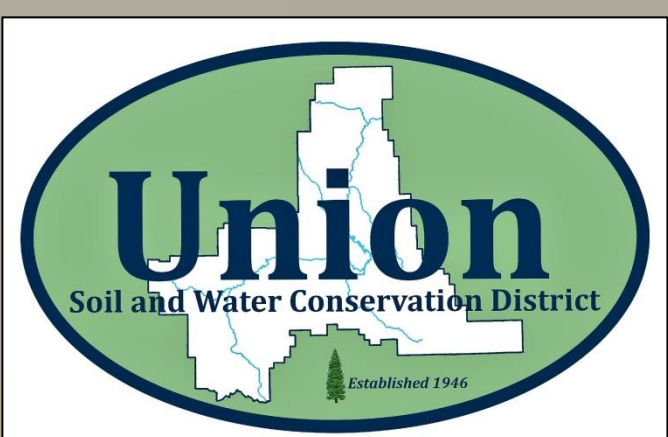


# Restoring functional, sustainable floodplain and watershed processes: Grand Ronde Subbasin Catherine Creek, *Saaxsaaxinma* (Kingfisher)



Jake Kimbro<sup>1</sup>, Ian Wilson<sup>1</sup>, Allen Childs<sup>1</sup>, Travis Dixon<sup>1</sup>, Dave Mack<sup>1</sup>, Les Naylor<sup>1</sup>, Kate Frenyea<sup>2</sup> and Aaron Bliesner<sup>2</sup>

(1) Confederated Tribes of the Umatilla Indian Reservation Department (CTUIR) of Natural Resources, La Grande, OR

(2) Union Soil and Water Conservation District, La Grande, OR

## Introduction

The 402 square mile Catherine Creek watershed in Northeast Oregon’s Grande Ronde Basin historically supported viable and productive native fishery resources. Anthropogenic alteration of the watershed has decreased habitat quality, quantity, and fishery productivity, creating decreased fish habitat suitability for multiple key life histories, including juvenile summer and winter rearing, adult holding, and spawning. Habitat limiting factors include: streamflow, passage, water quality, channel and bed form, channel/habitat complexity, side channels, and riparian/wetland habitat. These factors have been detrimental to a host of native aquatic species and contributed to the Endangered Species Act listing of spring-summer Chinook salmon (*O. tshawytscha*), summer steelhead (*O. mykiss*) and bull trout (*S. confluentus*).

Strategic watershed planning conducted by basin partners identified river mile 44 along Catherine Creek as a core reach exhibiting degraded habitat with high intrinsic potential for fishery productivity. An Interdisciplinary planning and design team focused project development to address habitat limiting factors using the CTUIR’s River Vision as a guide to restoring watershed process and function. This Vision embraces physical and hydrologic relationships and provides a framework to restore diverse, complex, and productive habitat for focal fish and natural resources.

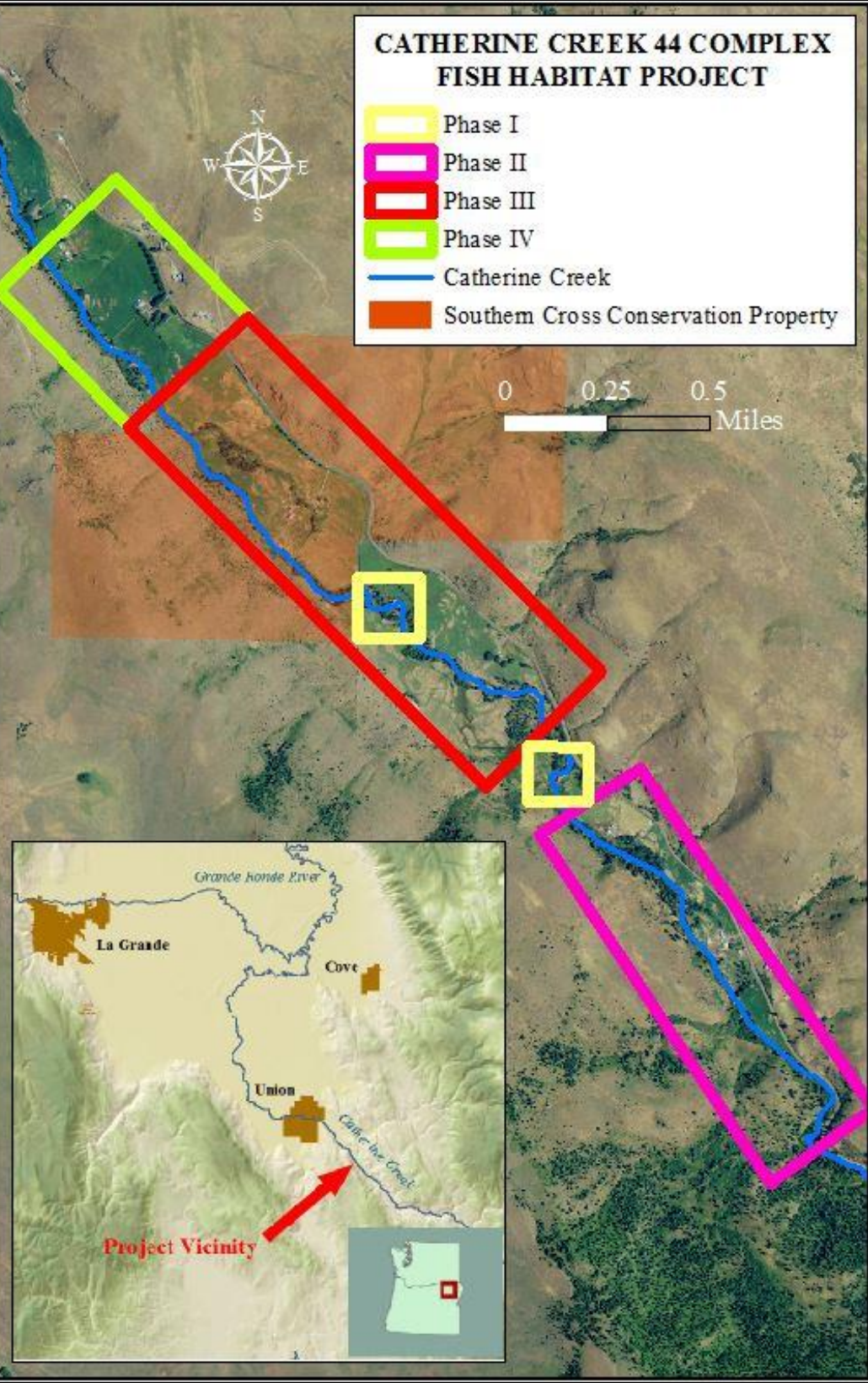


Figure 1: Catherine Creek River Mile 44 (CC44) restoration project area with subbasin inset and project phases

Project goals and objectives focused on increasing habitat suitability for all life stages of salmon and steelhead. Actions included habitat protection, streamflow conservation, improved passage, restored floodplain connectivity, and natural channel morphology. Additional actions included enhanced habitat complexity, side channels, and riparian/wetland communities. Habitat protection was accomplished through term conservation easements and acquisition of the 545 acre Southern Cross Conservation Property known as *Saasaxinma* (Kingfisher) for permanent conservation by the CTUIR and BPA.

Project goals and objectives focused on increasing habitat suitability for all life stages of salmon and steelhead. Actions included habitat protection, streamflow conservation, improved passage, restored floodplain connectivity, and natural channel morphology. Additional actions included enhanced habitat complexity, side channels, and riparian/wetland communities. Habitat protection was accomplished through term conservation easements and acquisition of the 545 acre Southern Cross Conservation Property known as *Saasaxinma* (Kingfisher) for permanent conservation by the CTUIR and BPA.

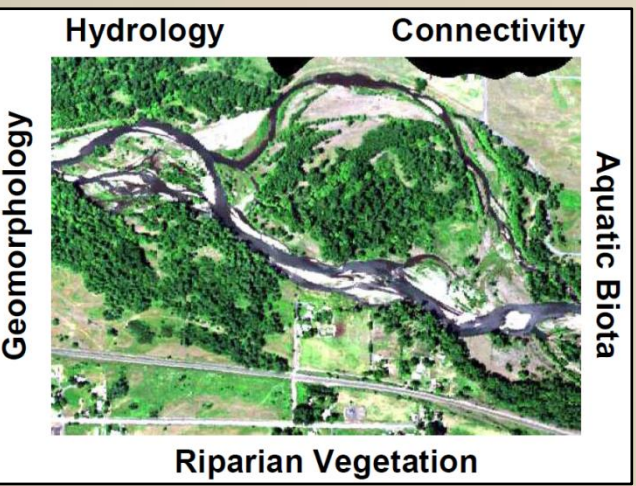


Figure 2: Key River Vision considerations to support First Foods production

## Methods

- CTUIR’s River Vision (Jones et al. 2008) identifies physical and ecological processes of a highly functional and dynamic river system integral for providing water quality and fish habitat that supports aquatic First Foods (Figure 2).
- The Catherine Creek Atlas is a strategic planning methodology to rank and prioritize watershed reaches and habitat actions. Fish use, life stage utilization and habitat limiting factors are core considerations used in the prioritization process.
- Habitat uplift modeling for the project was conducted for existing and proposed conditions using habitat suitability indices (HSI) for all life stages of Chinook and steelhead.

## Results

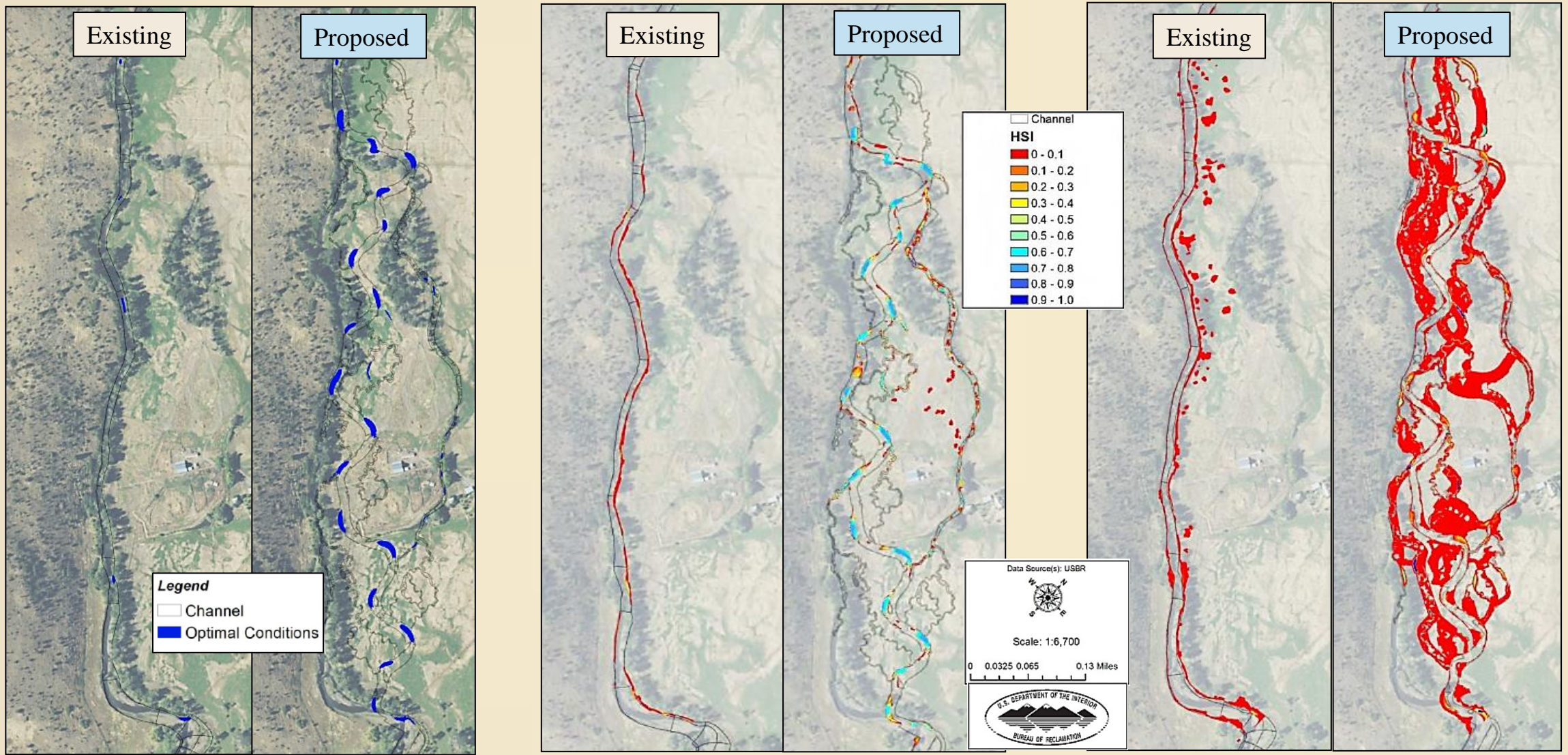
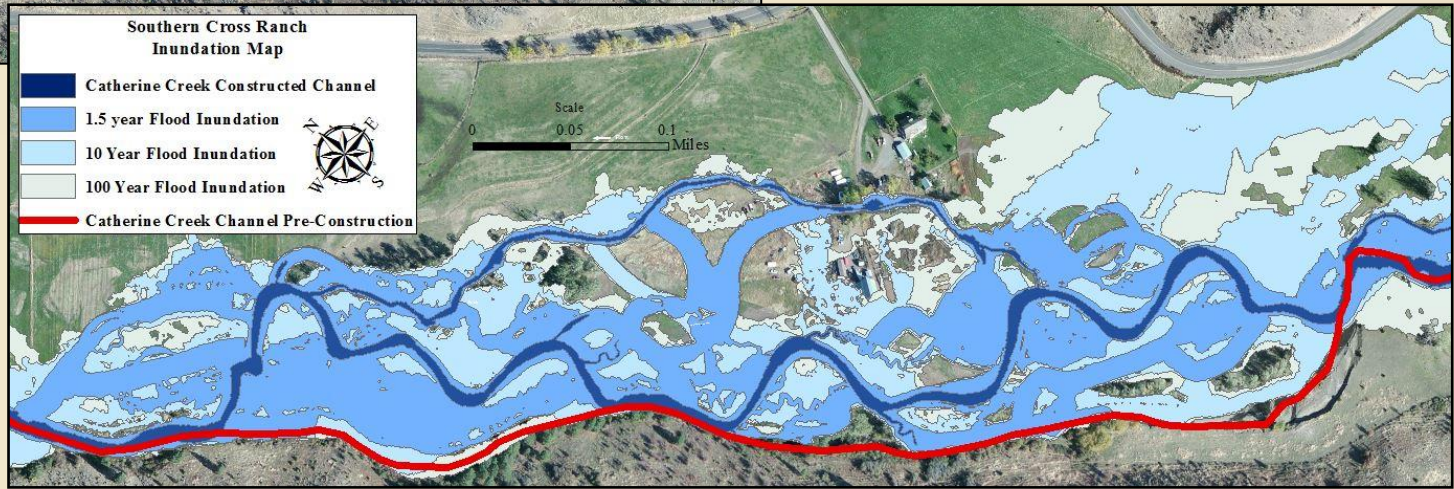


Figure 3: 1937 aerial photo, showing historic conditions (left)



Figure 4: 2014 aerial photo prior to construction (left)

Figure 5: Flow inundation model with pre project channel alignment, new constructed channel, 1.5 yr, 10 yr, and 100 yr inundation (right)



Adult holding (acres)				Summer Chinook WUA (acres)				Winter Chinook & Steelhead WUA (acres)			
Discharge (cfs)	Existing	Proposed	% Change	Discharge (cfs)	Existing	Proposed	% Change	Discharge (cfs)	Existing	Proposed	% Change
40	0.06	1.03	1616%	40	0.06	0.81	1170%	565	0.05	0.59	1137%

Figure 6: HSI maps for adult Chinook holding (left), juvenile Chinook summer habitat (middle) at Q=40 cfs (early summer flow) and juvenile winter Chinook and steelhead (right) at Q=565 cfs (bankfull) (Bureau of Reclamation report: Habitat Uplift Modeling-CC-44 Project: Southern Cross Project Area)

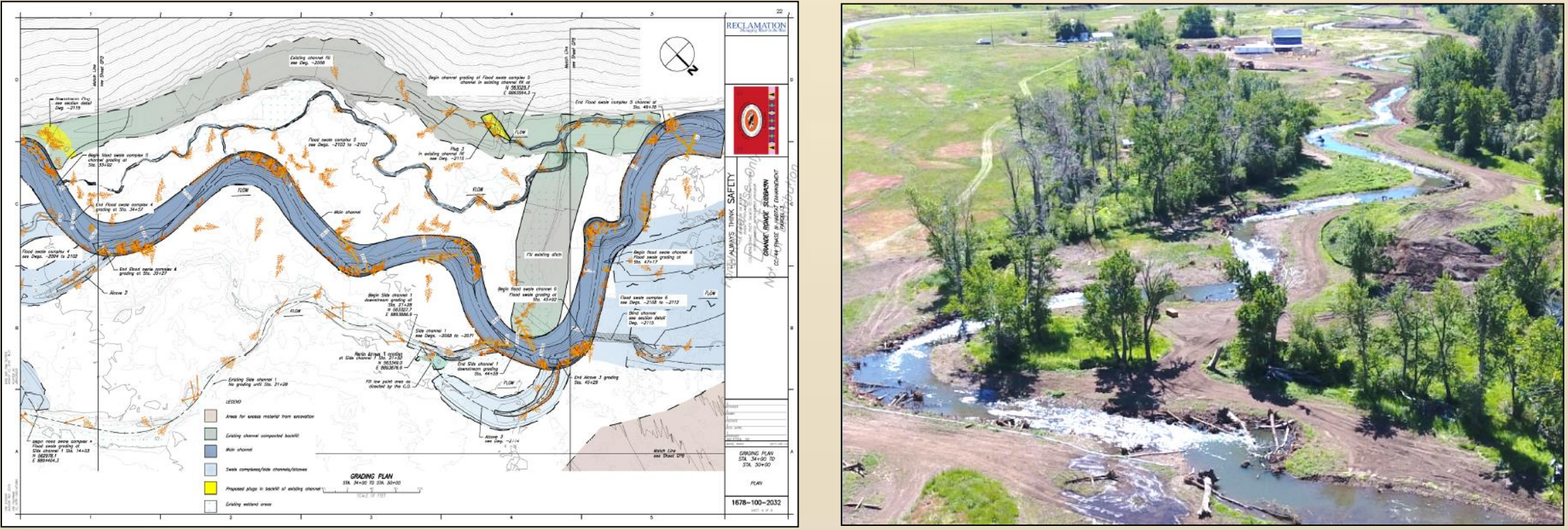


Figure 7: Fish habitat design (left) and corresponding drone flight aerial photo at downstream reach of project (right). (Aerial imagery courtesy of the Grande Ronde Model Watershed)

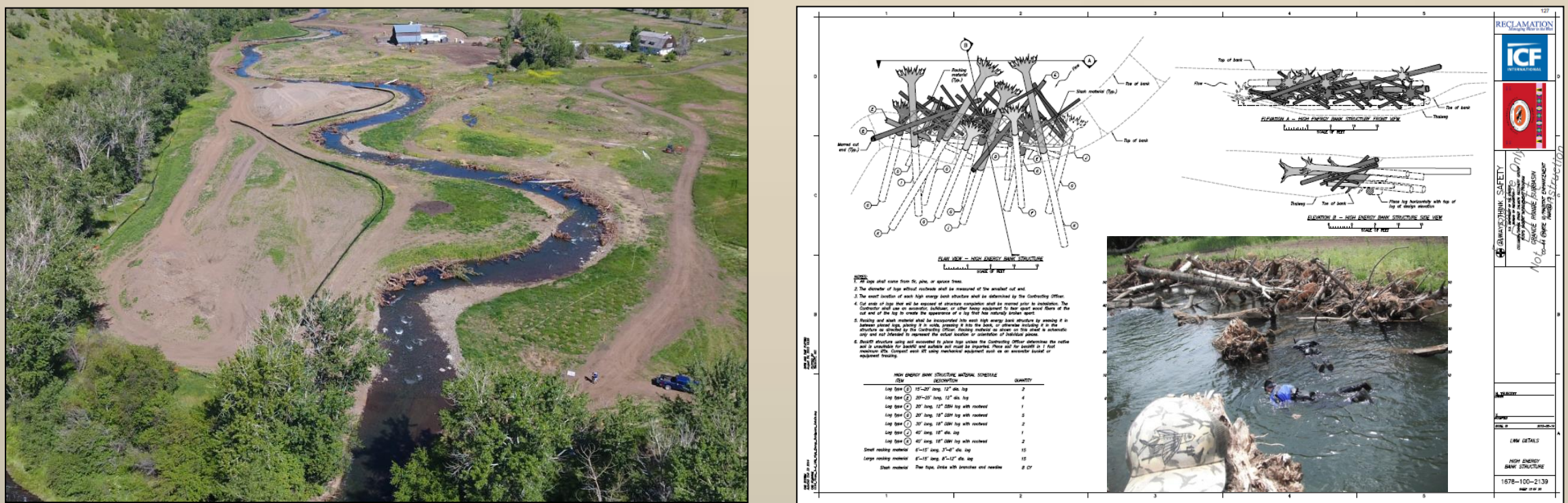


Figure 8: Drone flight aerial photo at upstream reach of project (left) and engineered wood complex with inset photo of a snorkel survey at corresponding wood complex (right)

## Restoration Metrics

- Permanent protection along 1 mile main-stem Catherine Creek and 64 acres of historic floodplain
- 21% increase in main channel length
- Increased floodplain connectivity (64 acres)
- 18 main channel large pools and 15 riffles in main channel
- 142 main channel large wood/habitat structures
- 374 floodplain and side channel roughness/habitat structures
- 22,000 trees, shrubs, willows and sedge/rush plugs planted
- 800 pounds of native grass seed broadcast
- Protection of revegetation with enclosures and deterrents
- Invasive vegetation control
- 1866 senior water rights (1.075 cfs) protected instream
- Increased irrigation efficiency and improved passage

Discharge (cfs)	Total Wetted Area (acres)		
	Existing	Proposed	% Change
18	3.8	4	4%
40	4.3	5.6	29%
60	4.6	6.1	34%
120	5.2	7.2	39%
280	5.9	9.9	69%
450	6.6	15.9	140%
565	8.6	20.8	143%

Table 1: Total wetted area uplift, including side channel, alcove and spring channels and flood plain/swale wetland complex (Bureau of Reclamation report: Habitat Uplift Modeling-CC-44 Project: Southern Cross Project Area)

## Monitoring

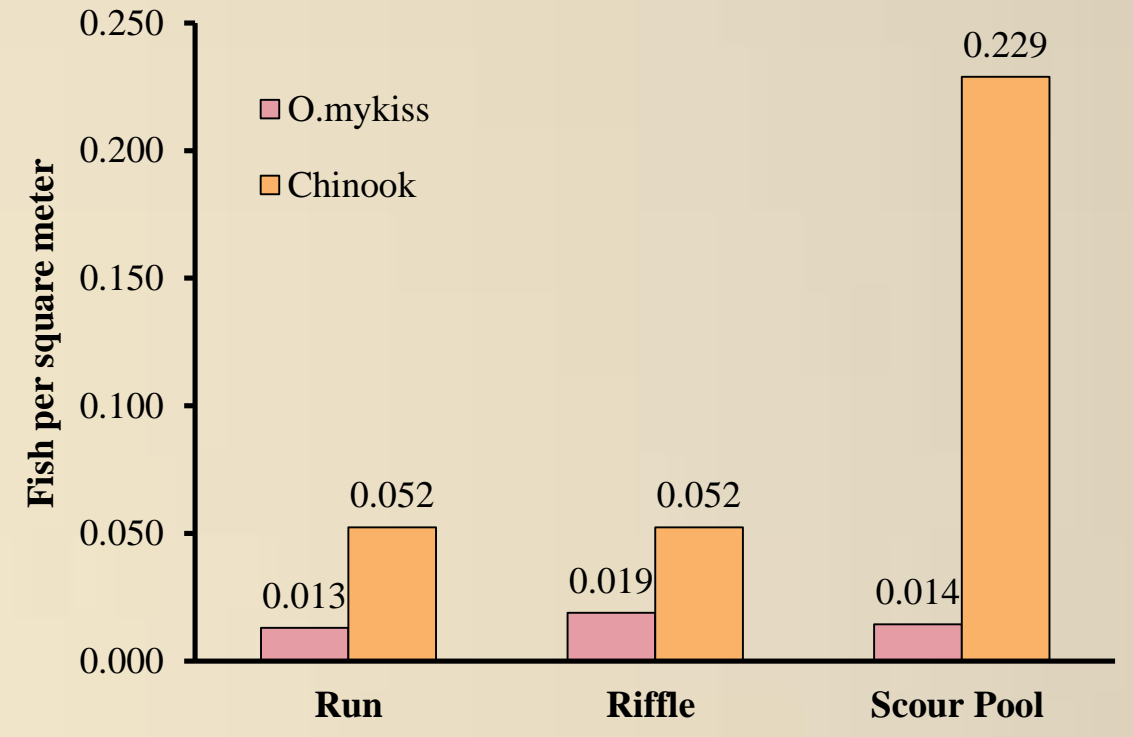


Figure 9: Mean fish densities of juvenile Chinook and steelhead by habitat type at a 75m monitoring site post-construction.

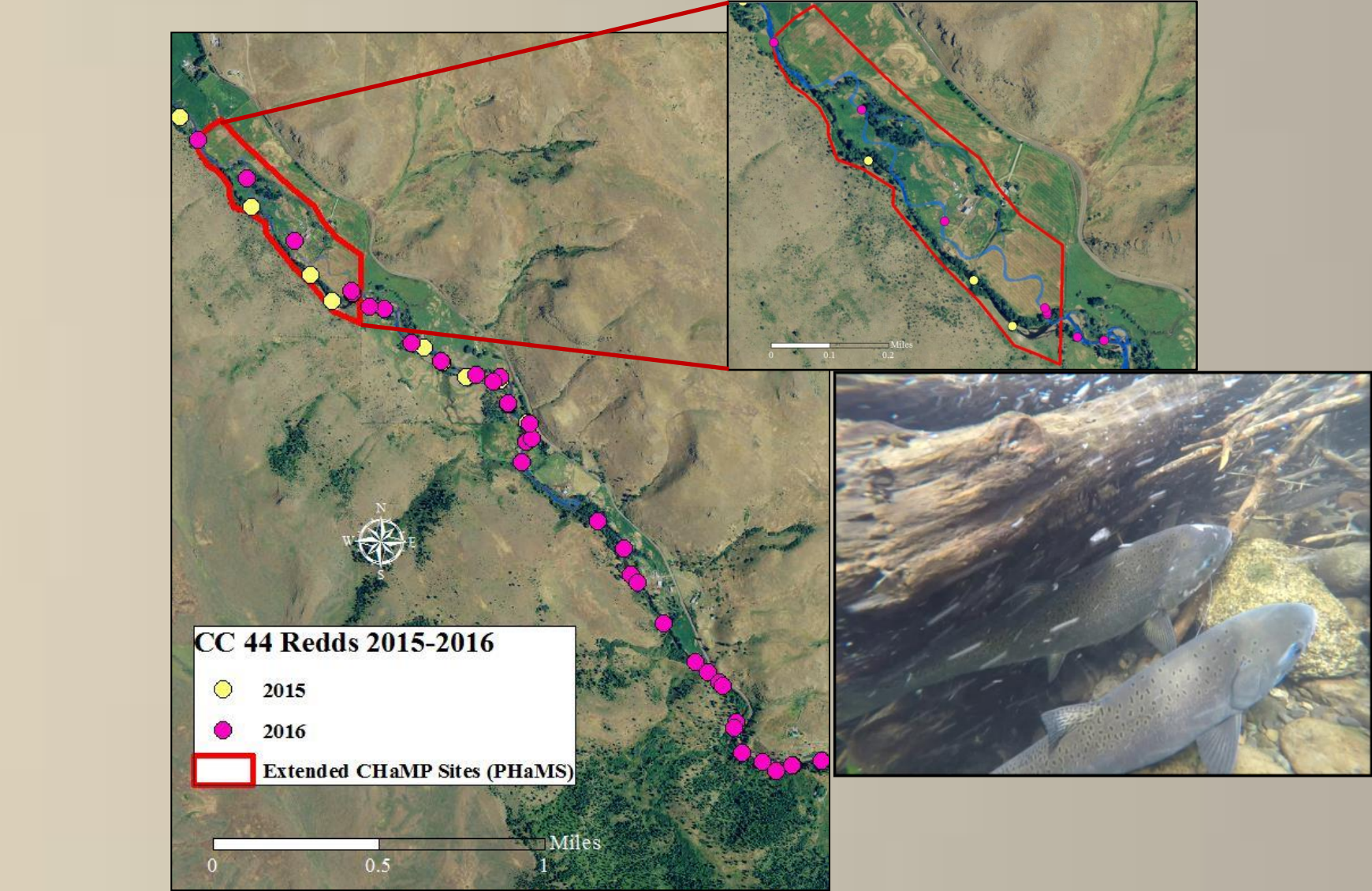
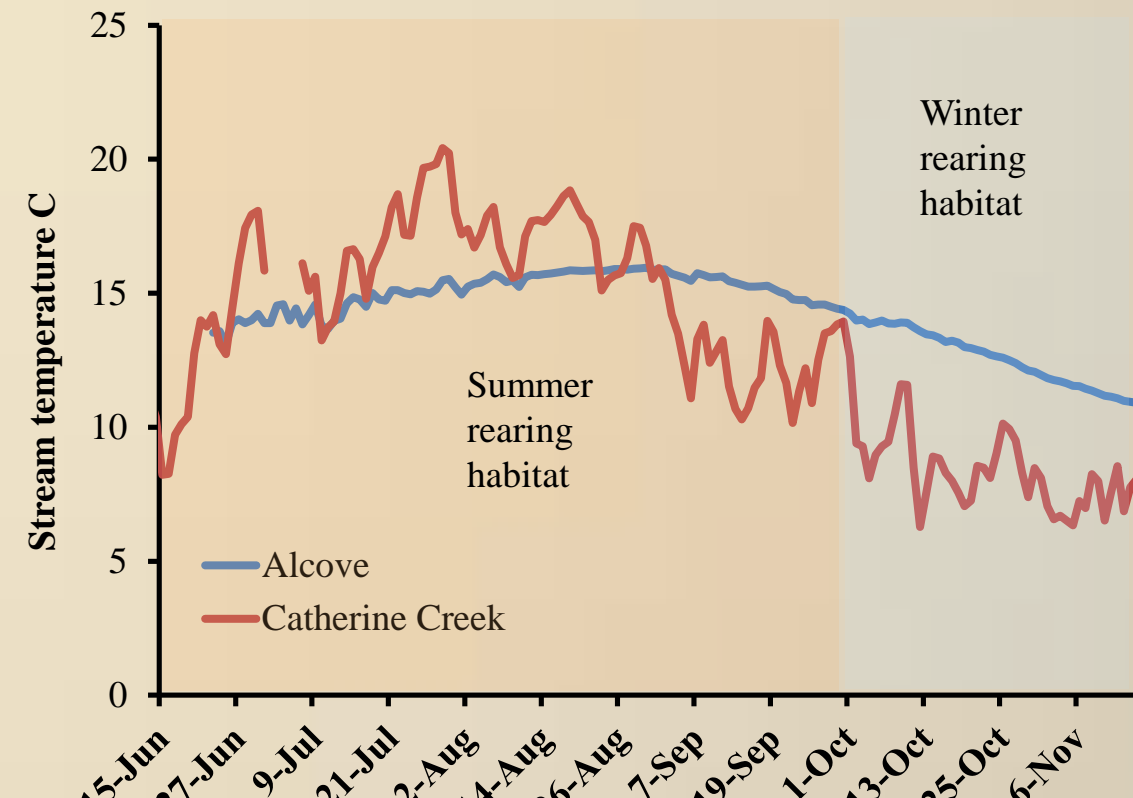


Figure 10: Chinook redds observed in 2015 & 2016 along entire restoration project reach with inset showing phase 3 and adult Chinook holding

Figure 11: Mean stream temperature in Catherine Creek and floodplain feature alcove in first year of activation with juvenile rearing periods highlighted (left)

## Discussion

- Land acquisition provided for the large scale restoration of channel, riparian, and floodplain processes and function in accordance with CTUIR’s River Vision resulting in significant habitat uplift for all life stages of ESA listed salmonids.
- Innovative, extensive use of GPS machine control allowed more efficient channel, swale, and floodplain grading and precise placement of key members within large wood structures.
- Conventional practice to activate constructed channels during in-water work periods presents challenges for turbidity management and mitigation during low flow conditions. The project conducted “early activation” of the constructed channel to promote fine sediment flushing during natural high flow turbidity periods to moderate effects of turbidity on fishery resources.
- Collaboration, scale and nested stream restoration projects create synergistic value for species at high risk and may prove to be more resilient to climate change compared to single projects.
- Monitoring efforts will be ongoing, using CHaMPs and PHaMS protocols.

## Acknowledgements

