THE UMATILLA RIVER ANADROMOUS FISH HABITAT PROJECT

2016 Annual Report

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Reporting Period:
January 1, 2016 to December 31, 2016

Prepared for:
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208-3621

BPA Project Number 1987-100-01
Contract Number 71600

August 2017

Administrative Summary

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Suggested Citation:

Christian, Richard L. and Ethan D. Green. 2017. The Umatilla Anadromous Fish Habitat Project: 2016 Annual Report. Confederated Tribes of the Umatilla Indian Reservation, report submitted to Bonneville Power Administration, Project No. 1987-100-01.

Cover Image: Photograph overview image of the Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7.1, April 19, 2016. Image by CTUIR.

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

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
SE	Standard error
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 2016 fiscal year (FY) reporting period (January 1, 2016- December 31, 2016) primary project activities focused on improving passage, in-stream and riparian habitat complexity and restoring natural channel morphology and floodplain function. Project activities in FY 2016 largely focused on designing future projects on Meacham & Wildhorse Creeks and the mainstem Umatilla River. Other project activities included constructing approximately ½ mile of fencing on a mainstem Umatilla River conservation easement to exclude grazing livestock from the riparian area. 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 intensive treatment of 1 acre of invasive blackberry vines and knapweed through hand and mechanical removal, 800 acres were treated for yellow starthistle through selective grazing, and persistent biological controls were present throughout the UAFHP project areas (e.g. *Larinus minutus*, *Mecinus janthiniformis*). The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) UAFHP completed development of 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 2017 (and beyond) construction. Additional planning/assessment tasks were accomplished on Meacham, Wildhorse, Birch, and Iskúulktpe 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 16 conservation agreements on 15 individual landowner's properties throughout the basin. The UAFHP also developed a new conservation agreement a property on 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. Action effectiveness and project implementation/compliance monitoring will continue prior to and following each project to oversee progression and inspire timely managerial actions. Most monitoring efforts were moved into other CTUIR projects that are specific to monitoring and out of the UAFHP project beginning in the 2016 contract year. 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 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 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 29-year project history, the CTUIR has helped administer and implement a number of fisheries habitat enhancement projects in the Umatilla River Subbasin. In FY 2016, the CTUIR maintained 23 partnership habitat enhancement projects along Meacham Creek, Iskúulktpe 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 NWPCC 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 2016 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 2016.

Work Element	Location	Description
Bank Stability	Birch Creek	Installed brush revetment bioengineering treatment to maintain an existing bank stabilization project.
Conservation Agreements	Umatilla River	Executed a new conservation agreement.
	Wildhorse, Birch, EFK Birch, WFK Birch, Cottonwood, & Umatilla River	Maintain current conservation agreement terms and conditions on 16 agreements, including maintaining fencing and watering plantings.
Weed Treatment	Meacham Creek	1 acre was intensively treated by hand and, CTUIR Range Program selective grazing treated an additional 800 upland acres, and biological controls have been introduced throughout the project area.
Planting	Birch Creek	300 willow cuttings were installed
	Meacham Creek	921 containerized plants were installed
		359 plants were planted with BPA funding; an additional 562 plants were planted with EPA cost share funding.

Table 2. Major designs and project planning for the 2017 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	Completed a final design for full floodplain restoration on 4 miles of stream.
Dillon Dam Removal	Coordinated with ODFW & UBWC to develop alternate water delivery system to be constructed in early 2017. Removal design began in 2016 and is expected to be completed in 2017 before the in-stream work window.
Wujek Reach Floodplain Restoration	Developed and executed an agreement with the primary landowner in the reach. Constructed a riparian livestock exclusion fence on the conservation agreement.
Isquúlktpe Creek Road Impact Evaluation	Developed a plan to investigate the aquatic habitat impacts of the road network in the Isquúlktpe Creek subwatershed.
Birch Creek Watershed Assessment	Completed a final Birch Creek Assessment and Action Plan.

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 Riparain/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 reprojected 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 [km^2]) and flows approximately 89 mi. (143 km) from where it branches into the north and south forks of the Umatilla River to the mouth at the confluence with the Columbia 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 naturally-produced fish stocks throughout the basin.

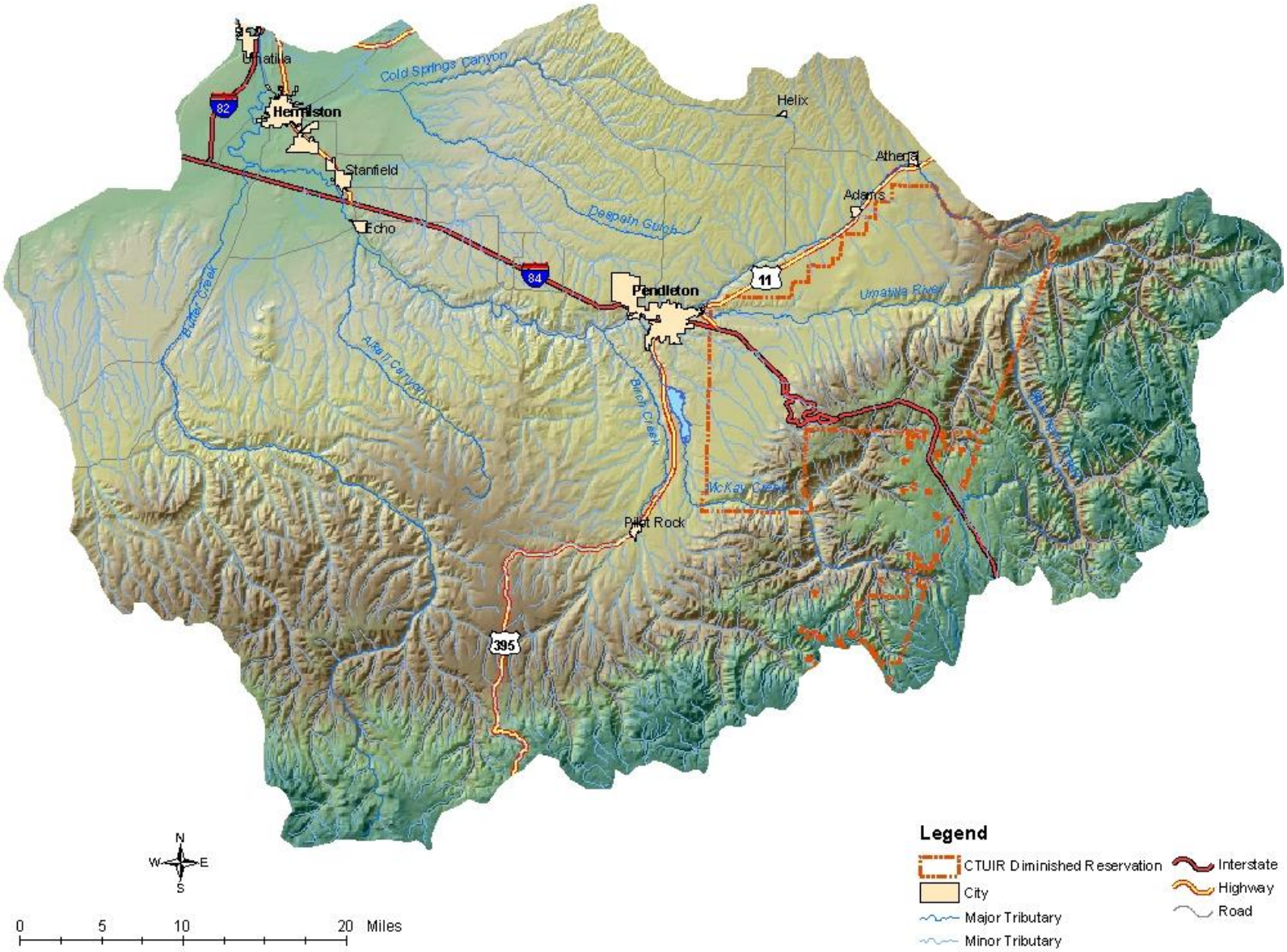

Figure 1. Umatilla River Subbasin

Our primary area of focus for restoration and monitoring work in FY 2016 was Meacham Creek, Birch Creek and mainstem Umatilla River (Figure 2, below; and Contract Map: *http://www.cbfish.org/Contract.mvc/Map/71600*).

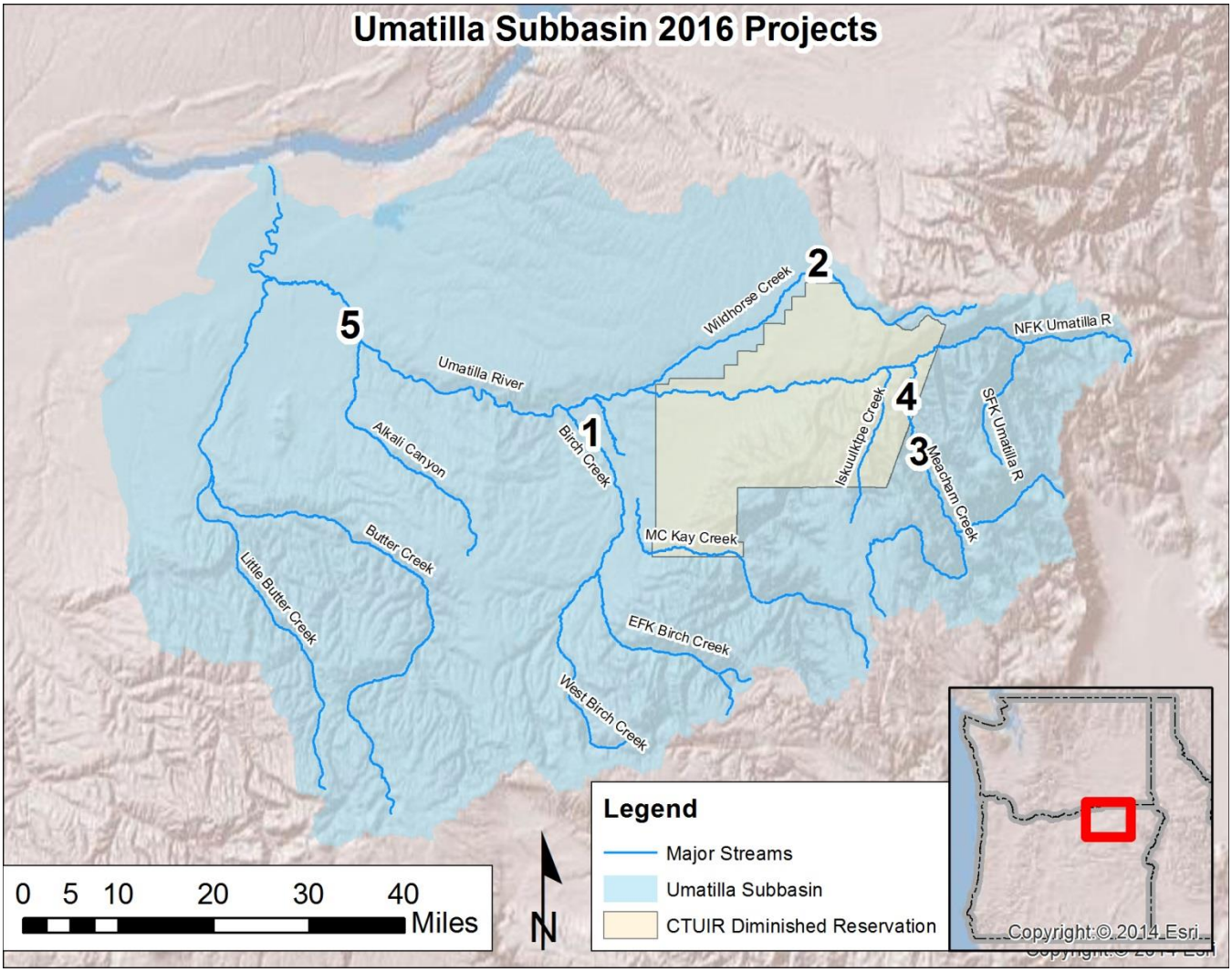

Figure 2. Umatilla River Basin FY 2016 UAFHP Project Sites

1: Birch Creek – 2016: Bioengineering treatment; Willow Planting.

2: Wildhorse – 2016: Fish passage feasibility study and preliminary design.

3: Meacham Creek – 2016: Additional weed treatment, plantings as part of the 2011-13 Floodplain Restoration and In-stream Enhancement Project.

4: Meacham Creek (Bonifer Reach) – 2016: Developed construction design and specifications document for the Meacham Creek – Bonifer Reach Floodplain Restoration Project.

5: Dillon Dam – 2016: Collaborate with partners to complete irrigation diversion change and complete removal design.

METHODS: Protocols, Study Designs, and Study Area

Method Title: Umatilla Basin Photo Points v1.0
Method Link: https://www.monitoringresources.org/Document/Method/Details/1313
Method Summary: The CTUIR (Confederated Tribes of the Umatilla Indian Reservation) Umatilla Basin Photo Points Method is based off of the 2002 USDA "Photo Point Monitoring Handbook" by Frederick C. Hall (http://www.fs.fed.us/pnw/pubs/gtr526/gtr526A1.pdf). Photos are taken using the protocol above and are eventually logged in the CTUIR photo point database. This database is currently only accessible by CTUIR staff. Sites are set up in order to track the progression of landscape features (i.e. vegetation, channel morphology) of past, present and future projects of the CTUIR Umatilla Basin Fish Habitat project. All aspects of this protocol are to ensure that all photo points repeatable, capture the same landscape each time taken and are able to be located well into the future. Some differences between the USDA handbook and CTUIR Umatilla Basin Photo Points Methods do exist in order to increase the repeatability of each sites photo and address the specific needs and goals for the CTUIR Umatilla Basin Fish Habitat program. Each site is geolocated and labeled rebar is pounded in the ground in order to monument the site. The focus points in the optical view finder are focused on a semi-permanent fixed object (i.e. tree, snag, boulder) within the landscape every time a specific photo point is taken. Focal length on the camera lens is at a fixed length (ex. 35mm, 18mm) for each specific photo point. All information is entered into a CTUIR specific field data form that includes information such as bearing and slope in order to ensure photo point repeatability to the furthest extent possible. Resolution settings on camera are set to high in order to zoom into specific features.

Starting in 2016, the UAFHP initiated a small pilot study to collect quantitative data using a modified grid-intersect analysis (Hall 2002). Photos selected for the pilot were taken from above the project and at intermediate distances. For each photo point and each year, an index of proportion of bankfull channel length with established perennial vegetation was estimated. For each photo a 28 x 18 square grid was overlain on the photo, each grid cell that contained bankfull channel was counted as well as each grid cell that contained bankfull channel with perennial vegetation. The proportion of cells with vegetation to the total number of cells yields an index of the proportion of the length of the bankfull channel with perennial vegetation.

Proportions of vegetated bankfull channel of the selected sites are averaged across years for analysis to represent the recovery across the whole project area. The data are analyzed with a simple linear regression to test the null hypothesis that the proportion of vegetated bankfull channel remains constant across the years after implementation.

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 UAFHP efforts outlined for this contract period.

Work Element A: 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 B: 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 FY 2016 projects:

- Meacham Creek – Bonifer Reach Floodplain Reconnection
- Lower Mainstem Umatilla River – Dillon Dam Removal

CTUIR successfully submitted many applicable 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 FY2016. 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.

Environmental compliance documentation was not pursued for the Birch Creek Peterson Dam Removal Project or the Wildhorse Creek Athena Bridge Fish Passage Improvement Project. The Peterson Dam Removal Project is currently on hold indefinitely due to lack of landowner interest in the project. Environmental compliance for the Athena Bridge Fish Passage Improvement Project was not pursued at this time because the project partners opted to construct a temporary adult passage structure at the

bridge site to monitor fish use before making the substantial investment in the preferred design alternative, bridge replacement.

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) Dillon Dam Removal Fish Passage Improvement Project - pipeline

At the time of this report, the CTUIR DNR Cultural Resource staff has not completed subsurface surveys of the Meacham Creek Bonifer Reach Floodplain Reconnection project area due to inclement weather that occurred late in 2016. The report is expected to be completed in early 2017. Cultural resources clearance has not been pursued for the Wildhorse Creek Athena Bridge Fish Passage Improvement Project or the Peterson Dam Removal Project for the same reasons listed above. The Dillon Dam Removal footprint has not been fully surveyed because the design and area of impact is not yet finalized.

UAFHP Environmental Compliance Documentation

ESA consultation with NMFS for FY 2016 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 K: 47): No project planting activities occurred under the HIP III BO consultation. Project staff focused the entire 2016 spring 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 H: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.) 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 I: 186): CTUIR monitored and maintained existing easements and habitat improvement sites. Maintenance included vegetation watering and installing bioengineering treatments to stabilize habitat features.
- Maintain/Remove Vegetation (WE J: 198): Project activities included watering and maintaining plants on NRCS CREP tracts and treating noxious weeds.

Work Element C: 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

The Assessment was completed to final Birch Creek Assessment and Action Plan was delivered to CTUIR on January 31, 2017. The final plan includes a watershed and subwatershed-scale assessment of the limiting factors affecting steelhead production as well as watershed and subwatershed scale assessments

of current and potential steelhead populations. Finally, the Birch Creek Assessment and Action Plan prioritizes reach-scale work areas and identifies potential action categories to best address the limiting factors in each geomorphic reach.

Work Element D: 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 2017 BPA statement of work and budget.

Work Element E: 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 F: 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 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 G: 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 3). 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.

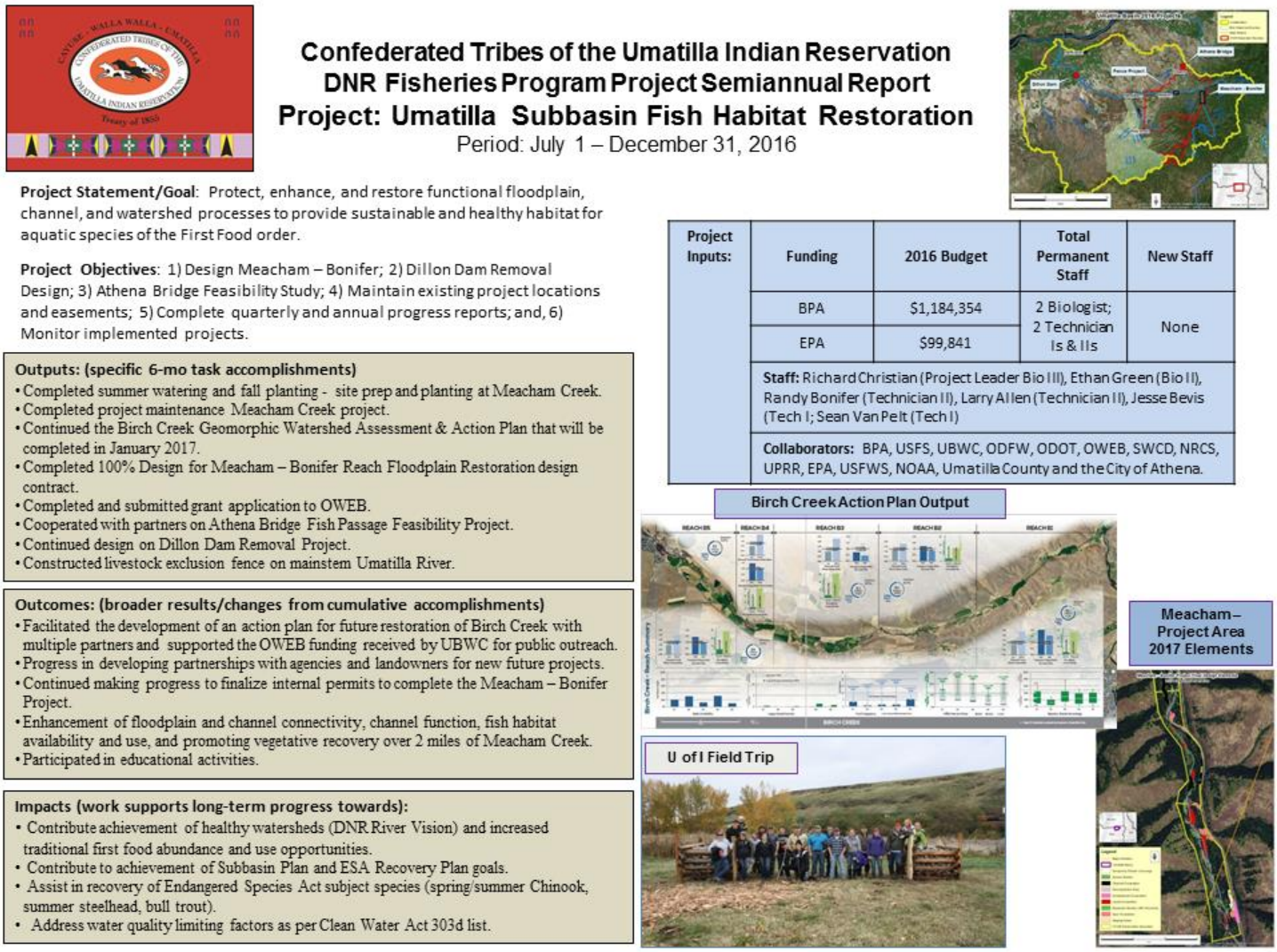

Figure 3. CTUIR semi-annual report for the Umatilla Subbasin Fish Habitat Restoration Project, July – December, 2016.

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 conveyed 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 2016 to government and agency officials and employees, education groups, policy and management staff, funding partners.

Community Education

The UAFHP participated in a number of community outreach and education opportunities in 2016. In March, 2016, a group of students from Whitman College visited the Umatilla Indian Reservation on a service learning trip. The Whitman College group was provided with a tour of the Meacham Creek project, educated about the project and floodplain processes, and got hands-on restoration experience planting trees in the Meacham Creek floodplain. The UAFHP again participated in the Watershed Field Days program to educate local elementary school children about the importance of stream and watershed health. The annual First Foods Festival was held in August, 2016, where the UAFHP maintained a booth to educate the community about fish habitat and the current restoration projects occurring in the Umatilla Basin. A service learning group from the University of Idaho also visited the UAFHP in the fall of 2016 to learn about fish habitat conservation and also assist in the construction of a riparian livestock exclusion fence on a mainstem Umatilla River conservation easement.

Numerous tours were also conducted of the previous work that has been completed on Meacham throughout the 2016 contract year. Some of these tours were for other resource professionals, while some of them were for educational purposes.

Figure 4. UAFHP outreach and education activities. Clockwise from top left: University of Idaho service learning field trip building riparian fence on the Umatilla River; posters presented to the community at the annual First Foods Festival; UAFHP staff presenting information on riparian buffers to local elementary students at the annual Watershed Field Days; UAFHP staff and Whitman College students planting trees in the Meacham Creek floodplain.

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 poster presentations of project activities including:

Future of Our Salmon Conference (2016 – Poster)

Meacham Creek Floodplain Restoration and In-stream Enhancement Project – Michael Lambert, Richard Christian, Ethan Green, and Scott O'Daniel

Work Element H: 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 2016, a small bioengineering treatment was implemented as maintenance on part of the Peterson In-stream Habitat and Bank Stabilization Project area on Birch Creek. The bank was stabilized with placement of small (<50 ft long) brush revetments anchored by hand into the bank to provide additional roughness and decrease erosive energy. Additionally, approximately 300 willow cuttings were hand placed behind and around the brush revetments during construction. This will provide necessary stability while the planted vegetation recovers for increased bank stability and protection. The remaining 2016 project activities involved routine maintenance.

Work Element I: 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. The 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 specifies 26 miles of stream. 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 J: 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 FY2016 included the monitoring and maintenance of 15 conservation agreements on numerous individual landowner properties. 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, 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. The UAFHP now maintains a licensed pesticide applicator on staff to spray/control noxious weeds on sites where chemical application is necessary. This staff member 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 UAFHP utilizes backpack spraying applications to treat perennial, annual and biennial weed species. All herbicide applications are consistent with Oregon Revised Statue (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. Due to staff turnover, switching from contracted services to staff herbicide application, growth stage timing of weed species, and internal purchasing restrictions, the UAFHP was unable to apply chemical herbicides in FY2016. Biological controls are used in advantageous areas.

Work Element K: 47. Plant Vegetation

Work Element Title: Meacham Creek Floodplain Restoration and In-Stream Enhancement, RM's 4.9-6.1
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 FY2016 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 FY2016, UAFHP staff manually maintained noxious weeds around plants within project areas (Table 4). In addition to 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 2016, CTUIR focused most of the spring planting season within the newly implemented Meacham Creek Floodplain Restoration and In-stream Enhancement Project area replanting areas where previous plantings failed to meet survival goals (Table 5). Staff also completed some conservation easement planting on Birch Creek in the Peterson project area.

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 L: 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.

UAFHP staff collected and maintained field data necessary to inform project tasks and habitat site management in 2017. Data collected included vegetation surveys from 34 previously and newly established transects in past planting sites to determine site survival, natural regeneration, as well as to survey for any noxious weeds that may require control.

In 2016, mean stem density in planting locations was approximately 0.17 stems per m^2 (Figure 5A). Mean Shannon-Weiner diversity index value of woody plants was 1.1 and mean woody plant species richness was 4.9 (Figure 5B and 5D). Mean species evenness was approximately 0.77 (Figure 5C). Additionally, naturally recruited plants made up approximately 35% ± 5.3% (mean ± SE) of the woody vegetation surveyed in 2016.

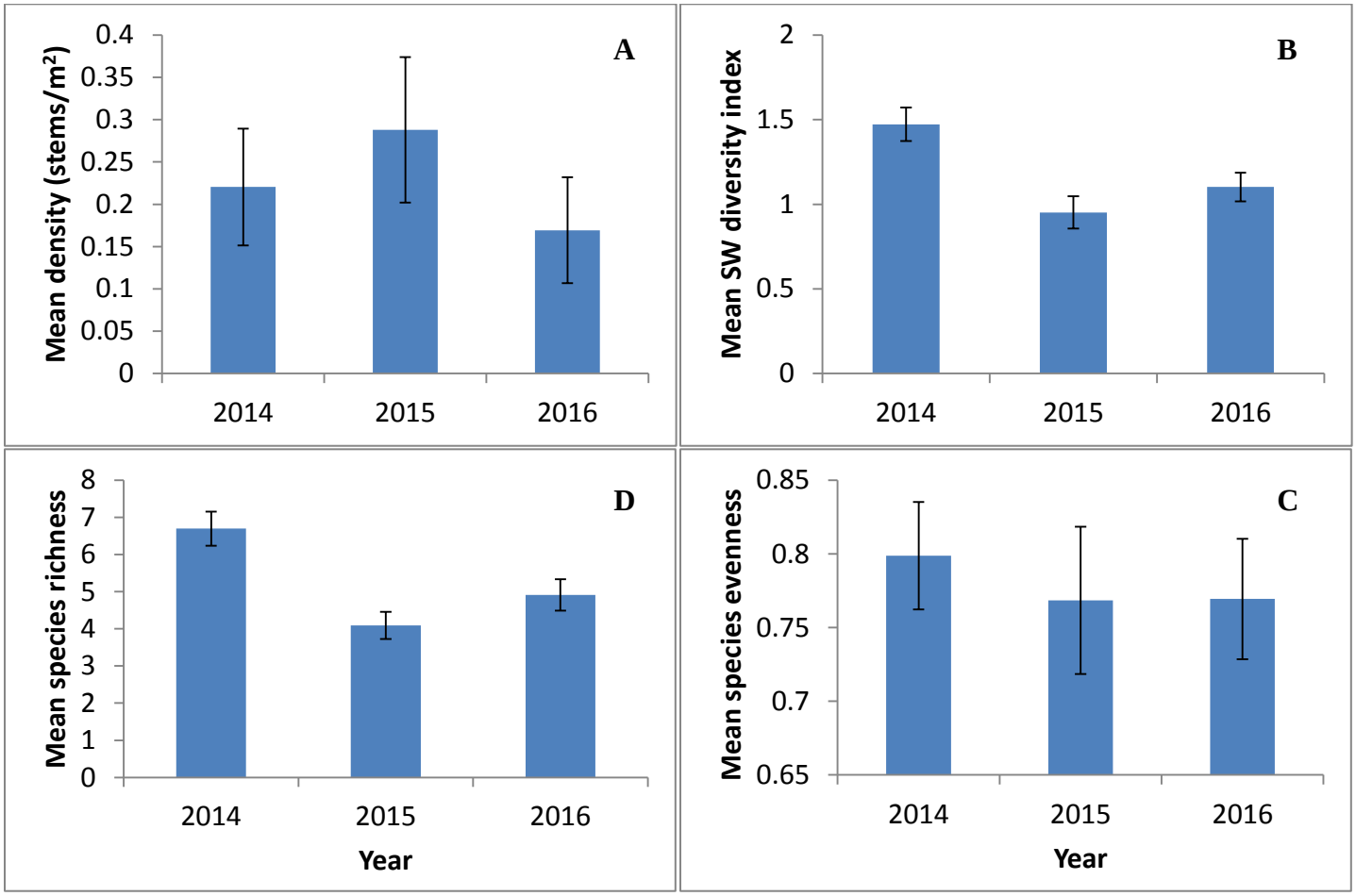

Figure 5. Summary of vegetation statistics across the period of record from 2014 to 2016 within the Meacham Creek Floodplain Restoration and In-stream Enhancement project. Clockwise from top left: A) Mean stem density per m^2 by year; B) mean Shannon-Wiener diversity index value by year; C) mean species evenness by year; D) mean species richness by year. Error bars represent standard error.

Concurrently with vegetation transects, previously planted areas were surveyed for invasive weed species. Sixteen major weed species were identified in the Meacham Creek Floodplain Restoration and In-stream Enhancement project area in 2016 (Figure 6). The most abundant weed species found was sulfur cinquefoil (*Potentilla recta*) and the highest priority species for control identified was common bugloss (*Anchusa officinalis*).

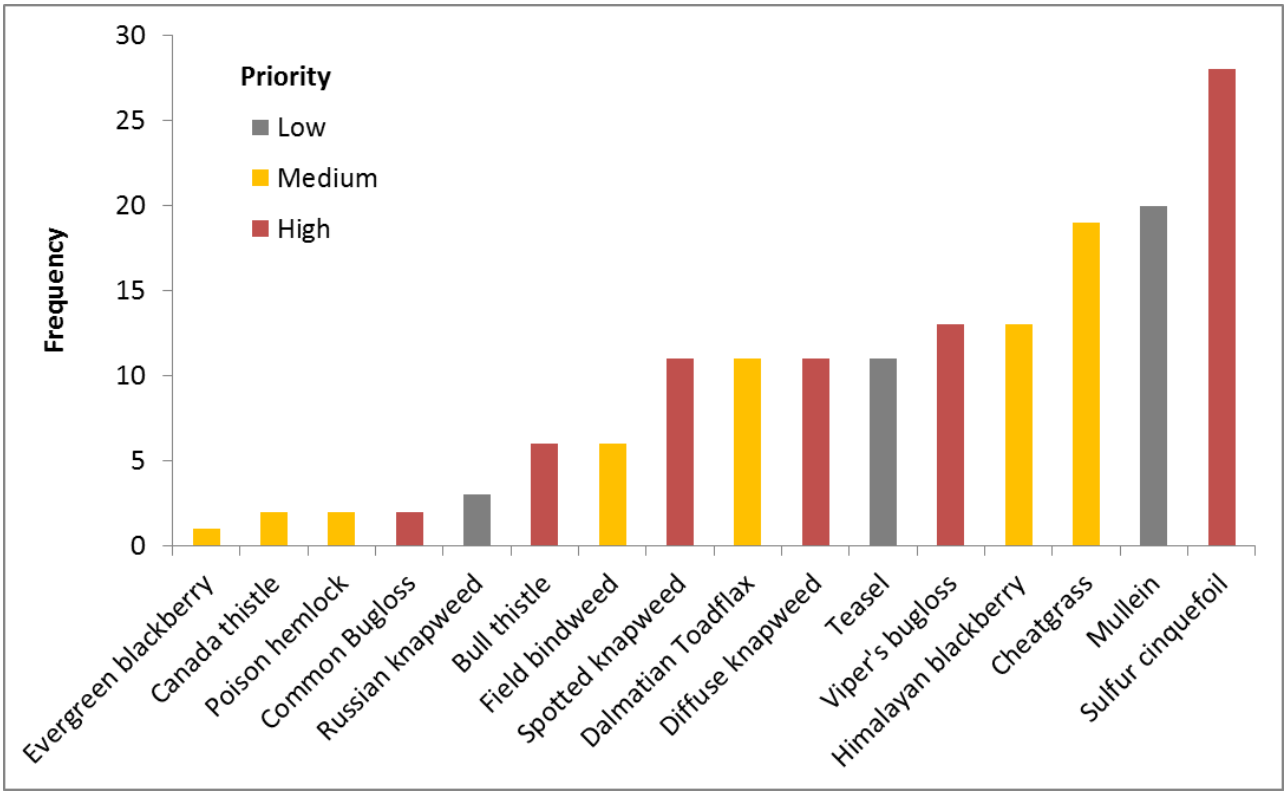

Figure 6. Invasive weed species detected in Meacham Creek Floodplain Restoration and In-stream Enhancement Phase I and II planting areas in 2016 and relative priority for control efforts.

Work Element M: 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.

The CTUIR UAFHP continued its intensive photo point monitoring in the 2016 contract year. Photo points were conducted in the spring of 2016 and uploaded to the UAFHP internal photo point data depository (Figure 7).

Figure 7. Before (2011) and after (2016) photos of the Meacham Creek Floodplain Restoration and In-stream Enhancement Project RM 6-7 taken at photo point monitoring locations.

Grid-intersect analysis of photo point data from 2011 to 2016 revealed that the proportion of the bankfull channel that supports perennial woody vegetation has been steadily increasing since the completion of the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase I project in 2011. Immediately after construction, approximately 36.6% ± 4.9% (mean ± SE) of the bankfull channel supported perennial woody vegetation, while in 2016 75% ± 8.4% was vegetated.

Linear regression showed that the year since implementation has a significant effect on the proportion of the bankfull channel that is vegetated ($df = 1$, $F = 49.79$, $P < 0.001$; Figure 8).

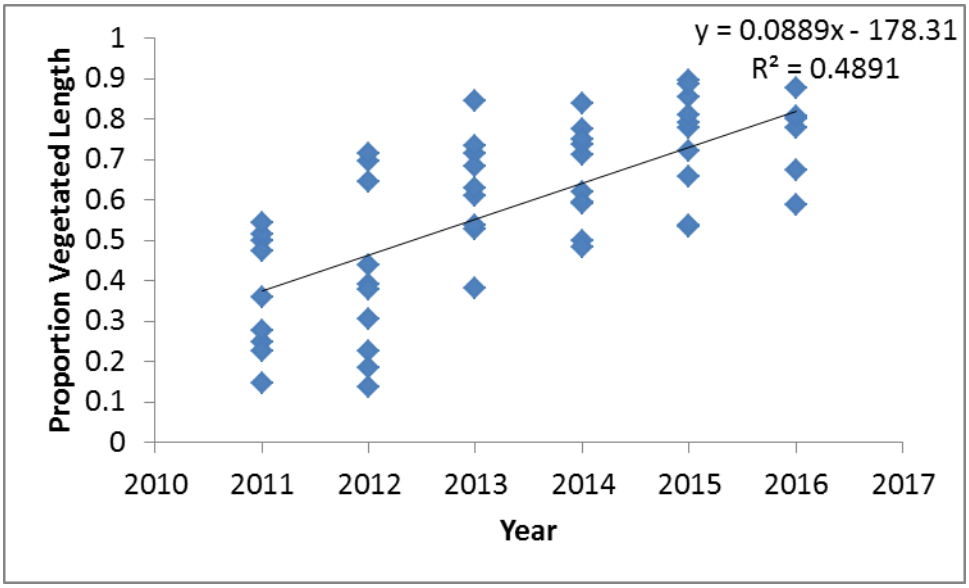

Figure 8. Proportion of vegetated bankfull channel length within the Meacham Creek Floodplain Restoration and In-stream Enhancement Phase I project area by year based on grid-intersect analysis of photo point data.

Work Element N: 175. Produce Design and/or Specifications
Work Element Title: Meacham Creek – Bonifer Instream Restoration Design Project
Milestone Deliverable: Meacham Creek – Bonifer Instream Restoration 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 was finalized in December 2016. 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 3 years, the design approach considered how to include this timeframe during construction in a less invasive way (Table 7). 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 9).

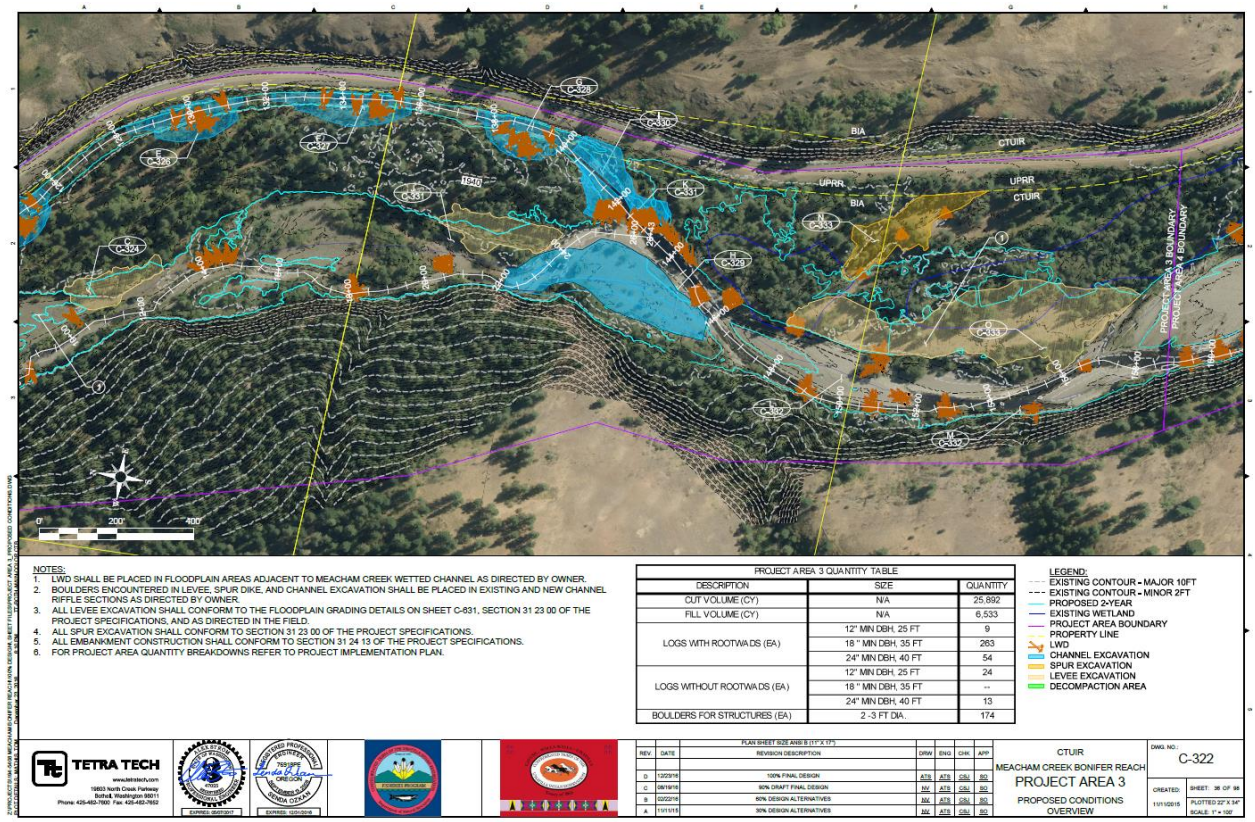

Figure 9. Meacham Creek – Bonifer Floodplain Restoration Project Example Final Design Features, RM 1.9-5.7.

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 O: 180. Enhance Floodplain/Remove, Modify, Breach Dike
Work Element Title: Meacham Creek – Bonifer Floodplain Restoration and In-stream Enhancement (RM 1.9 – 5.7) – Year 1
Milestone Deliverable: Complete channel reconstruction and in-stream enhancement on about 0.9 miles of stream

The UAFHP was unable to implement the Meacham Creek Bonifer Reach Floodplain Reconnection and In-stream Enhancement Project this year for a number of reasons. Permitting, both internally and externally, and scheduling of cultural resources surveys have delayed the project by several months. However, most permits have now been submitted and are either approved or awaiting National Historic Preservation Act Section 106 consultation to move forward. The design is complete and implementation is expected to commence in early summer 2017 following the completion of all permits and consultation with relevant entities.

Work Element P: 30. Realign, Connect, and/or Create Channel
Work Element Title: Meacham Creek – Bonifer Floodplain Restoration and Off-channel Habitat Complexity (RM 1.9 – 5.7) – Y1

Milestone Deliverable: Completed channel construction

The UAFHP was unable to implement the Meacham Creek Bonifer Reach Floodplain Reconnection and In-stream Enhancement Project this year for a number of reasons. Permitting, both internally and externally, and scheduling of cultural resources surveys have delayed the project by several months. However, most permits have now been submitted and are either approved or awaiting National Historic Preservation Act Section 106 consultation to move forward. The design is complete and implementation is expected to commence in early summer 2017 following the completion of all permits and consultation with relevant entities.

Work Element Q: 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 2016 contract period, the UAFHP staff was able to intensively treat 1 acre of the Meacham project area for invasive plant species mechanically (Table 4). In addition to this treatment, a variety of plant species were planted in the previous project area (Table 5), during spring and fall of 2016.

Project staff also spent a significant amount of time maintaining the previous plantings and fences. Due to the hot, dry summer conditions, 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.

Work Element R: 115. Produce Inventory or Assessment

Work Element Title: 2016 Upper Umatilla River/Meacham LiDAR Flight Acquisition
Milestone Deliverable: Upper Umatilla and Meacham Creek LiDAR Flight Data Acquisition

A LiDAR flight of the Upper Umatilla River basin (including the Umatilla River, Wildhorse Creek, and Meacham Creek) was completed in cooperation with the Oregon Department of Geology and Mineral Industries (DOGAMI). These data are invaluable for both project planning in the Upper Umatilla River and for monitoring of previously implemented projects in the data collection area. The data collected in 2016 will be especially useful in monitoring the Meacham Creek restoration projects completed in 2011-2013 as well as providing a pre-project snapshot of the landscape prior to the implementation of the Meacham Creek Bonifer Reach project. These data will also be used in the design of the Athena Bridge passage project and will serve as valuable information for the planned Umatilla River assessment.

Work Element S: 175. Produce Design and/or Specification

Work Element Title: Wildhorse Creek – Athena Fish Passage Project Design
Milestone Deliverable: Wildhorse Creek – Athena Bridge Replacement Project

Due to the conclusions reached in the completed feasibility report and preliminary design, the UAFHP delayed contracting a full design until a consensus could be reached among the project partners on the

best course of action. The preferred design selected in the feasibility report completed in 2016 was a full bridge replacement, which is an expensive project to design and implement. Initially, the project partners decided to examine a temporary passage structure at the site to allow monitoring of fish use above the 3rd Street bridge in Athena and to concurrently design the replacement bridge and pursue outside funding assistance. After further review and analysis it was determined by all of the stakeholders that a temporary passage structure was not an efficient path to proceed. The Athena Fish Passage Project is expected to be designed in 2017.

Work Element T: 175. Produce Design and/or Specification

Work Element Title: Dillon Dam Fish Passage Project Design
Milestone Deliverable: Dillon Dam Fish Passage Improvement Project Design

Design for the Dillon Dam Fish Passage Project was initiated in 2016 and is expected to be completed in early 2017. The design is being completed in cooperation with the Umatilla Basin Watershed Council and the Oregon Department of Fish and Wildlife and is approaching the 60% design stage at the time of this report.

Work Element U: 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-March (2/1/2016 - 3/31/2016)
April-June (4/1/2016 - 6/30/2016)
July-September (7/1/2016 - 9/30/2016)
October-December (10/1/2016 - 12/31/2016)
Final January (1/1/2017 - 1/31/2017)

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 V: 132. Produce Annual Progress Report

Work Element Title: Produce Annual Progress Report CY15 (Jan 1, 2015 thru Dec 31, 2015).
Milestone Deliverable: Completed Annual Report

A. Review progress report format requirements
B. Draft calendar yr 2015 RM &E tech rpt
C. Interagency/tribal review of draft
D. Revisions in response to review of draft
E. Upload MS version calendar year 2015 RM&E Tech report to Pisces.
F. Confirm BPA posted received.

The CY2015 BPA Annual Progress Report was completed and was uploaded to BPA through Pisces in the fall of 2016.

Work Element W: 132. Produce Annual Progress Report
Work Element Title: Begin drafting Progress Report for Jan 1, 2016 thru Dec 31, 2016.
Milestone Deliverable: Draft CY2016 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 2016 RM&E technical report and email version to Pisces.

The 2016 BPA Annual Progress Report was completed and was uploaded to BPA through Pisces in January 2017.

Table 4. Noxious weed treatments completed by location within the Umatilla River Basin, 2016.

Location			Floodplain			Upland		
Stream Name	**Lat**	**Long**	**Acres Treated**	**Method**	**Species Targeted**	**Acres Treated**	**Method**	**Species Targeted**
Meacham	45.6203	-118.35	1	Hand pulling/motorized trimmers	*Rubus* spp./ *Centaurea* spp.			
Meacham	45.6577	-118.36				800	Selective grazing*	*Centaurea solstitialis*

**Selective grazing completed by the CTUIR Range Program*

Table 5. Planting materials and grass seed by species, quantity, and size, planted and established at Umatilla River Basin existing and new project sites, 2016.

Stream	Date Planted	Project Site Location	Species (Common Name)	Quantity
Birch Creek	March	Peterson's Bank Stabilization	Serviceberry	5 – 1 gal
Birch Creek	March	Peterson's Bank Stabilization	Cascara	5 – 1 gal
Birch Creek	March	Peterson's Bank Stabilization	Oceanspray	5 – 414TP
Birch Creek	March	Peterson's Bank Stabilization	Blue Elderberry	10 – 1 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Douglas' Maple	16 – 414TP
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Thin-leaf Alder	23 – 5 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Sitka Alder	15 – 7 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Serviceberry	110 – 1 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Water Birch	30 – 1 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Red Osier Dogwood	20 – 1 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Cascara	71 – 1 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Oceanspray	107 – 414TP
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Mallow Ninebark	36 – 414TP
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Ponderosa Pine	222 – 414TP 68 – 2 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Black Cottonwood	40 – 3 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Chokecherry	18 – 414TP
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	*Salix* spp.	19 – 2 gal
Meacham Creek	March	Meacham Creek Floodplain Restoration (Phase II)	Blue Elderberry	94 – 1 gal
Birch Creek	October	Peterson's Bank Stabilization	*Salix* spp.	300 – cuttings
TOTAL POTTED PLANTS				**914**
TOTAL WILLOW CUTTINGS				**300**
TOTAL PLANTS				**1214**

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	Hoeft Dam fish passage rectification (juvenile and adult passage)

Table 7. Meacham Creek Bonifer Reach implementation schedule.

Implementation Year	Project Areas	Stream Location	Project Description
2017	3 & 4	RM 4.05 – 5.7	Remove levees/dikes, create primary and secondary channel, enhance pool/alcove habitat, construct large woody jams, add large wood, construct embankments
2018	2	RM 3.25 – 4.05	Create primary and secondary channel, add large wood
2019	1 & 5	RM 1.9 – 3.25, Bonifer Pond	Reconnect Bonifer Pond to Boston Canyon Creek, remove levees/dikes, create side channel, add large wood, construct embankments

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.

In 2016, the majority of monitoring conducted by the Umatilla Fish Habitat Project was done on Meacham Creek. More specifically, the monitoring was focused on the 2011-13 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 were incorporated into the appropriate monitoring projects during the 2016 CY. Only photo point monitoring and project-specific revegetation monitoring conducted by the UAFHP are reported herein.

Monitoring Objectives

1. Track changes in biotic and abiotic ecological process within the Umatilla Subbasin, specifically in and around restoration project areas.
2. Track the effectiveness of designed stream restoration features 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 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 7). 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 for comparable visuals for tracking physical appearance changes over time. This database is currently only accessible by CTUIR staff.

Collecting quantitative data, as was done in 2016 with a selected subset of the Meacham Creek Floodplain Restoration and In-stream Enhancement project, from photo points continues to be a promising method of collecting broad-scale data for monitoring trends in a project. For example, the photo point monitoring data collected in 2016 shows that the riparian vegetation in the immediate vicinity of the bankfull channel is rebounding from the disturbance of the project quite well. Over ¾ of the channel in the most disturbed sites now has perennial woody vegetation along the bankfull channel, indicating a relatively stable channel configuration and now contributes shade to the creek in the summer months.

With the proof-of-concept pilot study completed in 2016, collecting quantitative data from the photo point library may be extended to other areas other than vegetation recovery. For example, large woody material can be counted from some photo point locations to obtain a relative abundance estimate of large wood across several years. Sinuosity, cut banks, gravel bars, or other physical habitat characteristics can also be assessed on a large and long scale from photo point data collection.

ADAPTIVE MANAGEMENT

When the data from photo point monitoring is combined with other sources of data, such as the annual vegetation monitoring transects, we can gain insights into how the UAFHP can accelerate the recovery of heavily disturbed project areas. From the photo point monitoring, it is clear that vegetation at or near the bankfull channel is recovering well, but the vegetation transects show that floodplain vegetation continues to recover more slowly than desired.

By examining the vegetation transect data we can see which plant species are surviving more readily than others in different locations throughout the Meacham Creek restoration project. Project staff has begun to couple the First Foods concept to early seral species, which focuses the species planted to a more appropriate mix. In heavily disturbed sites, such as levee removal areas where environmental conditions are exceptionally harsh, rose species, golden currant, and mock orange appear to survive at a higher rate than other planted species. Staff have also been examining means to improve survival of plantings by selecting microsites (e.g. northern exposures of floodplain wood and topography), sewing whole berries or seeds (rather than rooted plants), changing the type and amount of mulch around each plant, and modifying the timing of plantings rom spring to fall. By planting in the fall, staff are able to complete plantings while plants are dormant, a difficult task with spring planting in the area. In future planting efforts, the UAFHP will focus on more carefully planting target species in preferred locations to increase survival in harsh environments.

Specifically related to increasing plant recruitment and survival, the current design for the Bonifer Reach Project has also focused on creating microsites. Some specific attributes that are being designed include floodplain topography. Again, current vegetation survey data suggest that a depression of only 1-2 feet deep can equate to a large amount of natural recruitment of species such as cottonwood and alder.

Outside of quantitative methods, photo point monitoring also has the benefit of allowing the UAFHP to qualitatively monitor how structures and habitat features perform over time. By reviewing similar structures in similar situations, UAFHP staff is able to determine the effectiveness and desirability of a particular feature in a future project or somehow modify the installation of a particular feature to obtain the desired result in a current project. For example, in past projects UAFHP staff has monitored how individual log jams have interacted with flow at different elevations in the active channel. In future projects, the UAFHP will likely try to increase the connection of log jams to the low flow channel where habitat will be created and maintained year-round instead of solely at high flows.

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 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 several design and planning documents that will serve to inform projects in the long and near term future of the UAFHP. First, the UAFHP completed the Birch Creek Assessment and Action Plan, a collaborative effort among the agencies and stakeholders of the Birch Creek watershed that has been more than 3 years in the making. The Birch Creek Assessment will inform the management and restoration priorities in the Birch Creek watershed for 20 years or more. In addition, the UAFHP also completed a full design and implementation plan for the Meacham Creek Bonifer Reach Floodplain Restoration and In-stream Habitat Enhancement Project. The nearly 4-mile Bonifer Reach project will begin implementation in 2017 and is expected to continue until 2019. Lastly, a preliminary design was completed to rectify a fish passage barrier at the 3rd Street bridge in Athena, Oregon. This is a crucial first step in reconnecting over 24 kilometers of potential spawning habitat for Middle Columbia River Steelhead. The UAFHP also implemented one primary habitat conservation project centered excluding cattle from the riparian zone and increasing vegetation complexity on the mainstem Umatilla River. 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, 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, US Forest Service, Umatilla Basin Watershed Council, Umatilla County Soil and Water Conservation District, 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 completion of 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 Middle Columbia River Steelhead. Project work further supports the CTUIR Department of Natural Resource ecological and First Foods mission statements to sustain production. The River Vision principles have been successfully applied in effort to reestablish the salmonids to self-sustaining levels. We expect a substantial positive 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 8. 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; 2007-2016.

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 (2010-2016)	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.

Meacham Creek Floodplain Restoration and In-Stream Enhancement Phase I Project RM 6-7.1 (2011-2012)	Floodplain and channel improvement with levee setback, large wood placement, side-channel connectivity, wetland enhancement, and riparian plantings.	STS, CHS, BT, Pacific Lamprey		X	X	X	X	X	X	X	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.
Birch Creek (2012)	Fish passage rectification and habitat restoration project.	STS, Coho	X	X		X	X	X		X	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.

West Birch Creek (2012)	Fish passage rectification and habitat restoration project.	STS	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 (2008-2016)	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	X	552 acres protected and maintained, 15.15 miles of riparian fence protection (184 ac.), 7,300 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