Protect and Restore Habitat; Tucannon Watershed

Annual Progress Report

(2013-2014)

Northwest Power Planning Council Project #2008-202-00

Contract #'s:

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Bonneville Power Administration

Prepared By:

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Project Leader – Tucannon Fisheries Habitat Project

Confederated Tribes Umatilla Indian Reservation

Department Natural Resources Fish and Wildlife Program

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

BONNEVILLE POWER ADMINISTRATION

Confederated Tribes of the Umatilla Indian Reservation

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ABSTRACT

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Tucannon Fisheries Habitat Project (TFHP) is an ongoing effort to protect, enhance, and restore riparian and in stream habitat for the natural production of anadromous salmonids in the Tucannon River Basin, Southeast Washington. Fish passage, channel characteristics, habitat diversity, floodplain confinement, temperature, turbidity, flow quantity, and lack riparian vegetation have been identified as the key limiting factors to Endangered Species Act (ESA) Listed salmonids as described in the CTUIR River Vision (RV) document (Jones, 2007). During the reporting period from January 1, 2013 to December 31, 2014, general project objectives focused on improving in stream and riparian habitat complexity, fish passage conditions, and restoring natural channel morphology and floodplain function. A two-mile long salmonid habitat enhancement project was implemented by CTUIR on the Tucannon River in 2014. Maintenance of past restoration sites occurred at the following locations; Cummings Creek, Russell Springs Creek, Hartsock Springs Creek, and Pataha Creek. Specific restoration strategies employed on the Tucannon River project included: (1) rectifying fish passage at three locations; (2) adding 825 pieces of woody debris and 500 boulders to the channel to improve habitat complexity; (3) planting 200 coniferous trees and seeding 1,000 pounds of native grasses; (4) reactivating/enhancing 5 secondary channel totaling 1,242 meters to promote floodplain interchange and provide off channel habitat. Project activities and objectives were based on a variety of fisheries monitoring techniques and habitat assessments used to determine existing conditions and identify factors limiting anadromous salmonid abundance in accordance with common language shared between regional Subbasin Plans and CTUIR's RV document and First Foods (FF) policy to adhere to mission statement guidance. Project evaluation strategies and treatment effectiveness shall be quantified by utilizing an array of monitoring and evaluation techniques by various entities to gage effectiveness and inspire timely adaptive management actions toward increasing probability of project success over time. Proper selection of the most effective site-specific habitat restoration plan, taking into consideration the unique characteristics of each project site, including the consideration of restrictive parameters was of paramount importance. CTUIR also participated in the planning and implementation process of several additional project opportunities with cooperating resource management entities. Much emphasis was dedicated to public relations and reporting obligations accomplished through oral presentations in a variety of professional forums across several states. Content was focused on highlighting project success.

ACKNOWLEDGEMENTS

The author would like to sincerely thank the following dedicated employees of CTUIR: Julie Burke, Catherine Dickson, Teara Farrow-Ferman, Mike Lambert, Eric Quaempts, Paul Raab, Alexa Maine, Gary James, Gerald Middel, Celeste Reeves, Collette Coiner, Dora Sigo, and Theresa Ulrich, for their support, professionalism and team atmosphere.

"From time immemorial, water has been the giver of all life. We must honor and protect it from the tributaries to the ocean". Enrolled CTUIR member Emma Farrow, words of wisdom.

Sincere appreciation to all good stewards of the land that treat all aspects with respect

CTUIR's fisheries habitat restoration work is dependent on the contributions and cooperation of many government and tribal organizations and individuals, private landowners, and small businesses without whom we would be unable to achieve a desired level of success. We are grateful to the following cooperating partners: Bonneville Power Administration, Columbia Helicopters, Department of Ecology, National Marine Fisheries Service, Oregon State Parks and Historical Society, Partney Construction, United States Forest Service, United States Army Corps of Engineers, Tetra Tech, and the Washington Department of Wildlife.

ACRONYMS

BPA	Bonneville Power Administration
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CFS	Cubic Feet per Second
DNR	Department of Natural Resources
ESA	Endangered Species Act
FF	First Foods
LWD	Large Woody Debris
M	Meters
RM	River Mile
RV	River Vision
TCC	Tucannon Coordination Committee
TFHP	Tucannon Fisheries Habitat Project
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department Fish & Wildlife
WWCC	Walla Walla Community College

INTRODUCTION

The Bonneville Power Administration (BPA) funds the CTUIR and other Pacific Northwest Tribes to restore salmonid habitat as part of its mitigation activities due to the harmful effects and loss of habitat caused by the massive Columbia River hydroelectric dams. The CTUIR TFHP, #2008-202-00, funded by BPA through the Northwest Power and Conservation Council in 2003Fish and Wildlife Program. The TFHP is part of the broader effort by Columbia River Tribes to protect and restore salmonid populations and to preserve community traditions that honor and celebrate the CTUIR's ties to this vital food source. The CTUIR is guided in its habitat restoration activities by objectives based on a variety of fisheries monitoring techniques and habitat assessments used to determine existing conditions and identify factors limiting anadromous salmonid abundance.

1805 Lewis and Clark journals noted the mouth of the Tucannon River entering the Snake River between a series of tumultuous rapids. Currently the confluence is highly inundated and undefined due to being located between and in close proximity to Little Goose and Lower Monumental Dam. Having the confluence inundated by slack water between two major dams is theorized to cause migrational homing issues for fishes returning from the Pacific Ocean seeking

suitable spawning grounds in their natal Tucannon River. Various research studies have indicated extremely high straying rates of adult salmonids (up to 55%) bypass the mouth and are detected at Little Goose Dam or further upstream. This detrimental phenomenon definitively affects potential success of habitat restoration projects and subsequent biological response of salmonid populations.

Historical accounts documented 1860 as the era in which livestock grazing was brought to the Tucannon region, targetting the once bountiful native bunchgrasses. A grist mill was located at the town of Marengo (RM 25) and diverted substantial quantities of water from the Tucannon River to power the mill. Dry land farming atop the adjacent hilltops was discovered to be highly productive as development activity increased accordingly. 1880 brought railroad construction actions to the lowlands of the Tucannon and in close proximity to the river. In 1915, survey crews noted gold and silver mineral mining in the headwaters. The Tucannon River was noted as averaging 11 yards wide by 3.5 feet deep, running along adjacent steep bluffs and having galleries of trees along the river (Beckham 1995, Figure 1).

Figure 1. Historical account of Tucannon River Conditions, healthy riparian, early 1900's

Native americans have hunted and gathered food and fished numerous rivers and streams of the Pacific Northwest for thousands of years and depended upon anadromous fish for subsistence and trade. The indigenous people of the CTUIR still rely on natural resources from several watersheds located within areas of traditional use to provide them with a multitude of life essentials. 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

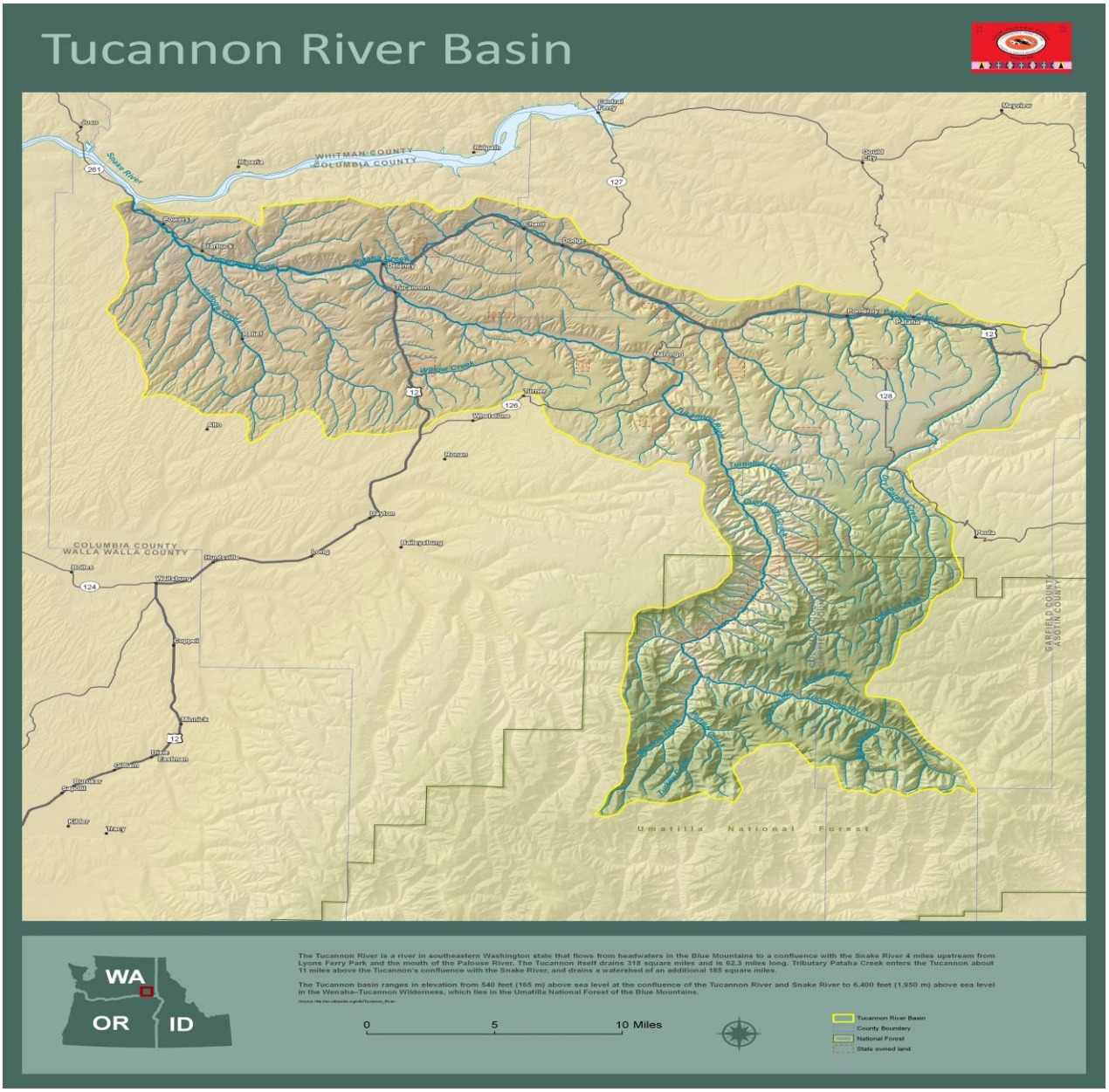
bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations…" (Treaty of 1855, Articles 1, p.3).

Decreased salmonid abundance has significantly impacted the livlihood of the tribal community and altered their way of life. It is the challenging duty of the TFHP 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. The CTUIR TFHP was initiated in August of 2009 with the hiring of one staff member.

Since the inception of the TFHP, 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 to improve physical habitat and population status for salmonids.

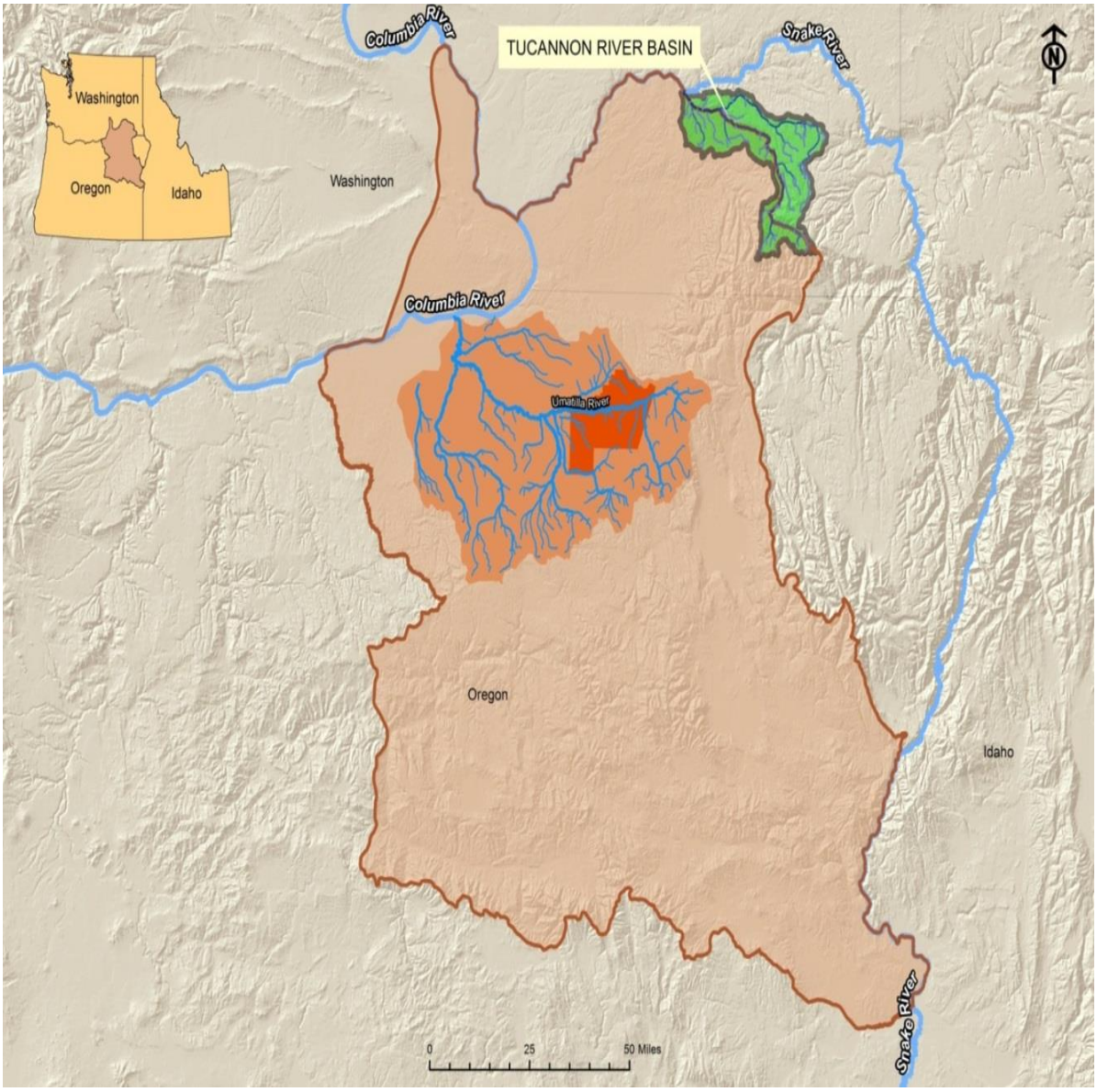
The Tucannon River originates in the Blue Mountains, located in the Umatilla National Forest, and flows generally northwest to its confluence with the Snake River near Starbuck, Washington (Figure 2).

Figure 2. Topgraphic map of the Tucannon Basin



The Tucannon River is approximately 62.3 miles long and drains watershed area that encompasses 502 square miles in Columbia and Garfield Counties. Elevation varies from 6,400 feet above sea level in the headwaters near the town of Pomeroy, to 540 feet at the confluence with the Snake River near Starbuck, Washington. The Tucannon Watershed is considerably smaller than the neighboring Umatilla Basin (Figure 3).

Figure 3. Proximity and size comparison of Tucannon Basin in relation to the Umatilla



Despite its relatively small size, the Tucannon Basin is a superior system with highly productive potential in regard to salmonids. High elevation headwaters and spring water provide consistent cold water flows and very good potential suitability for chinook salmon the mainstem Tucannon River (Figure 4).

Figure 4. View of Tucannon Watershed headwaters

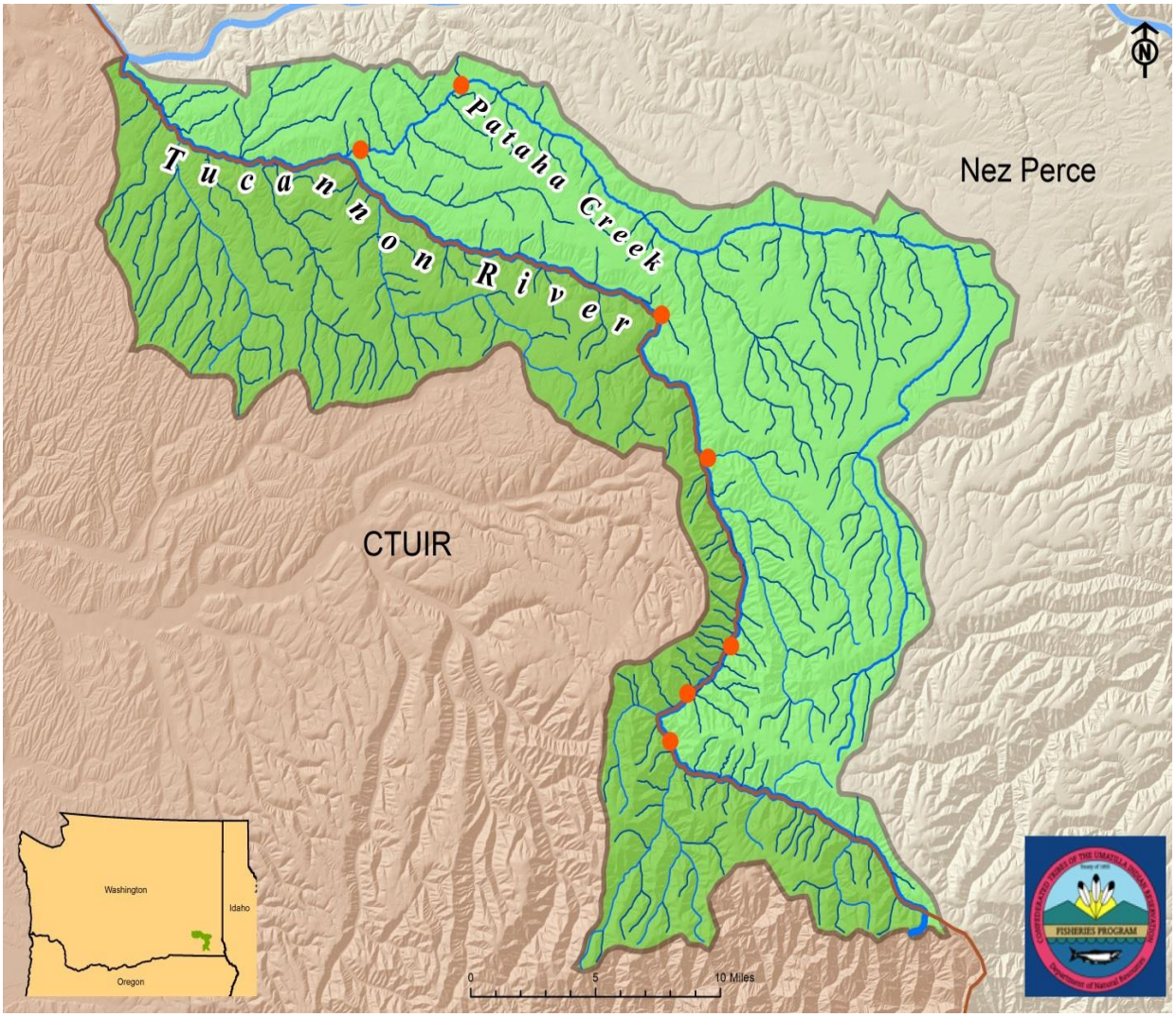
Snake River Spring & Fall Chinook Salmon, Columbia River Bull Trout, Snake River Steelhead Trout are listed as Threatened in the Tucannon Watershed. Restoration funding is aimed at protecting and/or improving the status of ESA-Listed fishes by way of habitat restoration under Accord and Programmatic agreements between BPA and CTUIR as mitigation for detrimental effects from Snake and Columbia River hydropower dams on protected fisheries resources. The Tucannon Watershed unique in that there are no tributaries suited for holding adult chinook salmon. All chinook production and potential is in the main stem, of which has an extended range of suitability when compared to more restrictive distribution observed in neighboring basins such as the Walla Walla and Umatilla. Roughly half of the mainstem Tucannons 60 miles harbors adult chinook salmon, while 45 miles is classified as suitable juvenile habitat. Geographically, the Tucannon Basin rates favorably in relation to other neighboring basins in regard to bull trout habitat and population status. Despite unfavorable trends in global warming, restoration activities in the Tucannon Basion are expected to yield noteable improvements of bull trout populations as an indiret beneficiary of enhancement activities targetted primarily for chinook salmon and steelhead trout.

Peak flow rates estimated for the 2, 10-, 25-, and 100-year flood frequency for the upper Tucannon River near river mile (RM 47) using a unit-discharge gage-transfer method were; 950 CFS, 2,200 CFS, 3,200 CFS, and 5,800 CFS respectively. Flows recorded at RM 8 show a minimum of 15 CFS, a mean of 170 CFS, and maximum of 7,980 CFS.

Riparian vegetation is highly intact, albeit as a reduced ribbon of growth adjacent to the river when compaired to historical belt width. There are very few irrigation withdrawls directly from the river. This combined with the stable nature of the hydrograph provide suoitable conditions as salmonids are found from mouth to headwaters. This salmonid distribution pattern is somewhat rare in semi-arid climates of the inland Pacific Northwest.

Since 2009, CTUIR has conducted salmonid habitat restoration projects at seven sites in the Tucannon Basin, as shown in figure 5. Project sites are stratified throughout the basin with most recent emphasis on upper reaches of the mainstem Tucannon River, in spring chinook salmon habitat.

Figure 5. Map of CTUIR salmonid habitat restoration projects, Tucannon River Watershed



1. **Cummings Creek:** *Habitat Complexity.*
2. **(Russel) Spring Creek:** *Habitat Complexity.*
3. **Hartsock Springs Creek:** *Habitat Complexity.*

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4. **Pataha Creek RM 1:** *Fish passage rectification.*
5. **Pataha Creek RM 10:** *Fish passage Rectification.*

6 & 7. Tucannon River: *Habitat Complexity.*

Noteworthy habitat restoration accomplishments for the CTUIR TFHP include:

- Improved fish passage at seven locations
- Improved habitat complexity with 2,200 pieces of woody debris and 1,300 boulder additions
- Planted 11,500 saplings/cuttings
- Seeded 2,000 pounds of native grass seed
- Conducted project monitoring, maintenance and improvement actions at restoration sites
- Conducted pre and post project aquatic habitat inventory and bioloical inventories

Although many project areas are in an early stage of recovery restoration activities have resulted in improving trends including:

- Improved stream channel stability with early succession dimension, pattern and profile
- Increased accessibility to suitable habitat in headwater streams via passage rectification
- Decreased channel width:depth ratios, gradient, and entrenchment. Increased sinuosity, length, floodplain connection, enhanced pool habitat, increased shade and undercut banks
- Increased availability of instream habitat, including off-channel rearing areas
- Improved watershed condition and function of riparian and wetland plant communities for fisheries benefit and wildlife species
- Increased instream habitat complexity and diversity resulting in improved pool-riffle sequences associated with dynamically stable channel morphology

The primary goal of the TFHP is to protect, enhance, and restore functional floodplain, channel complexity and watershed function to provide sustainable and healthy habitat and water quality for aquatic species in the Tucannon River Subbasin. This project will achieve shared biological objectives and strategies established in the Tucannon Subbasin Plan and address limiting factors while supporting physical and ecological conditions for the CTUIR FF framework and the RV guidance document. Restoration and enhancement activities are designed to improve aquatic and riparian habitats, resulting in an increase in viable populations of focal species and secondary species of fish and wildlife in the Tucannon River watershed. The TFHP philosophy as it relates to salmonid habitat restoration revolves around biomimicry using organic materials to achieve natural aesthetics as they relate to approaching historic watershed function. The TFHP strives to create edge-effect diversity, frequency and quantity through various means of improving the complex physical details within the watershed as a means of maximizing; overall population levels, density, fitness, and biomass of Listed Salmonid populations, inclusive to all life stages.

Based on a series of habitat assessments, the TFHP project has six objectives, to: 1) improve fish passage and migration conditions for salmonids, 2) restore river channel functions, 3) increase instream habitat complexity, 4) reconnect floodplains to the main river channel, 5) improve water quality, and 6) establish multi-tiered levels of vegetation in riparian areas.

The mainstem Tucannon River and tributaries provide spawning, rearing, and migrational habitat for four Endangered Species Act- (ESA) listed (Threatened) salmonids: Snake River summer

steelhead- (*Oncorhynchus mykiss*), spring and fall chinook salmon (*O. tshawytscha*), and Columbia River bull trout (*Salvelinus confluentus*). The Tucannon River represents the most downstream, tributary-population in the Snake River watershed and is also the lowest elevation drainage where Snake River spring chinook salmon reside. The population was in decline throughout the 1980's, and reached a critical low in the mid 90's, when the number of wild adults plummeted to three naturally-produced individuals. Secondary objectives address other preferred species of traditonal importance to CTUIR such as; resident redband rainbow trout, pacific lamprey, mountain whitefish, fall chinook, coho salmon, and freshwater mussels.

In 2007, the CTUIR Department of Natural Resources (DNR) adopted the following mission: *To protect, restore, and enhance the First Foods - water, salmon, deer, cous, and huckleberry - for the perpetual cultural, economic, and sovereign benefit of the CTUIR. We will accomplish this utilizing traditional ecological and cultural knowledge and science to inform: 1) population and habitat management goals and actions; and 2) natural resource policies and regulatory mechanisms* (Figure 6).

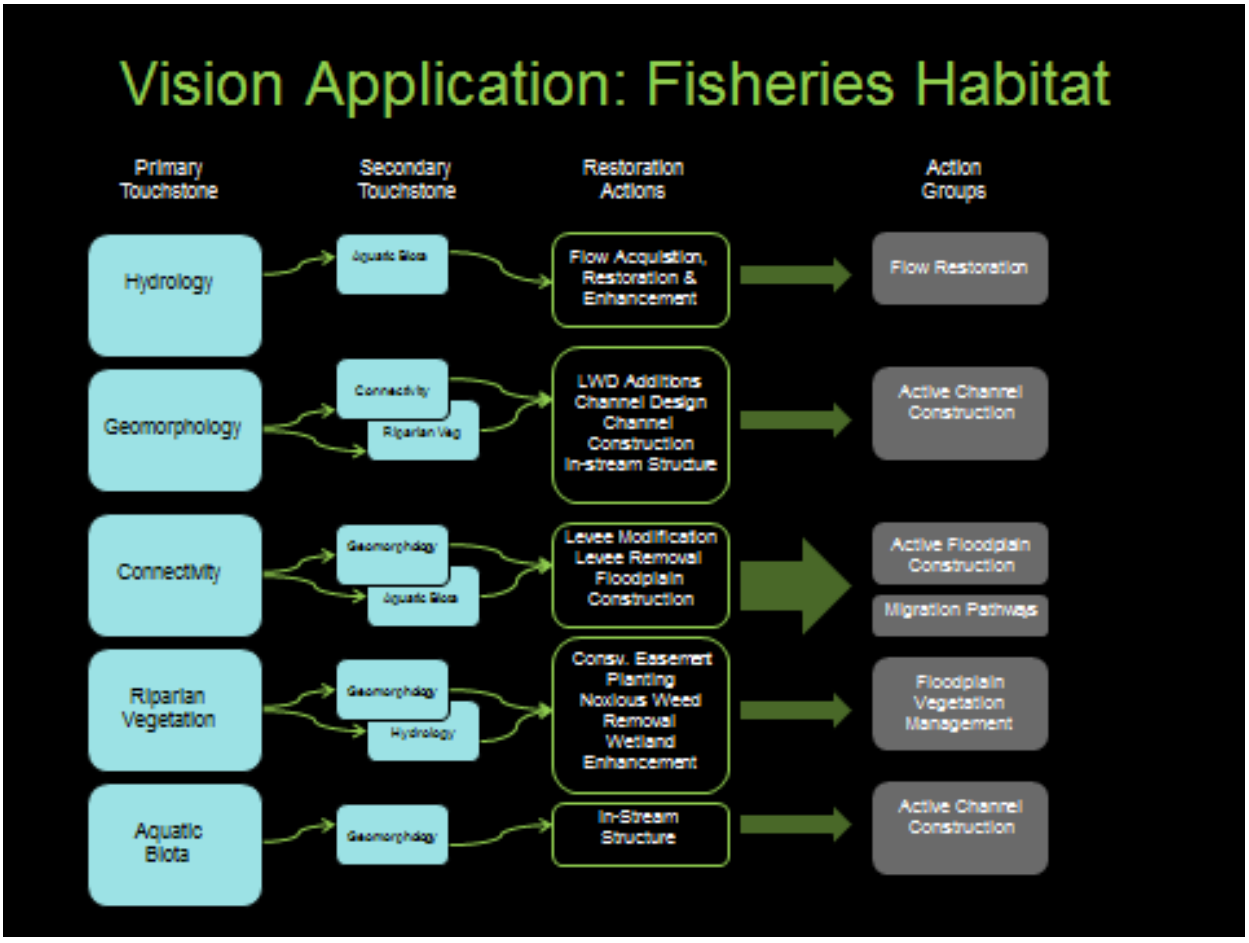
The mission was developed in response to long-standing and continuing community expressions of FF traditions, and community member requests that all FF be protected and restored for their respectful use now and in the future. The FF are considered by the CTUIR DNR to constitute the minimum ecological products necessary to sustain CTUIR culture.

Figure 6. First Foods Framework principals guiding CTUIR TFHP restoration actions

In addition to FF principals, CTUIR adheres to RV guidance. Utilization of this document in conjuction with FF, steers managerial decisions and means of conduct in regard to managing natural resources. The RV document identifies processes and conditions needed to sustain aquatic FF, information needed to inform their management, and potential management implications. Applying the FF approach and the RV, managers can focus on appropriate ecological processes that provide and sustain FF, and plan management actions accordingly. The RV seeks to promote a dynamic river and floodplain system with natural variability, address ecological processes rather than localized manipulations that may not take into account the causes of the degradation, and plan projects in relation to larger-scale watershed impacts. The "touchstones" (connectivity, riparian vegetation, aquatic biota, geomorphology, hydrology)

described in the RV have applications for managers to help ensure that planned management activities account for an appropriate breadth of ecological considerations and are aligned with one another in pursuit of the goals and needs of the Tribal community that depend upon rivers (Figure 7).

Figure 7. Utilization of River Vision Touchstone sequencing to guide restoration actions



Sound river management and restoration are predicated upon the need to develop a systemic and holistic vision of a functional river (Stanford et al. 1996; Ward et al. 2001; Jungwirth et al. 2002; Nilsson et al. 2007). Such a vision provides a framework for planning management or restoration efforts and an initial benchmark for assessing anagement success or failure. Similarly, a RV provides the context necessary for understanding the role of any specific management decision or action in the context of other decisions or actions. The RV philosophy outlines a means for achieving desired ecological characteristics of water quality and water resource management, and facilitates the sustained production of FF. The FF management framework adopts a broad definition of "water quality," incorporating the physical, chemical, biological, and ecological targets to assess the quality of water. Essentially, according to this framework, the ecological function and health of a watershed becomes a holistic measure of water quality, and provides a pathway toward the restoration and maintenance of FF production.

The CTUIR TFHP aims to effectively re-establish tribal presence into territories of traditional use to uphold cultural FF values, while preserving traditional tribal values in regard to natural resources management. The TFHP operates in a manner with conviction and guidance towards the internal RV document, while embracing common language within external salmon recovery plans and utilizing various data sets from a multitude of natural resource disciplines and sources. The TFHP utilizes a strategy that combines moderrn science with traditional, cultural procedures to uphold the responsibility of managing natural resources while upholding values. An important aspect of the process is the identification of limiting actors and devising objectives to guide project actions. Strategic restoration actions improve watershed function and cause changes in physical habitat, which trigger biological response with the intent to improve population status of ESA-Listed salmonids. Monitoring and maintencane of project sites improves aoverall appearance and efficiency of restoration actions and formulates effective adaptive management strategies to further enhance project success. Table 1 provides linkage from limiting factors to restoration objectives and RV Touchstones, and the associated metrics that can be evaluated for project designs and post-implementation effectiveness monitoring.

Table 1. Limiting Factors, Objectives, Touchstones, Evaluation and Monitoring Metrics

Limiting Factors (NOAA equivalent)	Restoration Objective	River Vision Touchstone	Metrics
In-Channel Characteristics (6.2: Channel Structure and Form: Instream Structural Complexity)	• Restore geomorphic processes • Increase habitat diversity in the channel • Improve habitat quantity and quality • Increase instream habitat structures • Arrest channel downcutting through structure installation	Primary: Aquatic Biota Secondary: Geomorphology	Channel geometry (bankfull width, bankfull depth, width/depth ratio), longitudinal profile
			Sinuosity (Lc/Lv)
			LWD Counts
			Pool frequency or spacing
			Percent pools
			Residual pool depth (dmax/dtail)
Floodplain Connectivity (5.2: Peripheral and Transitional Habitats: Floodplain Condition) **Riparian** (4.1: Riparian condition: Riparian Vegetation)	• Increase floodplain and secondary channels • Increase channel sinuosity • Add large wood to channels and floodplains to promote roughness, deposition, and vegetation establishment • Increase floodplain cross-sectional area • Restore riparian vegetation	Primary: Connectivity, Geomorphology Secondary: Riparian Vegetation	Percent of floodplain disconnected
			Entrenchment ratio or confinement ratio (Wfp/Wbf)
			Floodplain relative elevation
			Channel Complexity Index
			Size, density, and cover of native or site appropriate species
Sediment (7.2: Sediment Conditions: Increased Sediment Quantity)	• Restore geomorphic processes • Establish equilibrium conditions • Reduce fine sediment supply • Increase substrate quality	Primary: Geomorphology Secondary: Aquatic Biota	Threshold grain size and transport rate
			Meander belt width
			Aggradation rate

In order to meet the Project goal and objectives, restoration designs are developed that address limiting factors while improving riverine habitat for ESA-listed salmonids. Several previous studies have identified the preferred types of restoration activities for addressing the limiting factors in project areas. Table 2 illustrates recent status and projection of restoration potential of limiting factors in the Tucannon Basin.

Table 2. Recent status and restoration potential projections of limiting factors

Lower Snake River Steelhead Trout Status, 2009

Population	2009 Expert Panel Limiting Factors	Ecological Conser - Sub Category	Starting Low Booken	High Bookends		LF Weight
				2018	2033	
Tucannon River	Habitat diversity (LWD)	Instream Complexity	41	55	70	12.50
Tucannon River	High water temperature	Temperature	65	79	93	12.50
Tucannon River	High water turbidity	Turbidity	60	75	90	12.50
Tucannon River	Low stream flow	Decreased Water Quantity	95	97	99	12.50
Tucannon River	Riparian degradation	Riparian Condition	46	68	92	12.50
Tucannon River	Screens	Mechanical Injury	96	97	100	12.50
Tucannon River	Barriers	Anthropogenic Barriers	65	80	80	12.50

Lower Snake River Spring Chinook Salmon, 2009

Population	2009 Expert Panel Limiting Factors	Ecological Conser - Sub Category	Starting Low Booken	High Bookends		LF Weight
				2018	2033	
Tucannon River	Floodplain confinement	Floodplain Condition	68	75	83	12.50
Tucannon River	Habitat diversity (LWD)	Instream Complexity	51	62	75	12.50
Tucannon River	High water temperature	Temperature	34	60	87	12.50
Tucannon River	High water turbidity	Turbidity	50	62	75	12.50
Tucannon River	Low stream flow	Decreased Water Quantity	85	90	96	12.50
Tucannon River	Riparian degradation	Riparian Condition	46	68	92	12.50
Tucannon River	Screens	Mechanical Injury	96	97	100	12.50
Tucannon River	Barriers	Anthropogenic Barriers	65	80	80	12.50

Several studies have concluded that increased pools and large woody debris (LWD) were needed to address the primary limiting factor of habitat quantity in the Tucannon Basin. Recommendations for restoration activities are based on the following framework;

-Protect and maintain natural processes.

-Connect disconnected habitat.

-Address anthropogenic, confining infrastructure impairing natural processes/connectivity.

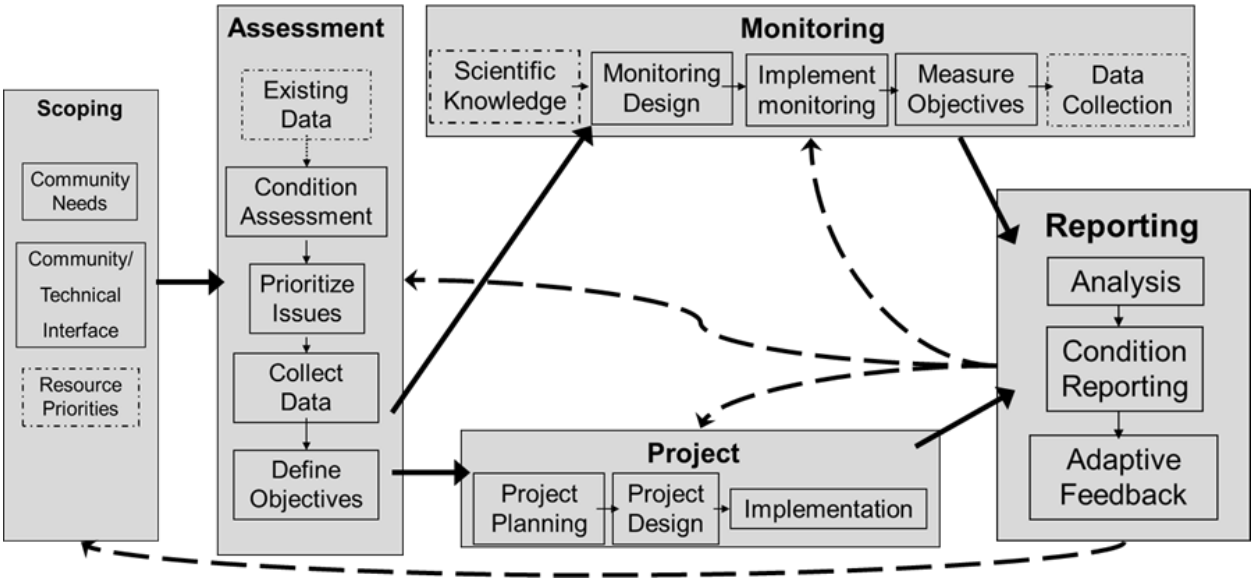
-Restore riparian processes and canopy. Utilize best forest management practices.

-Improve in-stream habitat. Add LWD to force pools and maintain channel complexity.

The CTUIR TFHP continues to gain and improve knowledge in floodplain and riverine processes and has applied that knowledge to this project resulting in improved administration, planning, design, implementation, and monitoring. Restoration actions implemented by CTUIR and supported by the RV promote a dynamic river and floodplain with natural variability to address ecological processes and approach project planning at a watershed scale. We recognize that stability in a riverine floodplain must be considered at geomorphic temporal and spatial scales in order for natural ecological processes to occur and restoration actions to be considered successful. Actions that only address symptoms of non-functioning systems have results that are ineffective at meeting restoration goals (Kondolf et.al. 2003). And, the interconnection between physical, chemical and biological processes within a watershed must be considered at multiple scales of time and space.

The CTUIR TFHP develops restoration projects through what we define as the Riverine Planning Approach that includes an adaptive management mechanism at several stages. The approach includes the 5 basic stages of scoping, assessment, monitoring, implementation, and reporting (Figure 8).

Figure 8. Riverine Planning Approach sequence



The results of reporting are then available to provide input to additional assessment, evaluation of project objectives, input to monitoring plans, and input to project development and adaptive management. Results from one project also provide information to the planning process of future projects and project in other subbasins. To improve future project development the following solutions have been applied:

1. Develop clear project goals and measurable objectives that address Primary Limiting Factors (Ecological Concerns) and drive the development of project actions and effectiveness monitoring plans through the Riverine Planning Process.

2. Develop integrated and organized planning teams to utilize the Riverine Planning Process. The basic team would be led by a CTUIR project leader with a formation of interdisciplinary members. Disciplines not represented by CTUIR staff or partners would be made available as necessary to the team through subcontract. Roles and responsibilities would be outlined and clearly understood. Develop a timeline and schedule for the planning process up front so that contract amendments and changes are minimized.
3. Adequate data and final design information is collected and provided. The level and detail of site data and information collected needs to meet or exceed the intended use.
4. Detail final plans to an accurate level based on updated site information. A final design plan should be agreed upon and understood by all team members before moving into the implementation phase.
5. Coordinate and communicate early and often with regulatory agencies. Make sure permitting agencies are aware of decision changes in a timely, official, and detailed manner.

Utilization of the RV application procedure to address limiting factors has been partaken by CTUIR with promising results. Examples of related conduct and project results are shown in Figure 9.

Figure 9. Project actions and results for the reporting period, 2013-2014

Confederated Tribes of the Umatilla Indian Reservation
DNR Fisheries Program Project Semiannual Report

Project: Tucannon Fish Habitat Restoration

Period: January 1–June 31, 2013

Project Goal: To protect, enhance & restore functional, healthy & sustainable floodplain, channel & watershed process for purpose of protecting & restoring fisheries & aquatic species, Tucannon Basin.

Objectives: 1) Identify, design, implement, maintain effective fish habitat projects. 2) Seek new partnerships & strengthen existing. 3) Seek additional funding. 4) Identify needs to be successful in reaching FY 13, 14 project objectives 5) Initiate development of 2013 & 2014 statement of work & budget.

Project Inputs:	Funding	2012 Budget	Staff	New 2013 Staff
	BPA & SRSRB	$220,000 Base +$167,407 BPA Supplemental	1 Bio 3	2 E Hire Techs replaced Bio 2
	Staff: Eric Hoverson			
	Collaborators: USFS, WDFW, NPT, SRSB, CTUIR Wildlife (Rainwater)			

Outputs (specific 6-mo task accomplishments):
- Orally presented results of CTUIR Habitat projects at 3 professional forums
- Successfully navigated through competitive ISRP funding review process
- Monitored & enhanced Pataha , Hartsock & Russel Springs Habitat Projects
- Planted 700 deciduous trees; Pataha, RM 1 &10, solidified high flow channel
- Planted 500 deciduous trees; Hartsock & Russel Springs riparian zone
- Advanced development of designs for expanded upper Tucannon Project
- Advanced the strategies for proceeding with future Tucannon River projects
- Partnered with USFS to identify/secure LWD sources for restoration projects

Outcomes: (broader results/changes from cumulative accomplishments)
- Highlighted CTUIR accomplishments and objectives throughout the pacific NW
- Secured favorable BPA funding eligibility for next 5 years for CTUIR via ISRP
- Improved riverine habitat complexity to benefit Salmonids in project areas
- Enhanced riparian status & associated benefits to fish & wildlife
- Increased steelhead & chinook fry observed & steelhead redds counted
- Increased leadership, input & expanded partnerships in the Tucannon Basin
- Developed and expanded autonomous abilities and group framework roles
- Participated in project prioritization & development to utilize BIOP dollars

Impacts (work supports long-term progress towards):
- Contribute to achievement of healthy watersheds (DNR River Vision) and increase traditional first food abundance and use opportunities.
- Contribute to achievement of Subbasin Plan and ESA Recovery Plan goals.
- Assist in recovery of Endangered Species Act subject species (spring/summer chinook, summer steelhead, bull trout).
- Address water quality limiting factors as per Clean Water Act 303d list.

Project #200820200 - Tucannon Watershed
Sponsor: CTUIR
ISRP Recommendation: Fund Project, meets Scientific Review Criteria.

FUTURE PROJECT EMPHASIS: ADDRESS FIRE IMPACT & IMPROVE SPRING CHINOOK HABITAT

2005 & 2006 Fire Impacts, Tucannon River

2013 Completed Project
2014 Planned Project, Tucannon River

Confederated Tribes of the Umatilla Indian Reservation
DNR Fisheries Program Project Semiannual Report

Project: Tucannon Fish Habitat Restoration

Period: July 1–December 31, 2013

Project Goal: To protect, enhance & restore functional, healthy & sustainable floodplain, channel & watershed process for purpose of protecting & restoring fisheries & aquatic species, Tucannon Basin.

Objectives: 1) Identify, design, implement, maintain effective fish habitat projects. 2) Select most beneficial partnerships towards attaining goals 3) Acquire additional supplemental funding 4) Identify and conduct strategic modes of operation and adaptive management to maximize potential for achieving project objectives 5) develop 2014 statement of work & budgets.

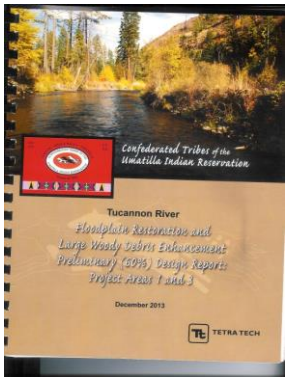
Project Inputs:	*Funding*	*2013 Budget*	*Staff*	*New 2013 Staff*
	BPA Accords & Programmatic	$220,000 Accord +$395,000 Programmatic	1 Bio 3	None
	Staff: Eric Hoverson			
	Collaborators: Tetra Tech, Kagey Forestry, USFS, WDFW, Camp Wooten, CTUIR (Mussel & Rainwater), WWCC, SRSRB			

Outputs (specific 6-mo task accomplishments):
- Presented results of CTUIR Pataha Passage project to funding entities
- Enhanced Tucannon River, Pataha , Hartsock & Russel Springs Habitat Projects
- Planted 200 deciduous trees at Pataha Creek, RM 1 prior to funding-tour
- Restoration blueprints; 2014 Tucannon R., RM 46.75-48.10 & 49.45-50.10
- Aquatic Habitat Inventory & field surveys to document pre project conditions
- Initiated agreement with private landowner for potential future project
- Identified 668 trees and 400 boulders for use on 2014 restoration project
- Staged 425 trees and 160 boulders adjacent to Tucannon project location

Outcomes: (broader results/changes from cumulative accomplishments)
- Enlightened resource management entities to CTUIR's 1st Foods & River Vision
- Secured total of $1,200,000 for 2014 implementation, 2 miles, Tucannon R.
- Work reviews and professional reputation strengthened via demonstration
- Improved riverine habitat complexity to benefit Salmonids in project areas
- Enhanced riparian status & associated benefits to fish & wildlife
- Increased ESA-Listed salmonid carrying capacity and potential
- Brought additional attention to water issues; Pataha Cr, resulting in change
- Increased most beneficial partnerships for CTUIR interests in Tucannon Basin

Impacts (work supports long-term progress towards):
- Contribute to achievement of healthy watersheds, CTUIR traditional use areas
- Promote CTUIR's First Foods & River Vision philosophical guidance policies
- Increase traditional first food abundance, status & participation opportunities
- Contribution toward achievement of guidance documents recovery goals
- Contribute measurable physical improvement of ESA salmonid habitat
- Address limiting factors of salmonid production in the Tucannon Basin

COMPLETION OF PROFESSIONAL, STAMPED BLUEPRINT DESIGNS FOR $1,000,000, 2MILE RIVER RESTORATION PROJECT PLANNED FOR IMPLEMENTATION IN 2014;



Confederated Tribes of the Umatilla Indian Reservation
DNR Fisheries Program Project Semiannual Report

Project: Tucannon Fish Habitat Restoration

Period: Jan 1–June 30, 2014

Project Goal: To protect, enhance & restore functional, healthy & sustainable floodplain, channel & watershed process for purpose of protecting & restoring fisheries & aquatic species, Tucannon Basin.

Objectives: 1) Identify, design, implement, maintain effective fish habitat projects. 2) Select most beneficial partnerships towards attaining goals 3) Acquire additional supplemental funding 4) Identify and conduct strategic modes of operation and adaptive management to maximize potential for achieving project objectives 5) develop 2015 statement of work & budgets.

Project Inputs:	*Funding*	*2014 Budget*	*Staff*	*New 2014 Staff*
	BPA Accords & Programmatic	$225,000 Accord +$894,815 Programmatic	1 Bio 3	None
	Staff: Eric Hoverson			
	Collaborators: Tetra Tech, Kagey & Radebaugh Forestry, USFS, WDFW, Columbia Helicopters, Partney Construction, WWCC, SRSRB.			

Outputs (specific 6-mo task accomplishments):
- Prepared for July/Aug restoration of Tucannon RM 46.75-48.1 & 49.45-50.1
- Submitted BPA 91 page Annual Report of CTUIR Tucannon accomplishments
- Advanced relations with private landowners for potential future projects
- Selected air & ground implementers. Signed contracts to perform restoration
- Acquired addtl. 150 mature green conifers & 180 boulders for stream habitat
- Developed construction access routes to Tucannon River, minimal impact
- Staged habitat materials closer to Tucannon River project site
- Maintained & improved conditions of existing habitat enhancement projects

Outcomes: (broader results/changes from cumulative accomplishments)
- Enlightened resource management entities of CTUIR 1st Foods & River Vision
- Secured total of $1,200,000 for 2014 implementation, 2 miles, Tucannon R.
- Work reviews and professional reputation strengthened via demonstration
- Improved riverine habitat complexity to benefit salmonids in project areas
- Enhanced riparian status & associated benefits to fish & wildlife
- Increased ESA-Listed salmonid carrying capacity and potential
- Increased most beneficial partnerships for CTUIR interests in Tucannon Basin
- Developed autonomous responsibility and leadership capability
- Expanded CTUIR presence and accomplishments in the Tucannon Basin

Impacts (work supports long-term progress towards):
- Contribute to achievement of healthy watersheds, CTUIR traditional use areas
- Promote CTUIR's First Foods & River Vision philosophical guidance policies
- Increase traditional first food abundance, status & participation opportunities
- Contribution toward achievement of guidance documents recovery goals
- Contribute measurable physical improvement of ESA salmonid habitat
- Address limiting factors of salmonid production in the Tucannon Basin

PREPARATION TO HARVEST 150 WINDBLOWN & 150 WHOLE GREEN CONIFERS FOR UTILIZATION IN THE WETTED CHANNEL OF THE TUCANON RIVER FOR FISH HABITAT BENEFIT

Confederated Tribes of the Umatilla Indian Reservation
DNR Fisheries Program Project Semiannual Report

Project: Tucannon Fish Habitat Restoration

Period: July 1–December 31, 2014

Project Goal: To protect, enhance & restore functional, healthy & sustainable floodplain, channel & watershed process for purpose of protecting & restoring fisheries & aquatic species, Tucannon Basin.

Objectives: 1) Identify, design, implement, maintain effective fish habitat projects. 2) Select most beneficial partnerships towards attaining goals 3) Acquire additional supplemental funding 4) Identify and conduct strategic modes of operation and adaptive management to maximize potential for achieving project objectives 5) develop 2015 statement of work & budgets.

Project Inputs:	*Funding*	*2014 Budget*	*Staff*	*New 2014 Staff*
	BPA Accords & Programmatic	$225,000 Accord +$895,000 Programmatic	1 Bio 3	None
	Staff: Eric Hoverson			
	Collaborators: Tetra Tech, Kagey & Radebaugh Forestry, USFS, WDFW, Columbia Helicopters, Partney Construction, WWCC, SRSRB.			

Outputs (specific 6-mo task accomplishments):
- **Increased # of pools from 58 to 167 (109)**
- **Increased channel length by 1,242 meters, primarily due to 3 new braids**
- **Increased habitat–type complexity index from 133 units to 258**
- **Increased undercut values from 20% to 46%**
- **Increased wood complexity index from 2.1 to 3.1**
- **Increased sinuosity from 1.26 to 1.65**
- **Increased River Complexity Index value from 3.78 to 9.88**

Outcomes: (broader results/changes from cumulative accomplishments)
- Assisted in the effort to reduce poaching of salmonids in the Tucannon Basin
- Enlightened resource managers of CTUIR First Foods & River Vision policies
- Dedicated $1,000,000 for restoration of 2 miles of the upper Tucannon River
- Work reviews and professional reputation strengthened via demonstration
- Improved riverine habitat complexity to benefit salmonids in project areas
- Enhanced riparian status & associated benefits to fish & wildlife
- Increased ESA-Listed salmonid carrying capacity, distribution and potential
- Increased most beneficial partnerships for CTUIR interests in Tucannon Basin
- Developed autonomous responsibility and leadership capability
- Expanded CTUIR presence and accomplishments in the Tucannon Basin
- Contribute measurable physical improvement of ESA salmonid habitat
- Address limiting factors of salmonid production in the Tucannon Basin

Impacts (work supports long-term progress towards):
- Contribute to achievement of healthy watersheds, CTUIR traditional use areas
- Promote CTUIR's First Foods & River Vision philosophical guidance policies
- Increase traditional First Food abundance, status & participation opportunity
- Contribution toward achievement of guidance documents recovery goals

Restored 2 miles of salmonid habitat, upper Tucannon River RM 46.75-48.1 & 49.45-50.1
Added 825 mature conifer trees and 500 boulders to improve salmonid habitat in treatment reach

The general objective sought by BPA for the time period 2008-2018 is to achieve a 17% improvement in physical habitat in the Tucannon Basin. This objective is to be a pooled effort in that it includes the efforts of all implementing entities involved with managing natural resources in the basin. The CTUIR comprises only a fraction of the handful of restoration entities in the basin. Results of CTUIR actions as they pertain to specific pre and post implementation metrics as physical and biological habitat categories are further analyzed and shown below in Figure 10. Results from one of the seven project sites (Tucannon River, RM 44) is not included in the chart as CTUIR was the project sponsor, but the Washington Department of Fisheries was responsible for data collection and analysis associated with the project.

Figure 10. Pre & post implementation results of physical and biological metrics 2009-2014

Physical habitat and biological response result summary for CTUIR habitat enhancement projects in the Tucannon River Basin, 2009-2014.
Aquatic Habitat Inventory methodolgy developed by Moore, Jones, 2006 was used to for habitat surveys.
Electrofishing was conducted to attain biological status of juvenile salmonids. Redd counts were conducted to tally adult spawning nest locations.

Location	RM	Pre # Hab units	Post # Hab units	Positive Improvement	Pre Wet Length	Post Wet Length	Positive Improvement	Pre Ave. Width	Post Ave. Width	Positive Improvement	Pre Ave. Depth	Post Ave. Depth	Positive Improvement
				# Hab units			Wet Chan L			Ave. Width			Ave. Depth
Tucannon River	47	133	258	94%	4057	5299	31%	n/a	n/a	n/a	0.31	0.31	0%
Pataha Creek	1	10	12	*20%*	163	163	*0%*	3.1	2.5	*24%*	0.26	0.31	*19%*
Pataha Creek	10	6	8	*33%*	105	105	0%	5.1	3.3	*35%*	0.17	0.31	*82%*
Russel Springs	0.5	19	50	*163%*	559	773	*38%*	1.0	2.0	*^100%*	0.09	0.27	*200%*
Hartsock Springs	1	7	16	*129%*	315	322	*2%*	2.6	1.1	*58%*	0.13	0.23	*70%*
Cummings Creek	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SUB-TOTAL/AVE		175	344	96%	5199	6561	26%	3.0	2.2	27%	0.19	0.29	53%

Location	RM	Pre Undercut	Post Undercut	Positive Improvement	Pre Erosion	Post Erosion	Positive Improvement	Pre Shade	Post Shade	Positive Improvement	Pre Wood Class	Post Wood Class	Positive Improvement
				Undercut			Erosion			Shade			Wood Class
Tucannon River	47	20	46	*142%*	n/a	n/a	n/a	n/a	n/a	n/a	2.1	3.1	*48%*
Pataha Creek	1	24	28	*17%*	29	0	**2800*%*	26	32	*23%*	1.0	2.4	*140%*
Pataha Creek	10	17	30	*76%*	43	6	*86%*	37	44	*19%*	1.0	2.6	*160%*
Russel Springs	0.5	35	41	*17%*	10	2	*80%*	39	46	*18%*	1.3	2.0	*54%*	
Hartsock Springs	1	29	43	*48%*	7	0	**600+%*	19	36	*89%*	1.1	2.1	*91%*
Cummings Creek	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.4	3.1	*121%*
SUB-TOTAL/AVE		25	37	48%	22	2	1000%	30	37	23%	1.3	2.6	100%

Location	RM	Pre # Wood Pieces	Post # Wood Pieces	Positive Improvement	Pre # Rootwads	Post # Rootwads	Positive Improvement	Pre Ave. Length	Post Ave. Length	Positive Improvement	Pre DBH	Post DBH	Positive Improvement
				# Wood Pieces			# Rootwads			Ave. Length			DBH
Tucannon River	47	375	1200	220%	75	625	633%	4.9	15.8	202%	0.27	0.38	41%
Pataha Creek	1	0	22	**2100+%*	0	20	**1900+%*	0	11.2	**1000+%*	0	0.48	**4700+%*
Pataha Creek	10	0	17	**1600+%*	0	15	**1400+%*	0	11.4	**1000+%*	0	0.41	**4000+%*
Russel Springs	0.5	18	156	*866%*	2	34	*1700%*	5.1	5.1	*0%*	0.19	0.27	*30%*
Hartsock Springs	1	2	22	*1000%*	0	3	**200+%*	3.0	4.0	*25%*	0.15	0.24	*60%*
Cummings Creek	3	23	81	*352%*	0	0	0%	7.9	12.2	*65%*	0.19	0.52	*174%*
SUB-TOTAL/AVE		418	1498	258%	77	697	805%	5.2	10.0	92%	0.20	0.38	90%

Location	RM	Pre STS # Redds	Post STS # Redds	Positive Improvement	Pre # Steelhead	Post # Steelhead	Positive Improvement	Pre # Chinook	Post # Chinook	Positive Improvement	Pre W:D Ratio	Post W:D Ratio	Positive Improvement
				# ST Redds			# ST			# CH			W:D Ratio
Tucannon River	47	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pataha Creek	1	0	2	*200%*	4	12	200%	0	0	0%	12	8	*33%*
Pataha Creek	10	0	4	*400%*	0	0	0%	0	0	0%	30	11	*173%*
Russel Springs	0.5	0	34	*3400%*	16	33**	106%	3	10	233%	11	7	*36%*
Hartsock Springs	1	0	12	*1200%*	3	8	167%	4	6	50%	20	5	*300%*
Cummings Creek	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SUB-TOTAL/AVE		0	52	5200%	23	53	130%	7	16	129%	73	31	135%

*Calculated using smallest possible value within the same decimal range as post-project recorded value of metric

^Objective was to increase wetted channel width due to increased flows

Orange highlighted areas indicate where the objective of attaining at least a 17% positive change was achieved at the specified project location

Green highlighted areas indicate where the objective of attaining at least a 17% positive change was achieved when expressed as average value for up to 5 project locations combined

Red Font indicates the specific habitat metric where at least a 17% increase was achieved when expressed as a cumulative total for all sites affixed with a determined value when compairing pre project status versus post implementation status.

n/a indicates when data was not available for compairative analysis.

It is theorized with a high degree of confidence that that the goal of 17% would be achieved in all biological catagories if repeat fish surveys were to be conducted based on visual observation of substantial increases in juvenile fish inhabitance in subsequent years following project implementation.

**One bull trout, 124mm was captured

Project accomplishments were highlighted by presenting orally or as posters in a variety of forums in three states during the 2013-2014 reporting period. The most noteworthy accomplishment entailed successful navigation through the Independent Scientific Review Panel process in 2013 and being recommended to receive project funding into 2018. An example of presentation content from poster and oral forums are shown below in Figures 11 and 12.

Figure 11. Poster content presented at Salmon Restoration Conferences

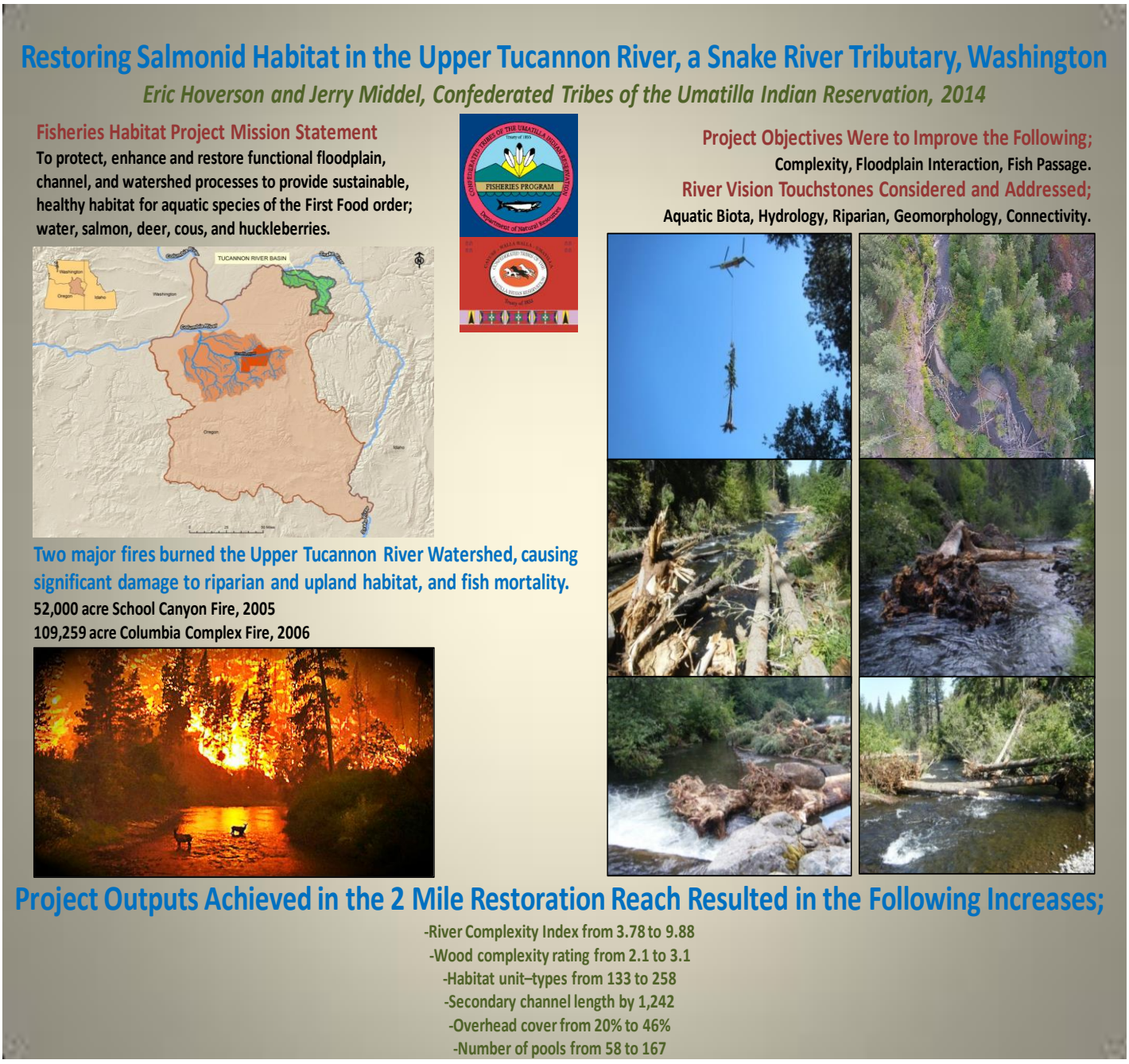


Figure 12. Oral presentation content presented at Salmon Restoration Conferences

Using Helicopters to Improve Salmonid Habitat in a Snake River Tributary

Eric D. Hoverson, Habitat Project Leader

Confederated Tribes of the Umatilla Indian Reservation Fisheries Habitat Program

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Natural Resources (DNR) adopted a First Foods mission to protect, restore, and enhance water and food resources in response to community cultural values and practices. A subsequent River Vision was developed to acknowledge the specific requirements of Columbia River tributaries and aquatic First Foods, and systematically guide restoration process towards preserving and reinvigorating such staples. These internal priorities and protocols ensure that the Tribal community can continue practicing and preserving valued traditions of CTUIR culture by means of clean water and habitat suitable for salmonids.

Degraded habitat conditions in the Tucannon River Basin, a tributary to the Snake River in southeast Washington, hydrologic code 17060107, have contributed to a decline in salmonid abundance from historical levels. Reduction of habitat is primarily due to anthropogenic changes and impacts associated with catastrophic fires that burned 150,000 acres in the watershed during 2005-06. These impacts have resulted in simplified aquatic habitat and decreased efficiency of ground and surface water interactions.

A variety of habitat monitoring techniques and habitat assessments were used to determine existing conditions, identify factors limiting salmonid abundance and select priority areas for restoration. Primary objectives of the project were to improve habitat complexity, reconnect the floodplain and rectify fish passage. Proper riverine function was sought with naturally appearing aesthetics to reflect preferences of Tribal philosophy in regard to processes associated with First Foods production and River Vision management. To achieve this, helicopters in combination with track hoes were utilized to place 825 trees and 500 boulders into the stream channel and riparian area to address factors limiting salmon production in a two-mile reach of the upper Tucannon River during July and August, 2014.

Helicopters are an effective means of incorporating whole trees into river channels to improve salmonid habitat complexity. Benefits of placing mature trees via aerial application are; increased capability to access isolated source materials, precise placement into remote areas, reduced disturbance and preservation of riparian and riverine features towards accelerated healing, and capability to transport large trees with full crowns. Combining aerial application with various ground refining techniques is an effective means of addressing habitat deficiencies and achieving ultimate project success.

Restoration of the two-mile restoration project resulted in increases of the following; pools from 58 to 167, channel length by 1,242 meters, habitat–type complexity index from 133 units to 258, undercut values from 20% to 46%, wood complexity index from 2.1 to 3.1, river complexity index from 3.78 to 9.88.

Landowner cooperation and multi-agency coordination were important determinants of the restoration strategy selected. Technique applicability, proper implementation, attention to detail, and adaptive management ultimately determined project success. Pre and post implementation monitoring will document the degree of achievement in regard to meeting a primary objective of improving physical habitat conditions in the Tucannon Basin by 17% over a 10 year period and will determine if project outcomes contribute towards positive CTUIR community impacts, including fisheries recovery and resource utilization.

REPORTING OF PROJECT ACTIONS BASED UPON BPA PISCES STATEMENT OF WORK DELIVERABLES; DESCRIPTIONS AND RESULTS

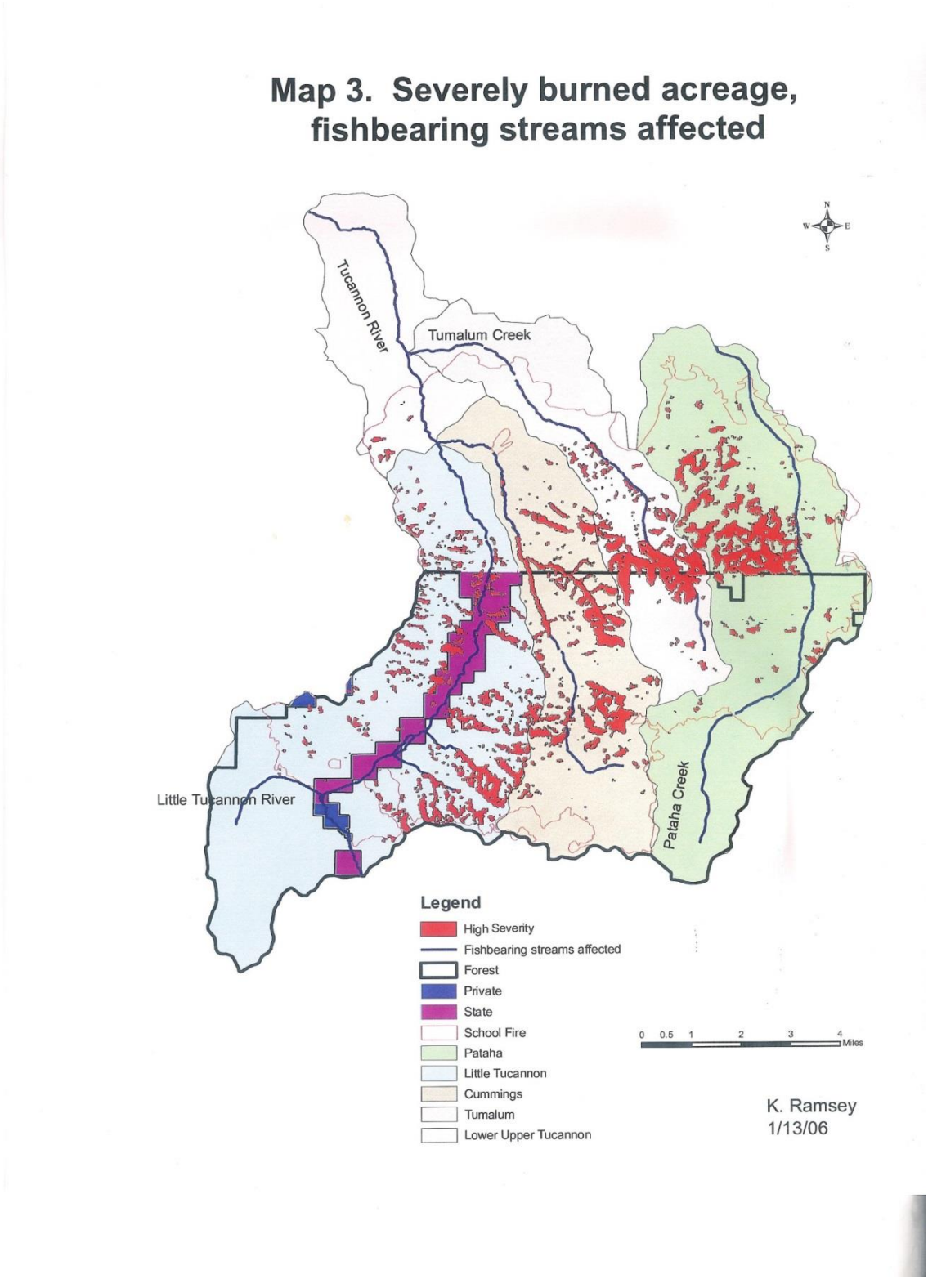
Work elements and identifier codes assigned by the BPA Division of Fish and Wildlife as displayed in PISCES are presented in the following section. The work elements and milestone descriptions provide a comprehensive view of FY2009-2012 TFHP work activities.

29: Increase In-stream Habitat Complexity

Human activities in the Tucannon River subbasin have transformed the river from a branching channel with a connected, diverse riparian zone, to a moderately incised and confined single-thread channel with a degraded and disconnected riparian zone. These impacts have resulted in severely reduced in-stream habitat complexity, pool frequency, and floodplain connectivity, which limits adequate spawning and rearing habitat for the ESA-Llisted species. Additionally, much of the surrounding watershed burned in the School Canyon Fire from August 5-19, 2005 which impacted over 52,000 acres of forest and riparian areas along the Tucannon River. Some of the most severe fire damage occurred throughout the the Hixon Canyon area, located in prime spring chinook salmon habitat, in the upper Tucannon River Watershed near RM 45.

The School Fire was the largest fire reported in the lower 48 states during the summer of 2005, and burned a substantial quantity of valuable riverine riparian habitat, important to salmonids (Figure 13).

Figure 13. Map of 2005 School Canyon Fire & burn severity classification (Ramsey, USFS)



The USFS provided the following description of the phenomenon as it pertained to the details of the fire: “One hundred and nine cabins and 106 outbuildings were destroyed. The conditions prior to the fire were volatile based on a dry winter with below-average snowpack, followed by an unusually wet spring, resulting in a healthy crop of grass. The wet spring was superseded by a hot, dry summer, and by August, fire danger had reached extreme levels only seen about once every 20 years. The trees shot burning embers hundreds of feet into the air, which the wind caught and deposited as much as half a mile away. The wind-borne embers created their own spot fires where they landed. Experienced firefighters reported flames as high as 75 feet in the grass and up to 200 feet in trees. Smoke rose to 15,000 feet and was visible as far away as Spokane, 120 miles to the north. 1,600 firefighters were on the scene. Their efforts were impeded by the area's rugged terrain of steep mountain slopes made tactful mobilization difficult. The canyons enhanced phenomena known as plume activity as when smoke billows high, builds and builds, and then collapses on itself. The (downward) rushing cloud sends fire-fanning winds down canyons and ridges."

A decade later, effects from the School Canyon fire on the adjacent hillslopes is still very apparent as illustrated in Figure 14. To facilitate recovery, CTUIR selected project sites within the fire footprint area, and implemented restoration efforts during the summer of 2014. Whole trees were placed into the river channel to mitigate for losses of LWD that had resulted from the fire.

Figure 14. Tucannon River, RM 45, 2005 School Canyon fire, Hixon Canyon uplands, 2015

The riparian vegetation has also been very slow to respond from the detrimental effects of the 2005 fire as shown in Figure 15. The fire's origin was traced to a dead pine tree falling over power lines, causing the lines to arc and send sparks to the ground (similar scenerio shown in Figure 16). The powerline serves only two customers, a lightly-used single dwelling owned by the USFS and numerous structures associated with the Camp Wooten Environmental Learning Center.

Figure 15. Tucannon River, School Canyon fire damage, and powerline, source of the blaze

Figure 16. A similar scenerio (tree contact with powerline) caused School Canyon fire, 2005

To reduce risk of future fires, preventative trimming and removal of trees near power lines is now standard practice. Considerable effort to remove timber near the powerline is now emphasized and conducted by Rural Electrical Association (Figure 17). This practice has significant effect on the recovery potential and overall health of the river and riparian area because the 14,000-volt power lines run in close proximity to the channel. Based on the potential repeatability of another wildfire and detrimental effects from maintaining the powerline alley, there is merit behind recommending that the powerline be buried, or electrical service be discontinued entirely and replaced by an alternative power source be considered to serve small customer base.

Figure 17. Extensive clearing of vegetation near powerlines stagnates riparian recovery

Additional fires were the Columbia Complex Fire, which was caused by a lightening strike on August 22 and ignited until September 30, 2006 after burning 110,000 acres. The Hubbard fire burned 11,500 acres until being extinguished on August 29, 2010. Despite the devastating magnitude of the fires, fine sediment budgets from this source yielded only 3% of the total input to the Tucannon River, whereas channel incision was identified as the dominant source, contributing 49% of the total, followed by channel migration (23%) . The Tucannon River offers significant potential for improvement of ESA-Listed salmonid species population recovery if in-stream habitat and floodplain conditions are improved from the current state of detriment caused by wildfires.

PROJECT DESCRIPTION & SUMMARY:

Tucannon River, Camp Wooten to Panjab Bridge (RM 46.75-48.10 & 49.65-50.10)

Ctuir's Tucannon River, Wooten to Panjab salmonid habitat restoration project was a cooperative effort with the USFS that occurred on the Wooten Wildlife Area, Columbia County, WA during the summer of 2014. In-stream habitat enhancement activities occurred on 2.1 miles of stream length. Project boundaries were spilt into project areas 1 & 3 and seperated by a private parcel that was not part of the project. Project area 1 boundaries extended from the upstream extent of the Camp Wooten Environmental Learning Center for 1.35 miles to the confluence with Little Tucannon River (¼ mile downstream from Cow Camp Bridge). Project area 3 extended from Panjab Bridge, downstream 2/3 of a mile. The treatment area is located within WRIA 35, approximately 17 miles south east of Dayton, in Columbia County, WA. GPS coordinates are 46.14191/ -117.42059 to 46.228451/ -117.722497. The HUC is 17060107. A Temporary Use Permit/Right of Entry was granted by the State of WA on February 4. In January 2014, an amended, more inclusive SEPA determination granted CTUIR permission to implement and conduct monitoring actions at the proposed project site. A JARPA/HPA permit was submitted by CTUIR in December, 2013. Figures 18 & 19 show the project vicinity.

Figure 18. General location of CTUIR's Wooten to Panjab habitat restoration project

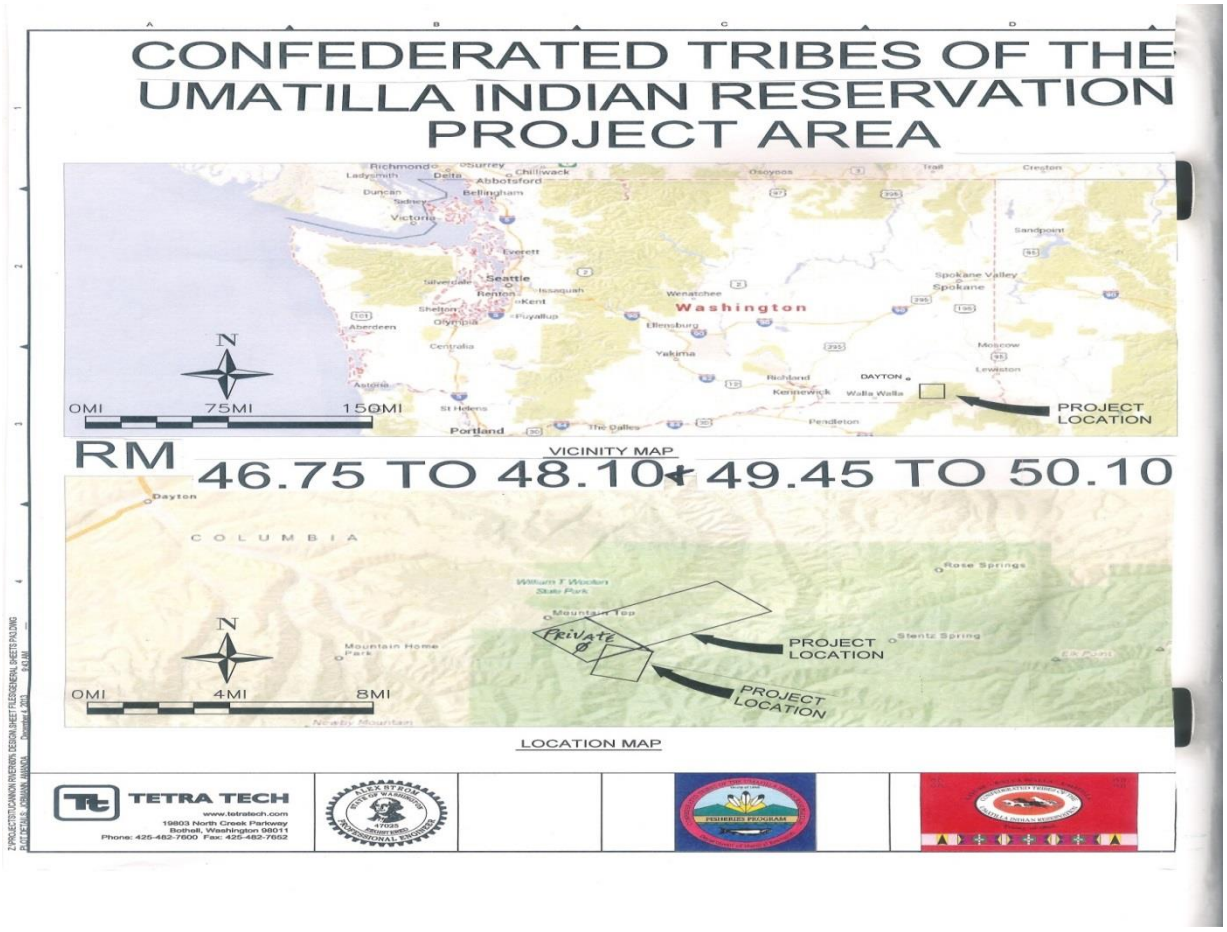
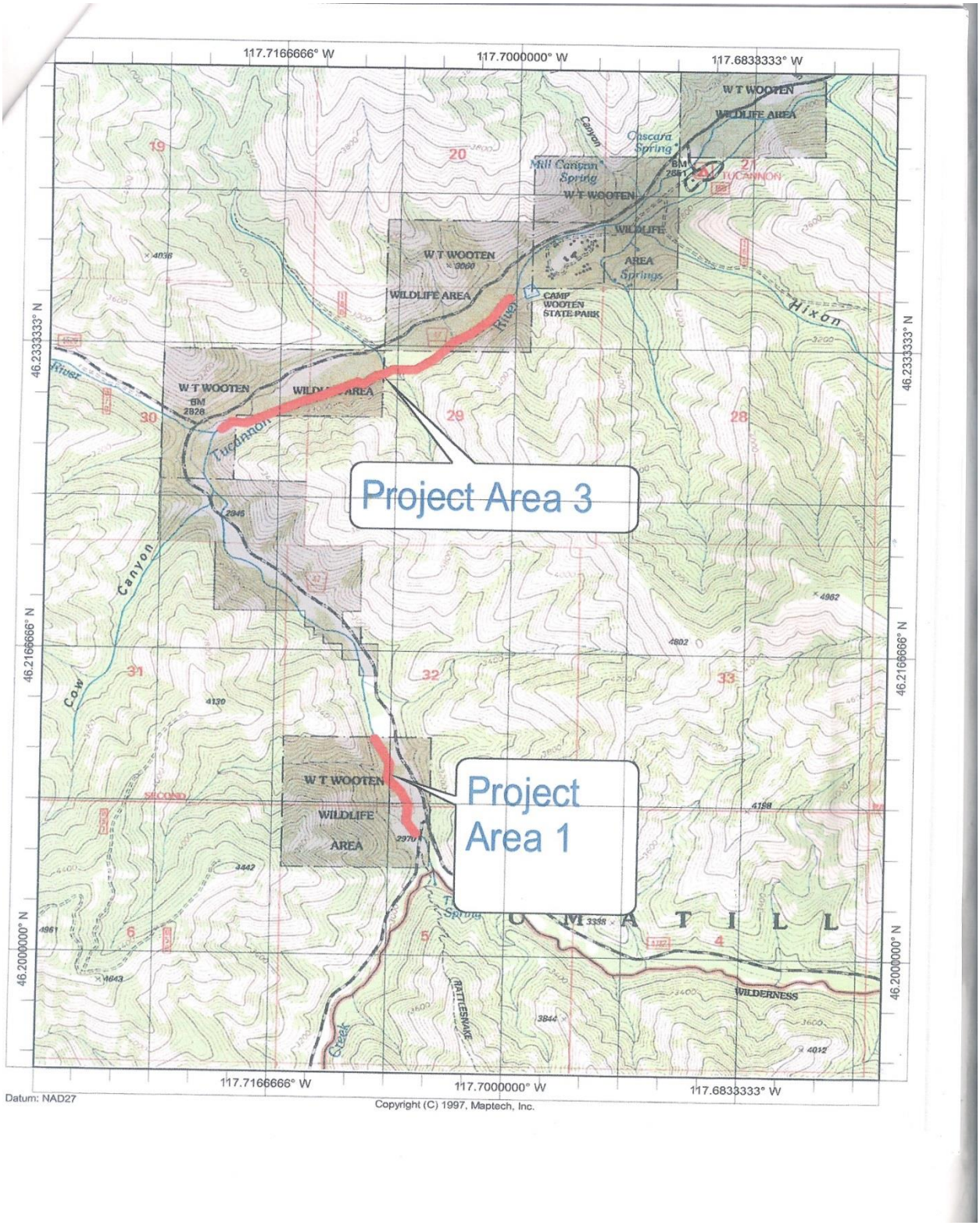


Figure 19. Specific location of CTUIR's Wooten to Panjab habitat restoration project



Riparian conditions in the the treatment reach are comprised of regenerated Fir with sparce, mature Ponderosa Pine and Cottonwood protrusions throughout and an understory comprised of alder adjacent to the river with tertiary levels of willow species. Upland grasses form a mass of near complete coverage of the riparian floor. Areas devoid of tree growth are intermittently spaced within the project area due to; tree harvest, construction of roadways and campsites, perched terraces above water table and reduction of groundwater to surface water exchange due to straightening, earth fill, levees etc. Current public recreational activities are prevalint in the area and comprised of camping, hunting, fishing and hiking. Public participation is projected to increase and overall enjoyment and experience of partaking in such activities improved due to project actions.

Justification for project actions was prompted by significant impacts to both in-channel and riparian habitat in the treatment reach. Designs were formulated based on extensive professional studies in the discipline of hydrology, fluvial geomorphology and aquatic/riparian assessment. Results guided restoration strategies selected and were reflected within project design development. Assessment results identified three main habitat concerns to focus restoration actions upon: lack of habitat complexity, loss of floodplain connection & secondary channels, and fish passage. An implementation plan was devised to address deficiencies of habitat attributes in the treatment reach.

CTUIR was assigned as the lead sponsor of the project due to having the most experience related to aerial application of LWD. Final designs incorporated theoretical determination of the most effective measures for protecting existing habitat features and approaching optimal riverine function while addressing deficiencies and limiting facors of salmonid production. Site specific decisions were made in regard to selecting type of wood configuration and method of implementation to be used.

CTUIR internally produced preliminary project designs to guide and promote directional development of final designs, of which were completed by Tetra Tech (Figures 20-22). CTUIR continued to provide technical review and input during the design process and field support prior to and during project construction. The project was completed in 3 phases: pre-project preparation in riparian area, in stream implementation; and post project detailing. A well-planned and orchestrated effort involving simultaneous treatment by multiple crews in several areas using a variety of treatment strategies allowed successful completion of project tasks within designated work windows.

Figure 20. Initial design overview completed internally by Hoverson and Middel, CTUIR

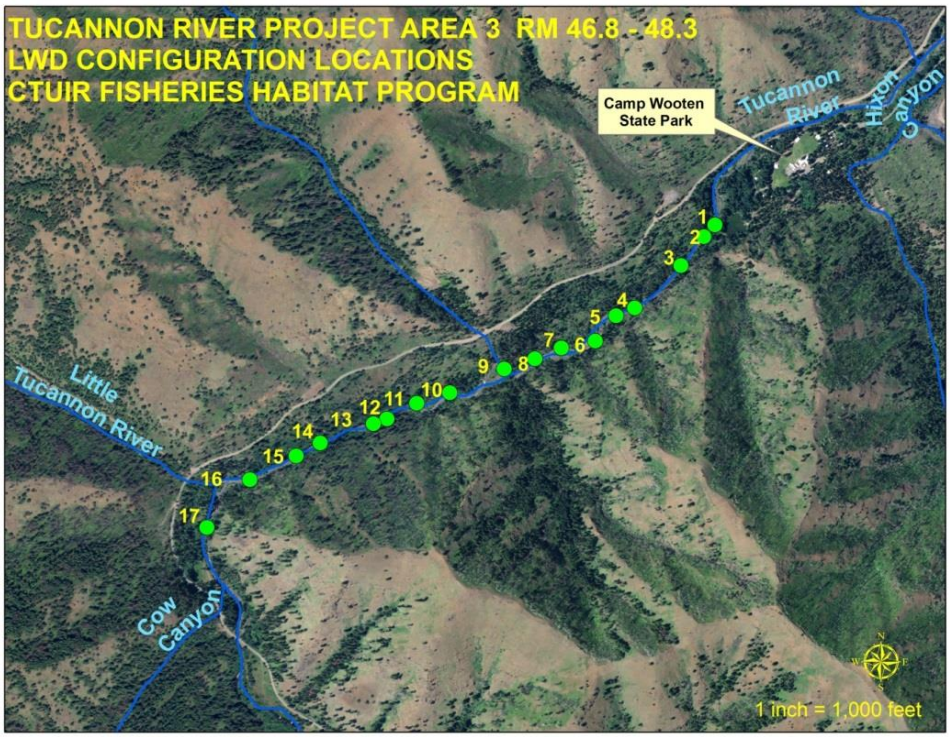


Figure 21. Initial LWD configuration designs completed by Hoverson and Middel, CTUIR

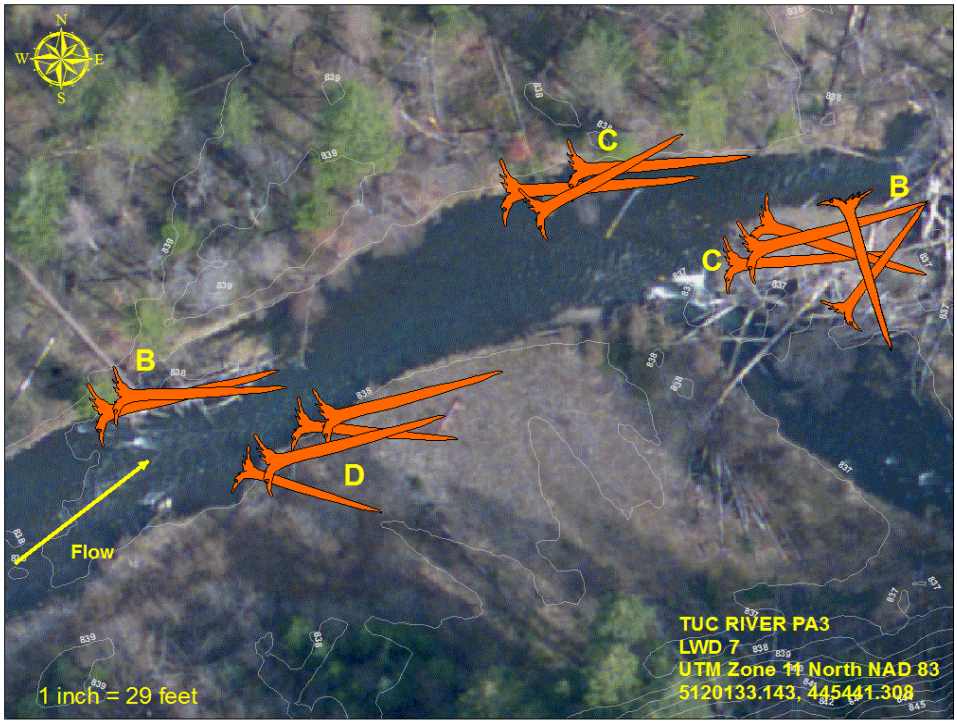


Figure 22. Final designs completed by Tetra Tech Inc.

The primary delinquency in regard to habitat complexity was the lack of quantity of wood in the channel. Therefore the strategy to improve habitat for ESA-Listed fishes was to incorporate trees into the channel primarily by helicopter to minimize the footprint of disturbance, and to retain critical length and complexity of whole trees. Tree sources were derived from two sources; 1) the USFS provided dead, blown-down coniferous trees from exposed ridges and timber harvest areas of USFS land, 2) a private source of live conifers that were removed as part of a timber stand improvement and fire reduction effort. Trees were transported from ridgetop properties approximately 1-3 miles from placement destinations using a Vertol 107 as modified by Columbia Helicopters Inc. Whole trees up to 110' in length and 25" DBH were successfully transported from staging areas and placed instream. Lift capasity at 3,500 feet elevation and 90 degree weather was rated at 9,000 pounds. Refinement and solidification of helicopter placed trees was necessary by ground equipment at the most downstream extent of the project areas to strengthen ELJ capabilities and protect infrastructure.

Some wood placement was conducted in strategic areas by ground equipment where good accessibility was observed and minimal disturbance was possible. Minimalization of vegetative disturbance was of paramount importance therfore extensive planning and surveying determined the least intrusive path to the treatment site. Open alleys in regard to vegetation-voids were exploited opportunistically as route-determinants to reduce impacts. A portion of downed trees or unhealthy trees were salvaged from entrace routes and placed on streambanks near the river. Track hoes were used in the construction of ELJ's with high catchment capability for trapping mobile LWD and smaller flotsam and jetsam to promote long term establishment of structures and retention of fine substrates for improved riverine process through rebuilding of channel features passively. Supplemental boulders were placed in strategic areas to provide ballast as well as roughness and diversity. The more elaborate ELJ's were constructed with track hoes and located at the most downstream end to capture and debris that migrated to that point to protect infrastructure downstream. Partney Construction implemented restoration actions from the ground.

Whole trees were strategically-placed into areas of need identified during prior survey work and as identified in final design plans. Material placement strategies ranged from simple configurations to complex jams to provide diversity, site-specific function and biomimcry of natural conditions. Wood configuration structures ranged from single to complex structures comprised of up to with 30 trees. The individual structures were designed to increase channel and habitat complexity, encourage channel aggradation to increase surface water elevations and to reconnect the river and floodplain, and activate secondary channels when possible to improve channel length and sinuosity. A total of 825 whole trees and 500 boulders (2-3') were placed in the treatment reach.

The overall goal of this fisheries habitat restoration and enhancement project is to improve conditions for ESA Listed salmonids classified as Threatened in the Tucannon Basin. Specific objectives of the project are to improve habitat complexity, floodplain connectivity and migratory passage.The oproject area is identified as a primary area of importance in regard to historic and potential suitability for Snake River Spring Chinook Salmon. Other Esa-Listed species that benefit from the project are; Snake River Fall Chinook Salmon, Columbia River Bull Trout, and Snake River Steelhead Trout.

River Vision Goals

- Hydrology: Increased sinuosity, channel complexity and stream gradient
- Connectivity: Increased secondary channels, passage improvement at RM 49.7, 50.0, 50.1, widening of active floodplain
- Geomorphology: Addition of LWD and boulder habitat, bank shaping
- Riparian Vegetation: Promote natural recruitment via sediment retention/seed capture, plant sapling and whips, seed-in native grass
- Aquatic Biota: spring chinook salmon spawning & rearing, steelhead/rainbow/bull trout spawning and rearing, whitefish, mussel & lamprey suitability

Protective Measures at Camp Wooten

Anthropogenic changes such as channelization and diking have reduced connection between the river and floodplain as reflected in vegetative growth patterns and the presence of levees and remnant secondary channels now void of flows. A common practice during the 1964 flood era was to “clean” out the channel, which significantly reduced in-stream complexity features, particularly in the Camp Wooten area.

Camp Wooten was constructed in the 1930’s with the intent of being close distance from the river in the days where river science was in the infancy of development and helpful tools such as various aspects of visual imagery technology had not yet been developed. Therefore, the Camp was developed in the floodplain and the river was forcefully moved to accommodate the presence of human infrastructure as it settled between the Camp and newly constructed roadway, leaving very little room for natural sinuosity as means of properly distributing energy. Since inception, there is ongoing evidence that a harmonic balance has not been achieved between the river and camp. Achieving proper riverine function as they relate to the restrictive paramenters as of Camp Wooten are complicated and challenging because of the unique effect they have on the environment of the uppe tucannon River. Project designs were intended to improve natural riverine processes, despite the challenging parameters as dictated by the firm establishment of effects from Camp Wooten.

Project designs were developed with the intent to address and improve deficiencies such as erosive potential, elevated temperatures of effluent, and flooding risks associated with Donnie Lake. Lake and trail components both show inundation during 10 year flood events in hydraulic

modelling simulation. Adding deflecting configurations made of large woody debris and supplemented with boulder ballast anchoring techniques where needed, shall improve armoring and insulation capabilities associated with elevated water levels. Additionally, in-stream restoration designs in the adjacent main stem upstream from the lake were produced with the intent of discouraging the encroachment of the main stem and braided Tucannon River upon the vulnerable earthen strip of land that separates the water bodies. River flows was discouraged from excessive erosional sheer stress forces on the prone earthen levee, reducing the potential for breach as the river is essentially steered away from the lake and the riparian components are strengthened with backbone structures as additional protection.

Protective ELJ's were constructed of partially buried, large, whole trees with a backbone of large, ballast boulders and accentuated with river substrate and course woody debris to protect private parcels as well as Donnie Lake, hiking trails, campgrounds, roadways, and dwellings. In addition, some trees were threaded between standing trees in the riparian area at strategic locations to ensure they remain in place during high flow regimes. ELJ structures were effective at enhancing riverine function as well as providing excellent hiding cover for salmonids.

The ELJ's provided organic strongholds, functioning both as catchment and deflector structures by reducing sheer stress and erosive potential of streambanks. ELJ structures provided safeguards and insulation capabilities associated with bouyancy and migrative potential of wood during elevated water levels. Additionally, in-stream restoration designs in the adjacent main stem upstream from areas of notable concern were devised with the intent of discouraging the encroachment of the waterway.

A particularily challenging aspect of the project was to address potential flood risk to campgrounds that were determined to be managerial fixtures of the landscape, despite showing inundation during 10 year flood events in hydraulic modelling simulation. Best protective measures were implemented when working around embedded infrastructure. Improved status in regard to flood resiliance accompanied project objectives as they related to fish habitat improvement.

LWD treatments were intermittently spaced throughout the reach. Tree sourcing was derived from blown down, dead coniferous trees from USFS lands and live trees purchased from a neighboring private parcel. Most trees were located in areas adjacent to the fire footprint or near areas that were recently harvested for timber sales. Both circumstances were responsible for increased wind exposure and subsequent failure of the tree to remain upright. Consideration was focused on selecting trees with limited value to wildlife upon making decisions for selecting trees for treatment.

In the Tucannon Basin, isolated pool habitat has been reduced to a fraction of historic abundance. Therefore reconnecting and restoring off channel habitat was deemed a high priority by reinvigorating degraded habitat features to benefit salmonids at a multitude of to all life stages. A primary objective was to reconnect and enhance habitat diversity in unique habitats that had become isolated from the Tucannon River due to levees or earthen fill. Complexity features were added throughout the braided channels when working in the dry. Upon completion, channel reshaping was conducted at the inlets of secondary channels to create an access point for water to re-enter the historic channels. Excavation of small areas at the intake was necessary in some areas to reinvigorate flows into archaic channels. This was done with minimal disturbance with the intent that braided channel networks would be immediately suitable for salmonid inhabitation and represented a net gain relative to pre-existing habitat quality ratings. The creation of backwater pool habitat was accomplished to attract influx of fishes from the adjacent, fast-flowing main stem. The resulting pool provides improved access for salmonids into braided areas for spawning, rearing and winter refuge habitat. Winter habitat and off channel rearing opportunities are two major limiting factors for ESA-Listed salmonids in the Tucannon Basin, and have been identified as high priorities under the Snake River Salmon Recovery Plan**.** ELJ configurations were constructed near secondary channel intakes to assist flow regulation by steering desired flow proportions. These actions increased the River Complexity Index by two-fold, which is calculated as sinuosity x (1+#braids). The project created or enhanced 5 secondary channels with total length of 1,242 meters. This addressed the limited off-channel habitat constraint identified in the Tucannon basin as a factor responsible for reducing salmonid populations. Secondary channels also were advantageous in regard to establishing improved floodplain reconnection.

The cost of the 2 mile restoration project was approximately $1,000,000. Funds were derived though BPA through the Accords and Programmatic agreements. The changes to physical habitat features and improved riverine function are projected to translate into biological improvements in regard to fish populations. The project outcome was very well-received by public and professional entities in the region. The wide array of project conditions, restoration techniques and results are illustrated in Figures 24-27.

Figure 24. Pre restoration conditions, Tucannon River; Wooten to Panjab reach

Historical condition a Camp Wooten, 1960's

Adjacent hillslopes burned, upper Tucannon R

Watershed overview, Wooten restoration reach

Angling not legal in upper restoration area

Additional signs posted due to poaching evidence

Typical expansive fast water habitat, Wooten

	
Lengthy riffle, downstream from Panjab Bridge	Overall lack of complexity, RM 47-50
	
Cross vane, passage concern, Panjab Bridge	Looking downstream from Panjab Bridge
	
Channel spanning log passage concern, Panjab	Third passage concern; channel spanning log

	
40” DBH Pine tree on hillslope	14’ boulder originated from under 40” pine tree

Figure 25. Implementation phase, Tucannon River; Wooten to Panjab reach

	
Relocating 14’ boulder from bank to mid-channel	40’ pine tree relocated from hill to channel
	
Combining 14’ boulder and 40” Pine tree	Much emphasis on turbidity control via. isolation

Preparation of whole root wads; intact and clean

Staging of whole trees for transport by helicopter

Modified Vertol 107, Columbia helicopters

Air transport of whole, green trees

Figure 26. Overview; habitat complexity

Diversification of whole tree configurations

Aggressively placed root wads; pool formation

Overhead cover, bank protection and apex jam	14’ boulder and 40’ DBH pine tree placement
	
ELJ deflector and linear whole tree configuration	Channel spanning, bank-lining, whole green trees
	
ELJ designed to capture mobile woody debris	Panjab area; diversity and complexity techniques
	
Windfall tree source wood loading, Wooten reach	Aggressive, mid-channel placement; whole trees

Nutrient loading and juvenile salmonid cover

Undercut created using existing & imported wood

Green tops placed in channel for juvenile cover

Converting a rapid to a series of pools

Undisturbed riparian due to helicopter placement

Using existing dead trees as pillars to hold LWD

Capitalized on slope-breaks to create lateral pools

Natural aesthetic philosophy for LWD loading

Trees perpendicular to thalweg to promote pools

Addressing instream wood deficiency

Promoting slow water habitat and aggradation

Lesser quality trees used for bank formation

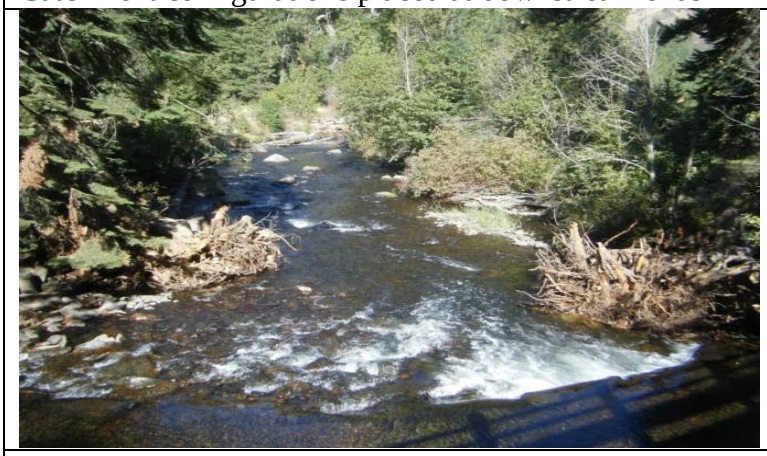
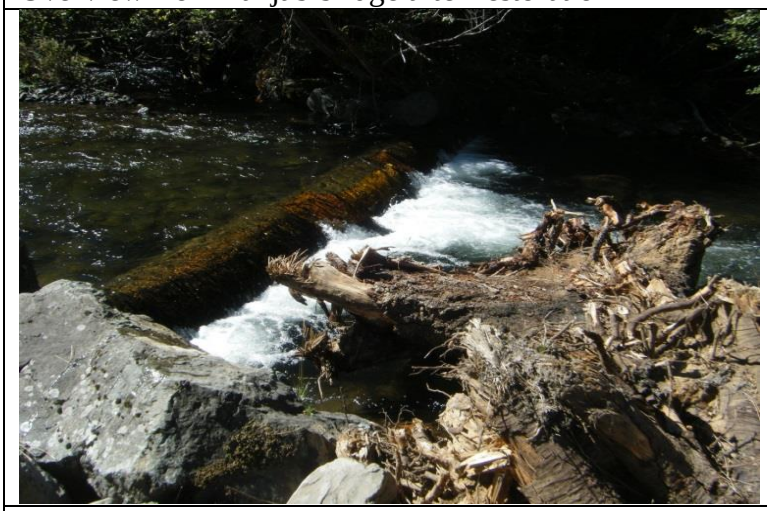
Cross channel trees converted rapid to pool

Spanning configuration activates during high flow

Boulder placement; create pocket water diversity

Stream bank ELJ to protect Wooten infrastructure

Figure 27. Fish passage & floodplain activation, Tucannon River; Wooten to Panjab

	
Catchment configurations placed at downstream ends	Roughened channel and notched cross vane
	
Overview from Panjab bridge after restoration	Passage concern #2; step height compliance
	
Deep scour pool created by constriction, passage rectified	Root wads and tail out ELJ to rectify passage

	
ELJ deflector and apex jam to create braided channel	Additional bank protection near braid inlet
	
Overhead cover provided by undercut bank simulation	Appearance of braid mimics natural channel
	
Extended apex to promote split channel wishbone	Slow activation of secondary channel, reduces silt

Deflector diverts flow away from logging road

Formerly dry channel now inhabitable for salmonids

Inundation of formerly intermittent channel

Floodplain activation achieved

Preventative measures to minimize turbidity such as; site isolation and working in the "dry" were an effective means of adhering to permit guidelines and staying within recommended compliance levels for sedimentation. Temporarily diverting or pumping water using generators away from the implementation area was effective at dispersing silt laden waters onto riparian banks away from the wetted channel. This method adds nutrients and moisture to riparian areas to help facilitate regeneration of vegetative components.

Considerable time was spent on attention to details in regard to minimizing construction scars upon exiting the site. Staging areas and the temporary access routes were reclaimed by extensive decommissioning. Areas disturbed by construction were tilled to relieve compaction and promote natural regeneration. Dozens of trees were set across roadways in the riparian area to promote accelerated healing by decreasing access, which ultimately equates to vegetative growth recovery stagnation (Figure 28). To further promote healing and provide natural aesthetics, native grass seed and coniferous saplings were provided by the USFS and utilized at areas of disturbance. Future plans call for willow whips will be planted along the river's edge throughout the treatment reach where any voids are observed and supplemental plantings are warranted.

Riparian vegetation will provide increased stream shade and cover and will provide a source for nutrients and food base for salmonids.

Figure 28. Decommissioned roadway detail, following implementation, recovery promotion

47: Plant Vegetation

Objectives;

-Establish multi-tiered levels of preferred vegetative species within project riparian areas.
-Achieving a self-sustaining mosaic of vegetative growth in riparian transects adjacent to project areas using species that meet plant hardiness criteria for the Eastern Washington Regional zone of the Pacific Northwest.

-Establishment of multiple levels of canopy height and ground cover using native species with demonstrated survival success and resilience to immediate threats at project site locations to provide stream shading, soil retention capability, filtering, overhead cover, long term recruitment of LWD, organic exchange of matter to essential trophic levels of biotic components as required to sustain healthy populations of ESA-Listed salmonids.

Planting tasks include site planning and development of planting strategies, collection and preparation of materials (pruning and conditioning of live whip material), pre-order coordination with the CTUIR 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. Maintenance of vegetation involves watering, trimming and weeding around plantings. Weeds are physically pulled to improve survival and avoid chemical use. An important aspect of establishing vegetation is the maintenance of structural integrity of riparian enclosure and livestock fencing at project sites. Supplementing riparian areas of existing and new projects with additional vegetation is part of the TFHP's riparian establishment protocol. Maintenance is performed by physically pulling weeds, rather than opting to use herbicides. Tree survival is enhanced by watering and weeding. Supplemental plantings were conducted as necessary to establish a desired level of riparian growth. From 2009 through 2014 CTUIR conducted planting projects at five project locations (Table 3).

Table 3. 2009-2014 Vegetation Plantings at CTUIR habitat restoration project sites

Water Body	**RM**	**Pounds Grass Seed**	**Tree Plantings**
Russel Springs	0.3	100	600 Willow, 200 Alder, 100 Birch, 100 Elderberry, 100 Cottonwood.
Hartsock Springs	0.5	100	500 Willow, 100 Alder, 100 River Birch.
Pataha Creek	1.0	500	900 Willow, 650 Alder, 125 River Birch, 25 Cottonwood.
Pataha Creek	10.0	300	400 Willow, 400 Alder, 100 River Birch.
Tucannon River	48.0	500	100 Tamarack, 100 Ponderosa Pine
TOTAL		**1,500**	**4,600**

99: Outreach and Education

CTUIR is firmly established as a partner with Walla Walla Community College (WWCC). WWCC was awarded top community college in the nation in 2013. CTUIR was instrumental in funding and planning the continued development of the WWCC Water and Environmental Center. Such a high quality partner is an asset to CTUIR and has contributed to restoration project success. The TFHP Project Leader also functions as an instructor at WWCC, teaching Watershed Process & Restoration 239. Content is comprised of restoration actions through CTUIR employment. College students are used as volunteers as well as paid technicians to improve appearance and function of BPA funded restoration projects in the Tucannon Basin. CTUIR also participates in WWCC Career Day to inform the public about program actions and in the recruitment and placement of employees associated with natural resources professions.

CTUIR in coordination with the WWCC Media Department produced a professional short film to promote the results of the 2014 Tucannon River Restoration Project. The film has received very favorable response from professional audiences in the Pacific Northwest region and acclaim for BPA project sponsorship. The nine minute short film can be accessed on You Tube using the at the following private link URL address;
https://www.youtube.com/watch?v=wS5BLxZ-7Hg&feature=youtu.be

During the reporting period, project results have been promoted very effectively as educational films and in Power Point format for utilization for presentations in three states, in a variety of professional forums. Additional video footage was used to professionally illustrate improvements and conditions of restoration project sites and to monitor and document changes of project conditions over time.

114: Identify and Select Projects

Conduct project solicitation and prioritize projects based on their merit and benefit to salmon recovery. Submit recommended projects to BPA. Provide technical support to project sponsors throughout implementation. The CTUIR TFHP supported the development of the Tucannon River Geomorphic Assessment and Habitat Restoration Study performed in 2011, which prioritized potential projects. The TCC working group assisted in the selection of sponsors for the proposed restoration projects. Funding was then identified and dedicated from BPA sources and additional financial contributors.

The consistency with CTUIR's RV as well as natural geomorphic process criteria was applied. Natural geomorphic processes are the primary factor in creating and maintaining high quality habitat in properly functioning rivers and streams. Designing for geomorphic process or removing inhibitors to geomorphic processes are very important considerations in project prioritization. The sustainability and functionality of the project is highly dependent on

consistency with geomorphic processes, and it is the restoration of these processes that will create and maintain habitat features in the long term. The projects that will effectively address the rehabilitation of natural processes received the highest qualitative rating. Consistency with natural geomorphic processes were evaluated within the following categories (1) removes stressors that promote habitat degradation or inhibit natural channel and floodplain processes, (2) promotes reach-scale geomorphic response consistent with natural processes, (3) promotes the retention of LWD and sediment and forces pool-riffle morphology and complex channel plan form.

115: Produce Inventory or Assessment

CTUIR independently collected pre-project data for project effectiveness monitoring on the following: water temperature, aquatic habitat inventory, fish composition, abundance and spawning potential. Aquatic habitat methods developed by Oregon Department of Fish and Wildlife (Moore, 2002) were used to inventory aquatic and riparian habitat. This Aquatic Habitat Inventory methodology was selected due to compatibility with the pre-existing data set that covered 20 years of utilization of the method by the TFHP Project Leader in the Umatilla Basin, therefore offering opportunities for; comparability, determination of measurable change through time, and degree of magnitude. The TFHP was trained in this specific discipline in 1992 by the authors of the methodology and have since operated as not only an implementer of the method but as a professional instructor internally and externally to Fisheries specialists as well as at the college level, having trained 150 persons in the discipline and having 200 miles of riverine data within four basins located in the eastern, WA and OR region over 20 years. The results of the data have been dispersed to cooperating entities to benefit natural resource managerial decisions.

Field surveys were conducted by one to two persons walking upstream, dividing the stream into a series of individual habitat quadrats. Quads were identified as riffle, rapid, glide, scour pool, off-channel/sub-unit pool, and numbered sequentially. Dimensions of quadrats were determined primarily on distinct hydraulic features as defined in the methods. The following data was recorded for each quad; habitat type, latitude, longitude, mean length, wetted and high-flow width, depth, shade, canopy, wood rating, substrate composition, channel type, percent flow, land use, bank class, undercut bank, dominant and secondary vegetation. Blackberries and young deciduous growth were classified as shrub cover. Wood ratings were categorical and useful for quantifying the value of in-river woody debris habitat for fish. In addition, pieces of woody debris were tallied if they met minimum size requirements, and were located within the high water channel. Shade values were taken when standing in the middle of a classified habitat unit, while canopy estimates were made from each adjacent shoreline.

Additionally, Tetra Tech Inc. provided advanced inventories of habitat conditions at project sites during design development. Pre and post Aquatic Habitat Inventory results were analyzed and compared to determine progress of restoration activities, gage effectiveness, and determine

magnitude of physical change. The objective of physical habitat monitoring analysis is to illustrate progress toward or achievement of the 17% physical habitat improvement goal set by the BPA Accords agreement. Progress is determined by summarization of both the pre data and post data with subsequent comparisons between the two. Pre data was taken just prior to implementation. Post inventory was done within a year of the implementation for reporting purposes, but the real improvement will be most prominent when repeat surveys are conducted near the conclusion of the 10 year Accord period as adequate time is allowed for optimal response to restoration actions. Conscious effort to contribute to the achievement of meeting the goal of 17% improvement of physical habitat conditions steers enhancement activities. One example is the emphasis toward planting and replanting riparian vegetation until a desired level of preferred growth is achieved.

Pre (2013) and post (2014) habitat inventory surveys were conducted by CTUIR. Results from the surveys showed the following improvements; 94% increase in the number of habitat units (complexity index), 142% increase in undercut/overhead cover, 48% increase in wood classification as it pertains to fish habitat, 220% (825 trees) increase in the number of wood pieces, 633% increase in root wad abundance (550 root wads), 202% increase in tree length located in stream (4.9 meters to 15.8 M tree length) and a 41% increase in DBH (.27 to .38) and a 1,242 meter increase in wetted channel length, primarily due to the creation and enhancement of 5 secondary channels.

Repetitive photo point monitoring is conducted to show change over time to gage project effectiveness. Monitoring and maintenance on all projects implemented is ongoing. This vital aspect of project management is embraced due to the importance and effectiveness derived from such activity. Project effectiveness is maximized when adaptive management is utilized.

Protocol within the CTUIR TFHP recommends that a pre-implementation fish inventory and relocation be conducted to ensure the safety of fishes in areas vulnerable to implementation impacts. From such efforts, baseline data in regard to species composition and fish density estimates are attained. Certified electrofishing equipment and trained, experienced operators are utilized for capturing and moving fishes from implementation areas deemed potentially harmful. Fish capturing crews made as many passes as necessary in attempt to remove 100% of the fish from the work sites. This is done prior to complete dewatering when in the best interest of fish health. A crew of three to four three persons conducted fish surveys. Backpack electrofishing units manufactured by Smith Root Inc. were used to capture fish. All species were targeted and captured with dip nets. Captured fish were temporarily held in buckets, and then placed in a flow-through live well. Fish were counted, identified to species, measured and weighed. After examination, fish were released back into the river, upstream from the area of impact.

The CTUIR TFHP relies on biological data collection and analysisd through the CTUIR Fisheries Monitoring and Evaluation Program as well as several subcontracting firms. BPA project#2009-014-00 Biomonitoring of Fish Habitat Enhancement has been developed to investigate the effectiveness of habitat actions on anadromous fish populations. Information

gathered and reported through this project in combination with other outputs from the M&E Program have provided and will continue to provide important information to the Habitat Program for restoration action prioritization and development.

The CTUIR's Department of Information Technologies uses a data coordinator to safely preserve a significant amount of data for the CTUIR DNR programs. These data are available to project managers for developing restoration monitoring plans. This strategy will link project objectives with physical habitat metrics and monitoring methods that are consistent and accepted within the region. By developing a monitoring plan through this strategy, project specific data will be comparable across projects and subbasins. Monitoring information and results from individual plans will be used as adaptive management input for CTUIR projects and could be coordinated with other monitoring efforts. This effort shall make data sharing more probable and identify CTUIR as a professional source for data while preventing overlap or redundancy in regard to cooperating entities and the potential need for collecting data in co-managed basins.

119: Manage and Administer Projects – Produce Quarterly Status Reports to BPA Contracting Officer Technical Representative (COTR)

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 land budgets, and property inventory to the assigned BPA representative. The project leader reports milestone 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, subcontracting for services, and administers habitat enhancement activities.

2009-Setup satellite office at Walla Walla Community College
2009- 2014; Submitted property inventory to appropriate source using designated template.
2009- 2014; Produced Statement of Work with projected budget to COTR.
2009- 2014; CTUIR Admin. submitted budget accrual estimate to BPA.
2009- 2014; Completed accurate quarterly status reports accepted by COTR.

The TFHP has a only one staff member, of which is a biologist of whom has 25 years of related fisheries experience with emphasis on natural production monitoring techniques of salmonid populations as well asinstructional experience in regard to aquatic habitat inventory and restoration techniques. The baseline budget is funded through BPA and designated at 200K annually with a 5% annual increase added for each subsequent year. Supplemental dollars were acquired through other BPA funding opportunities offered within the CTUIR hierarchy. The TFHP is in essence a very young project. CTUIR did not have staff dedicated to work in the Tucannon Basin in the initial start-up period of 2008. It was not until August of 2009 that staff was hired to manage the TFHP. Therefore expenditures during the start-up period were limited

as expected and restoration project size followed the typical trend of starting small in the establishment years, followed by an increase in magnitude, level of project responsibility, and involvement over time. This scenario offers a direct relationship to the operational budget and accompanying expenditures. With CTUIR becoming more prominent in the Tucannon Basin and being more familiar with the characteristics of the watershed and the operational procedures, CTUIR possesses the capability to conduct actions effectively due to having a diverse and highly talented support staff. The TFHP achieved autonomy of operation while maintaining a cooperative spirit towards realizing common goals with stakeholder entities that comprise natural resource management in various Tucannon forums. Budget spending trends in initial years included higher expenditures towards non-capitol and materials for baseline, essential start up materials to build our establishment off of the Reservation, at the satellite location at WWCC. A salary spike was observed in Fiscal Year 2011 when an additional staff biologist was hired, but the position was eliminated in 2012 due to inadequate return on investment. Despite the return to one staff member, and plans to experience 5% annual increases to the base budget, the total budget amounts over the past few years have exceeded the forecasted base budget plus 5% amount, due to transferring available dollars in from other sources managed by CTUIR. The additional funds were justified based on rationale provided when requesting the funds and for displaying demonstrated effectiveness and feasibility when utilizing the additional dollars in achieving effective results.

Fluctuations in spending are related to project development and associated tasks. Budget variation is derived from two origins; alternate years dedicated for surveying, designing, permitting, planning etc., versus years earmarked for implementation as well as the distinct difference between reporting timelines between CTUIR's calendar year versus BPA's October 1 fiscal budget year. Therefore expenditures rise and fall and are reflective of both reality and a by-product of offset reporting timelines. To date the TFHP has participated in habitat enhancement projects of varying magnitude each year since the onset of staff employment in 2009. Project size and cost is highly variable and therefore a contributing factor to the spending fluctuation trend. As larger projects are explored and conducted over time, expectations of implementing annually decrease, especially when staff size is limited to one. Under this scenario, experience dictates a most reasonable approach that considers administrative preparatory tasks one year followed by implementation the following. A bi-product of being comprised of a one person staff dictates that prioritization of tasks become paramount in importance in regard to achieving objectives within allotted timeframes.

The TFHP strives to achieve a 100% positive rating as it relates to PiSCES reporting. Success in achieving 92.57% of tasks in a positive manner from 2009-2014 is considered an achievement knowing the extent of effort offered to achieve such a proportionately high rating.

W132: Produce Annual Progress Report

CTUIR submitted the comprehensive annual report of work activities for the time period 2009-2012 on March 31, 2013 and for 2013-2014 on March 18, 2015. Portions of the annual reports are completed at various stages of the project, and often utilized for reporting opportunities as they arise throughout the reporting period. Report segments are compiled and combined for assembly holistic annual report and typically follow the implementation phase of the project.

165: Complete Environmental Consultation Processes

Produce Environmental Documentation-Prepare Biological Assessments for Applicable Projects; Submit permits to State and Federal Entities; Cultural Resource Protection and Preservation CTUIR successfully submitted all applicable and required permitting documents to the appropriate federal, tribal, state, county entities for select implementation projects in a timely manner. 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.

CTUIR coordinated operations associated with the Wooten to Panjab restoration project with valued assistance from the Nez Perce Tribe as it pertained to cultural resource protection.

184: Install Fish Passage Structure

Key objectives of the barrier rectification aspect of the project included:

- Improve access for ESA-Listed salmonids to headwater areas and cool water refuges
- Increase the quantity and quality of accessible salmonid habitat
- Approach historical free-flowing migratory corridor through passage improvement
- Approach natural stream slope, function and appearance

- Improve connectivity for populations of listed salmonid species to improve genetic exchange/integrity to improving fitness and long term survival capability
- Increased salmonid population dynamics and carrying capacity of preferred species
- Fulfill tasks identified in restoration plans by addressing limiting factors
- Improve survival rates by reducing stressors on salmonids

Anthropogenic barriers and areas of passage concern to all degrees and life stages were addressed and brought into compliance with state step height standards at three locations within the two-mile long project area. Fish passage was a concern at three particular areas of the treatment reach. Step heights ranged from 11-18". High velocity flows added to migratory challenges at the locations. Conditions near existing cross vanes made of wood and rock were modified to reduce step-heights to comply with state criteria (<9.6") in regard to jump height. Notches were made into channel obstructions. Supplemental wood and rock was strategically placed downstream of the obstructions to reduce velocity, restore proper gradient and increase water depth to enhance the jump-pool at the outfall. The most upstream barrier was located at Panjab Bridge. This was significant because the waters upstream of the bridge are classified as Wilderness, and possess the Basin's most optimal habitat. The reach provides suitable spawning and rearing area, in addition to cold water refuge during the summer months.

The benefits of passage remedy will be realized exponentially when coupled with ongoing restoration efforts that are occurring upstream and in the immediate area. As conditions in the Tucannon Basin are improved further, we expect improvements in population and distribution of salmonid species.

185: Produce Pisces Status Reports and Periodic Status Reports for BPA

Quarterly Pisces reports were prepared, reviewed, and accepted by the BPA project COTR. These reports provide a regular update on project progress on status of work elements and associated milestones to allow adaptive management. Quarterly status reports have been habitually submitted in a timely manner, and typically contain additional details provided within the voluntarily comment-column to keep BPA personnel informed about ongoing details as they pertain to conduct of project deliverables held within the PISCES Statement of Work.

191: Watershed Coordination

2009, 2010; Initialized a cooperative agreement processes with WDFW.
2010; Investigated cooperatives with Nez Perce Tribe, USFS. CTUIR formed the TCC.
2011; Established cooperative partner relationship and implemented with NPT and USFS.
2012; Strengthened and advanced partnership with USFS.
2013; Identified USFS as primary partner
2014; Furthered partnership with USFS as primary partner, added WDFW as secondary partner

Increased emphasis was placed upon coordinating habitat restoration actions with other entities to enable joint planning and participation in habitat enhancement projects and prevent duplication of effort or the potential for conflicting plans and negative effects on projects. Formation and active participation of natural resource management forums as effective relationships are forged with cooperating entities toward achieving common goals.
The CTUIR TFHP conducted project planning and developed work plans for stream habitat protection and restoration in the Tucannon Basin. Multiple project tours were conducted for various audiences to showcase accomplishments of the CTUIR TFHP.

CTUIR is the primary entity responsible for forming the TCC in 2010, a working group of professionals designed to bring natural resource managers together to formulate strategies in regard to coordinating restoration activities in the Tucannon Basin and develop partnerships with common goals as they relate to the association between improved habitat quality conditions and upgraded status of ESA-Listed Salmonids. The Regional Technical Team was in-place prior to the development of the TCC, but was too broad in scope as it represented topics in multiple basins, therefore leaving only a small portion of time dedicated to the Tucannon Basin. But with growing interest and representation in the Tucannon Basin, it became apparent for the need to share agency intentions and direction to avoid redundancy and streamline effectiveness of shared Tucannon activities towards common goals. The CTUIR TFHP is responsible for spawning the idea of forming the TCC, of which is essentially the Tucannon Basin branch of the Regional Technical Team. The TCC was dedicated towards increased resource management collaboration and project cooperation by seeking a team orientated concept to address common fishery habitat goals shared by various entities within the Tucannon Watershed. CTUIR has consistently helped build the framework of the TCC by recruiting interested parties to join the group. CTUIR is a primary orchestrator of the organizations content and conviction for frequent monthly meeting cycles to stimulate ongoing dialogues between agency personnel. A major component of the TCC's responsibilities pertains to the identification of project sites and subsequent enumeration of priority assignments and identification of the best suited sponsor within the TCC group. Open lines of communication help sort out details, particularly in the event of multiple entities being both qualified and interested in a project site. In such cases, open dialogue and rational thoughts are lobbied within the group until a decision is made in regard to what agency is best suited for marriage with a particular project site. The TCC functioned as an internal planning platform to prioritize and assign actions to the appropriate entity within or outside of the group if necessary. The CTUIR TFHP brought specific professional skill sets together and matched strengths in other disciplines and areas of responsibilities held by other cooperating entities to form project partnerships teams. Therefore symbiotic partnerships with mutually-shared goals make for project results becoming most effective.

In the two years of the TCC's existence, CTUIR provided the majority of meeting content for the group’s monthly meetings to promote further development of the group and stimulate crossover

thought-processes. After fulfilling its utility as a networking collaborative, the TCC was disbanded in 2012. The TCC was vital in the infancy stages of project coordination and solidified effective partnerships between entities with expertise in complimentary disciplines. The TCC had served much purpose by forging and maintaining important partnerships that continue to grow and prosper between former participants of the working group.

The TCC served as a conduit in regard to involvement in identifying, prioritizing, assigning and implementing salmonid habitat enhancement projects in the Tucannon Basin. The TCC was complimentary to exercising the results of the Geomorphic Assessment of the Tucannon Watershed document. Potential project sites were identified as tier 1, 2, or 3 level projects based primarily upon biological status and potential for spring chinook salmon based upon a collection of scientifically based knowledge. Benefit to spring chinook salmon is the ultimate determiner of project priority and timelines. Disqualifiers such as unwilling landowner cooperation may allow a tier 3 project to move ahead of a tier 2 project.

Approximately 1.2 million dollars of additional annual funding was recently dedicated by BPA through what is referred to as the Programmatic agreement to improving the status of spring chinook salmon in the Tucannon Basin. Despite this lofty boost to funding, a limit still exists and does require prioritization and strategic groupings of projects to approach the fiscal ceiling on an annual basis. Planning for longer term implementation typically combines lesser tiered projects after initial years concentrate on higher-tiered projects. Some tier 1 projects get suspended and replaced by lower tiered projects, due to unique issues such as when a landowner does not grant permission. The hope is that the status may change over time and compliance with agency requests is granted. With all players at the table, pairing by years is openly discussed and finalized when consensus is reached.

A review panel led by the local SRSRB office and comprised of state, federal, tribal, county, and private fisheries consultants and various natural resource professionals was assembled to select project sponsorship and allocate associated project dollars to selected entities. Having absolute power in that the SRSRB has basically been empowered to distribute project funds in the region does not come without concern. Human behavior indicates that complete un-bias is highly unlikely in any organization. A history of majority selection in regard to chosen sponsorships suggests potential conflicts of balance and may jeopardize the ability to achieve objectives by the group as a whole. Undeniable advantage exists to state and federal entities that own the majority of lands within the areas of spring chinook habitat and therefore are given first right of acceptance or refusal to implement of pass on the opportunity to implement on their respective boundaries of parcel ownership. Therefore a disproportionate quantity of projects were assigned to public landowners, which may offer challenges to accomplish all that has been assigned within allotted timeframes. CTUIR donated services and materials in a supportive role to the public landowners to assist in completing projects.

Delegation of a portion of the mass number of projects to other capable project sponsors could be considered as a more effective strategy towards achieving goals that encompass the

responsibilities assigned by BPA to the working group. Despite demonstrating high capacity for achieving effective restoration results, CTUIR was granted the opportunity to be a lead project sponsor on only 2 of 28 potential projects identified in phase 1 of a watershed assessment. This subsequently affected production of the CTUIR TFHP. The two projects awarded to CTUIR were completed in 2014 as part of the Wooten to Panjab restoration reach. Mutually beneficial partnerships with cooperating agency personnel were galvanized during the partaking of the Wooten to Panjab restoration project, which solidifies the probability of effective future cooperative efforts. The TFHP believes that strong partnerships increase the magnitude and frequency of success and often facilitate additional project opportunities. Professional and effective networking efforts provide opportunities to recruit specialized experts in the profession to jointly develop project strategies to strengthen the result of restoration and enhancement actions and achieve common goals within target time frames.

Changes in regard to the dilution of the empowerment of one guiding entity in the process of project fund allocation could provide better balance and therefore more diverse application of restoration methods towards achieving common goals of improving the status of spring chinook salmon habitat in the Tucannon Basin. Another beneficial option would be to dedicate restoration funds directly to CTUIR as a competent and highly qualified, professional sponsor. This would reduce administrative demands and offer CTUIR more equality in regard to available project sponsorship. Having a more balanced assignment of potential projects between more sponsors allows ample time and resources to meet Programmatic goals by 2018. Otherwise, it would appear that excessive dedication of projects to few entities may impact the ability of such sponsors to have enough time and resources to address the quantity and magnitude of such projects under a tight work window.

The CTUIR TFHP puts emphasis on intra-agency coordination by conducting coordination efforts with all habitat projects represented by CTUIR in various basins; Cultural Resources, Research Monitoring & Evaluation, Wildlife, mussel and lamprey programs to ensure project actions are consistent with the Tribes overall RV it relates to protection of FF and culturally significant resources and issues. Each of CTUIR's Habitat Projects in five basins embrace a planning approach that is consistent with in-house protocols and directives towards achieving RV Touchstone objectives while protecting FF interests.

In summary, the TFHP makes a conscious effort to network with entities within and beyond Tribal framework to assist in the process of attaining objectives. Future emphasis will be placed upon relationships with private landowners as a result of the experience with the TCC, a predominantly public entity. Building relationships from the ground up is essential towards the growing success of the TFHP. The TFHP emphasis the importance of strengthening partnerships and project performance with entities acting as extended staff and sharing common goals. Team building brings additional value to a relatively small and young project such as the TFHP. The TFHP desires to establish a regionally recognized value in regard to level of expertise in the discipline of fisheries habitat restoration and contribute by strengthening the capabilities of

various extended working groups. Project performance is strengthened by contributions from various entities in their scope of responsibility and filed of expertise. Coordinated efforts with networking partners filling specific roles and sharing common goals is a strategy embraced by the forthcoming actions of the CTUIR TFHP.

CONCLUSIONS

Degraded habitat in the basin identifies a need for restoration activities to approach historical habitat conditions and status of preferred biotic species levels. Necessary habitat preservation and restoration actions conducted by the TFHP will achieve the following; uphold the mission statement of CTUIR's TFHP, uphold and protect Tribal Treaty rights, provide FF for traditional and ceremonial purposes, improve the physical habitat and biological response of associated target species such as ESA-listed spring Chinook Salmon, Steelhead and Bull Trout in the Tucannon Basin. Habitat project implementation actions shall be strategically prioritized and conducted in areas of primary importance based upon feasibility, effectiveness, and preferred response potential. Work shall be conduct in an effective manner based on the application of the most pertinent and applicable techniques to generate efficient results. Duration and degree or magnitude of effort shall be based of adaptive management techniques over the period time required to achieve mutually beneficial results shared between funding entities and project sponsors in the best interest of the status of the resource targeted for assistance.

Achievement of optimal riverine ecosystem processes is being achieved through advancing understanding of site specific characteristics and associated causes. The establishment and acceptance of current maximum channel efficiency within the defining parameters and restrictive conditions that may exist due to irreversible degrees of anthropogenic change offers a realistic outlook as to what degree of historic condition can be approached and what restoration methods are chosen.

Learning lessons from past experience and applying the lessons to improve project success is a valued skillset and a point of emphasis within the TFHP. Being receptive to professional review advice and applying the lessons towards future performance is an opportunity to apply adaptive managerial techniques based upon the input from such entities as the ISRP review committee. Emphasis is placed beyond the project site as focus is enlarged to a magnified watershed-scale while identifying the cause of the issue and the proper remedy to rectify. Using understanding of proper watershed function and associated processes improves the potential for project success. Using this approach, the THP has evolved towards a more coarse vision of understanding and application. Emphasis of salmonid species has shifted from steelhead waterways to chinook habitat. Although it is understood what enhances chinook salmon habitat does indeed improve conditions for other preferred salmonid species. Chinook salmon are currently the primary species targeted for selection of restoration sites and the strategies for habitat restoration are derived according to chinook salmon need and preference.

Project personnel in regard to staffing performance, created lessons in regard to increases of project personnel, payroll and work output do not necessarily translate to more production of

acceptable quality. The TFHP is very attentive to spending BPA monies in an efficient manner, while accomplishing highly respected results. Therefore after what essentially became a one year experiment in regard to adding an additional biologist to the TFHP, the individual was released due to lack of fulfilling expectations in regard to productivity. The TFHP took the responsible, pro-active approach to improve overall project performance by minimizing the potential for ongoing negative impacts. The right match to the position could pay dividends in the future if the decision is made to hire additional personnel, of highly motivated and effective nature.

From an in-stream aspect, several important changes to protocol and techniques were successfully adopted: philosophical migrations toward softer-approaches such as utilizing LWD and natural materials whenever possible to achieve a more natural aesthetic appearance in performing proper riverine function is an ongoing emphasis. Knowledge of cutting edge techniques is gained and strengthened through active participation in continued education. Emphasis on techniques to reduce implementation footprints and increased attention to finishing detail improves not only public perception of the work we perform, but accelerated recovery and improved conditions at project sites. Working in the dry using a well-orchestrated de-watering plan including particular attention to safely relocating biota from the work zone prior to implementation preserves existing population status of target species as well as long term biological response to favorable habitat created.

Future project focus centers around areas of need towards restoring spring chinook salmon status in reaches identified as beneficial to the species and ranked as they pertain to categorical priority. Rate of projected recovery was noted as underachieving in the Tucannon Basin by BPA entities, therefore adaptive management techniques shared within the TCC, resource management working group is being conducted to bring a point of emphasis on this particular species in regard to restoration actions planned in the Tucannon Basin targeting a 17% improvement within the 2008-2018 timeframe in regard to measurable improvements of physical habitat components relevant to the improved status of fulfilling the needs for spring chinook improvement

Achievement of healthy watershed environments that meet the specific needs of all life stages of ESA-Listed salmonid species will continue to be pursued. Improvements to water quality towards meeting various established criteria by improving overall environmental conditions within the wetted channel associated with optimal fish health within the freshwater ecosystems in which target species inhabit and are theoretically adapted to thrive within though evolutionary processes.

From a project management standpoint, emphasis is placed beyond the project site as focus is enlarged to a magnified watershed-scale while identifying the cause of the issue and the proper remedy to rectify. Using understanding of proper watershed function and associated processes improves the potential for project success. Using this approach, the TFHP has evolved towards a more coarse vision of understanding and application. Increased emphasis of restoring holistic riverine function will guide future restoration actions through the establishment of optimal and

efficient interchange between surface and subsurface waterways, particularly in channels that have become perched or isolated due to detrimental land use practices. Seeking to improve the desired ratio between effluent gaining reaches and influent losing reach area to achieve balance within the valley wall framework that become activated as flows spill beyond bank full levels.

Adaptive management from a riparian aspect has resulted in the following use of innovative techniques; added riparian tarps to reduce competitive impacts from noxious weeds on project plantings. Evolution from using plastic tarps to a more natural, biodegradable and aesthetically pleasing coir fabric improved project appearance. Grazing reduction was achieved and higher plant survival attained using organic repellent, and selecting tree species such as Native Water/River Birch and Native Red Alder at sites where beaver were present reduced impacts when compared to sights that had significant losses of willow and cottonwood trees. Use of physical restrictors such as various types of fencing using natural and man-made materials became essential tools after learning lessons in regard to tree loss in previous years. Tall willow whips up to 16' in length were an effective and unique technique that essentially moved plant life out of the animals feeding zone-level and increased immediate tree heights to produce immediate stream shading in an accelerated manner.

Anthropogenic barriers and areas of passage concern to all degrees and life stages will be addressed and brought into compliance with state step height standards when possible, as landowner access can be a restraint. Additionally; velocity barriers, thermal, dry channel, and natural waterfalls in areas such as where exposed bedrock substrate exists shall be considered for rectification based on the unique characteristics associate with each phenomenon. For example an exposed bedrock outcropping substrate currently acting as a passage concern requires detailed inspection in regard if the barrier is indeed naturally occurring or the result of accelerated down cutting resulting from anthropogenic alterations encompassed within; channelization, channel relocation, incisional down cutting etc. Results of determinations shall dictate the platform on which to proceed or not proceed with various forms of rectification if merited.

The CTUIR TFHP hypothesizes that both ecological and physical forces currently limit salmonid production in the Tucannon River Basin and that the relationship between physical habitat conditions, ecological conditions, and salmonid abundance will improve in sites that receive habitat treatments. This is demonstrated by measured improvements in physical habitat conditions, which has resulted in an increased abundance of salmonid populations. Post-treatment monitoring is an important component of the habitat restoration process and is vital towards determining measurable results of restoration actions and identifying trigger-mechanisms responsible for instigating positive change. Project success is ultimately determined by technique applicability, accurate implementation, effective monitoring and timely adaptive management. The CTUIR TFHP is recognized as experts in the discipline of fish habitat restoration in this geographic region and strives to maintain this status.

The CTUIR is emphasizing more attention toward project planning in regard to developing a systematic approach for site selection based on scientific data as well as to increase efforts towards effectiveness monitoring (both have been considered as shortfalls in the past from review committees). The new CTUIR philosophy emphasizes adaptive management as a means of maximizing success at each project site.

Recognition of the unique characteristics of each project site should be considered in conjunction with landowner parameters when selecting the most effective, site-specific habitat restoration plan. A plethora of management strategies have been successfully applied in effort to reestablish the salmonids to self-sustaining levels. We expect exponential response of salmonid populations once habitat deficiencies are 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 Tucannon River Basin. Learning lessons from past experience and applying the lessons to improve project success is a valued skillset and a point of emphasis within the TFHP.

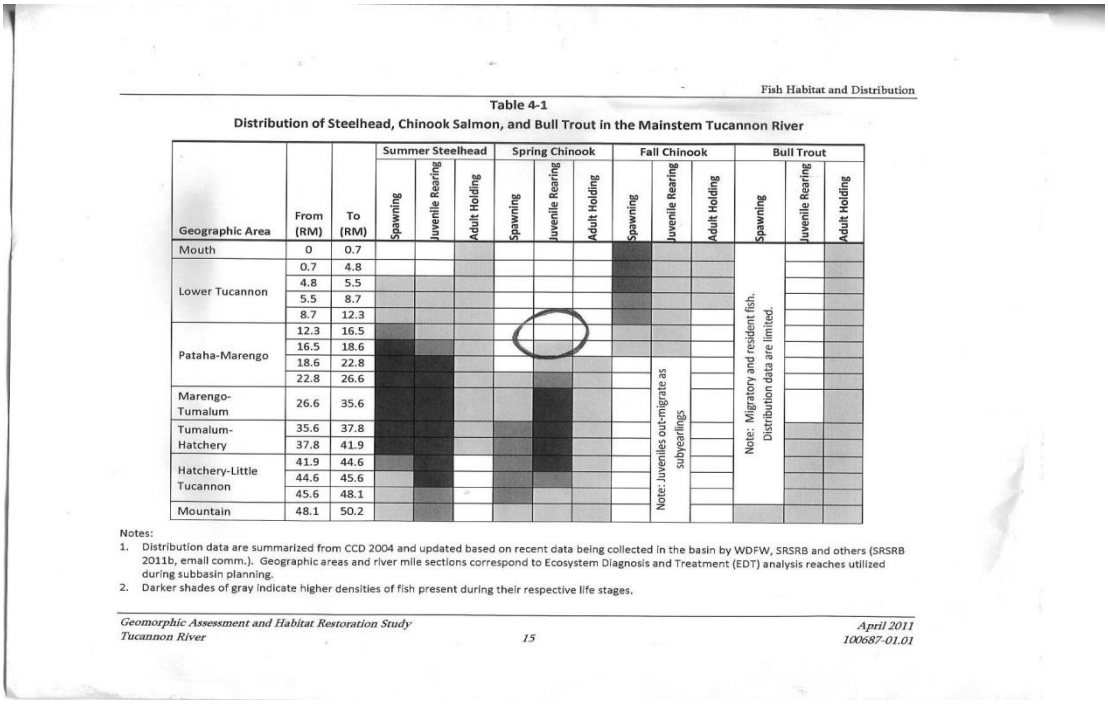
Best Management Practices and ethics are of paramount importance and should be embraced by all implementers in the basin. Complying with guidance parameters set by consultation entities during project implementation would be of benefit to all implementers in regard to public perception towards resource management entities. Accomplishing objectives with minimal adverse impacts to resources and critical habitat within the project reach should not be jeopardized.

Furthering exploring the value of connectivity strategies as they pertain to benefits of restoring habitat in in the lower reaches of the basin should be explored in the future. The lower limits of salmonid distribution have extended downstream theoretically due to restoration actions and subsequent water temperature reductions. Increased prioritization of restoration work in the lower reaches of the Tucannon River is encouraged. Recent data collected during electrofishing, hook and line sampling (Figure 29), visual observations, physical habitat data, trapping data, and habitat suitability assessments suggest the lower limit of distribution of chinook salmon in the Tucannon River is in dire need of being extended considerably further downstream. Managerial guidance in regard to fisheries policy was being based upon outdated 1996 classification of salmonid range as shown in Table 4. This practice translated to the lower river being de-prioritized to such a degree that primary funding sources would not dedicate funds to lower river restoration efforts. During the reporting period, acceptance of the updated, supporting data prompted rationale for revising the chart to reflect an expanded area of occupation down to RM 12.3. CTUIR sought even further expansion downstream from RM 12.3. This would connect the Tucannon River with the longest tributary in the watershed, Pataha Creek. Pataha Creek is a 47 mile long, cold water tributary that enters the Tucannon River near RM 1. Honoring connective potential between the two waterways heightens the possibility that fishes can move freely between Pataha and the Tucannon. This would protect populations from future catastrophic

events such as wildfires or chemical contamination as fish distribution is spread between multiple locations as opposed to the vulnerability of being concentrated at one site.
In 2011, CTUIR rectified fish passage at RM 1 and 10 of Pataha Creek. The impediments were identified as the two most prominent barriers in the Tucannon drainage. Fish response was favorable to CTUIR's habitat enhancement and passage actions on Pataha Creek, as juvenile steelhead trout presence in the restored reach increased from 0 to 10 individuals a year after project completion. More noteworthy was the reclassification of the adult steelhead population from an estimated 50 individuals to 500, due to trapping data derived near RM 5.

Figure 29. 1 of 4 juvenile chinook captured, RM 12, Tucannon River near Pataha Creek

Table 4. Classification chart showing salmonid range based upon 1996 data



Fish Habitat and Distribution

Table 4-1

Distribution of Steelhead, Chinook Salmon, and Bull Trout in the Mainstem Tucannon River

Geographic Area	From (RM)	To (RM)	Summer Steelhead			Spring Chinook			Fall Chinook			Bull Trout		
			Spawning	Juvenile Rearing	Adult Holding	Spawning	Juvenile Rearing	Adult Holding	Spawning	Juvenile Rearing	Adult Holding	Spawning	Juvenile Rearing	Adult Holding
Mouth	0	0.7												
Lower Tucannon	0.7	4.8												
	4.8	5.5												
	5.5	8.7												
	8.7	12.3												
Pataha-Marengo	12.3	16.5												
	16.5	18.6												
	18.6	22.8												
	22.8	26.6												
Marengo-Tumalum	26.6	35.6												
Tumalum-Hatchery	35.6	37.8												
	37.8	41.9												
Hatchery-Little Tucannon	41.9	44.6												
	44.6	45.6												
	45.6	48.1												
Mountain	48.1	50.2												

Note: Juveniles out-migrate as subyearlings

Note: Migratory and resident fish. Distribution data are limited.

Notes:
1. Distribution data are summarized from CCD 2004 and updated based on recent data being collected in the basin by WDFW, SRSRB and others (SRSRB 2011b, email comm.). Geographic areas and river mile sections correspond to Ecosystem Diagnosis and Treatment (EDT) analysis reaches utilized during subbasin planning.
2. Darker shades of gray indicate higher densities of fish present during their respective life stages.

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