

THE UMATILLA RIVER ANADROMOUS FISH HABITAT PROJECT

2015 Annual Report



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Cover Image: Photograph overview image of the Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7.1, July 15, 2015, image by CTUIR

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ACRONYMS

| | |
|--------|---------------------------------------------------------------------|
| BA | biological assessment |
| B&G | Bauer & Gustafson |
| BIA | Bureau of Indian Affairs |
| BMHRC | Blue Mountain Habitat Restoration Council |
| BPA | Bonneville Power Administration |
| cfs | cubic feet per second |
| COTR | Contracting Officer Technical Representative |
| CREP | Conservation Reserve Enhancement Program |
| CTUIR | Confederated Tribes of the Umatilla Indian Reservation |
| cy | Cubic Yards |
| dbh | diameter at breast height |
| EPA | United States Environmental Protection Agency |
| ESA | Federal Endangered Species Act |
| ft | foot/feet |
| FY | fiscal year |
| gpm | gallons per minute |
| in | inch/inches |
| JPA | Joint Permit Application |
| km | kilometer/kilometers |
| LWD | large woody debris |
| m | meters |
| mi | mile/miles |
| MOA | Memorandum of Agreement |
| mph | miles per hour |
| NMFS | National Marine Fisheries Service |
| NPPC | Northwest Power Planning Council |
| NWPCC | Northwest Power and Conservation Council |
| NRCS | Natural Resource Conservation Service |
| ODEQ | Oregon Department of Environmental Quality |
| ODFW | Oregon Department of Fish and Wildlife |
| ODSL | Oregon Department of State Lands |
| OWEB | Oregon Watershed Enhancement Board |
| OWRD | Oregon Water Resources Department |
| PCSRF | Pacific Coastal Salmon Recovery Fund |
| RM | river mile |
| SOW | Statement of Work |
| TMDL | total maximum daily load |
| UAFHP | Umatilla Anadromous Fisheries Habitat Project |
| UBNPME | Umatilla Basin Natural Production Monitoring and Evaluation Project |
| UBWC | Umatilla Basin Watershed Council |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| UPR | Union Pacific Railroad |
| WHIP | Wildlife Habitat Incentive Program |

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EXECUTIVE SUMMARY

The Umatilla Anadromous Fish Habitat Project (UAFHP) is an ongoing effort to protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic species in the Umatilla River Subbasin, including Threatened Mid-Columbia summer steelhead and Columbia River bull trout. Flow quantity, water temperature, passage, and lack of in-stream channel complexity have been identified as the key limiting factors in the subbasin. During the 2015 fiscal year (FY) reporting period (January 1, 2015- December 31, 2015) primary project activities focused on improving passage, in-stream and riparian habitat complexity and restoring natural channel morphology and floodplain function. Project activities focused on designing future projects on Meacham & Wildhorse Creeks and the mainstem Umatilla River. Other projects activities included channel reshaping, and input of rock and large wood structures on a small project on Birch Creek, resulting in increased channel and fish habitat complexity directly benefiting Threatened Mid-Columbia summer steelhead. The UAFHP completed vegetation plantings associated with the Meacham Creek Floodplain Restoration and In-Stream Enhancement Project (RM 6-7.1) planting plan following 2011 construction. Control of noxious weeds also occurred within this reach of Meacham Creek and other project areas and agreements, resulting in the treatment of 419 acres through hand and mechanical removal, biological control and chemical application. The CTUIR UAFHP staff are developing construction design and specification documents for the Meacham Creek Floodplain Restoration and In-stream Enhancement – Bonifer Reach Project (RM 1.9 – 5.7), and worked on completing environmental compliance and permitting for 2016 (and beyond) construction. Additional planning/assessment tasks were accomplished on Meacham, Wildhorse, Birch, and Iskúultpe Creeks and the Umatilla River. The planning elements that occurred during this contract period included providing technical input on plans and proposals by entities within the Umatilla River Basin that may adversely impact floodplain or riverine processes and biota productivity, public project planning relevant to floodplain, river and wetland restoration or impacts, development and review of grant funding proposals, and proposed landowner projects. The UAFHP staff also has an obligation to annually monitor and maintain 15 conservation agreements on 14 individual landowner's properties throughout the basin. The UAFHP also worked on the development of new conservation agreements on three properties on Wildhorse and Birch Creeks and the mainstem of the Umatilla River. Given the ongoing project activities in Meacham Creek and the accumulative value of project activities within the lower 15 mile focus area, CTUIR focused monitoring efforts to evaluate the effects on biotic and abiotic ecological processes as a result of habitat restoration efforts. Habitat and aquatic assessment inventories were conducted at project sites prior to and following implementation. Action effectiveness and project implementation/compliance monitoring will continue prior to and following each project to oversee progression and inspire timely managerial actions. All monitoring efforts are being moved into other CTUIR projects that are specific to monitoring and out of the UAFHP project. Project work is supported both locally and regionally by multiple planning documents: Umatilla/Willow Subbasin Plan (NPCC 2005), Five-Year Action Plan for the Development and Maintenance of Habitat Improvement Projects in the Umatilla Subbasin: 2006-2010 (CTUIR and ODFW 2006), Umatilla River Basin TMDL and Water Quality Management Plan (2001), CTUIR TMDL (2005), Umatilla River Vision (Jones et al. 2008; Existing Project Document ID: P130339), Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (NMFS 2009), Bull Trout Draft Recovery Plan within the Umatilla-Walla Walla Recovery Unit (USFWS 2002), Meacham Creek Watershed Analysis and Action Plan (Andrus and Middel 2003) and Umatilla and Meacham Watershed Assessment (UNF 2001).

INTRODUCTION

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) retain aboriginal and treaty rights related to fishing, hunting, pasturing of livestock, and gathering of traditional plants within the Umatilla River Subbasin. The CTUIR Department of Natural Resources (DNR) has developed and accepted a First Foods organization and approach to ecosystem management based on the cultural traditions and practices of the Longhouse. The organization follows the serving order of food and conceptually “Extends the Table” to manage for sustainability within the Umatilla River Subbasin. The First Foods are considered to be the minimum ecological products necessary to sustain CTUIR culture. The order is watershed-based beginning with water at the first and lowest point and progresses up to salmon, deer, cous, and huckleberry. This creates clear links to treaty rights and resources and sets direction and goals that relate to the community culture. In addition the DNR developed the Umatilla River Vision that provides a description of the processes and conditions needed to protect and provide for First Foods. The River Vision describes physical and biological processes in support of 5 touchstones; hydrology, geomorphology, connectivity, riparian vegetation, and aquatic biota. The work accomplished through this project is directly related to the First Foods of water and salmon and the 5 touchstones, which incorporates goals of restoring high water quality and healthy and sustainable salmonid fish populations.

CTUIR’s right to fish in its historical fishing places was acknowledged in the Treaty of 1855 that stated: “the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations...” (Treaty of 1855, Articles of Agreement, Article 1, page 3). Decreased salmonid abundance has significantly impacted the livelihood of the Tribal community and altered their way of life.

Overfishing, sweeping changes to rivers and streams, and policies that changed the landscape have endangered salmon and created a “salmon crisis” (Montgomery 2003). It is the challenging duty of the CTUIR Umatilla Anadromous Fisheries Habitat Project (UAFHP) to restore and sustain healthy conditions of local watersheds to both assist in salmon recovery and ensure they provide adequate quantities of sustainable natural resources to satisfy the CTUIR’s needs and preserve opportunities for traditional ways of life.

As part of the Northwest Power Conservation Council’s Columbia Basin Fish and Wildlife Program, this project is one of Bonneville Power Administration’s (BPA) many efforts at off-site mitigation for damage to salmon and steelhead runs, their migration, and wildlife habitat caused by the construction and operation of FCRPS dams. The Umatilla Anadromous Fish Habitat Project (UAFHP; #1987-100-01) initiated by CTUIR in 1987 is an integral component of the Umatilla River Subbasin Salmon and Steelhead Production Plan (NPPC 1990), and project work is supported both locally and regionally by multiple planning documents: Umatilla/Willow Subbasin Plan (NPCC 2005), Five-Year Action Plan for the Development and Maintenance of Habitat Improvement Projects in the Umatilla Subbasin: 2006-2010 (CTUIR and ODFW 2006), Umatilla River Basin TMDL and Water Quality Management Plan (2001), CTUIR TMDL (2005), Umatilla River Vision (Jones et al. 2008; Existing Project Document ID: P130339), Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (NMFS 2009), Bull Trout Draft Recovery Plan within the Umatilla-Walla Walla Recovery Unit (USFWS 2002), Meacham Creek Watershed Analysis and Action Plan (Andrus and Middel 2003) and Umatilla and Meacham Watershed Assessment (UNF 2001).

The Final Umatilla Willow Subbasin Plan (Umatilla/Willow Subbasin Planning Team 2005; <http://www.nwcouncil.org/fw/subbasinplanning/umatilla/plan/>; Management Plan) provided a systematic vision of a healthy ecosystem with abundant, productive, viable, and diverse populations of

aquatic and terrestrial species with goals, objectives, and management strategies necessary to reach the subbasin vision. The vision entails several broad goals for habitat: 1) Protect existing high quality fish and wildlife habitat and strongholds, 2) restore and enhance degraded and diminished fish and wildlife habitats to support population restoration goals and to mitigate impacts from the construction and operation of the Columbia basin hydropower system and other anthropogenic impacts, and 3) restore the health and function of ecosystems in the Umatilla subbasin to ensure continued viability of their natural resources (Management Plan, page 5-3). Specific aquatic qualitative objectives and strategies were developed in to support the subbasin vision and goals. Quantitative management objectives relative to the UAFHP work activities include 1) maintain and enhance natural production, productivity, abundance, life history characteristics and genetic diversity of fish and mussels throughout the Umatilla Subbasin using habitat protection and improvement and 2) maintain and enhance passage of adult and juvenile steelhead and Chinook throughout the Umatilla Subbasin with passage protection and restoration (Management Plan, page 5-5). The Umatilla Subbasin Plan 2005 determined that the limiting factors could be addressed through habitat restoration and implementation ("Phase III") of the Umatilla Basin Project (pages 5-10). An identification and analysis of limiting factors/conditions and priority areas for action are fully described within the Subbasin Plan (Section 3.5) including passage barriers/entrainment, in-channel characteristics, habitat diversity (LWD), floodplain confinement, high water temperatures, high turbidity, inadequate flows, and poor riparian/floodplain vegetation. Priority management strategies are being conducted by the UAFHP in accordance with the Final Umatilla Willow Subbasin Plan (Umatilla/Willow Subbasin Planning Team 2005; pages 5-8 & 5-9) to address limiting factors within the subbasin:

- Increase water conservation and irrigation efficiency
- Large Wood/Boulder Structure Placement
- Fence/Plant Riparian Zones
- Modify Channel Floodplain Function
- Construct Pool/Riffle – In-stream Modification
- Modify Detrimental Land use Activities
- Restore Upstream/Headwater Attributes to Improve Downstream Conditions
- Increase Passage Efficiency

The UAFHP is an ongoing effort to protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic species in the Umatilla River Subbasin. Habitat restoration efforts fit within a holistic watershed approach supporting capacity building and long-term progress towards 1) achievement of the CTUIR DNR ecological river vision and first foods mission statements, 2) Endangered Species Act delisting of Columbia River bull trout and middle Columbia River steelhead, and 3) addresses water quality limiting factors per the Clean Water Act 303d list.

During the 25-year project history, the CTUIR has helped administer and implement a number of fisheries habitat enhancement projects in the Umatilla River Subbasin. In FY 2015, the CTUIR maintained 23 partnership habitat enhancement projects along Meacham Creek, Iskúultpe Creek, Birch Creek, Wildhorse Creek, West Birch Creek and the mainstem Umatilla River, among other sites. The CTUIR has developed effective interagency partnerships and is effectively working at the policy and project levels with various federal, state, and county agencies and private landowners.

The UAFHP is an integral component of the *Umatilla River Subbasin Salmon and Steelhead Production Plan* (NPPC 1990) and is well integrated into the framework of the *Umatilla Subbasin Plan* (Umatilla/Willow Subbasin Planning Team 2005) established by the NWPC to better coordinate habitat restoration work in the Umatilla River Basin. The CTUIR, ODFW, Natural Resource Conservation Service (NRCS), Umatilla Basin Watershed Council (UBWC), and other participating

agencies and organizations have made significant progress towards restoring and protecting vital salmonid habitat in the basin.

The major project accomplishments during the 2015 contract are described in the table below. This only includes the major implementation activities. The planning and design related activities for future implementation projects are contained in the subsequent table.

Table 1. Summary of Implementation work accomplished in 2015.

| Work Element | Location | Description |
|--------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Bank Stability | Birch Creek | Installed large rock ballast & 8 root wads to maintain previous habitat project. |
| Conservation Agreements | Umatilla River, Wildhorse Creek & Birch Creek | Develop, write and execute 3 new conservation agreements. |
| | Wildhorse, Birch, EFK Birch, WFK Birch, Cottonwood, & Umatilla River | Maintain current conservation agreement terms and conditions on 15 agreements, including fencing and watering plantings. |
| Weed Treatment | Lower & Upper Umatilla River, Wildhorse, McKay, Birch & Meacham Creeks. | 419 riparian and upland acres chemically treated. |
| Planting | Birch Creek | 700 Willow whips were installed 25 pounds of grass seed sown. |
| | Meacham Creek | 500 Willow whips were installed 4,272 plants were planted with BPA funding; an additional 1,432 plants were planted with EPA cost share funding. |

Table 2. Major designs and project planning for the 2016 field season.

| Project | Description |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Athena Fish Passage Mitigation | Partnered with the UBWC to complete a feasibility study on addressing passage at this site. |
| Meacham Creek – Bonifer Project | Selected a contractor & produced a 60% design for full floodplain restoration on 4 miles of stream. |
| Dillon Dam Removal | Coordinated with ODFW & UBWC to develop alternate water delivery system. Design planned in 2016; removal planned in 2017. |
| Wujek Reach Floodplain Restoration | Coordinated with SWCD & ODFW to begin discussions with the primary landowner on the mainstem Umatilla River; developed landowner agreement; design in 2017; implementation in 2018. |
| Birch Creek Watershed Assessment | Continued working with selected contractor and multiple partners to complete the Assessment & draft the Atlas. Expected completion date is June, 2016. |

Subbasin planning teams utilized information from a variety of resource assessment sources to classify existing habitat status, determine limiting factors, and identify priority areas for restoration activities. A combination of both passive and active restoration strategies were then developed to

address habitat deficiencies. Collection of aquatic habitat, geomorphology, water quality, and fish abundance data is ongoing and utilized for optimizing adaptive restoration plans at project areas.

Project results are reported in various BPA formats including Pisces status reports, project completion reports, and annual reports. The CTUIR maintains a complete database on project planning, proposals, permitting, implementation, and results through the completion of required project deliverables. For a complete list of reports submitted by the CTUIR's UAFHP since 1989, please consult the following website at URL: <http://www.efw.bpa.gov/integratedfwp/reportcenter.aspx> and search **publications**, typing 1987-100-01 in the project number box provided.

F&W Program Management Question: What are the tributary habitat limiting factors (ecological impairments) or threats preventing the achievement of desired tributary habitat performance objectives?

Habitat protection and restoration needs in the Subbasin have been recognized in numerous reviews, planning processes, and reports (CTUIR 1993; CTUIR 2000; Umatilla/Willow Subbasin Planning Team 2004; 2005). The National Marine Fisheries Service (NMFS) has recently restarted the recovery planning effort for Chinook salmon and steelhead and tributary habitat restoration. The National Research Council (1996) notes the importance of protecting and rehabilitating freshwater habitat as part of salmon recovery and specifically notes the importance of riparian areas. This body recommended that habitat reclamation or enhancement should emphasize rehabilitation of ecological processes and function (NRC 1996). The United States Fish and Wildlife Service (USFWS) draft bull trout recovery plan (USFWS 2002) also recognized the importance of habitat protection and restoration and specifically noted the need to improve water quality, reduce or eliminate fish passage barriers, and restore impaired in-stream and riparian habitat. Pre-project implementation aquatic habitat inventory surveys conducted by CTUIR revealed that habitat quality ranked poor in 85% of areas surveyed and fair in 15% in the Umatilla River.

The Oregon Department of Environmental Quality (ODEQ) listed the Umatilla River Subbasin on the State's list of water quality limited water bodies' 303(d) list (Please see the ODEQ website at URL <http://www.deq.state.or.us/wq/assessment/rpt0406/results.asp> for details). A Total Maximum Daily Load (TMDL) was also written for waters within reservation boundaries (CTUIR 2005) that, in combination with CTUIR's habitat enhancement work, should lead to water quality improvements over the long term (Please see <http://yosemite.epa.gov/R10/WATER.NSF/TMDLs/Approved+TMDLs#OR>, select "Oregon", and navigate to "Umatilla Tribal TMDL" for a copy of this report.).

Throughout much of the Subbasin, maximum water temperatures exceed lethal limits for bull trout and approach lethal limits for Chinook salmon and rainbow/steelhead trout. The high stream temperatures potentially limit carrying capacity, adversely affect fish fitness, and should be considered as a primary factor limiting salmonid production in the Subbasin. In addition, passage barriers and entrainment, in-channel characteristics, habitat diversity (LWD), floodplain confinement, high turbidity, flow quantity, and poor riparian/floodplain vegetation were identified as other key limiting factors/ecological impairments.

The UAFHP ecological objectives are derived from planning documents and processes relative to limiting factors/ecological impairments (Table 3).

F&W Program Management Question: How has your work supported exchange and dissemination of fish and wildlife data or the development of a database to manage data that may be shared regionally, relative to the RM&E data management strategies roadmap?

The UAFHP is currently working with the local Geographical Informational System (GIS)/ Information Technologies (IT) staff to develop a database that is central to all CTUIR Department of Natural Resource (DNR) programs. Due to the rapid increase in DNR programs in the past 5 years, and the data being collected, it has been deemed a priority to review and organize all data collection efforts. The CTUIR DNR Program recently hired a “data steward” whom is tasked with this duty. Currently, the most requested data from outside agencies is our annual temperature data. Since 1995 CTUIR has managed a publicly accessible website/database that houses all temperature data (back to 1993), water quality data (back to 1989) and fish survey data (back to 1987) collected on an annual basis. Additional information on conservation easements, water quality study sites, and floodplain area is also housed on this website (<http://data.umatilla.nsn.us/index.aspx>).

Recently the UAFHP has created a GIS based geodatabase to store and display all monitoring that they have conducted within the Umatilla Subbasin. The database contains point location information and is linked to files that house all the data for the coinciding location. This database is used to maintain consistency for monitoring and monitoring locations and to leave a “paper trail” for biologist that leave or enter the program. Past monitoring locations have been lost through changing program managers and

Table 3. The Umatilla Anadromous Fish Habitat Project objectives relative to the Umatilla River Vision touchstones (Jones et al 2008), BPA 2008 Fish Accords primary limiting factors (Fish Accords 2008) and NOAA’s ecological concerns (NMFS 2009).

| Umatilla Habitat Program Objectives | Umatilla River Vision 2008 Touchstones Addressed | BPA 2008 Fish Accords Primary Limiting Factor's Addressed | NOAA Ecological Concerns | NOAA Ecological Concerns Subcategories |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protect and conserve natural ecological processes that support the viability of fish populations and their primary life history strategies | Biota Connectivity Geomorphology Hydrology Riparian Vegetation | In-channel Characteristics Floodplain/Riparian Sediment | Multiple(Habitat Quantity, Injury and Mortality, Peripheral and Transitional Habitats, Channel Structure and Form, Sediment Conditions, Water Quality, Water Quantity, Population Level Effects) | Multiple |
| Restore passage and connectivity to habitats blocked or impaired by artificial barriers and maintain properly function passage and connectivity | Geomorphology Connectivity | Passage/Entrainment | Habitat Quantity | Anthropogenic Barriers |
| Maintain and restore floodplain connectivity and function | Aquatic Biota, Connectivity, Riparian Vegetation, Geomorphology, Hydrology | Water Quality-Temperature Riparian/Floodplain | Food, Peripheral and Transitional habitats, Riparian Condition, Channel Structure and Form, Water Quantity | Altered Primary Productivity, Altered Prey Species Composition and Diversity, Riparian Condition, LWD Recruitment, Floodplain Condition, Bed and Channel Form, Instream Complexity, Decreased Water Quantity, Altered Flow Timing |
| Restore degraded and maintain properly function channel structure and complexity | Connectivity, Riparian Vegetation, Geomorphology | In-channel Characteristics | Riparian Condition, Peripheral and Transitional Habitats, Channel Structure and Form | Riparian Condition, LWD Recruitment, Side Channel Conditions, Floodplain Condition, Bed and Channel Form, Instream Structural Complexity |
| Restore riparian condition and LWD recruitment and maintain properly functioning conditions | Aquatic Biota, Riparian Vegetation, Hydrology | In-channel Characteristics Riparian/Floodplain | Food, Riparian Condition | Riparian Condition, LWD Recruitment, Altered Primary Productivity, Food-Competition, Altered Prey Species Composition and Diversity |
| Restore natural hydrograph to provide sufficient flow during critical periods | Connectivity, Aquatic Biota, Hydrology, | Floodplain/Riparian Water Quality-Temperature | Habitat Quantity, Water Quality, Water Quantity | HQ-Competition, Oxygen, Increased Water , Alter Flow Timing |
| Improve degraded water quality and maintain unimpaired water quality | Hydrology, Aquatic Biota | Floodplain/Riparian Water Quality-Temperature | Riparian Condition, Sediment Conditions, Water Quality | Riparian Condition, Decreased Sediment Quantity, Temperature, Oxygen Turbidity, Toxic Contaminants |

scattered monitoring efforts within the subbasin. As mentioned throughout this document, the UAFHP has drastically increased the amount of and the scale of restoration within the subbasin, as expected increased restoration calls for increased monitoring. With this increase in monitoring the CTUIR and UAFHP are continuing to refine and strive for more continuous and concentrated monitoring.

Data that is collected and housed by CTUIR and CTUIR staff that is to be shared must go through a data sharing agreement with specific details on how the data is to be used and translated. All CTUIR data is to be collected in the NAD83 zone 11N coordinate system. If data is received from outside resources the information and coordinate system is translated into the CTUIR coordinate system in order to avoid data translation errors. When outside data is collected for CTUIR programs, a requirement within the contract is to have the data translated to NAD83 11N or to state what coordinate system the data was collected.

Data collected for CTUIR through outside agencies or contractors is required to contain an attachment stating the protocol used and the data standards for processing the data. Data collected by CTUIR is collected using standardized data sheets generated internally with specific requirements on coordinate system, system of measurements (English vs. metric), and specific attributes that are important to the data set.

The CTUIR's IT Department houses a significant amount of data for the CTUIR DNR programs. Efforts are currently underway, through an on-site data coordinator, to standardize and better document many sets of data that are used throughout the CTUIR Fisheries Habitat Program related to projects. Once fully established, this system will improve our ability to store, query, and share data. Currently all data are kept in a MS SQL database using a format conducive to existing reporting needs.

Most monitoring data compiled by the UAFHP is collected locally within the program. Temperature and sediment data related to TMDLs within the Umatilla Subbasin are collected by and coordinated through the Umatilla Watershed Council and then distributed to the UAFHP for review and project report addition. Fisheries biological life cycle information (smolt trap, redd surveys, and fish population) that the UAFHP uses for project or action effectiveness monitoring are collected by the CTUIR Natural Production Monitoring and Evaluation Program (BPA contract 1990-005-01) which is coordinated with local ODFW Juvenile Salmonid Outmigration Program (BPA contract 1989-024-01). Both the CTUIR and ODFW programs coordinate data and provide results for the UAFHP. For large restoration projects topographic survey work is required for effectiveness monitoring and project design surfaces. In these instances the work is contracted out and the UAFHP project works with the data internally or builds additional analysis into the contracted survey work. In past projects the UAFHP contracted work to private firms to complete full topographic surveys, CHaMP habitat surveys, sediment analysis, geomorphic analysis and modeled flow analysis. In most instances UAFHP staff does not have the capacity to complete this work in addition to their daily work requirements within the local CTUIR agency.

All data collect by the UAFHP is housed on a local backed up server and is protected through user privilege agreements. Only UAFHP staff is able to view and manipulate this data. All data is linked to the aforementioned GIS geodatabase so it can be easily viewed spatially. Metadata for this information is stored in an IGDC metadata standard format and attribute information is populated within the GIS geodatabase. Additional metadata is documented within the UAFHP protocol on MonitoringMethods.org (<https://www.monitoringmethods.org/Protocol/Details/681>). The UAFHP strives to use regional standards for data collection whenever applicable, however we do develop our own data collection methods and/or protocols for certain aspects of project effectiveness monitoring. These locally developed protocols are housed internally and are attached to all data collected using the protocol as well as attached to the GIS geodatabase.

The UAFHP directly contributes and submits data and information to the following FCRPS BiOp programs: PNAMP, CHaMP, Columbia Basin Pit Tag Information (through our M&E Program), PIBO and indirectly contributes to the Integrated Status and Effectiveness Program through required BPA submittals. The only local staff with access to raw data associated with PNAMP, CHaMP, PIBO and the Columbia Basin Pit Tag Information is project managers and assistant managers directly related to the information collected and the project in which it is collected for. CHaMP data is collected by a contracted agency and they are responsible for entering the data into the CHaMP system and providing the UAFHP with the associated raw data and summarized data. For data sharing databases like PNAMP "colleague permission" is granted to counterparts within the organization and project collaborators for information sharing and collaborative data analysis/review purposes. Once

information is put on the respective database viewing permissions are set to database manager discretions.

PROJECT AREA

Umatilla River Subbasin

The Umatilla River Subbasin is located in the northwest portion of the Blue Mountain Ecological Province in northeast Oregon. The Umatilla River Subbasin comprises 1,465,600 acres of the 6,400,000 acres of ceded CTUIR land (CTUIR 1995) as identified by the Treaty of 1855. Figure 1 illustrates the vicinity of the Umatilla River Subbasin within the Blue Mountain Province (Project map: <http://www.cbfish.org/Project.mvc/Map/1987-100-01>). The Umatilla River drains an area of approximately 2,540 square miles (mi.²) (6,579 square kilometers [km²]) and flows approximately 89 mi. (143 km) from its mouth to where it divides into the north and south forks of the Umatilla River. Each fork adds another approximately 10 mi. (16 km) of length. Major tributaries in addition to the north and south forks include Meacham Creek, Birch Creek, McKay Creek, Butter Creek, and Wildhorse Creek. The Umatilla River originates at elevations up to 4,228 feet (ft.; 1,289 m) and flows west and north to its confluence with the Columbia River (USFWS 2002) at an elevation of about 269 ft. (82 m).

The Umatilla River Subbasin historically supported viable and harvestable populations of spring/summer and fall Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), summer steelhead (*O. mykiss*), Pacific lamprey (*Entosphenus tridentatus*), bull trout (*Salvelinus confluentus*), steelhead-rainbow trout (*O. mykiss* sp.), and mountain whitefish (*Prosopium williamsoni*). Anthropomorphic alterations have negatively impacted the watershed and caused significant reductions of endemic salmonid populations. Beginning in the late 1800s, fish populations started to decline due to habitat degradation; sockeye and coho were extirpated in the early 1900s. Irrigation and agricultural development throughout the basin in the early 1900s is believed to be the primary cause of the decline of steelhead and the extinction of salmon. Since the signing of the Treaty of 1855, aquatic and riparian habitats have been degraded through irrigation diversions, water extractions, channelization, livestock grazing, logging, agriculture and urban development (Umatilla/Willow Subbasin Planning Team 2004). Subsequently, the abundance of Chinook, steelhead, bull trout, and other fish species has also been dramatically reduced. With declining fish populations, Tribal governments, federal, state and international agencies were obligated to eliminate or significantly reduce subsistence and sport fisheries by the mid-1970s. The Federal government listed Columbia River spring Chinook salmon, summer steelhead, and bull trout as threatened species under the ESA in 1973, 1992, 1997, and 1998, respectively.

The following species listed under the ESA currently occur in the Umatilla River Basin: Columbia River bull trout Critical Habitat (designated), Columbia River bull trout (threatened), and Mid-Columbia River steelhead (threatened). In the mid-1980s, a successful, hatchery-based salmonid reintroduction effort for the Umatilla River was instituted using neighboring strains of various salmonid species. Although hatchery programs currently support subsistence and restricted sport fishing opportunities for steelhead and Chinook salmon, there remains significant need to re-build viable, harvestable, and sustainable fish stocks throughout the basin.

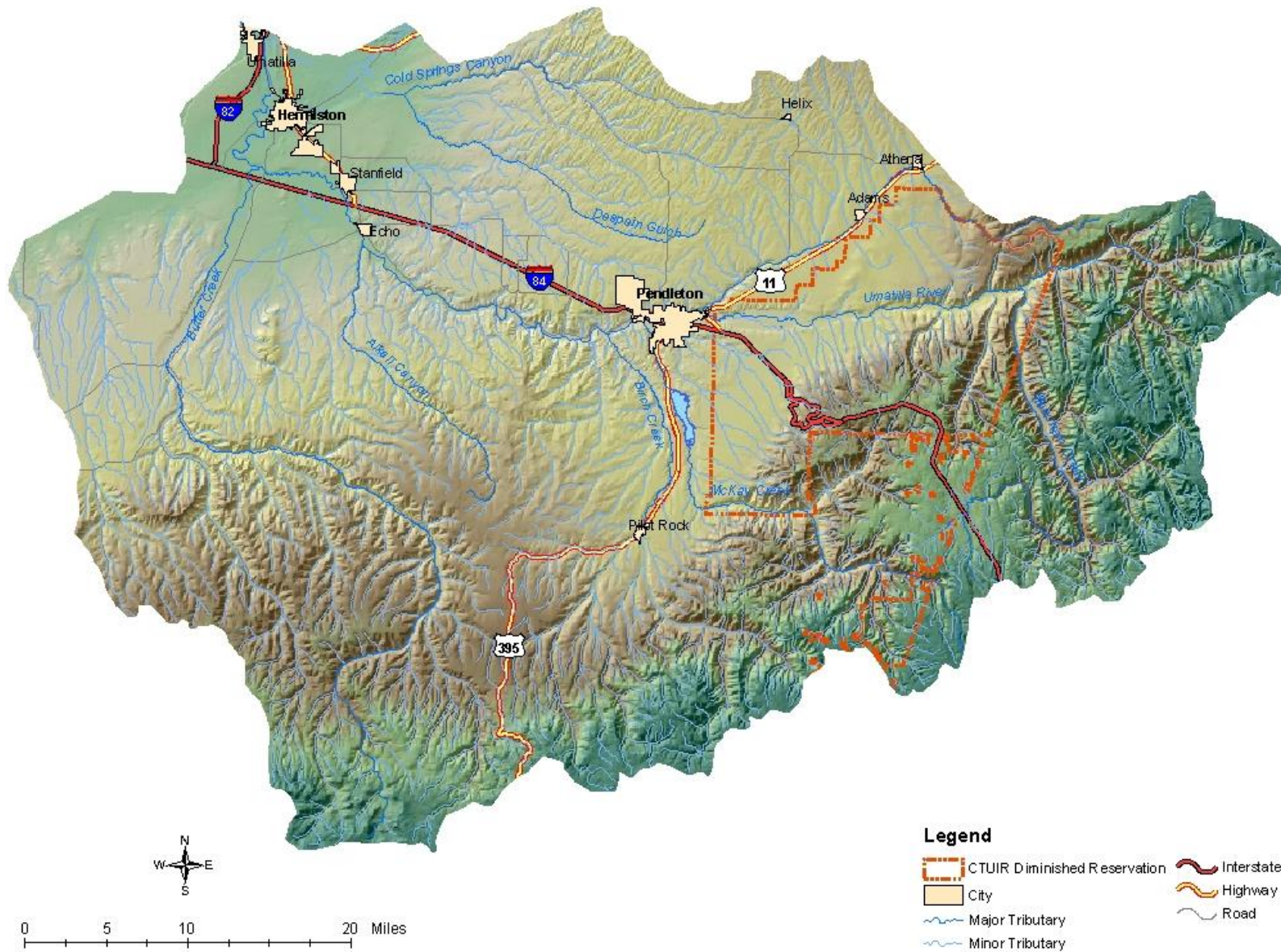


Figure 1. Umatilla River Subbasin

Our primary area of focus for restoration and monitoring work in FY 2015 was Meacham Creek, Birch Creek and mainstem Umatilla River (Figure 2, below; and Contract Map: <http://www.cbfish.org/Contract.mvc/Map/57257>).

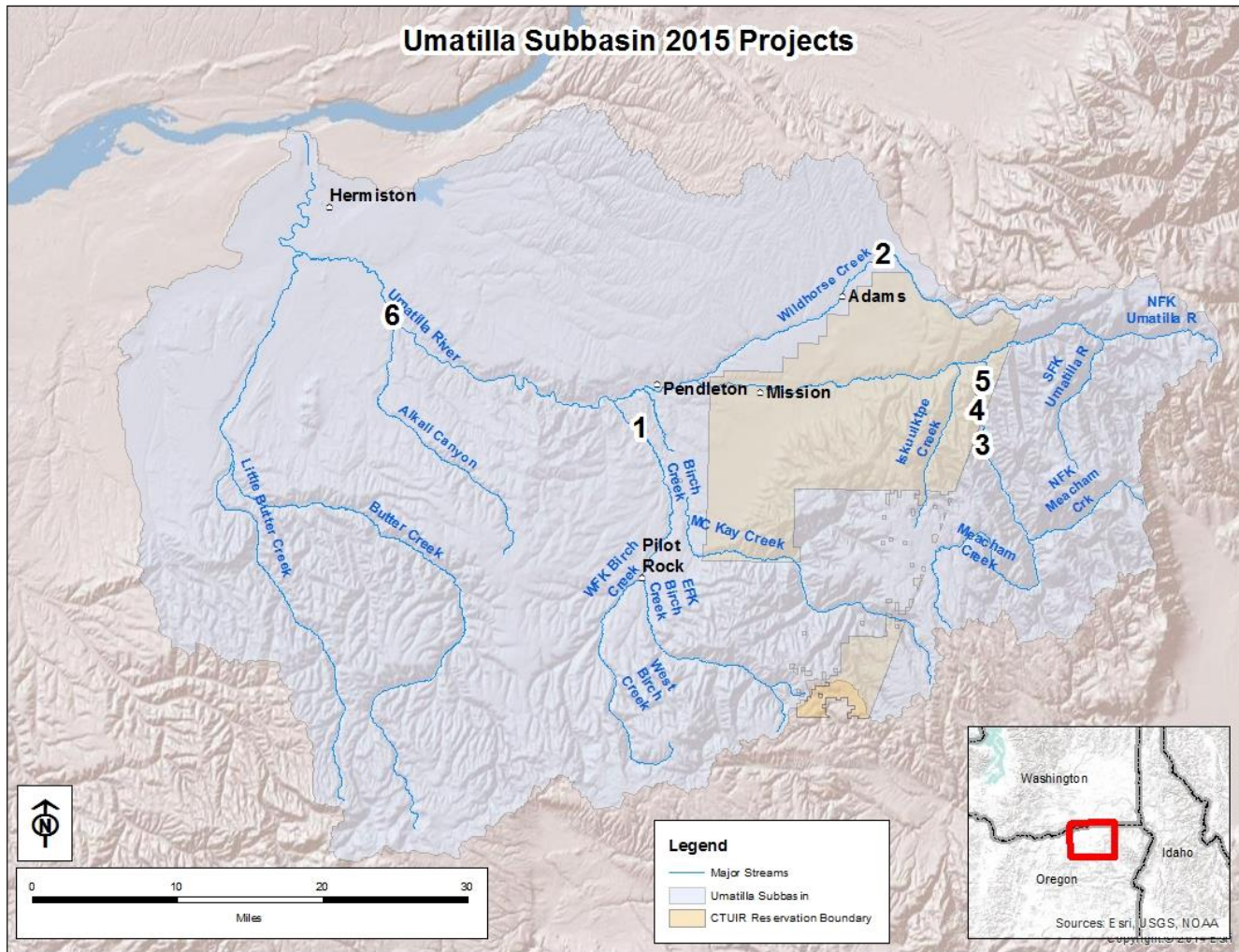


Figure 2. Umatilla River Basin FY2015 UAFHP Project Sites

1: Birch Creek – 2015: Bank Stabilization Project, Weed Treatment; Willow Planting.

2: Wildhorse – 2015: Fish passage feasibility study.

3: Meacham Creek – 2015: Additional weed treatment, plantings and seeding as part of the 2011 Floodplain Restoration and In-stream Enhancement Project.

4: Meacham Creek (Bonifer Reach) – 2015: Developed construction design and specifications document for the Meacham Creek – Bonifer Reach Floodplain Restoration Project.

5: Meacham Creek Project Implementation/Compliance and Action Effectiveness Monitoring – 2015: Synthesis of monitoring methodologies to evaluate the effects on biotic and abiotic ecological processes as a result of habitat restoration efforts.

6: Dillon Dam – 2015: Collaborate with partners to complete Phase I and begin discussing completing a design in 2016.

METHODS: Protocols, Study Designs, and Study Area

Protocol Title: Meacham Creek Geomorphic-Hyporheic Flow Study v1.0

Protocol Link: <http://www.monitoringmethods.org/Protocol/Details/677>

Protocol Summary:

CTUIR proposes to strategically implement enhancement work on Meacham Creek river miles 5 to 7.3 to enhance floodplain and stream morphology, while providing enhanced habitat for fish. Enhancement techniques include, but are not limited to, woody debris placement in channel and in floodplain, levee setback or removal, channel reconstruction for increased in-stream habitat complexity and stabilization, and native plant and grass restoration. Project actions are expected to improve physical functions by 1) diversifying channel morphology and 2) increasing connectivity between surface and subsurface features. With time, we expect watershed treatments will lead to increased abundance and diversity of riparian vegetation, and increased fish habitat diversity. This includes project goals of: 1. Quantify water residence time distribution both prior to and after restoration actions to assess changes in recharge and discharge between Meacham Creek and its alluvial aquifer (hyporheic exchange). 2. Establish a monitoring network of stream thermographs to measure changes in surface and subsurface water temperature due to restoration actions. 3. Pilot a new method of stream restoration monitoring that will have broad utility to other restoration efforts in the region. 4. Produce and submit manuscripts for peer reviewed publication describing the results of the study.

Protocol Title: Scientific Protocol for Salmonid Habitat Surveys within the Columbia Habitat Monitoring Program (CHaMP) v1.0

Protocol Link: <http://www.monitoringmethods.org/Protocol/Details/416> & <https://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P142839>

Protocol Summary:

CHaMP is designed as a Columbia River basin-wide habitat status and trends monitoring program built around a single protocol with a programmatic approach to data collection and management (RM&E Workgroup 2010). CHaMP will result in the collection and analysis of systematic habitat status and trends information that will be used to assess basin-wide habitat conditions. When coupled with biological response indicators, this status and trends information will be used to evaluate habitat management strategies. This program will be integrated with ongoing Pacific Northwest Aquatic Monitoring Program (PNAMP) recovery planning efforts and will be part of the collaborative process across Columbia Basin fish management agencies and tribes and other state and federal agencies that are monitoring anadromous salmonids and/or their habitat. The implementation of CHaMP will characterize stream responses to watershed restoration and/or management actions in at least one population within each steelhead and spring Chinook Major Population Group (MPG) which have, or will have, “fish-in” and “fish-out” monitoring (identified in RPA 50.6), thereby meeting the requirements of RPA 56.3, RPA 57, and RPA 3. CHaMP was designed to deliver trends in habitat indicators and requires that monitoring occurs for three cycles of a sampling panel (see section 1.6), at least 9 years.

RESULTS

This section highlights and describes completed work elements in an outline similar to our statement of work in Pisces. Each work element with associated identifier code and milestone are listed, followed by a comprehensive summary of completed work under each work element. In addition to a description of completed work elements specific to restoration activities, we briefly highlight monitoring results specific to tributary habitat RM&E, coordination and data management for RM&E and tributary habitat restoration and protection. More information is available in annual reports and specific methods used in other documents, which will be identified in the appropriate sections below.

Work Element A: 185. Produce Pisces Status Report

Work Element Title: Periodic Status Reports for BPA

Milestone Deliverable: Complete Periodic Pisces Status Reports

CTUIR reported to BPA periodically during the contract period on the status of each statement of work element, and milestones and deliverables using the computer program Pisces:

February-June (2/1/2015-6/30/2015)

July-September (7/1/2015 - 9/30/2015)

October-December (10/1/2015 - 12/31/2015)

Final January (1/1/2016 - 1/31/2016)

The BPA Contracting Officer Technical Representative (COTR) reviewed the Pisces status reports, recommended changes as necessary and accepted them electronically upon approval. Additionally, upon completion of each deliverable milestone, we provided metrics and final project location (latitude and longitude) when required. These Pisces status reports provide a tool for the BPA COTR and administrative staff to track project progress in meeting contract requirements.

Work Element B: 119. Manage and Administer Projects

Work Element Title: Manage and Administer Project

Milestone Deliverable: Upload Statement of Work, Budget, Property Inventory for Upcoming Contract Period to Pisces

- A. Per COTR, revise/finalize the new contract package (statement of work, environmental compliance documentation, budget, and property inventory).
- B. Accrual – submit September estimate to BPA.
- C. Funding package – conduct internal review (e.g., supervisor or interagency).

This work element includes a suite of management actions required to administer the project, including preparation of annual operations and maintenance budgets, managing and preparing statements of work and budgets, and property inventory to the assigned BPA COTR for the following contract period. The project leader reports quarterly or as necessary on milestones and metrics to BPA using the BPA Pisces Program, supervises, trains, and directs staff activities, conducts vehicle and equipment maintenance and management, performs payroll, purchasing, obtains quotes and subcontracting for services, and administers habitat enhancement activities.

Work Element C: 165. Produce Environmental Compliance Documentation
Work Element Title: Produce Environmental Compliance Documentation
Milestone Deliverable: Receipt of Environmental Compliance Clearance from BPA

The following milestones were completed for FY2015 projects:

- A. Meacham Creek – Bonifer Reach Natural Channel Design and Levee Modification Project RM 1.9-5.7 environmental compliance package.
- B. Birch Creek Peterson Dam Removal Project environmental compliance.
- C. McKay Creek Bank Stabilization and Riparian Floodplain Vegetation Enhancement Project environmental compliance. (NOTE: This project did not occur, and is not planned for future implementation at this time).
- D. Birch Creek Bank Stabilization and riparian floodplain vegetation environmental compliance package.
- E. Herbicide use proposed and actual summaries for project.

CTUIR successfully submitted all applicable and required documents to the appropriate federal, tribal, state, county entities for select implementation projects in a timely manner required under work elements related to producing environmental compliance documentation in FY2015. Secondary environmental compliance accomplishments during the reporting period included coordination with various compliance personnel to prepare supplemental documentation and reporting for ongoing and planned management actions. Environmental compliance methods include development of appropriate documentation under various federal, Tribal, state and county laws and regulations governing federally funded project work. Methods involve coordination with various federal and state entities agencies and development and submittal of permit applications, cultural clearances, biological assessments, National Environmental Policy Act checklists, etc., as necessary. Part of the environmental compliance work element includes planning and developing site-specific proposals tailored to accomplish fisheries goals and meet compliance standards. The details concerning the implementation of treatments and preparations for putting efforts on the ground, including preparations for subcontracting, and specifics in regarding the safeguarding of ESA-Listed species during the implementation process are outlined in the proposals.

Cultural Resource Protection and Preservation

CTUIR submitted a letter and attachments with necessary project descriptions and geo-referenced maps for assisting BPA with section 106 National Historic Protection Act consultations and environmental compliance. The following projects were submitted for compliance:

- 1) Meacham Creek Bonifer Reach Project RM 1.9-5.7;
- 2) Birch Creek Taylor Diversion Dams Removal and Habitat Restoration Project environmental compliance package RM 0-1.0;
- 3) Birch Creek Peterson Bank Stabilization Project; and,
- 4) Dillon Dam Removal Fish Passage Improvement Project.

The CTUIR DNR Cultural Resource staff completed the cultural resource project area surveys and reports and submitted to BPA for cultural resource compliance with the State Historic Preservation Office (SHPO) and Tribal Historic Preservation Office (THPO) for all projects with the exception of the Birch Creek Peterson Dam Removal Project given lack of landowner participation and the Meacham Creek Bonifer Reach Project RM 1.9-5.7. The survey on the Meacham project area was completed but the report will be completed at a later date. As an example of the type of maps provided to the CTUIR Cultural Resource Staff, see Figure 3, below.

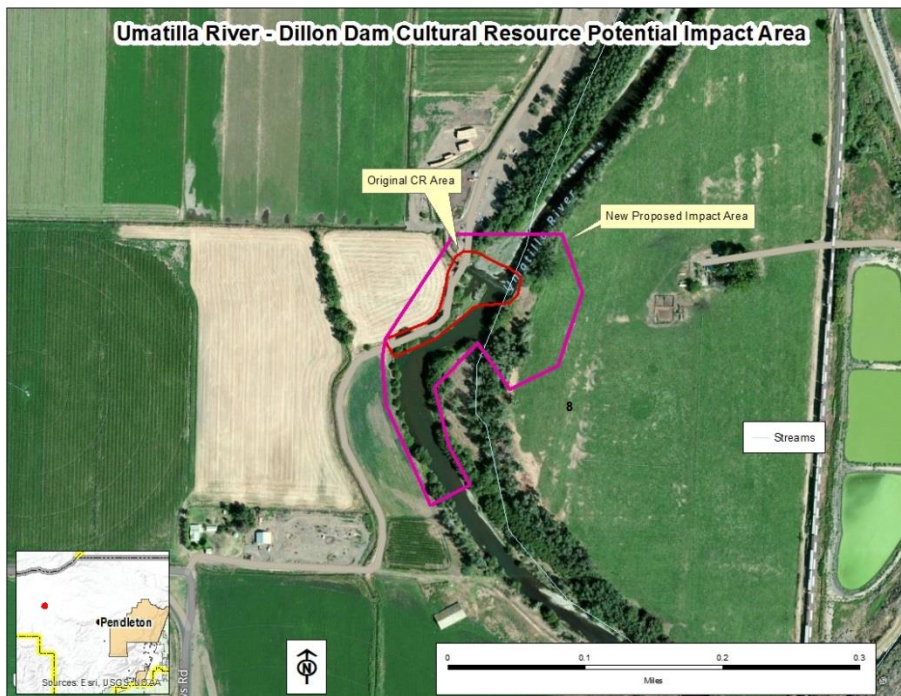


Figure 3. Potential impact area for staging and construction for the Dillon Dam Removal Fish Passage Project.

UAFHP Environmental Compliance Documentation

ESA consultation with NMFS for FY 2015 project activities was covered under the Terms and Conditions of the HIP III Programmatic Biological Opinion (HIP III BO). Project activities covered under the HIP III BO included:

- Plant Vegetation (WE N: 47): No project planting activities occurred under the HIP III BO consultation. Project staff focused the entire 2015 spring and fall planting season within the newly implemented 2011 Meacham Creek Floodplain Restoration and In-stream Enhancement Project (RM 6.0-8.5 area). The planting plan was covered under a Biological Opinion specific to the project.
- Operate and Maintain Habitat/Passage/Structure (WE K:186): CTUIR monitored 7 passage rectification projects to assure that treatments are effectively working and to insure that intrusive objects are not interfering with the designed function of the passage structures (Table 6. Habitat passage structures monitored and maintained by CTUIR to meet design specifications. Table 6). Routine quarterly scheduled site visits of all individual projects were conducted either independently by the CTUIR or jointly with project partners such as ODFW. CTUIR complied with terms of all existing conservation easements.
- Operate and Maintain Habitat/Passage/Structure (WE L: 186): CTUIR completed one bank stabilization project on Birch Creek.
- Maintain/Remove Vegetation (WE M: 198): Project activities included watering and maintaining plants on NRCS CREP tracts and treating noxious weeds. Plant watering, weeding and mowing on CREP tracts were maintained weekly during this extremely dry summer.

Meacham Creek Instream Restoration Feasibility and Design Project RMs 3.0-6.0 Environmental Compliance Documentation

This project implementation is scheduled for implementation over a 4 year time period, beginning in 2016. Funding for the Meacham Creek project is provided by the Bonneville Power Administration (BPA), a federal agency under the Department of Energy. This project area occurs on CTUIR fee lands, and entirely within the reservation boundary. Under Section 7 of the Endangered Species Act (ESA) all federal agencies must, through consultation with the USFWS and the NMFS, ensure that that actions which they authorize, fund, or conduct are not likely to jeopardize the continued existence of threatened or endangered species or adversely modify their habitats. Therefore, CTUIR has to demonstrate Section 7 compliance, which will occur through the HIP III process.

Habitat for endangered and threatened species listed under the ESA was identified in the Meacham project focus area: bull trout (and designated critical habitat; project area is within the Umatilla-Walla Walla recovery area) and steelhead (middle Columbia River DPS).

The following permits and approvals will be required for the project:

- U.S. Army Corps of Engineers Regional General Permit No. 4 (Aquatic Habitat Restoration, Establishment, and Enhancement Activities). Issued February 3, 2011 and Extension April 9, 2012.
- Potentially, the Oregon Department of State Lands Removal/Fill Permit No. 42104-GP. Issued December 31, 2013.
- Internal CTUIR land use permits (i.e. Conditional Use Permit and Stream Zone Alteration Permit).

Work Element D: 141. Produce Other Report

Work Element Title: Meacham Creek Phase I-II Project RM 6-8.5 Completion Report

Milestone Deliverable: Attach Report in Pisces

- A. Review progress report format requirements
- B. Internal agency/tribal review of draft
- C. Revisions in response to review of draft
- D. Submit progress report for external review
- E. Submit draft for technical/co-manager review
- F. Finalize report

The Phase I and II Completion Report was completed and uploaded to BPA through Pisces.

Work Element E: 115. Produce Inventory or Assessment

Work Element Title: Birch Creek Assessment and Action Plan

Milestone Deliverable: Attach Birch Creek Geomorphic Assessment and Action Plan in Pisces

- A. Complete Environmental Compliance Documentation
- B. Select environmental subcontractor
- C. Environmental conditions
- D. Interpretation and synthesis
- E. Complete draft document
- F. Review and edit draft document

The Assessment was completed to 90%, while the Action Plan was completed to 50%. The Atlas and remaining work on the Assessment and Action Plan will be completed during the next contract year.

Work Element F: 114. Identify and Select Projects

Work Element Title: CTUIR Umatilla Subbasin Restoration Coordination

Milestone Deliverable: List of Final Projects

- A. Coordinate regularly with project partners and landowners
- B. List projects

CTUIR UAFHP staff annually coordinated and planned projects with State, Federal, and local partners, and private landowners to develop habitat restoration and enhancement projects consistent with local planning documents. CTUIR project development is guided and prioritized by project activities that are supported by the CTUIR Department of Natural Resources ecological and First Foods mission statements to enhance or protect ecological and physical processes thus sustaining biota production (Jones et al., 2008). The CTUIR is guided in its habitat restoration activities by multiple planning documents:

- 1) Final Umatilla Willow Subbasin Plan (Umatilla/Willow Subbasin Planning Team 2005),
- 2) Middle Columbia River Steelhead Recovery Plan (NMFS 2009),
- 3) Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan (USFWS 2002), and
- 4) Five-Year Action Plan for the Development and Maintenance of Habitat Improvement Projects in the Umatilla Subbasin: 2006-2010 for BPA-Funded Fish Habitat Improvement Programs sponsored by: Oregon Department of Fish and Wildlife (ODFW) and Confederated Tribes of the Umatilla Indian Reservation (CTUIR and ODFW 2006).
- 5) Meacham Creek Watershed Analysis and Action Plan (Andrus & Middel, 2003)

Projects were identified, prioritized and developed with project partners (ODFW, UBWC, and SWCD) who implement restoration projects within the Umatilla River Basin. Projects that were ranked by priority, CTUIR identified funding sources and projects were prepared for planning, engineering design, permitting and implementation and included in the FY 2016 BPA statement of work and budget.

Work Element G: 122. Provide Technical Review

Work Element Title: Review and Provide Technical Input on Issues and Topics that Affect the Areas Natural Resources

Milestone Deliverable: Provide Technical Input and Summaries to Enhance or Protect Natural Resources in the Subbasin

- A. Conduct review and provide input as necessary on natural resource preservation issues.
- B. Review and provide technical input on issues that may adversely affect natural resources.

CTUIR UAFHP staff reviewed and provided technical input as applicable on plans and proposals by entities within the Umatilla River Basin that may adversely impact floodplain or riverine processes and biota productivity, public project planning relevant to floodplain, river and wetland restoration or impacts, development and review of grant funding proposals, and proposed landowner projects. Project staff provided input to multiple CTUIR departments on annual activities relevant to work within the floodplain, rivers, and wetlands, US Army Corps of Engineers/Oregon Division of State Lands removal-fill permit applications, and CTUIR Stream Zone Alteration (SZA) Permit applications on work proposed within the floodplain on Reservation land.

Work Element H: 191. Watershed Coordination

Work Element Title: Umatilla River Watershed Coordination Duties

Milestone Deliverable: Coordinate Watershed Association Activities

- A. Coordinate with Umatilla Basin Watershed Council
- B. Coordinate with NRCS and local conservation districts
- C. Network with professionals in the field of habitat restoration
- D. Coordinate with co-manager ODFW and other Federal agencies

CTUIR UAFHP staff participated and coordinated with multiple agencies and stakeholders in the Umatilla River Subbasin through the Umatilla Subbasin Restoration Team (Restoration Team) including ODFW, USFS, NRCS, conservation districts, USFWS, Umatilla Basin Watershed Council and local stakeholders to enhance natural resources, identify problems and solutions, coordinate efforts to prevent duplication, enhance communication and cooperation and identify funding and cost share opportunities within the Umatilla River Subbasin. Staff further coordinated with other agencies in planning and implementing partner habitat restoration and enhancement projects, ESA planning processes, and project prioritization and selection processes. The Restoration Team was established in 2010 and is an informal group formed of agency or entity representatives that do restoration work within the Umatilla River /Willow Creek Basin floodplain and riverine system. The Restoration Team coordinated several passage projects in Birch Creek, and upcoming project activities in McKay Creek and the lower Umatilla River. CTUIR staff prepared agreements, if necessary, to assign duties and responsibilities to the appropriate entities. We also developed documents, press releases, web sites, and other communications to impart information to participating stakeholders and the public. Furthermore, CTUIR UAFHP staff updated the Restoration Team, UBWC, CTUIR Committees and Commissions, and permitting agencies on project activities by presentation and in writing on project activities.

Work Element I: 99. Outreach and Education

Work Element Title: Public Outreach and Education

Milestone Deliverable: Complete Outreach and Education Activities

CTUIR UAFHP staff educated the public on natural resource protection and restoration principles, and communicated on project activities throughout the year. This work included giving project tours and presentations (field, written, and verbal) and participating in local and regional workshops, symposia, technical teams and/or conferences (training, project presentation, and memberships), newspaper articles and public education (local school districts or college programs).

CTUIR UAFHP staff completed CTUIR semi-annual reports summarizing project objectives and outputs, expected outcomes, and resulting impacts of project restoration activities (Figure 4). These reports are used by the CTUIR Department of Natural Resources to inform CTUIR staff and government officials, other agencies and entities, and the public of project activities.

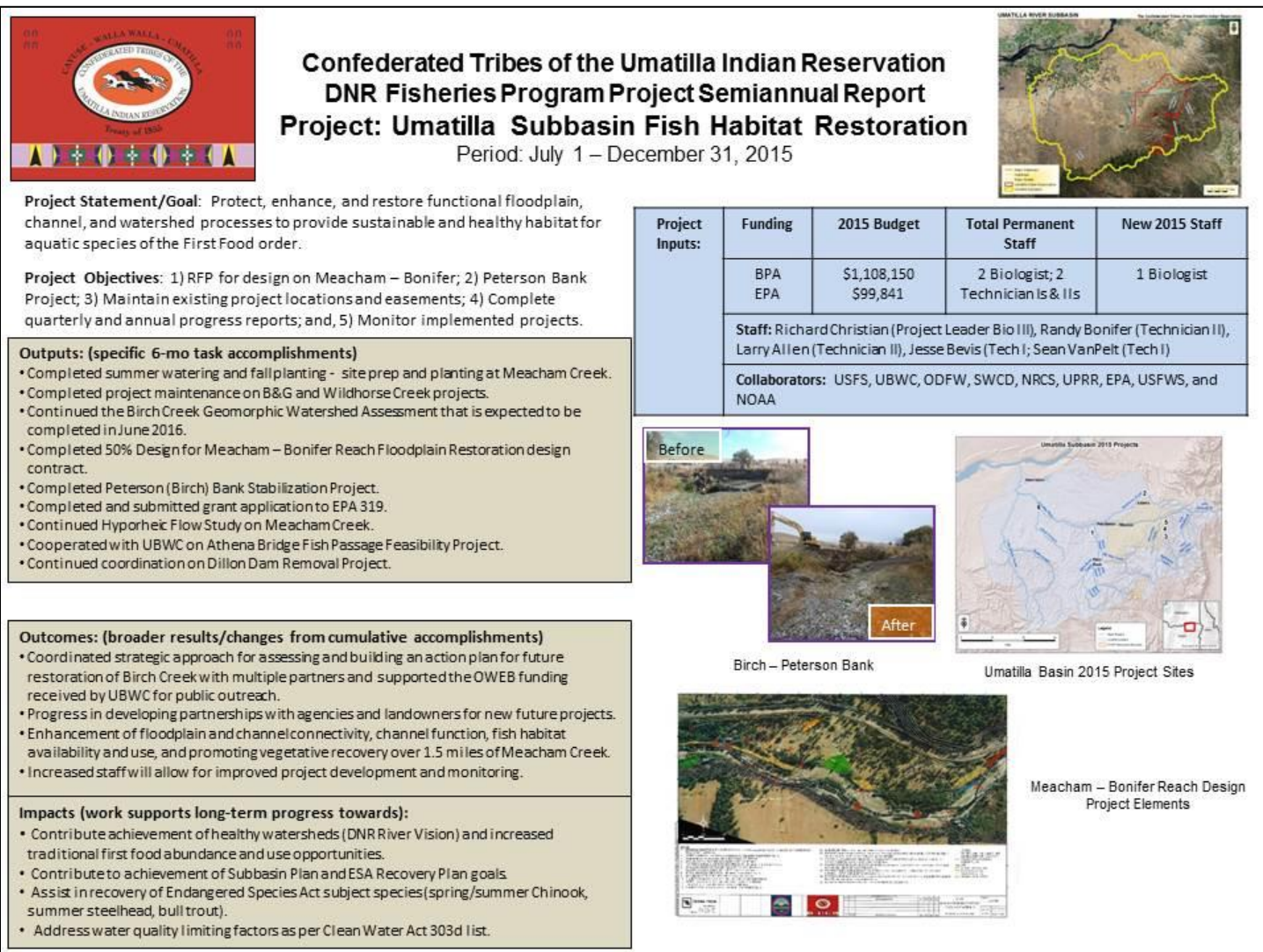


Figure 4. CTUIR semi-annual report for the Umatilla Subbasin Fish Habitat Restoration Project, July – December, 2015.

Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7.1

The Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7.1 was a historic partnership between CTUIR and USFS that restored processes in Meacham Creek that create and maintain habitat complexity (CTUIR 2012). The restoration effort in relationship to past efforts in Meacham Creek highlights efforts by CTUIR and project partners to restore floodplain processes. A partnership and project of this significance and magnitude was one that demanded the spotlight. A high level of coordination between the USFS and CTUIR went into ensuring a consistent, common, and clear message was portrayed to our local communities. This project received attention throughout the region and country for its success. Project and educational tours were led by CTUIR staff throughout 2015 to government and agency officials and employees, education groups, policy and management staff, funding partners. A professional handout outlining a common message of the project including background, partners, strategies, goals, objectives and monitoring was developed for message consistency amongst agencies.

Community Education

CTUIR participated in an Oregon Field Guide broadcast on Oregon Public Television in 2015. The story was titled “Restoring Meacham Creek to its Original Location”, and aired on November 22, 2015. The story was about CTUIR First Foods, Root Festival and Subsistence uses along the Meacham Creek Restoration Project site. Thus, the restoration work that was done and that which is being planned was a key element of the story, told from a tribal perspective.



Figure 5. Community education and involvement; the CTUIR Fisheries booth at the 2015 Pendleton River Walk Celebration.

Numerous tours were also conducted of the previous work that has been completed on Meacham throughout the 2015 contract year. Some of these tours were for other resource professionals, while some of them were for educational purposes.

Professional Workshops and Working Groups

Project staff also developed and fostered relationships with participating experts in related fields by attending training, professional workshops and working groups, and gained professional advancement and improved project success through informative, instructional interactions. CTUIR UAFHP and DNR Fisheries Habitat Program staff attended multiple professional conferences and workshops, and participated in oral and poster presentations of project activities including:

American Geophysical Union (2014- Poster)

Opportunities and Limitations of Hyporheic Restoration in a 4th Order Semi-Arid Floodplain: A Case Study of Meacham Creek, Oregon – Scott O’Daniel, CTUIR, Pendleton, OR (co-authors: Byron E. Amerson and Michael Lambert

Spring TWIG Meeting, Suquamish, WA (2015- Oral Presentation)

A Restoration Case Study of Meacham Creek, Oregon – Scott O’Daniel & Michael Lambert, CTUIR, Pendleton, OR

2015 Salmon Recovery Conference, Vancouver, WA (2015- Oral Presentation)

Meacham Creek Hyporheic Restoration Monitoring Project – Byron Amerson, Geoffrey Poole, Scott O’Daniel & Michael Lambert

2015 Society for Freshwater Sciences Conference, Milwaukee, WI (2015- Oral Presentation)

Use of Annual Hyporheic Temperature Signals to Evaluate the Effects of Channel Realignment – Byron Amerson, Geoffrey Poole, Scott O’Daniel & Michael Lambert

Work Element J: 186. Operate and Maintain Habitat/Passage/Structure

Work Element Title: Inspect and Maintain Function of In-stream Improvement Structures

Milestone Deliverable: Maintain Proper Operation of In-stream Habitat Structures

- A. Environmental compliance requirements complete.
- B. The inspection, replacement and/or maintenance of passage and habitat structures.
- C. Hire contractor to perform work.

CTUIR monitors 6 passage rectification projects to assure that treatments are effectively working and to insure that intrusive objects are not interfering with the designed function of the passage structures (Table 6). Routine quarterly scheduled site visits of individual projects are conducted either independently by the CTUIR or jointly with project partners such as ODFW. Site visits typically follow significant flow events or responses to landowner requests at project sites. Project maintenance included, but was not limited to, meeting specified conditional language in state and Federal permits, maintaining debris that is routinely captured or caught on in-stream structures, responses to landowner requests and concerns, and completion of post-treatment surveys to monitor and quantify changes to physical and ecological responses. A work plan was developed and contractor hired for completion for project activities greater than routine maintenance. In 2015, maintenance was necessary on Birch Creek (RM 2.8) to stabilize a 50 ft section of bank, as part of the Peterson In-stream Habitat and Bank Stabilization Project area. The bank was stabilized with placement of eighteen large boulders about 4-6 ft in diameter with an excavator along the upper end of the upper most structure to ballast the eight root wads that were placed along the toe of the bank. Approximately 700 willow cuttings were hand placed behind and around the root wads during construction. This will provide necessary stability while the planted vegetation recovers for increased bank stability and protection. No in-stream work or area fish isolation was necessary, as the channel was completely dry at the time of implementation. The remaining 2015 project activities involved routine maintenance.

Table 4. Modified BPA form annually submitted by CTUIR listing actual herbicide application, both the active ingredient and adjuvant, by location within the Umatilla River Basin, 2015.

| LOCATION | | | Active Ingredient | Application Rate (oz/acre) | Adjuvant | Riparian | | | Upland | | |
|----------------|---------|-----------|---------------------------|----------------------------|-------------------------|-------------|---------------------------|-----------------------|-------------|---------------------------|-----------------------|
| Stream Name | Lat | Long | | | | Acres Treat | Broadcast/ Backpack/ Hand | Amount A.I. Used (oz) | Acres Treat | Broadcast/ Backpack/ Hand | Amount A.I. Used (oz) |
| Wildhorse | 45.7425 | -118.6025 | Clopyralid | 16 | <i>Super Spread MSO</i> | | | 1.7 | Backpack | 32.0 | |
| | | | Metsulfuron methyl | 0.5 | | | | | | 0.17 | |
| Birch | 45.6285 | -118.8475 | Clopyralid | 16 | <i>Super Spread MSO</i> | | | 1.8 | Backpack | 28.8 | |
| McKay | 45.5099 | -118.7082 | Clopyralid | 16 | <i>Super Spread MSO</i> | | | 0.4 | Backpack | 6.4 | |
| | | | Metsulfuron methyl | 0.5 | | | | | | 0.2 | |
| Upper Umatilla | 45.7412 | -118.2192 | Clopyralid | 16 | <i>Super Spread MSO</i> | | | 0.1 | Backpack | 1.6 | |
| Lower Umatilla | 45.6232 | -118.9602 | Clopyralid | 16 | <i>Super Spread MSO</i> | | | 10.6 | Backpack | 217.6 | |
| | | | Metsulfuron methyl | 0.75 | | | | | | 50.4 | |
| Meacham | 45.6307 | -118.3562 | Clopyralid | 16 | <i>Super Spread MSO</i> | 2.3 | Backpack | | Backpack | 253.6 | |
| | | | Metsulfuron methyl | 0.5 | | | | | | 0.9 | |
| Total | | | Clopyralid | | | | | | | 36.6 | |
| | | | Metsulfuron methyl | | | 2.3 | | | | 30.45 | 540.0 |
| | | | | | | | | | | 0.9 | |
| | | | | | | | | | | 50.77 | |

Table 5. Planting materials and grass seed by species, quantity, and size, planted and established at Umatilla River Basin existing and new project sites, 2015.

| Stream | Date Planted | Project Site Location | Species (Common Name) | Quantity |
|---------------|---------------------|-------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------|
| Birch Creek | November | Peterson's Bank Stabilization | Bluebunch wheatgrass, Blue Wildrye, Idaho Fescue, California Brome, Basin Wildrye | 200 lbs. |
| Birch Creek | November | Peterson's Bank Stabilization | Willow Cuttings | 700 |
| Meacham Creek | November | Meacham Creek Floodplain Restoration (Phase II) | Willow Cuttings | 500 |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Douglas Maple | 186 – 1 gal 81 – Tall Pot |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Thin-leaf Alder | 34 – 1 gal 54 – Tall Pot |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Mountain Alder | 10 – 5 gal 36 – 1 gal 45 – 5 gal |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Sitka Alder | 80 – 5 gal 10 – 20 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Western Water Birch | 60 – 2 gal 35 – 3 gal 45 – 5 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Red Osier Dogwood | 104 – 1 gal 38 – 2 gal 16 – 5 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Cascara | 134 – 1 gal 28 – 2 gal |
| Meacham Creek | November | Meacham Creek Floodplain Restoration (Phase II) | Ninebark | 200 – 1 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Ponderosa Pine | 806 – Tall Pot 363 – 1 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Quaking Aspen | 80 – 3 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Black Cottonwood | 125 – 2 gal |

| Stream | Date Planted | Project Site Location | Species (Common Name) | Quantity |
|----------------------------|---------------------|-------------------------------------------------|------------------------------|------------------------------------------|
| | | | | 270 – 5 gal |
| Meacham Creek | Nov – Dec | Meacham Creek Floodplain Restoration (Phase II) | Chokecherry | 66 – Tall Pot 226 – 1 gal |
| Meacham Creek | November | Meacham Creek Floodplain Restoration (Phase II) | Bittercherry | 50 – 1 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Douglas Spirea | 200 – 1 gal 192 – 3 gal |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Snowberry | 478 – Tall Pot 27 – 1 gal |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Black Hawthorn | 286 – 1 gal 127 – 3 gal |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Mockorange | 94 – 1 gal 39 – Tall Pot |
| Meacham Creek | April-May& Nov | Meacham Creek Floodplain Restoration (Phase II) | Golden Banner Current | 99 – 1 gal 10 – 3 gal 40 – 5 gal |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Wax Current | 71 – 1 gal |
| Meacham Creek | April-May | Meacham Creek Floodplain Restoration (Phase II) | Woods Rose | 65 – 2 gal 150 – 3 gal 40 – 5 gal |
| Meacham Creek | Nov – Dec | Meacham Creek Floodplain Restoration (Phase II) | Serviceberry | 255 – 1 gal |
| Meacham Creek | Nov – Dec | Meacham Creek Floodplain Restoration (Phase II) | Oceanspray | 7 – Cones 49 – 1 gal 87 – Tall Pot |
| Meacham Creek | Nov – Dec | Meacham Creek Floodplain Restoration (Phase II) | Blue Elderberry | 4 – Tall Pot 102 – 1 gal |
| TOTAL POTTED PLANTS | | | | 5,604 |
| TOTAL WILLOW WHIPS | | | | 1,200 |
| TOTAL PLANTS | | | | 6,804 |

Table 6. Habitat passage structures monitored and maintained by CTUIR to meet design specifications.

| Year | Stream | Stream Location | Project Description |
|------|------------------|-----------------|---------------------------------------------------------------------------------------------------------------|
| 2007 | Meacham Creek | RM 1.7 | Passage rectified by removing large cabled boulders (improved adult passage) |
| 2007 | Meacham Creek | RM 20.2 | Partial dam removed (juvenile and adult passage) |
| 2007 | Camp Creek | RM 0.3 | Partial dam removal (juvenile and adult passage) |
| 2007 | Greasewood Creek | RM 0.4 | Partial dam removal (juvenile and adult passage) |
| 2007 | West Birch Creek | RM 3.2 | Roughened channel to restore proper gradient and reduce step height at road bridge crossing for adult passage |
| 2008 | West Birch Creek | RM 2.7 | Hoelt Dam fish passage rectification (juvenile and adult passage) |

Work Element K: 186. Operate and Maintain Habitat/Passage/Structure

Work Element Title: Maintenance of Habitat Features Associated with Project Conservation Easements

Milestone Deliverable: Maintenance of Land or Structures Associated with Conservation Easements

- A. Environmental compliance requirements complete.
- B. Adhere to details of existing easements and/or initiate additional agreements as feasible.

The purpose of these conservation easements is to protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic species in the Umatilla River subbasin. The UAFHP have and will continue to maintain the individual projects to ensure that project structures and fencing are functioning and habitat recovery is progressing towards meeting projects goals and objectives. . CTUIR currently maintains 15 conservation agreements. Current agreements provide secured access and protection of resources for functional floodplain, channel watershed processes to provide sustainable and healthy habitat for aquatic species 26 miles of stream (<http://data.umatilla.nsn.us/maps/ConservationEasements/index.html>); (Figure 6). CTUIR routinely conducts custodial maintenance on individual projects to ensure that project structures and fencing are functioning and habitat recovery is progressing towards meeting projects goals and objectives. Activities include, but are not limited to, installing and repairing riparian cattle exclusion fences, maintaining or installing water gaps, riparian and floodplain plantings and maintenance, noxious weed control, maintenance of fish habitat improvement structures, and landowner coordination and education.

Work Element L: 186. Operate and Maintain Habitat/Passage/Structure

Work Element Title: Maintain bank stability on 2 properties that had damage in 2014.

Milestone Deliverable: Maintenance of stream banks to improve riparian vegetation and in channel habitat.

- A. Environmental compliance requirements complete.
- B. Repair/reinstall/clean structures.
- C. Maintenance of stream banks to improve riparian vegetation and in channel habitat.

Work Element M: 198. Maintain Vegetation

Work Element Title: Maintain Vegetation and Control Noxious Weeds in Project Areas within the Umatilla River Subbasin

Milestone Deliverable: Maximize Survival of Native Vegetation in Enhancement Project Areas

- A. Environmental compliance requirements complete.
- B. Physical removal of non-preferred species of vegetative growth from project area.
- C. Weed control in project areas by chemical means.
- D. Water vegetation and reduce weed competition to improve survival at CTUIR project areas.
- E. Till established weed areas as necessary for noxious weed control.

Project activities conducted in FY2015 included the monitoring and maintenance of 15 conservation agreements on numerous individual landowner properties (Figure 6). Watering, weeding and maintenance methods for each conservation easement and project area is important for enhanced native vegetation and project site but maintenance varies by site conditions. Strategies to address weeds are included in agreements that are either completed by the landowner, CTUIR, subcontractor, and/or through the County Weed Control Board. CTUIR staff provides assistance to landowners by coordinating and managing herbicide application vendors, providing funding, and developing treatment strategies. Manual, biological and chemical treatment options are utilized by CTUIR and may be employed when consistent with existing standards. Weed control is essential in establishing native grass and plant species. CTUIR subcontracts a professional, licensed applicator to spray/control noxious weeds on sites where chemical application is necessary. The contractor identifies problem weeds, determines the appropriate herbicide and selects the most effective application methods and rates in accordance with the National Oceanic and Atmospheric Administration's (NOAA) Biological Opinion under BPA's Habitat Improvement Program. The contractor utilizes backpack spraying applications to treat perennial, annual and biennial weed species. All herbicide applications are consistent with Oregon Revised Statute (ORS).570.505 and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Regulations. CTUIR complies with BPA standards and supplies a report to BPA detailing the types and quantities of herbicides applied to specified locations. Biological controls are used in advantageous areas.

Conservation Easement Locator

This map is designed as a tool to assist in the inventory and monitoring of conservation easements managed by the Umatilla Anadromous Fisheries Habitat Project (UAFHP) within the Umatilla subbasin in northeast Oregon. The purpose of these conservation easements is to protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic species in the Umatilla River subbasin.

Use this map to view information on parcels containing conservation easements by selecting the current property owner name from the list below, or by clicking on an icon in the map. Please note that the property owner name in the legal description may not be the same as the current owner. Taxlot numbers are also subject to change, and may differ from those in the legal description as well.

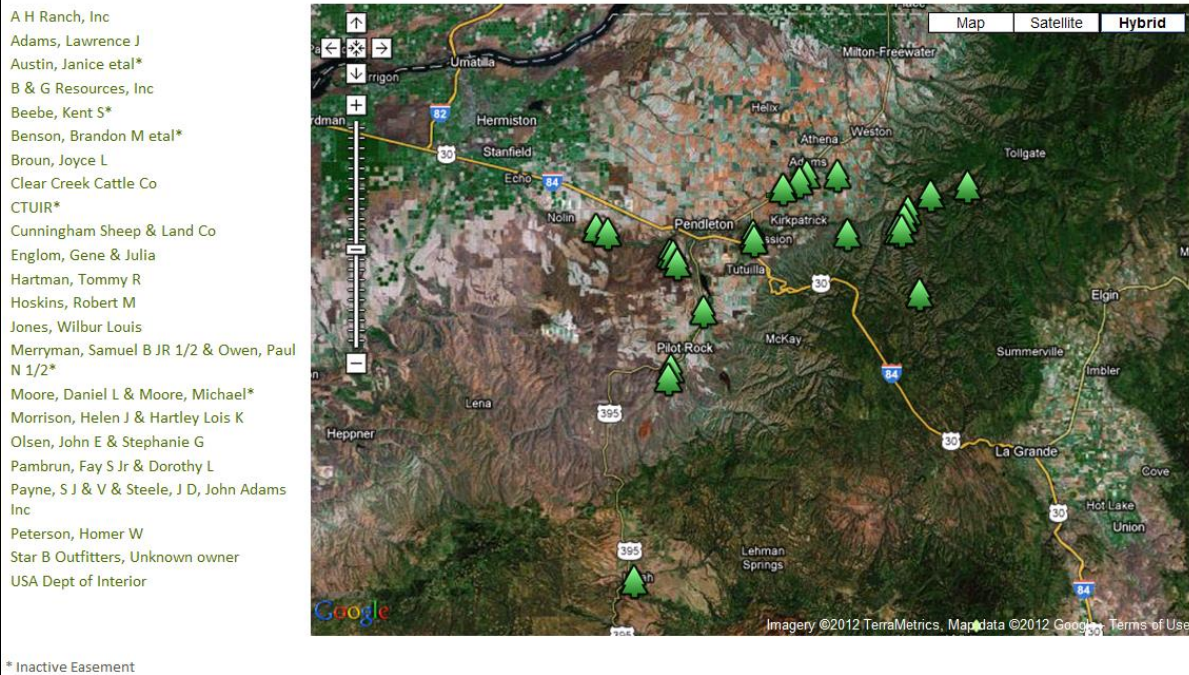


Figure 6. Screen shot of the UBAFH Project conservation easement locator web map.

In FY2015, CTUIR removed noxious and/or undesirable weeds through mechanical, biological, or chemical means. CTUIR is obligated to control noxious weeds on 121 riparian non-wetland habitat and 465 upland non-wetland habitat acres in Wildhorse Creek, Umatilla River, McKay Creek, Spring Hollow Creek, Birch Creek and Meacham Creek. CTUIR complied with BPA standards and supplied a report to BPA detailing the types and quantities of herbicides applied to specified locations. CTUIR chemically treated 2.3 riparian non-wetland habitat and 30.45 upland non-wetland habitat acres (Table 4). These are ongoing work sites where environmental compliance has been cleared in prior contract periods.

In addition to the CTUIR UAFHP, the CTUIR DNR Range Department used goat grazing for biological control treatment of yellow starthistle along the canyon walls and floodplain of Meacham Creek from river mile 1.0 to 6.0.

In the future, the UAFHP will have staff that has obtained their own commercial herbicide applicator's license. This will enable the project to utilize in-house staff, rather than contracting weed treatment. This has been proven to allow for a lot more control over the chemical and application method, which subsequently leads to a much better survival of native plants.

Work Element N: 47. Plant Vegetation**Work Element Title:** Meacham Creek Floodplain Restoration and In-Stream Enhancement, RM's 6-8.5
Phase II Planting**Milestone Deliverable:** Complete Scheduled Tree and Shrub Plantings in Project Areas

- A. Environmental compliance requirements complete.
- B. Agreement with the Native Plant Nursery for Growing Plants and Developing Plant Protocol.
- C. Establish Planting Locations in Existing Project Areas for Increased Recovery.

Project activities conducted in FY2015 included the monitoring and maintenance of managed properties under conservation easements and specific project areas. CTUIR personnel routinely maintain and replant vegetation, water and weed plantings, and maintain structural integrity of riparian enclosure and livestock fencing at project sites. In FY2015, UAFHP staff manually maintained noxious weeds around plants on tarps within CREP project areas (Table 4). In addition to tarp maintenance, UAFHP staff annually plant vegetation and distribute native grass seed in areas we have implemented existing or new habitat enhancement projects or have identified a need in maintained riparian conservation easement areas. In 2015, CTUIR focused most of the spring and fall planting season within the newly implemented Meacham Creek Floodplain Restoration and In-stream Enhancement Project (RM 6.0-7.1) area finishing planned project plantings (Table 5). Staff also completed some conservation easement planting on Birch Creek.

Planting tasks include site planning and development of planting strategies, collection and preparation of materials (pruning and conditioning of live willow material), pre-order coordination with the CTUIR Tribal Native Plant Nursery, and installation. Planting techniques are customized for conditions within each project area. Planting location, species, age, form (cuttings, saplings, bare-roots, potted, plugs), and soil/substrate conditions were considered and addressed during the implementation planning phase. The CTUIR UAFHP staff work closely with the Tribal Native Plant Nursery to collect local seed and plant stock to provide native plants for particular project areas by elevation and planting zones.

Work Element O: 115. Produce Inventory or Assessment**Work Element Title:** Field Data Collection**Milestone Deliverable:** Incorporate project effectiveness and regional data into project activities and annual BPA report.

- A. Environmental compliance requirements complete.
- B. Pre- and post-project effectiveness data collection.
- C. Retrieve biological and physical data from local and regional data depositories.
- D. Analyze and collect biological and physical data from local and regional depositories.

Work Element P: 157. Collect/Generate/Validate Field and Lab Data

Work Element Title: Macroinvertebrate study for evaluating Meacham Creek restoration effectiveness.

Milestone Deliverable: Written summary report describing the 2015 findings compare to previous work.

- A. Environmental compliance requirements complete.
- B. Review, revise, and publish protocol, study design and methods in monitoringmethods.org.
- C. Sample aquatic macroinvertebrates at 16 sites using standard protocols.
- D. Analyze macroinvertebrate data from project area streams.

Work Element Q: 157. Collect/Generate/Validate Field and Lab Data

Work Element Title: Geomorphic-Hyporheic Flow Study on Meacham Creek

Milestone Deliverable: A summary report with data analysis and findings will be incorporated into the annual report.

- A. Environmental compliance requirements complete.
- B. Review, revise, and publish protocol, study design and methods in monitoringmethods.org.
- C. Data analysis and storage.
- D. Monitoring well measurements and maintenance.
- E. Water quality field monitoring relevant to the study design.

Work Element Q: 157. Collect/Generate/Validate Field and Lab Data

Work Element Title: Meacham Creek Water Quality ISCO Sampling and Lab Analysis

Milestone Deliverable: Samples analyzed at lab and data uploaded to CTUIR water quality database.

- A. Environmental compliance requirements complete.
- B. Review, revise, and publish protocol, study design and methods in monitoringmethods.org.
- C. Analyze suspended solids and turbidity data from project area streams.

Work Element Q: 157. Collect/Generate/Validate Field and Lab Data

Work Element Title: Meacham Flow/Hydrology Monitoring (USGS)

Milestone Deliverable: USGS posted, real-time and accurate instantaneous stream flow data.

- A. Environmental compliance requirements complete.
- B. Review, revise, and publish protocol, study design and methods in monitoringmethods.org.
- C. Meacham Flow/Hydrology Monitoring (USGS)

Work Element Q: 157. Collect/Generate/Validate Field and Lab Data

Work Element Title: Project Effectiveness Photo Point Monitoring

Milestone Deliverable: Upload project effectiveness photo point photos to CTUIR data repository.

- A. Environmental compliance requirements complete.
- B. Review, revise, and publish protocol, study design and methods in monitoringmethods.org.
- C. Conduct photo point documentation of project conditions related to specified project areas.
- D. Upload photo point photos and site data to the CTUIR photo point data depository.

Work Element U: 132. Produce Annual Progress Report

Work Element Title: Produce Annual Progress Report CY 2013-2014 (Jan 1, 2013 thru Dec 31, 2014).

Milestone Deliverable: Upload to Pisces the CY 2013-2014 Annual Progress Report.

- A. Review progress report format requirements
- B. Draft calendar yr 2013-2014 RM &E tech rpt
- C. Interagency/tribal review of draft
- D. Revisions in response to review of draft
- E. Upload MS version calendar year 2013-2014 RM&E Tech report to Pisces.
- F. Confirm BPA posted received.

The CY 2013-2014 BPA Annual Progress Report was completed and will be uploaded to BPA through Pisces in January, 2016.

Work Element V: 132. Produce Annual Progress Report

Work Element Title: Begin drafting Progress Report for Jan 1, 2015 thru Dec 31, 2015.

Milestone Deliverable: Finalize Report.

- A. Prepare for calendar year RM&E reporting downloading template from cbfish.org
- B. Interagency/tribal review of draft
- D. Revisions in response to review of draft
- E. Draft 2015 RM&E technical report and email version to Pisces.

The FY 15 BPA Annual Progress Report was completed and will be uploaded to BPA through Pisces in January, 2016.

Work Element W: 175. Produce Design and/or Specifications

Work Element Title: Meacham Creek instream Restoration Feasibility and design project.

Milestone Deliverable: Meacham Creek Instream Restoration Feasibility and Design Project

- A. Environmental compliance requirements complete.
 - B. Discuss HIP III ESA coverage with BPA EC Lead; obtain risk determination.
 - C. Obtain cultural resource clearance for ground-disturbing survey and monitoring actions
 - D. Determine cost estimate, including cultural surveys, permitting, construction and M&E.
- Deliverable: Meacham Creek Instream Restoration Feasibility and Design Project.

The Meacham Creek – Bonifer Floodplain Restoration Project (RM 1.9-5.7) design and implementation plan will be finalized by June, 2016. Project staking and construction will begin at the end of June and first part of July. An outline of the anticipated timeline is contained in **Figure 7**. This figure contains all of the pertinent external major milestones and review processes. However, since almost this entire project is located within the CTUIR reservation boundary, there are also a variety of internal processes that must be followed. This process is being refined throughout the project’s development and design.

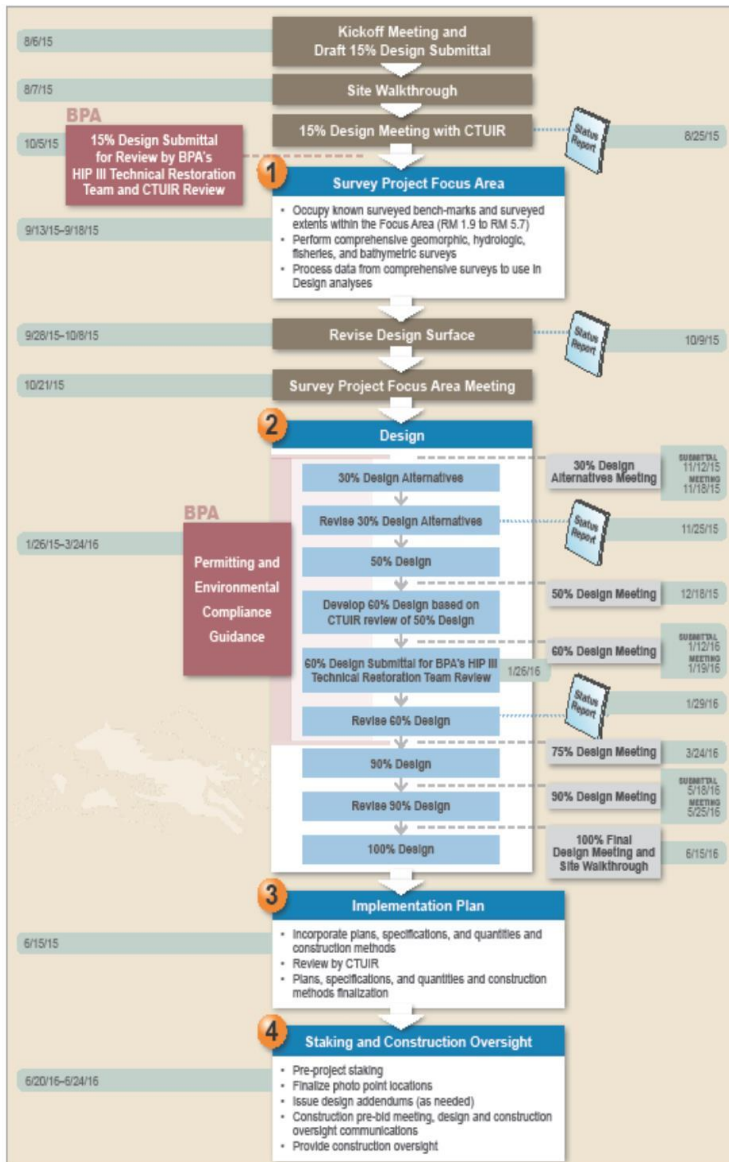


Figure 7. Meacham Creek - Bonifer Floodplain Restoration Design Timeline.

This project was designed to the 60% level in 2015 (Figure 8). The purpose of the project was to improve floodplain connectivity and in-stream and riparian habitat for listed and non-listed fish species in Meacham Creek by restoring channel morphology and hydrologic, riparian, and in-stream processes. The need for the project has resulted from past impacts and current factors limiting aquatic productivity; specifically, levees and spur dikes limit floodplain connectivity and riparian shade, and lack of large wood or other structures limits in-stream habitat complexity and quantity.

This project builds on the previous Meacham floodplain restoration projects. However, because this project will be implemented over a number of years, the design approach considered how to include this timeframe during construction in a less invasive way. Thus, the implementation plan will outline a specific construction sequencing to allow the water to “work for us” over annual high water events.

Another unique aspect of this project is that the design firm was asked to include modelled efforts to determine how the design will make this section of Meacham Creek more resilient to climate change impacts over the next 50 years (and beyond). Additionally, this project has the luxury of having the same team members available that designed and constructed the previous two phases of Meacham restoration. Therefore, the design and implementation plan are strongly incorporating lessons learned from those previous projects.



Figure 8. Meacham Creek – Bonifer Floodplain Restoration Project Example Design Features, RM 1.9-5.7.

The proposed actions will help meet the overall project objectives of improving floodplain connectivity and in-stream and riparian habitat for listed and non-listed fish species in Meacham Creek by restoring channel morphology and hydrologic, riparian, and in-stream processes.

Work Element X: 175. Produce Design and/or Specifications

Work Element Title: Upper Umatilla River Instream Restoration Feasibility and design project.

Milestone Deliverable: Upper Umatilla River Instream Restoration Feasibility and Design Project

- A. Environmental compliance requirements complete.
- B. Discuss HIP III ESA coverage with BPA EC Lead; obtain risk determination.
- C. Obtain cultural resource clearance for ground-disturbing survey and monitoring actions
- D. Determine cost estimate, including cultural surveys, permitting, construction and M&E.

Since the Meacham Creek – Bonifer Reach Project is so large in scope, it was determined that the Umatilla River project should be postponed for a couple of years. The workload associated with the design and development of these scales of projects is such that both projects would likely fail if they were initiated at the same time. Therefore, the staff decided to wait to further develop this project until Meacham is further developed. Thus, project staff have identified the landowners associated with this project and begun working with landowners to develop agreements, but will not pursue any design at this time.

Work Element Y: 198. Maintain Vegetation

Work Element Title: Meacham Creek Riparian Vegetation Maintenance.

Milestone Deliverable: Meacham Creek Weed Treatment, Riparian Planting and Coordination.

- A. Environmental compliance requirements complete.
- B. Schedule maintenance activities.
- C. Coordinate on Revegetation and Future Restoration Activities.
- D. Implement vegetation maintenance activity.

During the 2015 contract period, the UAFHP staff was able to treat over 18 acres of the Meacham project area for invasive plant species (Table 4). In addition to this treatment, a variety of plant species were planted in the previous project area (Table 5), during the spring and fall. This effort involved close coordination and the development of a Supplemental Participating Agreement with the USDA- Forest Service, as a portion of the areas planted and treated were located on Forest Service lands.

Project staff also spent a significant amount of time maintaining the previous plantings and fences. Due to the extremely hot, dry conditions this summer, crews had to water plantings that were 1 and 2 years old at least one time every week for the entire year. In addition miscellaneous fence maintenance must occur throughout the project area on an annual basis to prevent trespass cattle from entering the project area.

Several discussions and on-site visits were also conducted with Forest Service staff in an effort to begin coordination and planning on an additional reach of Meacham Creek floodplain restoration that is mostly located on Forest Service lands (RM 9.0 – 11.0). It is likely that this planning effort will be a multi-year effort that may lead to another implementation project within the next three to five years.

Work Element Z: 198. Produce Design and/or Specifications.

Work Element Title: Wildhorse Creek – Athena Feasibility and Preliminary Design.

Milestone Deliverable: Meacham Creek Weed Treatment, Riparian Planting and Coordination.

- A. Hold/attend scoping or stakeholder meetings.
- B. Environmental compliance requirements complete.
- C. Integrate HIP III into design solicitation – ESA species only
- D. Obtain cultural resource clearance for ground-disturbing survey and monitoring actions
- E. Discuss HIP III ESA coverage with BPA EC Lead; obtain HIP III risk determination
- F. Review Alternatives and Select the Preferred Alternative with Partners.
- G. Determine cost estimate, including cultural surveys, permitting, construction and M&E.

Project staff has been coordinating with ODFW and the UBWC on completing the feasibility of improving fish passage at this site. The UBWC have taken the lead with an engineering firm to complete the geomorphic assessment, site surveys and begin coordination with stakeholders. Several meetings have occurred with a variety of stakeholders on this project to date and the feasibility study is nearly complete at the time of the publication of this document. Currently, the private consulting firm is working to develop a suite of realistic alternatives for passage at this very difficult and complicated site. Once this is finalized and the preferred alternative is selected, the cultural resource surveys and HIP III determination can be initiated. The selected alternative will then be contracted for full design in 2016, which will determine permitting and M&E requirements, as well as construction costs.

SYNTHESIS OF FINDINGS: DISCUSSION/CONCLUSIONS

Background/Rationale

The CTUIR-Umatilla Fisheries Habitat Program continues to invest substantial resources in restoring fisheries habitat within the Umatilla Subbasin and its tributaries. With time, we expect watershed treatments to improve stream functions by 1) diversifying channel morphology 2) increasing floodplain connectivity 3) decreasing annual maximum stream temperatures 4) increasing summer base flows 5) increasing abundance and diversity of riparian vegetation and 6) increasing macroinvertebrate abundance and diversity.

Within the subbasin we have established baseline monitoring to help understand relationships between our in-stream restoration efforts and aforementioned ecological processes. In order to accomplish this we continue to conduct a combination of monitoring activities and methods included within the Umatilla Subbasin Fish Habitat Restoration Monitoring Plan located at the Pacific Northwest Aquatic Monitoring Partnership website (Citation URL: <http://www.monitoringmethods.org/Protocol/Details/681>). This protocol is specific to physical monitoring (except for aquatic macroinvertebrate monitoring) and is continually being refined. The protocol does not include any information on monitoring fish populations. It is believed that measurable changes in physical habitat improvements are a predictor for improved changes to survival and productivity of various salmon and trout life stages.

Furthermore, in the context of habitat restoration actions, project staff must consolidate regional and local data in order to assist in project activities, such as local and regional project presentations, permitting, development of biological assessments and evaluations, design, pre- and post-project analysis, project effectiveness, and long-term biological and physical recovery response. The Umatilla Anadromous Fish Habitat Project coordinates with multiple CTUIR and ODFW research projects that monitor and evaluate the success of the Umatilla Fisheries Program as a whole. These projects deal with natural production monitoring (CTUIR Umatilla Basin Natural Production Monitoring and Evaluation Project; 1990-005-01 and ODFW Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River; 1989-024-01) and are critical for evaluating natural production relative to sustainable habitat for salmonids. This project utilized data from research projects in the basin to identify trends in response to habitat management actions which will help prioritize future restoration actions. Juvenile production and adult spawning surveys from the above fish monitoring projects were used to examine relationships between production and restored function in the Umatilla River Basin and help to document fish benefits to restoration actions. In addition to biological and physical monitoring, project

staff further coordinated with the CTUIR Water Quality Program to attain water quality data as environmental baseline and response for project activities.

In 2015, the majority of monitoring conducted by the Umatilla Fish Habitat Project was done on Meacham Creek. More specifically, the monitoring was focused on the 2011 Floodplain Restoration and In-stream Enhancement Project. Again, because of the regional efforts to consolidate monitoring and protocols, the UFHAP began to remove monitoring activities from the project in 2015. These activities will be incorporated into the appropriate monitoring projects during the 2016 CY. The only monitoring activity that will be directly retained into the future under this project is the photographic point monitoring.

Monitoring Objectives

1. Evaluate changes in water quality as a result of stream restoration within the Umatilla Subbasin
2. Evaluate changes in summer low flow periods as a result of stream restoration within the Umatilla Subbasin
3. Study changes in thermal regime as a result of stream restoration projects within the Umatilla Subbasin
4. Evaluate changes in riparian stands as a result of stream restoration projects within the Umatilla Subbasin.
5. Track changes in biotic and abiotic ecological process within the Umatilla Subbasin, specifically in and around restoration project areas.
6. Track the effectiveness of designed stream restoration features within the Umatilla Subbasin
7. Track the changes in macroinvertebrate populations and richness within the Umatilla Subbasin

Key Assumptions

Improvements in fish habitat and physical stream characteristics will result in improvements in all of the VSP parameters (adult spawner abundance, productivity, spatial distribution and species diversity), which will lead to an increase in overall viability, survival and sustainable fish populations.

Project Feasibility and Development Monitoring

Water Quality and Sediment Monitoring

CTUIR cost share operates with the USFS an automated water sampler (ISCO) near the mouth of Meacham Creek (RM 2.0). Water samples are analyzed under subcontract at the USFS Water Quality Laboratory for turbidity, total suspended solids (TSS), total dissolved solids, and specific conductivity. Data is entered into the CTUIR water quality data base. About 1,460 samples are processed yearly for Meacham Creek and approximately 6,550 samples are processed for other locations on the CTUIR ceded lands.

Analyzed data can measure changes in suspended solids and turbidity from watershed activities, and is a good measure of water quality. Samples for turbidity, TSS, and specific conductivity will be collected and transported to the USFS Water Quality Laboratory for analysis. Sampling procedures and water quality analysis will conform to the stipulations included in the latest edition of EPA's Water Quality Criteria (1986) and *A Guide to the Sampling and Analysis of Water and Wastewater* (1987). All approved data is then uploaded to the CTUIR water quality data base semi-annually. Figure 9 is a summarized turbidity

plot from 2009 to 2012. Meacham Creek is a low sediment input stream and not listed for turbidity, but this helps monitor for any significant changes in turbidity levels. Monitoring will continue to be used for evaluating habitat project effectiveness from long-term project ground disturbance. Major restoration actions were implemented in 2009, 2011, and 2013 on Meacham Creek.

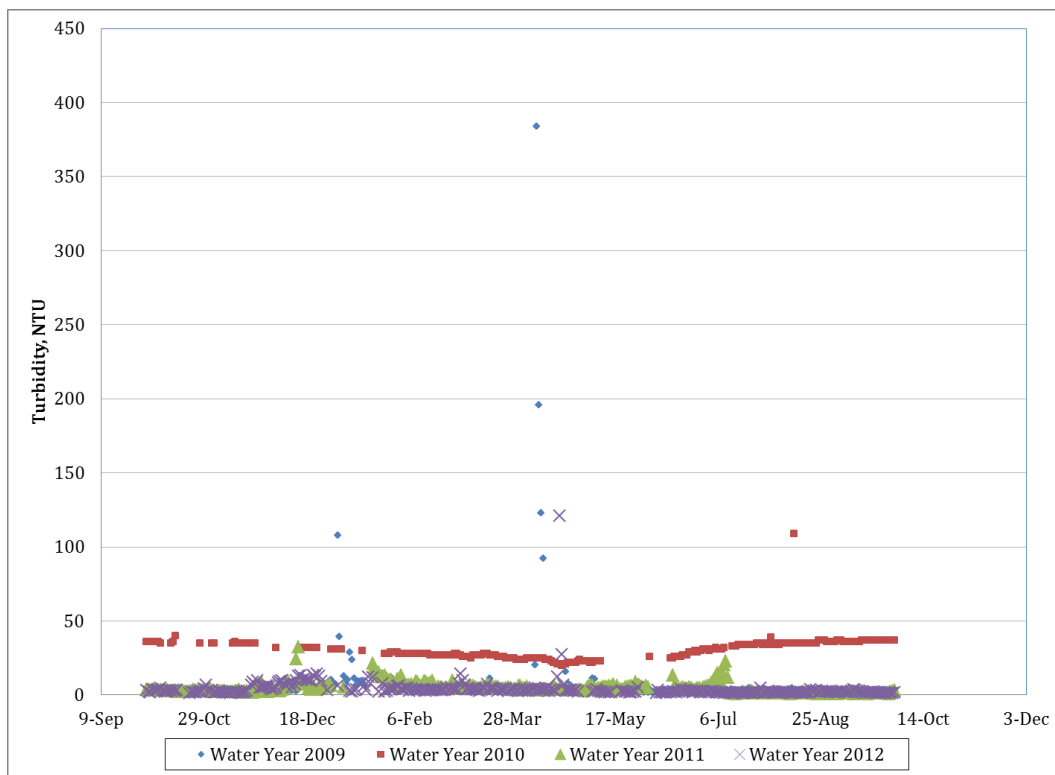


Figure 9. Meacham Creek turbidity plot (NTU's), 2009-2012.

The hydrological analysis for the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase II Project RM 6-8.5 site were determined by evaluating the USGS average daily stream flow data (Tables 7, 8 and 9). The annual flood-frequency analysis for the gage data was performed using the USGS PeakFQ software package (USGS 2006), which follows the Bulletin 17B methods. Discharge estimates for the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase II RM 6-8.5 Project area were reduced from the recorded flows and calculated statistics at the USGS stream gage by applying the gage transfer equation using the ratio of the applicable drainage areas (OWRD 2006). The results from the hydrological analysis were incorporated into a hydraulic model to evaluate the existing adequacy of the 100-year flood protection to the Union Pacific Railroad (UPRR). In addition, the hydraulic model is used to evaluate the potential risks to the UPRR and restoration action response associated with changes in geomorphic, hydrologic, hydraulic, and habitat characteristics of the stream from removing levees and spur dikes throughout the project area.

Characteristic flows represent the typical range of flows that can be expected in a stream or river during the hydrologic year. Characteristic flows (Table 7) include average annual flow, seven-day average low flow, and one-day average flood flow.

Monthly flows represent the range of flows to be expected during each month of the year. These flows, shown in Table 8, include average monthly mean, minimum, and maximum flows.

Table 7. Characteristic Flows for Meacham Creek at the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase II RM 6-8.5 Project.

| | |
|----------------------------------------------------------|-------|
| Average Annual Flow (cubic feet/second) | 197 |
| Seven-Day Average Low Flow (cubic feet/second) | 8.8 |
| One-Day Average Flood Flow 2 Year RI (cubic feet/second) | 2,230 |
| Bankfull Flow 1.5 RI (cubic feet/second) | 1,761 |

Table 8. Monthly Flows for Meacham Creek at the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase II RM 6-8.5 Project.

| | Monthly Flow (cubic feet/second) | | | | | | | | | | | |
|---------|----------------------------------|-----|-----|-----|-------|-------|-------|-------|-----|-----|-----|-----|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| Mean | 15 | 70 | 191 | 262 | 359 | 508 | 586 | 363 | 126 | 13 | 12 | 12 |
| Minimum | 8 | 11 | 18 | 22 | 27 | 134 | 228 | 58 | 22 | 12 | 7 | 7 |
| Maximum | 29 | 323 | 582 | 724 | 1,074 | 1,016 | 1,185 | 1,028 | 483 | 52 | 21 | 17 |

Flood flows represent the high flows that can be expected at different recurrence intervals. These flows, shown in Table 9, are instantaneous peak flood flows to be used in the Project design.

Table 9. Flood Flows for Meacham Creek at the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase II RM 6-8.5 Project.

| | Recurrence Interval Flow (cubic feet/second) | | | | | |
|------------|----------------------------------------------|---------|---------|---------|----------|----------|
| | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
| Peak Flood | 3,561 | 4,552 | 5,941 | 7,082 | 8,322 | 11,665 |

Project Implementation/Compliance Monitoring

Photo Point Documentation

Protocol: CTUIR-Umatilla Basin Photo Points (URL Citation: <https://www.monitoringmethods.org/Method/Details/1313>)

Photo point monitoring intensity varies depending on the magnitude of size and project type. We conduct selected photographic data points from about 150 photo locations over 24 habitat restoration project areas or conservation easement locations completed or managed by CTUIR. Photo points are taken prior to project initiation in order to capture pre project conditions and project progression. If possible photos will be taken showing high and low flow conditions. During project construction photos are taken in order to capture major changes within the project area. After project completion, photos are repeated opportunistically to capture major changes or during bankfull plus events, low flows and/or every 2-5 years. New projects typically have a higher intensity of photo point monitoring due to the high level of changes that can occur.

Currently, CTUIR is heavily monitoring the 2009 Meacham Creek Levee Removal Project (RM 5-6) and Meacham Creek Floodplain Restoration and In-stream Enhancement Project (RM 6-7.1) completed in 2011. Photo point sites are set up in order to track the progression of landscape features (i.e. vegetation, channel morphology) of past, present and future projects (i.e. Figure 10). Repeatable photo point

documentation is used to monitor and quantify the general magnitude of change in habitat characteristics to distinguish trends and determine the relation to habitat enhancement projects as a means of effectiveness monitoring. Besides monitoring the Meacham Creek Project, CTUIR continues to use photo point monitoring to assess changes on past projects on Meacham Creek, Birch Creek, the Umatilla River, Wildhorse Creek and McKay Creek.

The CTUIR-Umatilla Basin Photo Points Method utilizes the 2002 USDA "Photo Point Monitoring Handbook" by Frederick C. Hall (<http://www.fs.fed.us/pnw/pubs/gtr526/gtr526A1.pdf>). Photo points are uploaded and archived in the CTUIR photo point database repository (<http://intranet/resources/dnr/fisheries/Photo%20Points/Forms/AllItems.aspx>) for comparable visuals for tracking physical appearance changes over time. This database is currently only accessible by CTUIR staff.

Action Effectiveness Monitoring

Physical and Ecological Assessment of Habitat Actions-Meacham Creek Case Study

Following completion of the Meacham Creek Floodplain and In-stream Enhancement Project RM 6-7.1 a detailed monitoring design was developed in 2012 to assess effectiveness of restoration actions addressing limiting factors and ecological concerns identified for Meacham Creek. Monitoring of hydrologic and geomorphic conditions, aquatic habitat, and fish distribution were conducted between 2009 and 2012. In addition, there has been pre- and post-implementation monitoring of the Meacham Creek Floodplain and In-stream Enhancement Project RM 6-7.1 from 2009 to 2012. CHaMP surveys were completed for three reaches on Meacham Creek in 2012, 2013, 2014 & 2015.

Columbia Habitat Monitoring Program (CHaMP) Habitat Surveys

Utilizing the CHaMP protocols, Meacham Creek baseline conditions were surveyed in July 2012 to assess both the physical and biological state of three sites over time at an untreated reach where future actions are expected to occur (future project site; RM 2.5 to 3.0), treated reach (Meacham Phase I Project area; RM 5.5 to 6.0), and untreated reach (non-treatment control; RM 8.5 to 9.0). These surveys were selected to establish baseline geomorphic and aquatic habitat conditions in reaches which can be used for detecting change and evaluating the effectiveness of restoration actions over time. The data collected as part of these surveys provided a range of topographic, hydrologic, geomorphic, and aquatic information for which analyses can be undertaken and metrics reported beyond the metrics associated with the CHaMP protocols. These additional metrics led to the CTUIR utilizing metrics and measurements from CHaMP, AEM and CTUIR protocols to create the CTUIR Biomonitoring Protocol in 2015. This protocol will not be described in this report, as there is an annual report written for the CTUIR Biomonitoring Program. However, the protocol can be found at the following link: <https://www.monitoringresources.org/Document/Protocol/Details/1955>.

In 2014 an additional site was added along the Umatilla River, in anticipation of another floodplain restoration project that is planned for the future. At this time it is unclear what year implementation will begin, but it is anticipated to occur in 2018. In 2015 the Biomonitoring Protocol was used at this site as well.

For a more detailed report on the findings and results of this monitoring effort, refer to the latest annual report (Chapter 6): <https://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P142839>.

Before



After



Figure 10. Before and after photos of the Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7.

Meacham Creek Geomorphic-Hyporheic Flow Study

Protocol: Meacham Creek Geomorphic-Hyporheic Flow Study (URL Citation: <http://www.monitoringmethods.org/Protocol/Details/677>).

Synthesis of Findings: Discussion/Conclusions

Results to Date: Work on the Groundwater and Surface Water Hydrologic and Temperature Monitoring is ongoing, and aside from the preliminary hydrologic modeling, no substantive results are yet available. However, observation of over 25 groundwater upwelling features along the restored channel demonstrated that there has been a shift in groundwater hydrology at the restoration site (Figure 11). These features include a range of types from strongly flowing springs to seeps along the downstream margin of point bars marked by filamentous algae growing in these nutrient-enriched outflows. In addition, observations of groundwater flow into the exposed portions of the baseline channel and in other areas throughout the floodplain suggest substantial changes in groundwater hydrology. It is expected that there has been concomitant changes in the thermal processes of the aquifer as well. Cursory exploration of level logger confirms these observations.

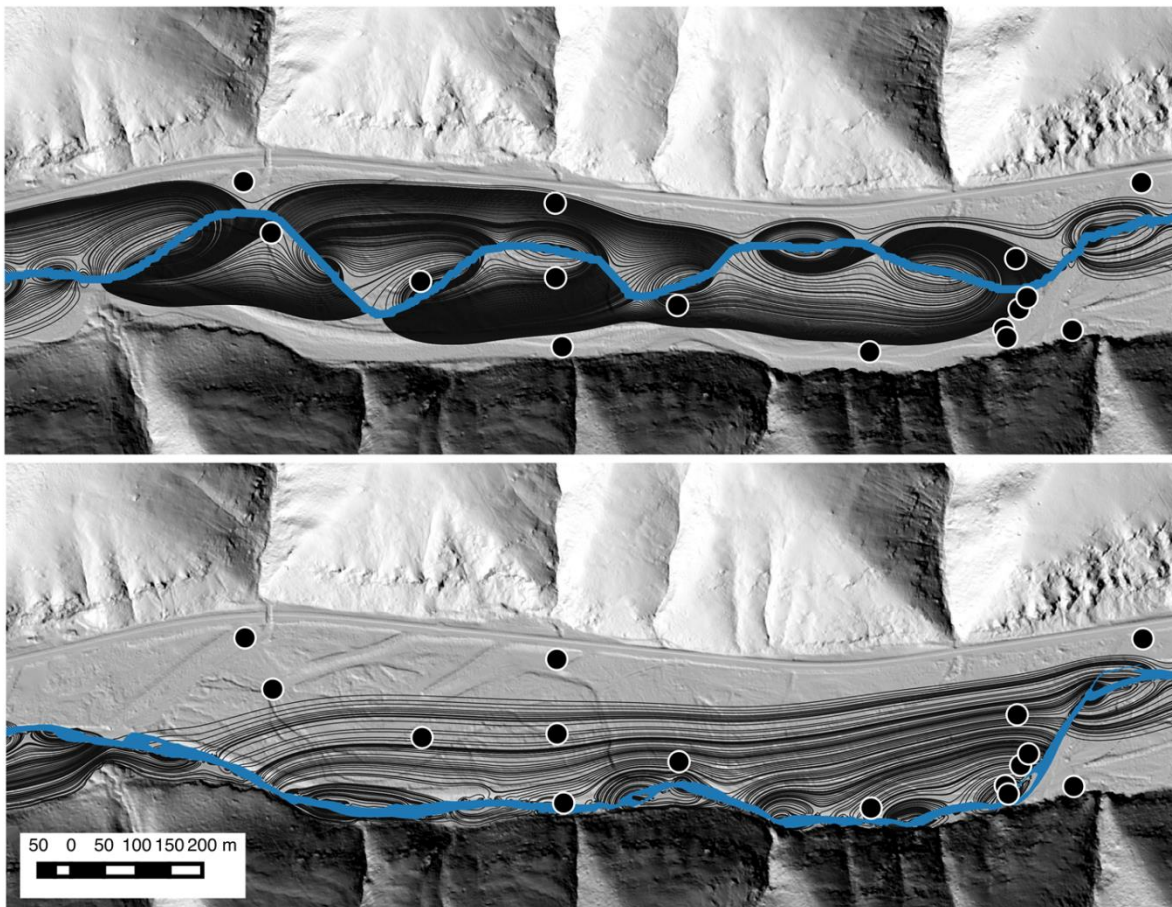


Figure 11. Results from MODFLOW simulation showing the influence of restoration on hyporheic flow paths (grey lines) before (bottom) and after (top) the Meacham Creek

Floodplain Restoration and In-stream Enhancement Project RM 6-7. Dots show locations of installed monitoring wells in the project site area.

Macroinvertebrate Study

The macroinvertebrate study is on-going with annual project report updates. These reports are uploaded as an attachment to this project in Pisces. The latest report period extended through 2014 and can be viewed at the following link:

<https://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P147524>

In this latest report there were suggestive, but inconclusive, findings related to the improvements in condition in the restored reaches. The Assemblage Tolerance Index, which has been described in previous annual reports, was negative. This suggests an improvement in conditions at the project site over the duration of the sampling. Even though the regression line was not statistically significantly different from the regression of the slope of the control sites, it could be argued that it is biologically significantly different.

SUMMARY AND CONCLUSIONS

In accordance with the 2006 NPCC solicitation outline, the CTUIR UAFHP since 2007 focused its restoration activities primarily on Meacham Creek, Birch Creek, and mainstem Umatilla River. However, project restoration activities occur in other areas of the basin where floodplain and riverine processes are treated with outcomes that are beneficial to ecological processes, water quality and fish production. The Meacham Creek Watershed has long been a primary focal point of the CTUIR effort to improve habitat conditions in the Umatilla Basin because of its location, size, historical significance, and recovery potential. Table 10 highlights the CTUIR Umatilla Anadromous Fish Habitat Project restoration accomplishments since 2007.

Proposed restoration actions have focused on protection, enhancement, and restoration of functional floodplain, channel and watershed processes at multiple scales using passive and active restoration techniques. Over the past decade, the CTUIR Department of Natural Resources and UAFHP have transitioned from restoration toward a fixed endpoint to address symptoms to a restoration of processes. The CTUIR UAFHP currently operates under the 2008 Columbia Basin Fish Accords Memorandum of Agreement between the Three Treaty Tribes and FCRPS Action Agencies (Fish Accords 2008). Restoration of process is more likely to address causes of river ecosystem degradation, whereas restoration toward a fixed endpoint addresses only symptoms. Specific restoration actions proposed for completion by CTUIR, partnering agencies and hired independent contractors include levee and dike removal and or modification, floodplain and channel construction, in-stream and floodplain large wood debris additions, in-stream structure placement, wetland enhancement, floodplain and riparian plantings, noxious weed removal, riparian management through fencing, and removal of physical migration barriers. The UAFHP

have and will continue to maintain project areas under secured conservation agreements with landowners on private properties for protection and enhancement of floodplain and riparian habitat and investments from past passage and in-stream structure projects. Completed project activities are described below in more detail in the context of the watershed with reference to annual progress reports.

The CTUIR UAFHP completed one primary habitat enhancement project centered on improving in-stream fish habitat and riparian vegetation complexity within the Birch Creek watershed. The project included reinstalling log structures to stabilize an eroding bank and create a pool habitat unit to increase channel complexity. Planning for several future projects continued or began in CY2015. In addition to the ongoing Birch Creek Assessment and Action Plan process, CTUIR initiated a request for proposals and selected a contractor to design a large-scale floodplain reconnection project on Meacham Creek from RM 1.9 – 5.7. CTUIR also began a feasibility study to examine options for rectifying a fish passage barrier in Wildhorse Creek in Athena, Oregon. This is a cooperative project with the Umatilla Basin Watershed Council and the City of Athena. Additionally, the UAFHP completed maintenance of ongoing riparian enhancement and passage projects at properties where the CTUIR has pre-existing riparian conservation agreements. This maintenance included watering riparian plantings, mechanically and chemically treating noxious weeds, maintenance of built structures, and additional riparian plantings as needed. Lastly, the UAFHP completed plantings associated with disturbed areas from previous phases of the Meacham Creek Floodplain and In-stream Enhancement Project.

A principal strength and focus of the CTUIR UAFHP project is the ability to work cooperatively with the various entities throughout the restoration process. Staff participated and cooperated with multiple agencies and stakeholders in the Umatilla Basin Watershed including ODFW, USFS, Natural Resource Conservation Service, conservations districts, US Forest Service, Umatilla Basin Watershed Council and local stakeholders to enhance or protect natural resources, identify problems and solutions, coordinate efforts to prevent duplication, enhance communication and cooperation and identify funding and cost share opportunities within the Umatilla River Subbasin. This was magnified by the coordination within the Birch Creek Technical Team. This forum was established to build a coordinated and strategic approach to the restoration of habitat in the Birch Creek watershed.

The Birch Creek Watershed Assessment and Action Plan process emphasizes the CTUIR's commitment to project planning with a systematic approach for project selection based on scientific data as well as to increase efforts towards effectiveness monitoring. CTUIR emphasizes adaptive management as a means of maximizing success at each project site. With future years of monitoring data, the CTUIR will be able to track changes in the habitat quality and quantity of the restoration areas as compared to unrestored areas. This information will be useful in guiding future restoration actions and decisions in Birch Creek and Meacham Creek but also throughout the Umatilla Subbasin, and will ultimately help to restore salmonid populations for both cultural and ecosystem benefits.

The Umatilla Anadromous Fisheries Habitat Project is an ongoing effort to protect, enhance and restore functional floodplain, channel and watershed processes to provide sustainable and healthy habitat for aquatic species in the Umatilla River Basin, including Threatened Mid-Columbia steelhead. Project work further supports the CTUIR Department of Natural Resource ecological and First Foods mission statements to sustain production. Applying the River Vision principles have been successfully applied in effort to reestablish the salmonids to self-sustaining levels. We expect an exponential response of salmonid populations once habitat floodplain and channel function is addressed and improved. We believe a positive correlation between habitat improvement, salmonid density, and fitness levels will shift the status of ESA-Listed species towards a safer level of sustainability in the Umatilla River Basin.

Table 10. The CTUIR UAFHP restoration project descriptions by location, treated primary limiting factors (NMFS 2009) by CTUIR River Vision touchstones (Jones et al. 2008) and accomplishments; 2007-2015.

| Subbasin, Stream and Years | Project Description | Species | CTUIR River Vision Touchstones/ Habitat Limiting Factors (PLF's shaded in yellow-NOAA BiOP) | | | | | | | | Comment/ Accomplishments | |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------|----------------------------|-------------------------|------------------------|------------|----------------|-----------|-------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | Biota-Connectivity | Geomorphology | Connectivity | | Hydrology | | | Riparian Vegetation | | |
| | | | Passage Barriers/ Entrainment | In-channel Characteristics | Habitat Diversity (LWD) | Floodplain Confinement | High Temps | High Turbidity | Low Flows | Riparian/ Floodplain | | |
| Meacham Creek and Camp Creek, Tributary of Meacham Creek (2007) | Fish passage rectifications, pool development with rock structures, and plantings | STS | X | | | | | X | | | X | Rectified two diversion dams and one in-stream structure providing unimpeded access to the entire watershed, development of pools with boulder cross vanes, 335 ft of streambank stabilization with added wood complexity, 0.3 miles livestock exclusion fence, and 500 riparian plantings. |
| West Birch Creek (2007-2008) | Fish passage rectification, riparian protection fencing and plantings | STS | X | | X | | | X | | | X | Rectification of the Cunningham and Hoeft Dams providing 2.4 miles unimpeded habitat, 335 ft of streambank stabilization with added wood complexity, 0.3 miles livestock exclusion fence, and 5,000 riparian plants. |

| | | | | | | | | | | | |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---|---|---|---|---|---|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mainstem Umatilla River (Initiated 2008-2012) | Treated and maintained 3.5 miles of floodplain and channel; riparian and uplands | CHS, STS, Coho | | | X | | X | X | X | X | Conservation easement on B&G Property to maintain 355 (61 riparian and 294 upland acres; installation of 60.7 acres of CREP tract's), 2 off-channel water wells, 13,400 seedling trees planted, 1,335 lbs of native grass seed and noxious weed control; Installation of an access restriction fence (3 additional riparian acres protected). |
| Meacham Creek (2009) | Floodplain improvement with levee setback, initiation of off-channel rearing habitat, large wood placement, and riparian plantings | CHS, STS,BT, Pacific Lamprey | X | X | X | X | X | | X | X | Restored 40 acres of floodplain connectivity over 1-mile of stream by removal or modification of 3 levees and 1 dike (3,200 linear ft, 24,000 cubic yards); distribution of large wood on floodplain; 15,000 planted hardwood and conifer seedlings (30acres). |
| Meacham Creek (Initiated 2008-2012) | Riparian protection fencing and plantings | CHS, STS,BT, Pacific Lamprey | | X | X | | X | | X | X | Built 9.8 miles of livestock exclusion fence between RM 2.0-8.5 (~350 acres protected). |
| Birch Creek (2010-2015) | Bank stabilization and large wood habitat complexity and riparian plantings | STS | | X | X | X | X | X | | X | Restoration of 335 ft of streambank stabilization with large wood and boulders over 0.1 miles of stream, 2 large wood in-channel habitat structures, and planted 5,000 riparian plantings over the 1-mile property. |

| | | | | | | | | | | | |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Meacham Creek Floodplain Restoration and In-Stream Enhancement Phase I Project RM 6-7.1 (2011-2012)</p> | <p>Floodplain and channel improvement with levee setback, large wood placement, side-channel connectivity, wetland enhancement, and riparian plantings.</p> | <p>STS, CHS, BT, Pacific Lamprey</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>Restored 67 acres of floodplain over 1-mile of stream by removing a 2,800 foot levee and modification of two spur dikes (600 ft removed), realigned historic channel with meanders in the floodplain, developed 3 secondary channels and 3,568 ft of off-channel habitat, 12 large pool structures, 10 major and 286 medium rock and log features, and installed 38,290 plantings.</p> |
| <p>Birch Creek (2012)</p> | <p>Fish passage rectification and habitat restoration project.</p> | <p>STS, Coho</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>X</p> | <p>Removed two abandoned irrigation diversions (Taylor Property-ODFW lead agency) providing unimpeded access to 2.7 river miles of stream. Included channel reshaping, setback of leveed road adjacent to the channel; and reshaping of the channel and banks, two j-hook rock structure placements and riparian plantings over 0.6 miles of stream.</p> |

| | | | | | | | | | | |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---|---|---|---|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| West Birch Creek (2012) | Fish passage rectification and habitat restoration project. | STS | X | X | X | X | X | X | X | Removed one abandoned irrigation diversion (Low Property-ODFW lead agency) providing unimpeded access to 5.0 river miles of stream, installation of rock and large wood structures, channel re-shaping and plantings over 1-mile of stream. |
| Basin-wide easements O&M (2008-2015) | Ongoing maintenance of 17 riparian conservation agreements including livestock exclusion fencing, tree planting and weed control | CHS, CHF, STS, Coho, BT, Pacific Lamprey | X | X | X | X | X | X | X | 552 acres protected and maintained including noxious weed control, 15 miles of riparian fence protection (182 ac.), 7,000 planted hardwood seedling trees. |

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APPENDIX A: USE OF DATA AND PRODUCTS

Umatilla Projects Review

<http://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P130848>

APPENDIX B: LIST OF METRICS AND INDICATORS

| Category | Subcategory | Subcategory Focus 1 | Subcategory Focus 2 | Specific Metric Title |
|------------------------------------------------------|----------------------------------------|------------------------|---------------------|-----------------------------------------|
| Classification of Ecological or Geological Attribute | Form/Morphology | Habitat Type: Channels | | Channel Complexity |
| Classification of Ecological or Geological Attribute | Form/Morphology | Habitat Type: Channels | | Channel Score |
| Classification of Ecological or Geological Attribute | Form/Morphology | Habitat Type: Channels | | Channel Unit Volume |
| Classification of Ecological or Geological Attribute | Form/Morphology | Habitat Type: Channels | | Residual Pool Volume |
| Fish | Prey Availability for Fish Species | | | Growth Potential |
| Hydrology/Water Quantity | Flow | | | Discharge |
| Hydrology/Water Quantity | Flow | | | Velocity Heterogeneity |
| Landscape Form & Geomorphology | Composition/Structure of Habitat Types | Habitat Type: Channels | | Channel Unit Complexity |
| Landscape Form & Geomorphology | Composition/Structure of Habitat Types | Habitat Type: Channels | | Channel Unit Volumes |
| Landscape Form & Geomorphology | Composition/Structure of Habitat Types | Habitat Type: Channels | | Channel Unit Complexity |
| Landscape Form & Geomorphology | Cover | Habitat Type: Channels | | Percent fish cover |
| Landscape Form & Geomorphology | Cover | Habitat Type: Channels | | Fish Cover |
| Landscape Form & Geomorphology | Density of Habitat Type | Habitat Type: Channels | | Pool Frequency |
| Landscape Form & Geomorphology | Density of Instream Wood | | | Channel unit large wood volume |
| Landscape Form & Geomorphology | Density of Instream Wood | | | Channel unit large wood volume/count in |

| | | | | |
|--------------------------------|-------------------------------------------|---------------------------------|--|----------------------------------|
| | | | | log jams |
| Landscape Form & Geomorphology | Density of Instream Wood | | | Site large wood volume |
| Landscape Form & Geomorphology | Depth: Bathymetry | | | Thalweg Profile |
| Landscape Form & Geomorphology | Depth: Pool | | | Residual Pool Depth |
| Landscape Form & Geomorphology | Distribution of Habitat Type | Habitat Type: Channel: Pools | | Percent Pools |
| Landscape Form & Geomorphology | Distribution of Habitat Type | Habitat Type: Channel: Pools | | Pool Frequency |
| Landscape Form & Geomorphology | Distribution of Instream Wood | | | LWD Volume |
| Landscape Form & Geomorphology | Edge/Density/Sinuosity | Habitat Type: Channels | | Sinuosity |
| Landscape Form & Geomorphology | Gradient | | | Gradient |
| Landscape Form & Geomorphology | Size: Wood Structure | | | Residual Pool Volume |
| Landscape Form & Geomorphology | Width to Depth Ratio | | | Bankfull width-to-depth ratio |
| Landscape Form & Geomorphology | Width to Depth Ratio | | | Wetted width-to-depth ratio |
| Landscape Form & Geomorphology | Width: Bankfull | | | Bankfull Width |
| Light | Light Concentration | | | Riparian cover |
| Light | Light Concentration | | | Solar Input |
| Macroinvertebrates | Drift Density | Habitat Type: Channels | | Drift biomass |
| Macroinvertebrates | Drift Density | Habitat Type: Channels | | Total Drift Biomass |
| Sediment/Substrate/Soils | Composition: Substrate/Soil-Dominant Size | | | Percentage substrate composition |

| | | | | |
|--------------------------|--------------------------------------------|------------------------|--|--------------------------------------|
| Sediment/Substrate/Soils | Composition: Substrate/Soil-Dominant Size | | | Riffle Particle Size (D16, D50, D84) |
| Sediment/Substrate/Soils | Composition: Substrate/Soil-Dominant Type | | | Percent Fines |
| Sediment/Substrate/Soils | Depth-Fines | | | Subsurface Fines |
| Sediment/Substrate/Soils | Distribution of Sediment | | | Riffle Particle Size (D16, D50, D84) |
| Sediment/Substrate/Soils | Embeddedness | | | Percent cobble embedded |
| Sediment/Substrate/Soils | Embeddedness | | | Embeddedness of Fast water Cobble |
| Vegetation/Plants | Composition: Vegetative Species Assemblage | | | Riparian Structure |
| Vegetation/Plants | Density of Vegetation | | | Riparian Structure |
| Water Quality | Alkalinity | Habitat Type: Channels | | Alkalinity |
| Water Quality | Alkalinity | Habitat Type: Channels | | Average Alkalinity |
| Water Quality | Conductivity | | | Conductivity |
| Water Quality | Conductivity | | | Average Conductivity |
| Hydrology/Water Quantity | Flow | | | Radon 222 Geochemistry |
| Hydrology/Water Quantity | Ground Water Level Change | | | Groundwater Surface Elevation |
| Hydrology/Water Quantity | Hyporheic Flow | | | Groundwater Budget Model |
| Water Quality | Water Temperature | | | Groundwater Temperature |
| Water Quality | Water Temperature | | | Surface Water Temperature |