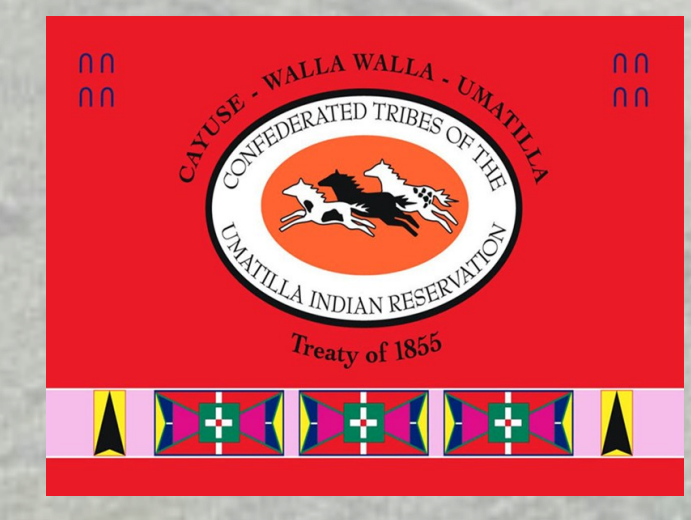


Using the Umatilla Tribe's River Vision to Implement Process-Based Restoration on the Tucannon River

Kris Fischer and Zach Seilo
 Tucannon Basin Fisheries Habitat Enhancement Project
 Confederated Tribes of the Umatilla Indian Reservation



1) Context

Historically the Tucannon River (a tributary to the Snake River in southeast Washington) was a multi-threaded channel with a mature, late stage riparian forest across the entire valley bottom. The mature riparian forest, which included live and dead wood on the floodplain and in the stream channel, helped to facilitate the formation of multithreaded channels and maintain dynamic habitat heterogeneity and geomorphic complexity. This diversity of structural forms and habitat niches supported a diversity of native aquatic biota.

A. Tucannon River, pre-settlement
 Channel cross-section depicting a multi-threaded Tucannon River with a fully forested floodplain and wood recruitment into the channel(s).
 Tucannon River pre-settlement planform (Hartssock Reach): Historically, the Tucannon River planform was likely characterized by a larger braid-channel ratio, greater sinuosity and many trees on the floodplain.

A trend toward homogenization of the stream channel and floodplain commenced
 Euro-American settlement during the 1800's led to clearing of the floodplain forest

B. Tucannon River, post-settlement
 Channel cross-section depicting decreased channel braiding with wider, more shallow channels and a depleted floodplain forest.
 Tucannon River post-settlement planform (Hartssock Reach): As the riparian forest was removed from the floodplain, the Tucannon River lost an important geomorphic driver for maintaining channel planform complexity.

Large floods in the first half of the 1900's resulted in a community-based desire for "flood control". The solution on the Tucannon River was to bulldoze the channel straight and confine it to a single thread with push-up berms.

Catastrophic regional flooding
 Bulldozers straightening Tucannon River in response to 1965 flood
 Straightened, plane bed channel with push-up berms (post-bulldozing)

The legacy of floodplain forest removal and straightening/confining the Tucannon River has created an oversimplified, plane bed channel which can no longer support the historic diversity of native aquatic biota.

C. Tucannon River, present day
 Channel cross-section depicting single channel, confined to one side of the valley with minimal floodplain forest or wood recruitment.
 Tucannon River, present day planform (Hartssock Reach): The Tucannon River and floodplain have lost their historic spatial/geomorphic complexity and habitat diversity. Few aquatic biota are adapted to the simplified conditions.

Snake River Spring/Summer Chinook
 Snake River Steelhead
 Causes for salmonid decline in the Columbia Basin and Snake River are many, however, it is interesting to notice how closely salmonid decline mirrors the chronology of habitat loss.

Habitat Recovery Goals

Desired recovery trajectory for PUBLIC LANDS on the Tucannon River: multiple narrow and deep channels with a mature floodplain forest providing sustainable opportunities for wood recruitment into the channel(s).
 Tucannon River rehabilitation planform (Hartssock Reach): The habitat restoration goals on the Tucannon River aim toward increased spatial and geomorphic complexity while acknowledging that complete restoration to the historic condition may not be possible in all locations.

2) River Vision

Watersheds within the CTUIR aboriginal title lands shall include a healthy river capable of providing First Foods that sustain the continuity of the Tribe's culture. This vision requires a river that is dynamic, and shaped not only by physical and biological processes, but the interactions and interconnections between those processes.



CTUIR Fisheries Habitat Enhancement Program
Mission Statement: To protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic species of the First Foods order.

In 2008 the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) developed programmatic guidance titled "River Vision" (Jones et al. 2008) which establishes process-based restoration as the primary objective for the CTUIR Fisheries Habitat Enhancement Program. River Vision provides a holistic framework for river restoration by identifying five "Primary Touchstones" of river systems. The Primary Touchstones are ecological and physical processes that are critical to support the sustainability of aquatic First Foods. The goal of CTUIR Fisheries Habitat Enhancement Program is to ensure that every CTUIR-sponsored river restoration project enhances all five of the Primary Touchstones to the maximum extent possible.

Primary Touchstone	Secondary Touchstone	Restoration Action
HYDROLOGY	Aquatic Biota	<ul style="list-style-type: none"> Increase water residence time Decrease water velocity
GEOMORPHOLOGY	Connectivity Riparian Veg.	<ul style="list-style-type: none"> Increase in-stream roughness Improve width to depth ratio Improve braid-channel ratio Improve sediment sorting
CONNECTIVITY	Geomorphology Aquatic Biota	<ul style="list-style-type: none"> Paleochannel re-connection Levee removal Address channel incision
RIPARIAN VEGETATION	Geomorphology Hydrology	<ul style="list-style-type: none"> Plant native vegetation Control noxious weeds Raise water table elevation
AQUATIC BIOTA	Geomorphology	<ul style="list-style-type: none"> Increase available refugia and food Improve temperature regimes Improve biogeochemical exchange

3) Application

Existing Problem
 The Hartssock Reach of the Tucannon River, had been an old homestead since the early 1900's until WDFW purchased it as part of the W.T. Wooten Wildlife Area. In this reach the river channel had been pushed to the east hill slope, straightened and leveed in place to allow for agriculture production. Once the river was confined on the east side of the valley, the river straightened, water velocities increased, habitat simplified and the river dug itself into a trench (incised) removing all the small gravel from the reach. This removed all the gravel that formed pools for adult holding and gravel bars for spawning, providing limited aquatic habitat diversity.

Goal
 CTUIR sought to enhance the Primary Touchstones of River Vision (process-based restoration), within the Hartssock Reach, to the maximum extent possible. The goals of the Southeast Washington Salmon Recovery Plan included instream wood replenishment, increasing channel complexity, and reconnecting the river to its floodplain.

- Objectives**
- 1) Replenish instream wood to two key pieces of wood per channel width.
 - 2) Design large wood structures to:
 - Raise the bed elevation by removing levees in confined areas and decreasing incision throughout the project area, reconnecting the river and floodplain
 - Decrease stream velocities and increase sediment deposition throughout the reach
 - Increase connectivity using old side-channels throughout the reach
 - Increase the local water table through hyporheic exchange with the alluvial aquifer
 - 3) Replenish the floodplain forest with native tree plantings.

Picture Key
BEFORE: Examples of pre-treatment plane bed channel in the Hartssock Reach
AFTER: Examples of plane bed channel, post-treatment with heavy wood loading (same location)

Tucannon River Fish Habitat and Floodplain Restoration Site Plan
 River Mile 33.1-34.3 - Hartssock Reach (Project Area 18)

Pilot Channels were excavated at the upstream junction of three historic side channels within the Hartssock reach. Large wood structures were designed and located adjacent to these pilot channels. The objective of the large wood - pilot channel complex is to collect a sufficient amount of sediment and water on the upstream side of the large wood structures to divert a portion of the flow into the side channel. The end result is an increase in floodplain connectivity and habitat complexity with minimal floodplain excavation.

LEGEND

- HARTSOCK PROJECT BOUNDARY
- HELICOPTER LOG JAM
- EMBEDDED BANK LOGS
- ENGINEERED LOG JAM
- PILOT CHANNEL EXCAVATION
- BOULDER BALLASTED LOGS
- PUSH-UP BERM
- LEVEE
- SIDE CHANNELS
- SPRING BROOK
- TUCANNON RIVER

- Lessons Learned**
- Large wood is and always has been an important driver of physical and ecological processes in the Tucannon River – (Primary Touchstones of River Vision)
 - When trying to restore natural processes on rural, non-navigable streams, it is difficult for restoration implementers to be TOO aggressive with wood loading; for this project, time and resources were more of a limiting factor on large wood quantities than the capacity of the Tucannon River to hold the wood.
 - Large wood restoration projects should be designed with an acknowledgement of the potential for rivers to change and alter the original function of a given large wood structure – but that's OK and should be considered a success since rivers that freely move material laterally and longitudinally are healthy, self-sustaining rivers.
 - When the focus is on reversing past land use practices (channel straightening and the associated incision), large wood can greatly increase the rate at which rivers rehabilitate (aggrade) themselves.