgrades
Fish Passage Improvements
Irrigation Pipeline
Instream Habitat & LWD
Roads Decommissioned
Conserved Lands
Irrigation Efficiency
Upland Habitat Improvement
Hood River Watershed
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.
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Project Descriptions

07-01 Eliot Branch Diversion Replacement

Lead/Partners: MFID/ODFW

Date Completed: May 2007

Cost/Funding Sources: $354,193/MFID insurance; ODFW in-kind

Description: The Eliot Diversion was totally annihilated after a debris torrent ripped through the Eliot Glacier drainage. The diversion structure was replaced with an off-channel, fish friendly FCA screen that allows unimpeded passage up and downstream.

08-01. Central Canal Pipeline

Lead/Partners: EFID/CTWS, ODFW, HRWG

Date Completed: October 2008

Cost/Funding Sources: $9.85 million/CTWS, EFID, OWEB, USFS Title II, DEQ 319, BOR, USFWS

Description: EFID's Central Canal was replaced with 4.7 miles of pipeline. This linked the EFID Main Canal with the Lower Eastside Lateral and reduced the use of Neal Creek for irrigation water conveyance from 42 cfs to approximately 5 cfs. Consequently, average turbidity levels in West Fork Neal Creek went from 72 to 11 NTU downstream of EFID's inflow. A fish passage barrier and poorly functioning fish screen on Neal Creek were eliminated, which opened up 4.8 miles of spawning habitat for winter steelhead and eliminated the entrainment of fish in the Lower East Side Lateral Canal. 3.88 cfs of water was conserved resulting in a 1.88 cfs East Fork Hood River instream water right.

Figure 4. Central Canal Pipeline project under construction.

08-02. Meadows Creek Fish Passage Project

Lead/ Partners: USFS

Date Completed: August 2008

Project Cost/Funding Sources: $50,000/USFS, OWEB, Title II

Description: Two fish passage barrier culverts were removed and replaced with log stringer cross country ski bridges designed to provide unimpeded fish passage. One culvert was in Meadows Creek and the other in a tributary to Meadows Creek. The bridges were designed using stream simulation techniques. Culvert removal resulted in over one mile of habitat now freely accessible to cutthroat, rainbow, and potentially steelhead trout.

09-01. Upper Clear Branch LWD Project

Lead/ Partners: USFS

Date Completed: July 2009

Project Cost/Funding Sources: $86,500/USFS, Ecotrust, Ice Fountain Water Co.

Description: The Clear Branch drainage experienced large scale timber harvesting during the 1950's, 60's and 70's. The removal of riparian vegetation set back natural large woody debris (LWD) recruitment to Clear Branch stream channels and floodplains by 50-100 years. The loss of instream LWD decreased bull trout and resident cutthroat trout spawning and rearing habitat.

This project was a continuation of previous work completed in 2000. In summer of 2009, about 500 logs were placed in both the Clear Branch Creek active stream channels and floodplain from river mile 2.6 upstream to river mile 3.1 with the use of a Boeing-Vertol BV 107II helicopter.

09-02. Beren's Bend Indian Creek Restoration

Lead/Partners: FID/HRWG, ICS, ODFW, Chris & Betsy Berens

Date Completed: October 2009

Cost/Funding Sources: $70,000/DEQ State Revolving Fund, American Recovery & Reinvestment Act

Description: Indian Creek along the Beren's property was channelized and dammed to manage roadside drainage and provide irrigation water in the early 1900s. This blocked fish passage, degraded fish habitat and water quality, created wide fluctuations in stream flow, and reduced flow in the Hood River. It also provided unreliable irrigation water delivery. The Beren's Bend project restored a 300-foot reach of Indian Creek by abandoning the old roadside channel and removing the small dam. The new channel is located away from the road and has increased sinuosity, improved fish habitat, and restored fish passage. Native willows are now thriving in the riparian zone and water quality has significantly improved.

09-03. FID Lower District Pressurization Project

Lead: FID

Date Completed: August 2009

Cost/Funding Sources: $4.8 million/DEQ Clean Water State Revolving fund

Description: The Lower District Pressurization project converted several miles of open ditch to 16-inch pipe and constructed a high-efficiency, variable frequency drive pump station. The new lateral pipelines and the Schull Dr. pump station provide pressurized water to Schull Dr., Hood River Valley High School, Indian Creek Golf Course, Von Lubken Orchards, and residents around the Hood River Airport. Also completed in 2009 were the Upper Markham and Country Club Rd. projects, which converted open ditch to pipeline and eliminated several canal end-spills. All of these projects enable FID to deliver filtered, pressurized water to their patrons using highly sophisticated and reliable technology.

10-01. Neal Creek Riparian & Instream Habitat Enhancement

Lead/Partners: CTWS, SWCD/County, ODF

Date Completed: May 2010

Cost/Funding Sources: $84,000/CTWS, OWEB, ODF, County

Description: This cooperative project included decommissioning 2.1 miles of abandoned roadway, placing 75 pieces of large wood at six sites along ¾ mile of the West Fork Neal Creek, removal of an unused bridge, creation of a high flow side channel and planting of native trees in 10 acres of former road way. The goal of the project was to improve the quality of aquatic and riparian habitat along Neal Creek by reducing erosion, improving stream-floodplain interaction, increasing the number of pools and aquatic refuge areas, and establishing riparian trees to shade and add future wood complexity to the stream.

10-02. Middle Fork Falls Fish Passage

Lead Entity: CTWS/ ODFW

Date Completed: July 2010

Cost/Funding Sources: $12,000

Description: During the 2006 debris torrent, a waterfall approximately 10-feet high developed on the lower Middle Fork Hood River (RM2.5), creating a passage barrier for spring Chinook, winter steelhead, and bull trout. CTWS used a spyder backhoe to remove the debris jam, restoring access to over 20 miles of fish habitat. Passage past the site was confirmed with the arrival of spring Chinook at the Parkdale Fish Facility, upstream of the project site.

10-03. Elk Creek Large Wood Placement Project

Lead Entity/Partners: CTWS/USFS, HRWG, Longview Timberlands

Date Completed: August 2010

Cost/Funding Sources: $65,000/CTWS

Description: CTWS and USFS installed 17 log jam structures with approximately 200 logs along the lower half-mile of Elk Creek. In addition, approximately 100 logs were installed along 2 acres of floodplain. About half of the project area was under the BPA powerlines. The project goal was to increase stream habitat quantity, complexity, and connectivity for summer steelhead and spring Chinook.

Figure 5. Elk Creek large wood project.

10-04. Powerdale Hydroelectric Dam Removal & Lands Transfer

Lead/Partners: PacifiCorp/ CLT, County, CTWS, HRWG, ODFW, USFWS

Date Completed: Dam removed October 2010; Land transfer March 2013

Cost/Funding Sources: $5.6 million/PacifiCorp

Description: The Powerdale Dam was removed, along with several flumes and portions of the pipeline. The stream bed was restored in the vicinity of the dam and the riparian area was planted with native trees and shrubs. The ≈400 acres of land along the mainstem Hood River previously owned by PacifiCorp were successfully transferred to the County and CLT on March 28, 2013. CLT has formed an advisory committee to help guide restoration and recreation planning, project funding acquisition, and future project implementation.

Figure 6. Powerdale Dam in 2009 (photo on left) and two years after dam removal (2012).

10-05. Indian Creek Corridor Piping Project

Lead/Partners: FID

Date Completed: November 2010

Cost/Funding Sources: $5 million/DEQ State Revolving fund, American Recovery & Reinvestment Act

Description: This project converted open ditches to lateral pipelines along lower Markham Rd., lower Country Club and Sunset Rd. and built a new pump station at Methodist Rd. In addition, a retrofit of Forebay#2 at Plant#3 resulted in a new inlet facility for the Lower District and Indian Creek Corridor pipelines. The new inlet facility uses a FCA Farmers Screen to eliminate gross debris from the irrigation and hydroelectric forebay, which substantially decreases the likelihood of overflow spill water into Indian Creek. By eliminating such overflow and spill water, FID's renewable hydropower production was also increased.

10-06. Graham Creek Bridge Replacement

Lead/Partners: HRWG/Ann Lameka, FID, ODF, ODFW

Date Completed: August 2010

Cost/Funding Sources: $27,410/Lameka, FID, ODF, HRWG, ODFW

Description: An undersized culvert on Graham Creek was replaced with a bridge. The existing culvert was undersized and disrupted natural sediment and wood transport at high flows. A 20-foot bridge was donated by FID. Design and permitting were completed by ODF, ODFW, and HRWG. Resident trout and potentially winter steelhead will benefit from this project.

10-07. Indian Creek Riparian & Instream Habitat Enhancement

Lead/Partners: HRWG, ICS/ FID, Hood River Valley Parks and Recreation District, Indian Cr. Golf Course, Northwest Service Academy, Pacific Power, Port of Hood River

Date Completed: November 2013

Cost/Funding Sources: ~$15,000/OWEB, SOLVE, Pacific Power, Hood River Electric Co-op, in-kind labor and supplies from ICS

Description: Between 2008 and 2013, about 0.8 acres of riparian habitat along Indian Creek were planted with native trees and shrubs. Invasive species, including blackberry, knapweed, reed canarygrass, and Scot's broom, were removed from about 0.75 of those 0.8 acres. In addition, four raptor poles with perches and/or nesting platforms were installed at Indian Creek Golf Course, HRVHS, and CGCC. In-stream, one LWD structure and one bank stabilization structure were installed along the CGCC section of Indian Creek.

10-08. Coe Branch Dam Removal and Diversion Upgrade

Lead/Partners: MFID/CTWS, USFS, ODFW, HRWG

Date Completed: July 2010

Cost/Funding Sources: $1,344,125/ CTWS, OWEB, USFS, MFID, ODFW

Description: The 5-foot high Coe Branch diversion dam and submerged drop inlet grate were removed, thereby restoring upstream fish passage for bull trout, winter steelhead, and cutthroat trout. A new diversion structure was created by building a simulated streambed using boulder weirs, large cobble, and gravel. A 50' Farmers Conservation Alliance horizontal flat plate, dual stage fish screen was installed, which provides downstream fish passage through a naturalized rock return channel. The screen also effectively manages glacial sediment and helps MFID meet DEQ turbidity standards.

10-09. Emil Creek Water Quality Improvements

Lead/Partners: MFID/HRWG

Date Completed: April 2010

Cost/Funding Sources: $196,300/MFID, OWEB

Description: Historically, MFID used 3.7 miles of Emil Creek to convey irrigation water to patrons in the East Fork sub-basin. This inter-basin transfer resulted in 5 cfs of sediment laden water originating from the Middle Fork to be dumped into historically clear Emil Creek. This adversely affected winter steelhead habitat and often caused turbidity levels that did not meet the state water quality standard. A new 6,000' pipeline was installed to convey the irrigation water between two existing pipelines. This eliminated the use of Emil Creek for conveyance, stopped overflow into Emil Pond, and conserved approximately 1 cfs. Results show a significant improvement to water quality in Emil Creek.

10-10. USFS Road 2840 Decommissioning

Lead Entity/ Partners: USFS

Date Completed: August 2010

Project Cost/Funding Sources: $70,000/USFS

Description: A total of 3.5 miles of road were decommissioned in the Upper Middle Fork Hood River sub-watershed. This included stabilizing over 45,000 cubic yards of sediment (e.g., surface de-compaction, side cast fill removal, out-sloping of roads by filling inboard ditch lines, erosion control) and removing 19 stream crossing and 17 cross-drain culverts. Before the project, many of the culverts had partially or fully plugged and the road fill had begun to fail. This posed a substantial risk to the bull trout and cutthroat trout populations of Clear Branch Cr. The vast majority of spawning for the Clear Branch bull trout population occurs in the mainstem of Clear Branch and one major tributary, all of which is found downstream of Road 2840.

10-11. Robinhood Creek Whole Watershed Restoration

Lead Entity/ Partners: USFS/HRWG, CTWS, Wasco County Weed Department, SWCD and Wilderness Volunteers.

Date Completed: Summer 2010

Project Cost/Funding Sources: $232,285/USFS, Title II, OWEB, CTWS

Description: Work included removal of 3 undersized culverts that were fish passage barriers, placement of 620 logs in the stream and floodplain, storm-proofing 8 miles of road, thinning of 37 acres of riparian forest, and invasive plant eradication along 3 miles of decommissioned road. A primary goal of this project was to prepare Robinhood Creek to capture Newton Creek, a glacial stream subject to repeated debris torrents. This work completed a holistic watershed restoration effort in Robinhood Creek that addressed the highest priority limiting factors to watershed health.

10-12. Deadpoint Fish Screen

Lead/Partners: FID/FCA

Date Completed: October 2011

Cost/Funding Sources: $45,000/FID

Description: In October 2011, the original FID Deadpoint fish screen was washed out and deformed by flood waters. The old screen was replaced with a modern FCA Farmers Screen to ensure a reliable, fish-safe diversion under all flow conditions. The new screen is installed with substantial drain curtains and underground ballasts intended to manage ground water and overcome the buoyant force of flood water that might, from time to time, inundate the screen.

11-01. McGee Creek Stream & Floodplain Restoration

Lead/Partners: CTWS/USFS, HRWG, Longview Timberlands LLC

Date Completed: July 2011

Cost/Funding Sources: $368,539/CTWS, EcoTrust, USFS

Description: CTWS and USFS installed 23 LWD structures (360 logs) along the lower 1.3 miles of McGee Creek. In addition, 400 logs were placed in the floodplain using a helicopter. The project objectives were to increase the amount of in-channel and floodplain LWD, sort and store spawning-sized gravel behind log structures, increase the number of pools, and increase connection between the channel and its floodplain. Target species were spring Chinook and summer steelhead. USFS also reconfigured a number of previously installed log sills upstream of the LWD placement project to improve passage for juvenile salmon and trout.

11-02. Red Hill Creek Fish Passage

Lead Entity/ Partners: USFS

Date Completed: Summer 2011

Project Cost/Funding Sources: $750,000/USFS

Description: A culvert located at RM 0.9 was replaced by a bridge over Red Hill Creek. The bridge was designed using stream simulation principles. This project provided unimpeded fish passage to one mile of upstream habitat for summer steelhead and resident rainbow trout.

11-03. Hwy. 35 Polallie Creek Culvert and Flood Resiliency Improvements

Lead/Partners: ODOT/USFS

Date Completed: July 2011

Cost/Funding Sources: $2,000,000/ODOT

Description: The culverts under Highway 35 at Polallie Creek were replaced with a concrete bridge sized to pass a 100-year flood event and provide unimpeded upstream fish migration. The new bridge was designed using stream simulation principles. Target species are winter steelhead and resident rainbow trout.

11-04. Neal Creek Headwaters Aspen Regeneration

Lead: USFS

Date Completed: August 2011

Project Cost/Funding Sources: $20,000/USFS

Description: USFS thinned conifers on a four acre parcel in the Neal Cr. headwaters. They also partially removed an existing buck & pole fence and replaced it with an 8 foot tall game fence to exclude deer and elk. The combination of increased sunlight and reduction of grazing pressure was intended to increase aspen regeneration. The extent of the aspen forests has declined in the watershed during the past 100 years, due to fire suppression and conifer encroachment.

11-05. Tieman Creek Livestock Crossing & Fencing

Lead: SWCD & CTWS

*Date Completed***:** September 2011

Project Cost/Funding Sources: $6,955/CTWS, SWCD, landowner, & local businesses

Description: A cooperative fencing and cattle crossing project was completed adjacent to Highway 35 during the summer of 2011. A 200-foot section of Tieman Creek was fenced and a cattle crossing was hardened, thanks to the support of the CTWS, SWCD, and the landowner. After being heavily impacted by unlimited cattle access for many years, the project involved excluding the cattle, and re-contouring and re-vegetating the stream bank with grasses and native plants. Local contractor Beam, Couch & Level installed the crossing while a CTWS crew constructed the fence. Materials were provided by J. Arlie Bryant and Bryant Pipe & Supply. CTWS funded the project, with both CTWS and SWCD staff providing manpower to implement it.

12-01. Lowline Canal Pipeline Project

Lead/Partners: FID

Date Completed: October 2012

Cost/Funding Sources: $2.9 million/DEQ State Revolving fund, Energy Trust of Oregon, CTWS

Description: FID converted 14,350 feet of Lowline Canal with 42 and 36-inch diameter pipe, resulting in the enclosure of the entire canal. Previous failures of the 100-year old canal negatively impacted irrigated agriculture and made FID operations difficult and dangerous. Before the project, floods and other storm-related events had caused 18 major canal failures causing 25 cfs or more to plunge downslope. This resulted in an annual average of 2,290 tons of fine sediment being washed into the West Fork, mainstem Hood River, and other important fish-bearing tributaries. Hydropower production was also stabilized and increased by the project.

12-02. Glacier Ditch Pipeline-Phase 3 (Evans Cr. Passage & Water Quality Improvement)

Lead/Partners: MFID

Date Completed: September 2012

Cost/Funding Sources: $540,000/MFID, OWEB

Description: This project was the final phase in replacing 100 year-old Glacier Ditch with pressured pipeline. MFID installed 11,000 feet of pipeline during this phase. Elimination of Glacier Ditch prevents an estimated 500 tons per year of sediment from entering historically-clear Evans Creek. Improved water quality in Evans Creek is a benefit to winter steelhead and coho. The project also permanently saves 0.3 cfs in the Clear Branch Creek. Other benefits include eliminating ditch failures and the transport of invasive weed seeds.

12-03. LWD Placement at West Fork Hood River near Marco Cr.

Lead Entity/Partners: USFS/CTWS, SWCD

Date Completed: July 2012

Cost/Funding Sources: $235,560/CTWS, USFS, Ecotrust, OWEB

Description: A helicopter was used to place 565 logs along a 0.7 mile stretch of the West Fork Hood River above the confluence with Marco Creek. A total of 25 log jams, mostly placed on the floodplain and/or overflow channels, were created to improve spawning and rearing habitat for spring Chinook, coho, summer steelhead, and resident rainbow trout.

12-04. Orchard Spray Buffer Riparian Planting

Lead Entity/Partners: CGFG, HRWG/CTWS, Mt. Adams Orchard

Date Completed: 2013 (ongoing)

Cost/Funding Sources: $29,000 /CTWS, HRWG

Description: In response to pesticide monitoring results, CGFG and CTWS began installing vegetated buffers between waterways and orchards to protect surface waters from pesticide spray drift. CGFG's 2009 BMP survey identified 36 orchards as candidates for riparian vegetation enhancement, based on buffer width and landowner interest. Since 2011, approximately 4 miles of waterway and 5.2 acres have been planted at 11 sites. HRWG worked with Mt. Adams Orchard in 2006 and 2007 to install a spray buffer along 0.7 mile of ditches draining into Neal Cr.

13-01. Water Quality & Fish Habitat Protection at W. Fork-BPA Crossing

Lead Entity/ Partners: CTWS/ BPA, HRWG

Date Completed: 2007-2013 (ongoing)

Cost/Funding Sources: ~$7,500/CTWS

Description: BPA's power lines cross the West Fork Hood River in an area with a high percentage of the Chinook spawning in the upper West Fork watershed. BPA's powerline vegetation management strategy relies heavily on herbicide use. Vegetation control at their

powerline crossing of the W. Fork Hood River had killed most of the trees and shrubs, causing streambank destabilization and reduced instream complexity. CTWS negotiated with BPA to implement an alternative vegetation management approach. Starting in 2007, CTWS and HRWG staff manually cut riparian vegetation to no more than four feet in height, in lieu of chemical control, over an approximately three acre area. This was done annually in late June. In addition, 15 acres were revegetated in 2008.

13-02. Small-scale Restoration Initiative

Lead Entity/ Partners: CTWS/private landowners, HRWG

Date Completed: 2013 (ongoing)

Cost/Funding Sources: $25,128/CTWS, Pacific Salmon Coastal Recovery Fund

Description: The Hood River Small Scale Restoration Initiative is aimed at protecting and improving salmon habitat. Since 2012, four projects have been implemented to fence livestock out of waterways, plant riparian buffers, improve a livestock stream crossing, and protect a series of beaver ponds. Livestock have been fenced out of 1,400 feet of stream and over an acre of riparian habitat has been improved or protected. Funding has been extended through 2014.

13-03. Dee Irrigation District Pipeline and Passage Project

Lead/Partners: DID/CTWS, HRWG

Date Completed: October 2013

Cost/Funding Sources: $2.33 million/CTWS, OWEB, DID

Description: This project converted the 4.5 mile-long Dee Flat Ditch from an open canal to a pipeline, which resulted in 3 cfs of conserved water converted to an instream water right for the West Fork Hood River. Fish passage was restored at four tributary diversions along the former canal. The Alder Cr. diversion was eliminated and stream bed restored. The Deer Cr. diversion was eliminated and fish passage was restored. Fish passage at Camp Creek was improved by removing the diversion dam, restoring the stream channel, and installing an FCA fish screen. Fish passage at No Name Cr. was improved by removing a section of the diversion dam and restoring the stream bed. The W. Fork Hood River is impaired for stream flow and provides habitat for ESA listed summer steelhead, spring Chinook and Coho salmon.

13-04. EFID Headgate & Fish Passage Project

Lead/Partners: EFID/CTWS, ODFW, HRWG

Date Completed: October 2013

Cost/Funding Sources: $1.75 million/CTWS, OWEB, EFID, USFS Title II

Description: This project upgraded EFID's main diversion at RM 6.4 from a push-up dam to an Obermeyer weir. A fish ladder was also constructed on the east side of the river to provide passage around the weir during the irrigation season. EFID has agreed to pass a

minimum of 15 cfs down the bypass reach for the next 5 years, during which time flow will be studied to evaluate the final agreed upon minimum flow. This will fall between 15 and 40 cfs. The East Fork Hood River provides spawning and rearing habitat for ESA-listed lower Columbia winter steelhead, coho, and spring Chinook. The former push-up dam reduced upstream passage to 30 miles of the East Fork Hood River and required annual disturbance of the streambed with heavy machinery to maintain the old diversion.

13-06. Farmers Canal Pipeline Projects

Lead/Partners: FID

Date Completed: Winter 2013/14

Cost/Funding Sources: $3.4 million/DEQ State Revolving fund

Description: Several sections of the Farmers Canal have been piped between 2008 and 2013. The Pine Creek reach was completed in 2008. This section accounted for 18% of the 20 % water loss along the Farmers Canal. This leakage also caused increased sediment delivery to Pine Creek, an otherwise clear tributary to the Hood River that supports resident trout.

Approximately 12,000' of additional high priority sections were piped in 2013. As of 2014, approximately 2.45 miles of open canal remain on the Farmers Canal/Pipeline. These final remaining sections are referred to as Schedule B and F and will be converted to pipeline as funding becomes available. However, with completion of the 2013 pipeline project, 100% of FID patrons are receiving pressurized water.

13-07. Substrate Augmentation on Clear Branch Creek

Lead/Partners: MFID/USFS, ODFW

Date Completed: September 2013 (ongoing)

Cost/Funding Sources: $15,800 /MFID, USFS

Description: This project improved aquatic habitat below Clear Branch dam by adding 66 cubic yards of coarse substrate (approx. ½" – 8" diameter gravel/cobble) using a conveyered aggregate delivery system and extended forklift. The goals of the project were to increase suitable bull trout and winter steelhead spawning habitat in the 2,900 foot reach of Clear Branch below the dam and mimic the substrate movement above the dam. USFS designed the project by evaluating composition of stream bed material above the dam and using a comparable size distribution for the project area. ODFW and USFS will monitor bull trout, steelhead and spring Chinook spawning in the project reach below the dam, and assess movement of gravel.

13-08. Agricultural Irrigation Efficiency and Water Quality Improvement

Leads/Partners: SWCD, NRCS, MFID, FID

Date Completed: 2008-2013

Project Cost/Funding Sources: $1,248,660/OWEB, NRCS (EQIP), private landowners, MFID, FID

Description: During 2008-2013, over 740 acres were upgraded to high-efficiency irrigation systems, over two miles of irrigation mainline was installed, two chemical handling facilities were constructed, two manure storage facilities were constructed, paddock footings were installed at one horse facility, one riparian fence was constructed, and four riparian planting projects were completed. In addition, MFID installed five pressure reducing stations and FID continued their sprinkler exchange program, which enables their patrons to exchange low-efficiency sprinkler heads for high-efficiency ones.

13-09. McGee Creek Riparian Thinning

Lead: USFS

Date Completed: October 2013

Project Cost/Funding Sources: $27,610/USFS, Title II

Description: Riparian forest stands along many streams within the Hood River and Barlow Ranger Districts are overstocked due to fire suppression, have reduced growth rates, and exhibit increased susceptibility to fire, windthrow, disease, and density related mortality. The stands along McGee Creek had many of these problems, particularly tree density related mortality. The objectives of the project were to increase the amount of large woody debris in the adjacent stream channel and floodplain and improve forest health. The project included thinning of 31 acres of riparian forest along McGee Creek and felling approximately 29 trees into McGee Creek along a ½ mile reach to increase the amount of LWD and improve fish habitat.

13-10. Early Detection Rapid Response Weed Abatement

Lead Entity/ Partners: SWCD/Columbia Gorge Cooperative Weed Management Area partners (CWMA), ODA

Date Completed: Ongoing

Project Cost/Funding Sources: $83,161 (EDRR project)/NFWF, CWMA; $25,65 (Garlic Mustard Abatement project)/ODA, CWMA

Description: The EDRR project was designed to protect the unique and sensitive habitats on state and federal lands in the Columbia Gorge and build Cooperative Weed Management Area capacity through early detection and rapid response to noxious weeds. Over two years, a total of 47 sites (over 150 miles of trail) in and around the Columbia Gorge National Scenic Area were surveyed for invasive species including the five target weed species (garlic mustard, knotweed, false brome, giant hogweed and leafy spurge). All findings were reported to both the appropriate state weed database and land manager. Thirty-three Columbia Gorge

CWMA partners were contacted and their existing weed species location data was reported to the appropriate state weed tracking systems in both Oregon and Washington. Seven Weed Watcher workshops were held for a total of 163 attendees and a field guide to the "Worst Weeds of the Columbia Gorge" was developed and published. Boot brushes and signage were installed at 25 key trailheads in the Columbia River Gorge to help increase awareness and help prevent the spread of noxious weeds.

The Hood River Garlic Mustard Abatement project was initiated in 2011. This project is using an integrated pest manageemnt approach to control the only two known sites of garlic mustard (*Alliaria petiolata*) in Hood River County – both in the upper valley adjacent to high priority habitat. Garlic mustard is designated as both a "B" and "T" weed by ODA.

Table A3.2. Monitoring & Assessment Projects

Project Name	Lead	Previous Action Plan #	Priority
Pesticide Stewardship Partnership	Multiple	WQ-10-08	High
Central Canal Pipeline Project Effectiveness monitoring	EFID	AP-2-08	High
West & East Fork Hood River LiDAR Mapping & Intrinsic Potential Study	CTWS	AH-13-08	Medium
Stream Habitat Project Effectiveness Monitoring	CTWS	WQ-7-08	High
Stream Temperature Monitoring	multiple	WQ-7-08	High
Irrigation Flow Meter Monitoring	SWCD	WQ-7-08	High
Orchard BMP Implementation Assessment	Multiple	WQ-7-08	High
Hood River Water Use & Water Conservation Assessments	County	none	

Pesticide Stewardship Partnership

Partners: DEQ, CTWS, OSU-MCAREC, ODA, SWCD, HRWG, CGFG

Date Completed: 2008-2013 (ongoing)

Project Cost/Funding Sources: ~$150,000/CTWS, DEQ

Description: Between 2008 and 2013, water grab samples were collected primarily on Neal, Odell, and Lenz Creeks and at the mouth of the Hood River to assess concentrations of pesticides (i.e., herbicides, insecticides, & fungicides). Sampling was conducted an average of 12 times per year during months of peak pesticide use in orchards (March – June & September- October). Samples were sent to the DEQ laboratory for analysis. In 2008, samples were analyzed for 15 different pesticides. Starting in 2009, new laboratory equipment enabled DEQ to analyze for over 100 pesticides. CTWS also deployed POCIS and SPMD samplers at a number of locations to assess cumulative levels of both hydrophillic and hydrophobic pesticides. Analysis of POCIS and SPMD results was completed by USGS.

The Pesticide Stewardship partners met annually to review results and plan monitoring for the following year. The meetings were also intended to assess progress in lowering instream pesticide levels and identify new pesticides being used by growers. In general, pesticide detections and concentrations remained low compared to levels and detections from 1999-2005. In addition, since 2012 very few pesticide detections have exceeded established water quality standards or benchmarks.

Central Canal Pipeline Project Effectiveness Monitoring

Lead/Partners: EFID & HRWG/CTWS, DEQ, BOR

Date Completed: 2012

Project Cost/Funding Sources: ~$30,000/CTWS, EFID, BOR Pacific NW Regional Lab

Description: The goal of this monitoring project was to evaluate the water quality effects of pipeline construction and resulting reduction of irrigation water in Neal Creek. Monitoring was

conducted for 6 years with 16 sampling rounds/year. Measurements included conductivity, temperature, pH, dissolved oxygen, turbidity, and total suspended solids at 9 sites. Total suspended solids and turbidity levels in Neal Creek significantly decreased after the pipeline was finished. However, turbidity levels in W. Fork Neal Creek still exceed DEQ standards downstream of EFID's ditch inflow.

West & East Fork Hood River LiDAR Mapping and Intrinsic Potential Studies

Lead/Partners: CTWS/USFS, SWCD, FID, Mt. Hood Meadows, Portland Area LiDAR Consortium

Date Completed: 2013

Project Cost/Funding Sources: ~$30,000/CTWS

Description: LiDAR surveys of the Hood River Basin were conducted in 2008. These data were used to analyze the riparian and upland areas along the West Fork Hood River to help guide management and identify restoration opportunities. The East Fork Intrinsic Potential study identified potential salmonid spawning habitat using physical habitat data and LiDAR imagery analysis. The project was developed as part of a 2012 East Fork Hood River LiDAR mapping project completed for the CTWS (Watershed Professionals Network, 2013). To date, preliminary site assessments have been completed in three reaches totaling three miles of the mainstem East Fork Hood River. Habitat surveys for the mainstem East Fork Hood River were updated by CTWS in 2013.

Stream Habitat Project Effectiveness Monitoring

Lead/Partners: CTWS/HRWG

Date Completed: 2013 (ongoing)

Project Cost/Funding Sources: ~$5,000/CTWS

Description: This monitoring was conducted to evaluate the impacts of stream habitat improvement projects, including large wood placement, fish passage, and riparian enhancement. For Elk and McGee Creeks, pre-project surveys were conducted to document habitat conditions before large wood placement. Methods included a modified Forest Service Stream Inventory Pacific NW Region 6 protocol, Wolman pebble counts, and photo points. Post-project monitoring was conducted 2 years after project completion on both creeks. Photo point monitoring was completed at the Middle Fork Falls fish passage project and Orchard Spray Buffer Riparian Planting Project sites.

Stream Temperature Monitoring

Partners: HRWG, CTWS, USFS, ODFW, DEQ, MFID, FID

Date Completed: Ongoing

Project Cost/Funding Sources: Approx. $15,000/year /CTWS, MFID, FID, ODFW, USFS

Description: Temperature probes were installed primarily during the summer, with the exception of a few year-round sites. Probes record hourly temperature throughout the

deployment period. Monitoring locations included sites around the basin used to document baseline temperatures, the impacts of diversions and other water management, and long-term trends.

Hood River Irrigation Upgrade Flow Meter Monitoring

Lead/Partners: SWCD/OWEB

Date Completed: December 2012

Project Cost/Funding Sources: $18,329/OWEB, SWCD, MFID, FID, EFID, OWRD and landowners

Description: This was a 3-year project, initiated in the spring of 2010. The primary purpose of the project was to quantify water savings achieved through irrigation upgrades installed using OWEB small grant funds. The SWCD conducted pre- and post-season readings on a total of 26 flow meters in 2010, 32 meters in 2011, and 36 meters in 2012, totalling 531.3 acres. All of these farms, with the exception of one still using a conventional irrigation system, received OWEB small grant funds to upgrade their irrigation systems from handlines and impact sprinklers to micro or drip irrigation. The study found that the average use of an upgraded (micro-sprinkler or drip) system was 585,572 gallons/acre/year. The average use of a conventional handline and impact sprinkler was 1,185,721 gallons/acre/year. Growers that had a high level of participation in the management of irrigation on their farm achieved the largest water savings.

Orchard BMP Implementation Assessment

Partners: CGFG, CTWS, OSU-MCAREC

Date Completed: October 2010

Project Cost/Funding Sources: ~$6,000/CTWS

Description: This project assessed and promoted the use of best management practices (BMP) by fruit growers in the Hood River Valley. It also identified surface waters near orchards that could benefit from riparian vegetation enhancement. Surveys were conducted with 52 growers who had orchards within 100 feet of surface waters (e.g., ditches, streams). This represented a 68% participation rate of all orchards meeting study criteria. The survey assessed spray fill stations, mixing and loading practices, pesticide container management, sprayer maintenance, application practices, and riparian vegetation. Results showed that most orchardists (60 – 100% depending on the practice) are using the range of recommended BMPs.

Hood River Water Use & Water Conservation Assessments

Lead/Partners: County/BOR, CTWS, DEQ, EFID, FID, HRWG, MFID, ODFW, OWRD, USGS

Date Completed: June 2013, August 2012

Cost/Funding Sources: $ 70,000/OWRD

Description: The Hood River Basin Water Use and Water Conservation Assessments were completed as part of the overall Hood River Basin Study. The Water Use Assessment documents all water use, water rights, and water infrastructure in the Basin. It summarizes data for potable, irrigation, hydropower, and instream use, and is based on both OWRD databases and data obtained from each irrigation district. The Water Conservation Assessment evaluates actions that could be implemented for potable and irrigation water conservation. For potable use, it focuses on retrofits of indoor fixtures, reducing outdoor water use, and reductions in use that could be achieved through changes in rate structure. The irrigation portion evaluates potential reductions in water use from converting impact sprinklers to micro-sprinklers, as well as water savings from eliminating canal seepage and overflows. The report also evaluates the effectiveness of different active and passive sediment control technologies, which is a key factor in successful use of micro and drip irrigation systems.

Table A3.2. Watershed Planning, Education, & Technical Assistance Projects

Project Name	Lead	Previous Action Plan #	Priority
Hood River RM 1 Habitat Restoration Alternatives Evaluation	CRC	AP-4-08	High
MFID Fish Management Plan, Clear Branch Dam Fish Passage Study, and Middle Fork IFIM Study	MFID	AP-6-08, WQ-13-08	High/ Medium
Watershed Education & Technical Assistance	HRWG & SWCD	ED-2-08, ED-4-08, ED-5-08	High/ Medium
Hood River County Rural Living Handbook	SWCD	ED-1-08	High
Salmon, Streams, & Science in the Classroom	SWCD	ED-2-08	High
Hood River Valley Coddling Moth Management	OSU-MCAREC	ED-3-08	High

Hood River RM 1 Habitat Restoration Alternative Evaluation

Lead/Partners: Columbia River Crossing/CLT, County, CTWS, HRWG, Mt. Hood Railroad, ODFW, PacifiCorp

Date Completed: January 2013

Description: The Columbia River Crossing, in collaboration with local partners, developed habitat enhancement alternatives on the lower Hood River and adjacent off-channel areas. The technical evaluation and design alternatives were completed by Inter-fluve Inc. The design goals were to improve aquatic habitat and ecological functions that support ESA-listed salmon and steelhead populations. The project included development of four restoration alternatives, evaluation of the alternatives based on habitat and feasibility criteria, selection of preferred alternative, and conceptual designs.

MFID Fish Management Plan, Clear Branch Dam Fish Passage Study, and Middle Fork IFIM Study

Lead/Partners: MFID/USFS, USFWS, NOAA Fisheries, ODFW, HRWG, DEQ, CTWS

Dates Completed: May 2010, March 2012, January 2013

Cost/Funding Sources: $554,928/MFID, OWEB, Title II (USFS), CTWS

Description: MFID, in collaboration with USFS, NMFS, USFWS, DEQ, ODFW, and CTWS, completed a Fisheries Management Plan (FMP) in 2010. The plan was intended to address current requirements for MFIDs Special Use Permit (SUP) from the USFS and provide a basis for the renewal of the SUP in 2021. In addition, the plan intends to help meet Endangered Species Act and Clean Water Act requirements for future projects. The FMP describes and prioritizes improvements to MFID's facilities and operations to enhance aquatic habitat, fish passage, and water quality, as well as to ensure sustainable, high quality irrigation water delivery.

Two recommendations made in the FMP were to evaluate fish passage options at Clear Branch Dam and the relationship between stream flow and aquatic habitat availability. The Clear Branch Dam Fish Passage Study concluded that constructing and operating a trap and haul facility for bull trout and possibly steelhead was the most feasible solution. The Middle Fork IFIM (i.e., Instream Flow Incremental Methodology) study evaluated streamflow and fish habitat relationships in six study reaches downstream of MFID points of diversion.

Watershed Education & Technical Assistance

Lead/Partners: HRWG & SWCD/CTWS, City of Hood River, CGCC, OSU-MCAREC, Master Gardeners, Hood River County School District, Horizon Christian School, Odell Lions Club, HRWG members

Date Completed: 2008-2013

Total Project Cost: ~$250,000

Description: 1) 45 Watershed Group meeting presentations on watershed conditions, status of species, and project results; 2) 22 "Field Series" classes on watershed natural history, 3) new SWCD/HRWG website; 4) 24 quarterly E-newsletters and six Annual Reports; 5) 11 BMP Workshops on topics such as irrigation efficiency, livestock and pasture management, stormwater management, noxious weed eradication, and forest stewardship ; 6) six annual native plant sales; 7) booth display for six Hood River County Fairs; 8) 26 storm drain marker installations within the City of Hood River; 9) Oil & Water Don't Mix Brochure in English and Spanish; 10) Indian Creek Outdoor Classroom; 11) two Indian Creek Stewards Open houses; 12) three Indian Creek Interpretive Signs; 13) annual Earth Day events; and 14) technical assistance provided to over 2,000 landowners

Hood River County Rural Living Handbook

Lead/Partners: SWCD

Date Completed: February 2008

Cost/Funding Sources: $26,957/OWEB, SWCD, all Watershed Group partners

Description: The 28-page guide to rural land management was designed for rural residents new to the County or unfamiliar with natural resource issues and regulations. It provides information on land use practices in the Valley (e.g., orchards, forestry), best practices for irrigation, livestock, and weed management, and many other helpful tips for managing rural landscapes in a sustainable way.

Salmon, Streams, & Science in the Classroom

Lead/Partners: CTWS/HRWG, SWCD, USFWS, ODFW

Date Completed: 2010-2013 (ongoing)

Cost/Funding Sources: ~$18,000

Description: In fall of 2010, 2011, 2012, and 2013, CTWS staff, with the assistance of partners and volunteers, hosted field days at the Parkdale Fish Facility for 4th and 5th grade

students from Parkdale Elementary and Mid-Valley Elementary. The field days included stations on the salmon lifecycle, hatchery rearing, stream and riparian habitat, salmon food sources, tribal culture, and hydropower production. The field days were followed up by three visits to each classroom focusing on watershed health and pollution sources, the tribal importance of salmon, and salmon anatomy. In addition, each class raised Chinook or steelhead from eggs to fry in their classroom while observing the developmental stages of the fish.

Hood River Valley Coddling Moth Management

Lead/Partners: CGFG/OSU-MCAREC

Date Completed: October 2012

Cost/Funding Sources: $261,983 /American Farmland Trust, DEQ 319, ODA

Description: This project began in 2008 and ultimately involved 1,250 acres and 24 growers in the Dee Flat and Odell area of Hood River who utilized codling moth mating disruption techniques to reduce the use of organophosphate pesticides. The number and frequency of organophosphate sprays was significantly reduced over the life of the project, as were the number and level of detections of organophosphates in area streams.