Riparian Habitat Restoration

The Lands Council
2025

THE LANDS COUNCIL



Vegetated Riparian Buffers
Beaver Coexistence
Beaver Dam Analogs (BDAs)

VEGETATED RIPARIAN BUFFERS

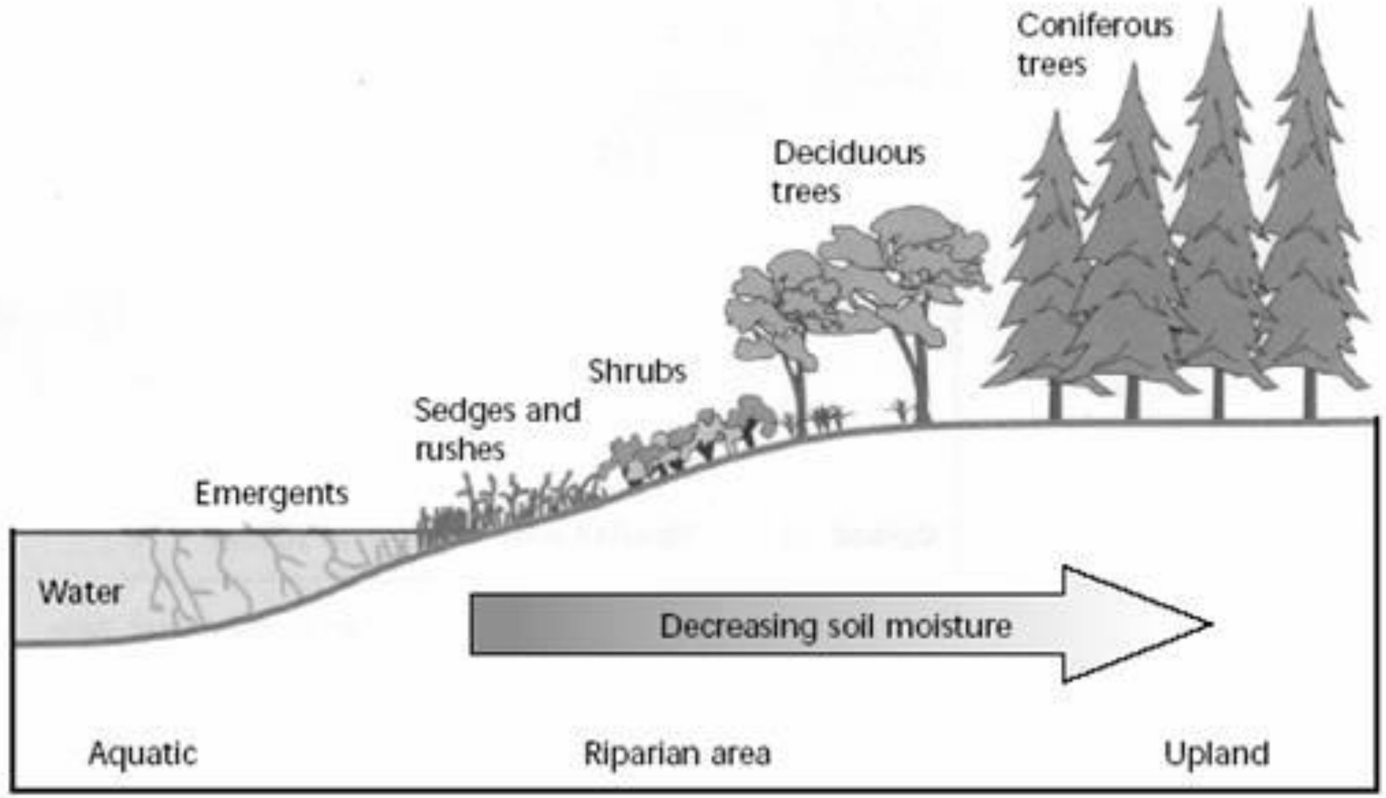


FIGURE 1 *Illustration of the moisture gradient in a typical riparian ecosystem (from Stevens et al. 1995:2).*

Riparian Zone:

- *Interface between land and stream*

Importance:

- *Erosion Control*
- *Nutrient Attenuation*
- *Temperature Reduction*
- *Wildlife Habitat*



ACE
The helpful place.

ACE
helpful place.

BEAVER COEXISTENCE

- Aquifer storage
- Clean water
- Wetlands
- Fish & wildlife habitat
- Wildfire defense

Tree Wrapping

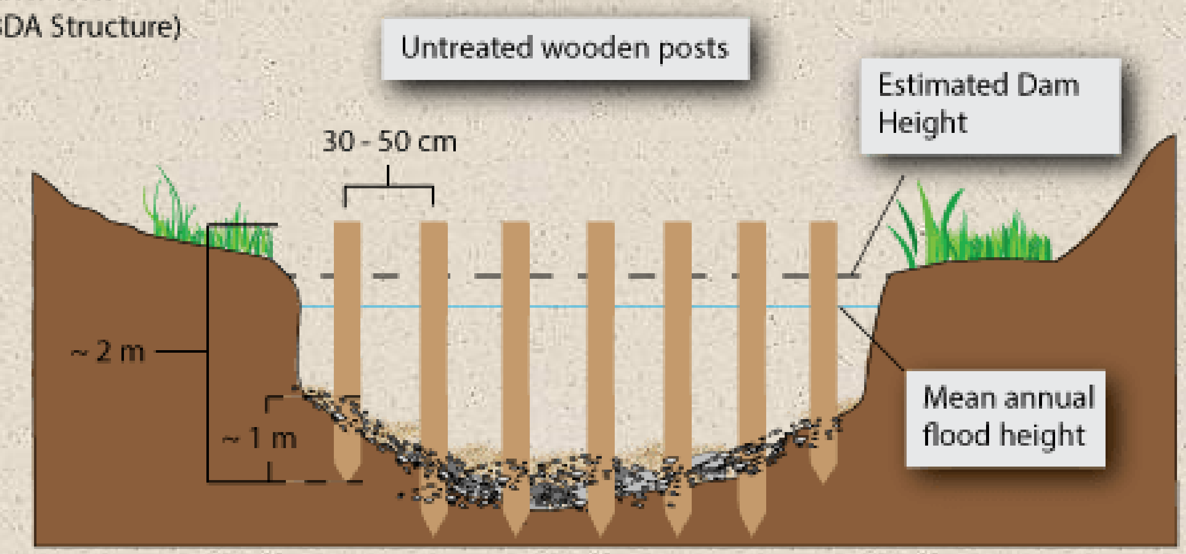
Culvert Protection

Beaver Dam Notch Fencing

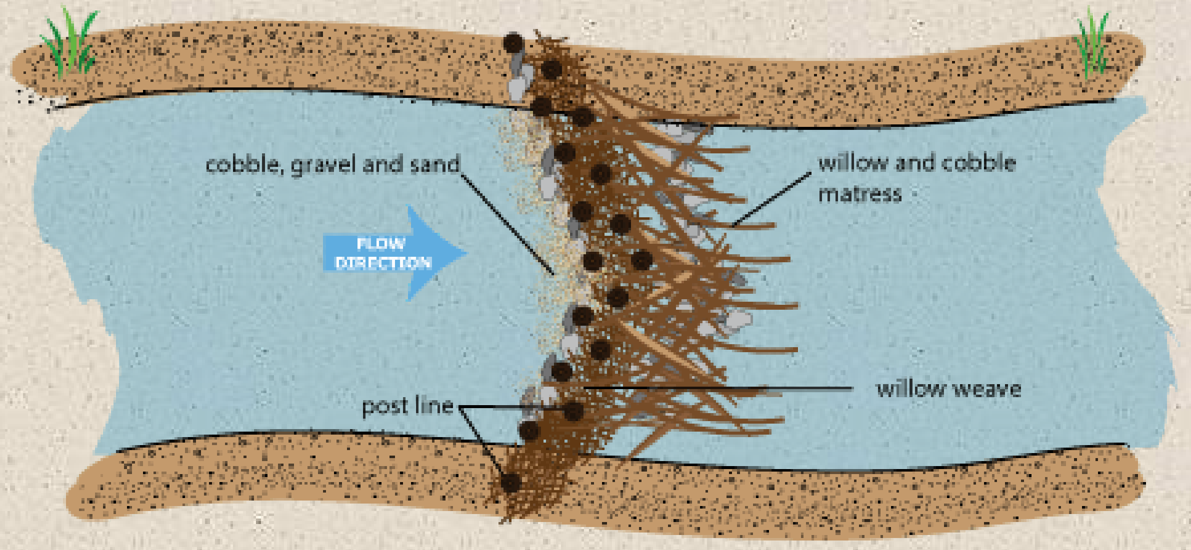
Flexible Pond Leveler

BEAVER DAM ANALOGS (BDAs)

Cross Section View
(Generic BDA Structure)

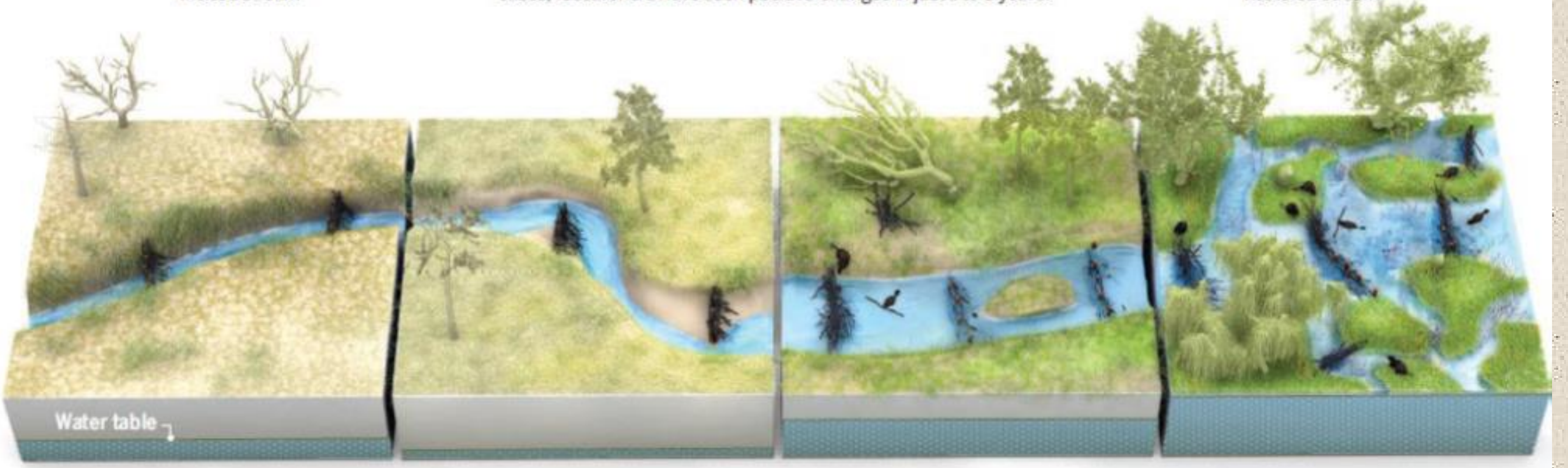


Plan View
(Convex Primary Dam)



A stream comes back to life

Across the U.S. West, scientists and land managers are using beaver dam analogs (BDAs) to heal damaged streams, re-establish beaver populations, and aid wildlife. In some cases, researchers have seen positive changes in just 1 to 3 years.

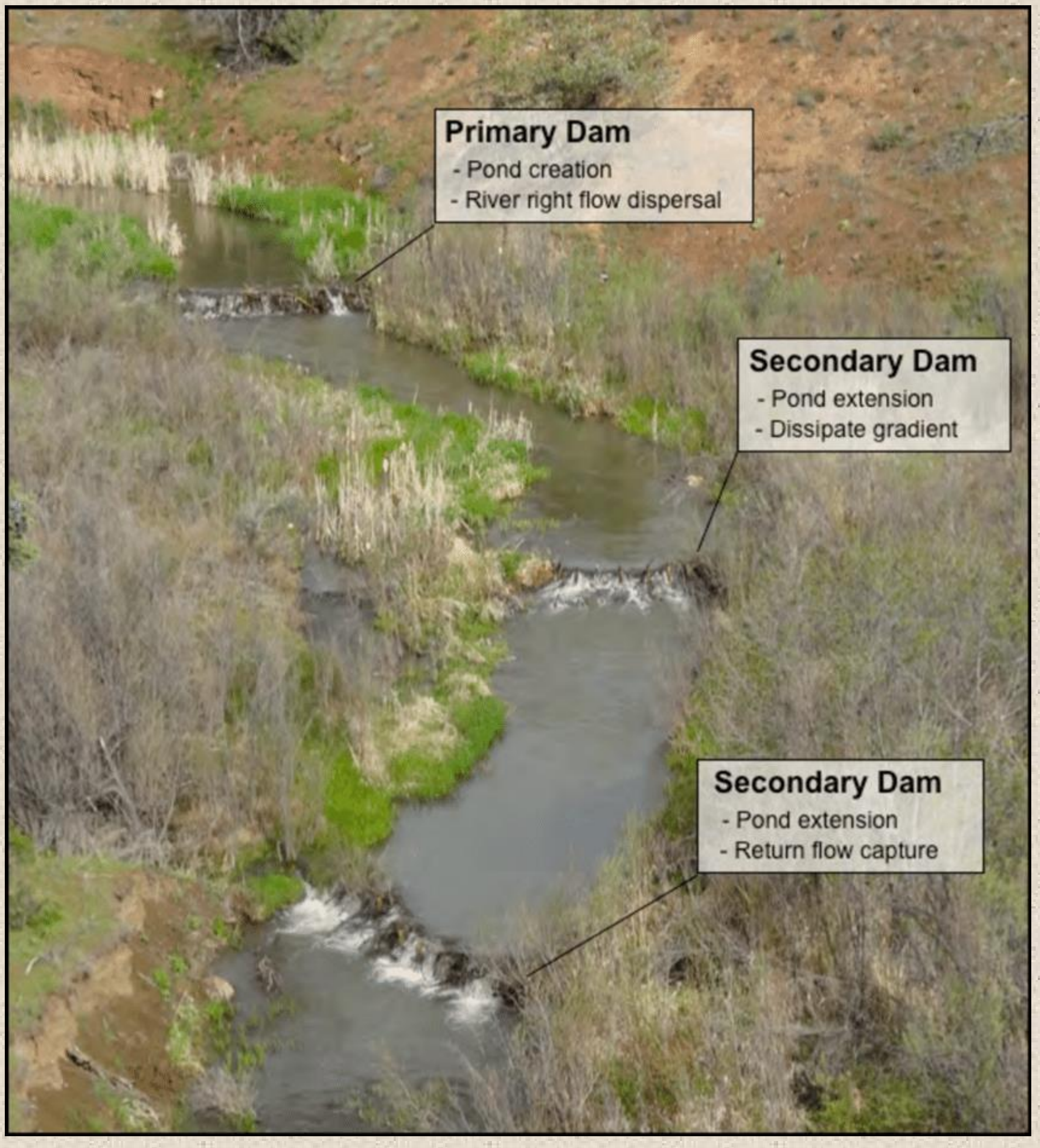


Adding dams
Beaver trapping and overgrazing have caused countless creeks to cut deep trenches and water tables to drop, drying floodplains. Installing BDAs can help.

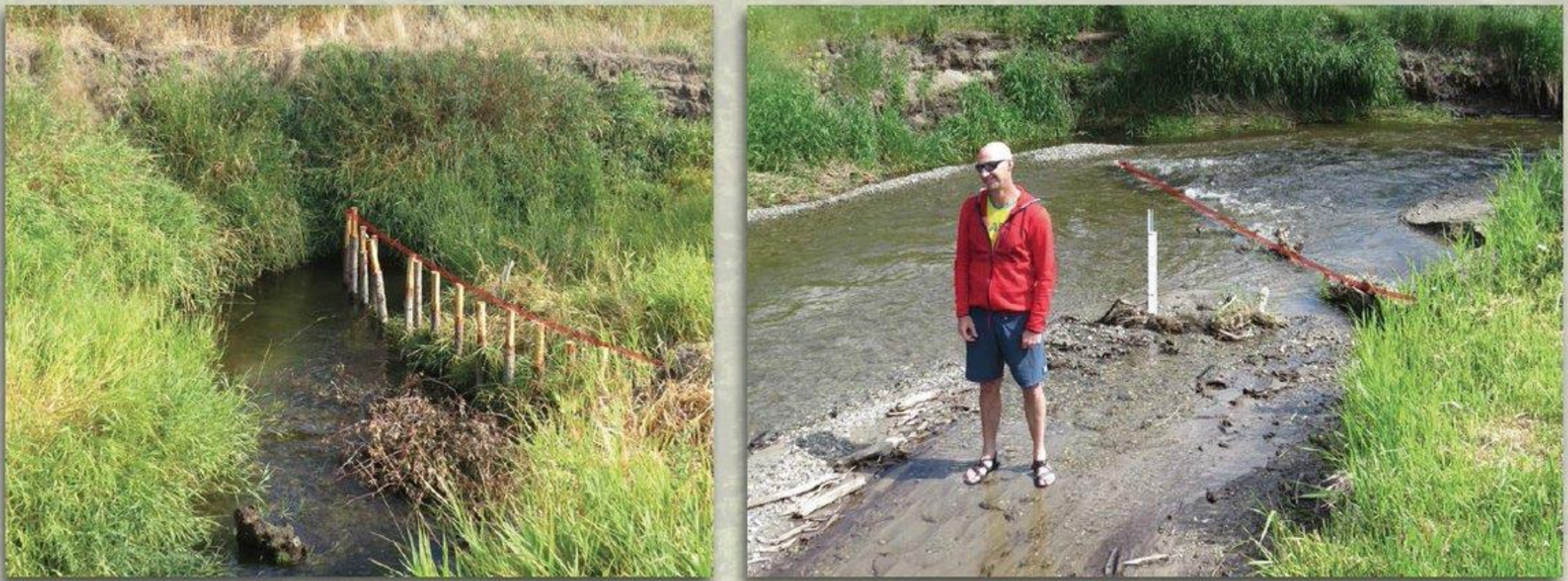
Widening the trench
BDAs divert flows, causing streams to cut into banks, widening the incised channel, and creating a supply of sediment that helps raise the stream bed.

Beavers return
As BDAs trap sediment, the stream bed rebuilds and forces water onto the floodplain, recharging groundwater. Slower flows allow beavers to recolonize.

A complex haven
Re-established beavers raise water tables, irrigate new stands of willow and alder, and create a maze of pools and side channels for fish and wildlife.


Primary Dam
- Pond creation
- River right flow dispersal
Secondary Dam
- Pond extension
- Dissipate gradient
Secondary Dam
- Pond extension
- Return flow capture

Okanogan Highlands Alliance



Before: Beaver Dam Analogue (BDA) #17 on September 7, 2016, right before it was woven. Note the red line along the post tops.

After: On June 22, 2017, Robes Parrish stands on top of 4.5 feet of aggraded sediment, in front of BDA17. Note the red line, at the new streamed elevation!

Okanogan Highlands Alliance

Thompson Creek Beaver Dam Analog (BDA) Stream Restoration Project


Newman Lake
Google
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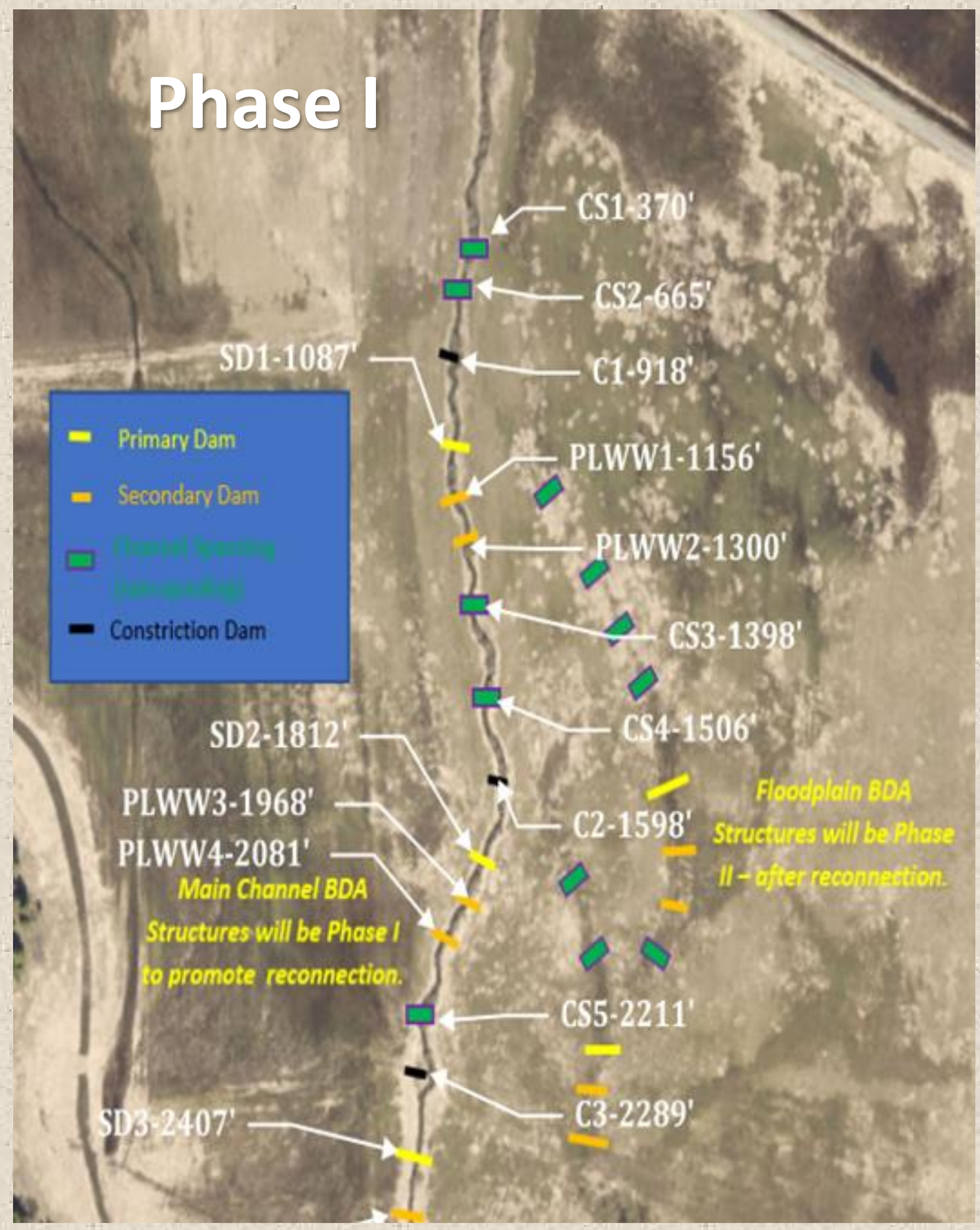
Design Phases of Thompson Creek BDA's

- Phase I design and construction completed Nov 2021
- Phase II design complete, construction Summer/Fall 2025
- Phase III, design underway for BDAs in reach upstream of Phase I and II

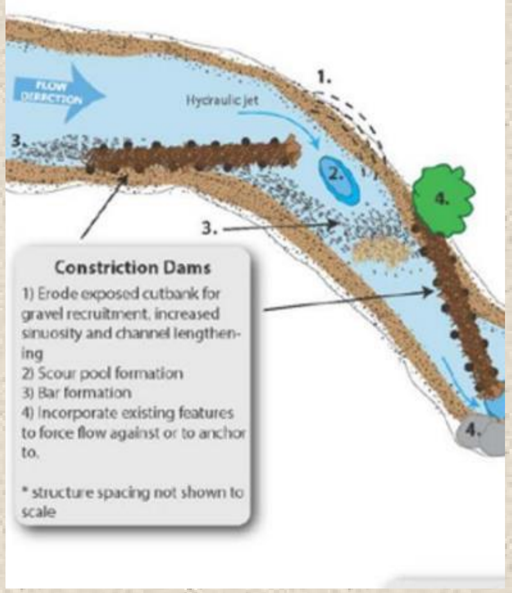


Primary Dam

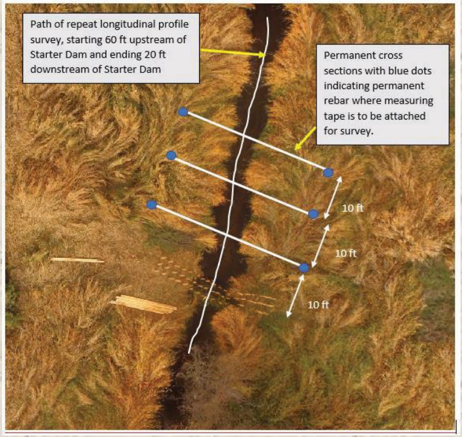
Secondary Dam

Channel Spanning Dam

Constrictor Dam



Beaver Dam Analog Type	Crest Elevation	Structure Objective
Primary Dam	equal to or above bankfull	Create extensive deep water habitat; force overbank flows; cause aggradation
Secondary Dam	equal to or below bankfull	Extend pond habitat; support primary dam by reducing hydraulic gradient
Channel spanning dam (non-ponding)	equal to or below bankfull	Force overbank flows during peak runoff; alter local hydraulics to increase geomorphic complexity; increase instream roughness to cause channel widening and incision recovery; increase water depth
Constriction dam	equal to or below bankfull	Force channel widening to increase channel incision recovery, create hydraulic diversity



Phase I, Three Years of Monitoring (2021 – 2024)

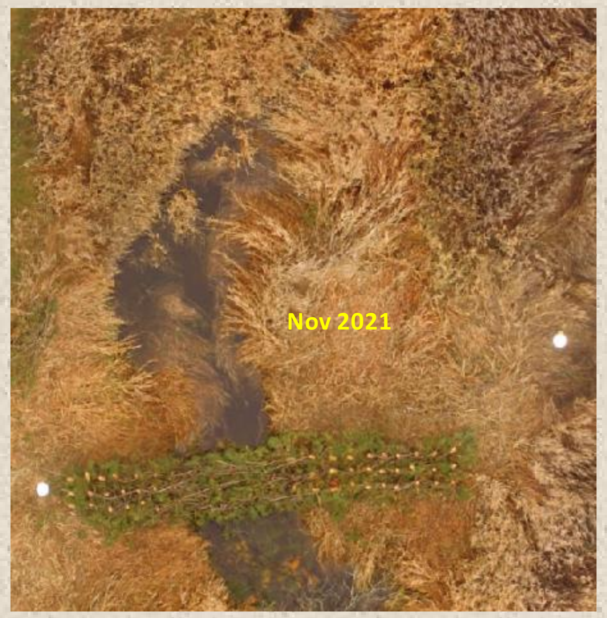
- **Hypotheses**:
  - #1 Increase water storage
  - #2 Increase sediment storage
  - #3 Reduce total phosphorus concentrations entering lake
  - #4 Increase macroinvertebrate diversity
- **Methods:**
  - #1 - Aerial images from drone with water depth profiling
  - #2 - Soil probing
  - #2 - Repeat cross section and longitudinal profile surveys
  - #3 - Water sampling and testing for total phosphorus concentrations
  - #4 - Macroinvertebrate sampling and identification

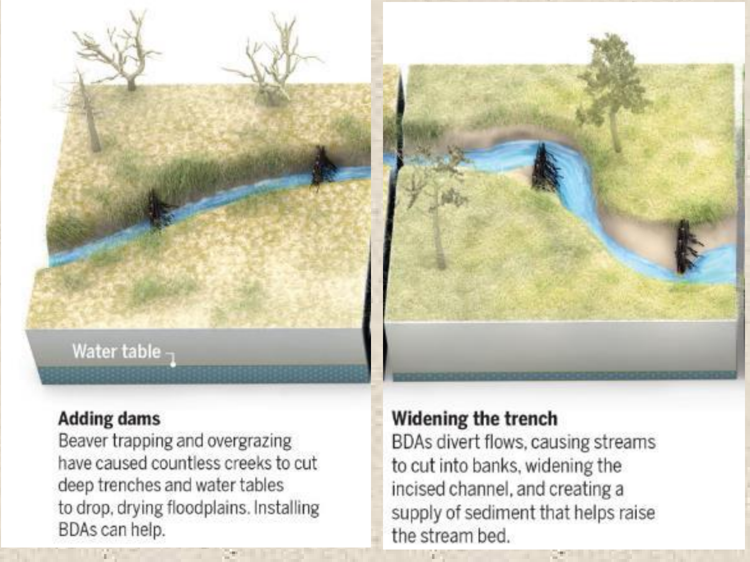










Aerial Images Starter Dam #1

Repeat Cross Section Surveys - Starter Dam #1

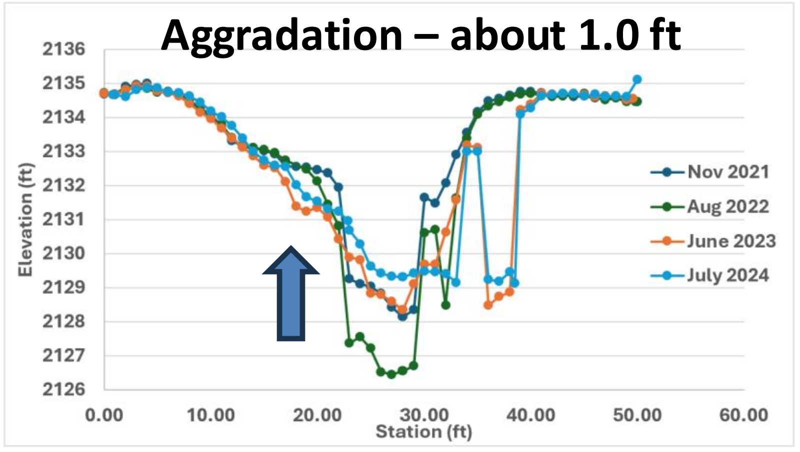


Figure E.18. Comparison of Cross Section #1A, located 10 ft upstream of Starter Dam #1

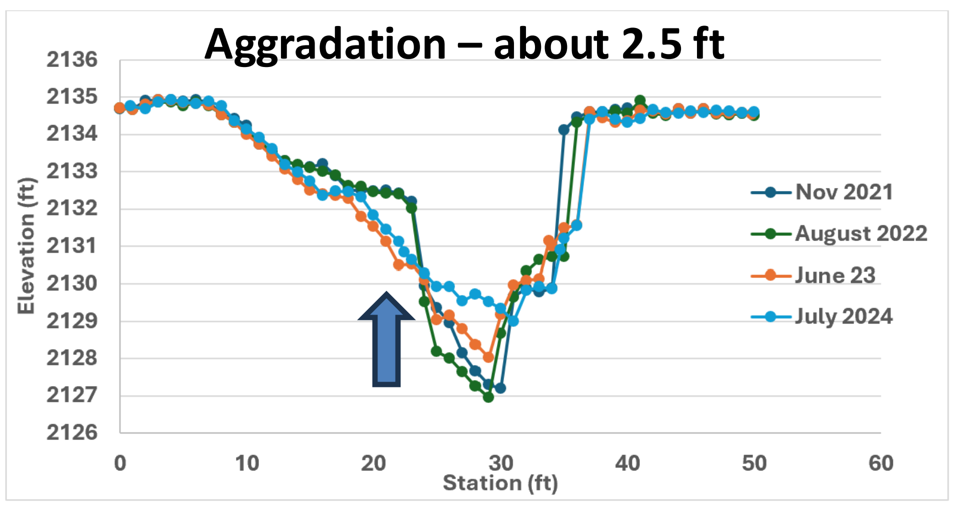


Figure E.19. Comparison of Cross Section #1B, located 20 ft upstream of Starter Dam #1

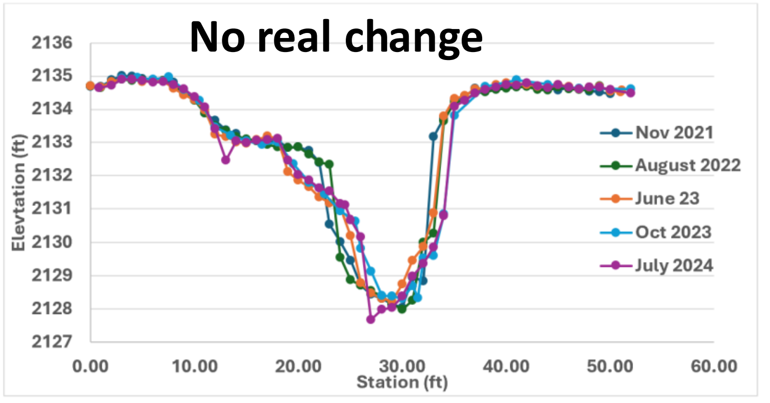
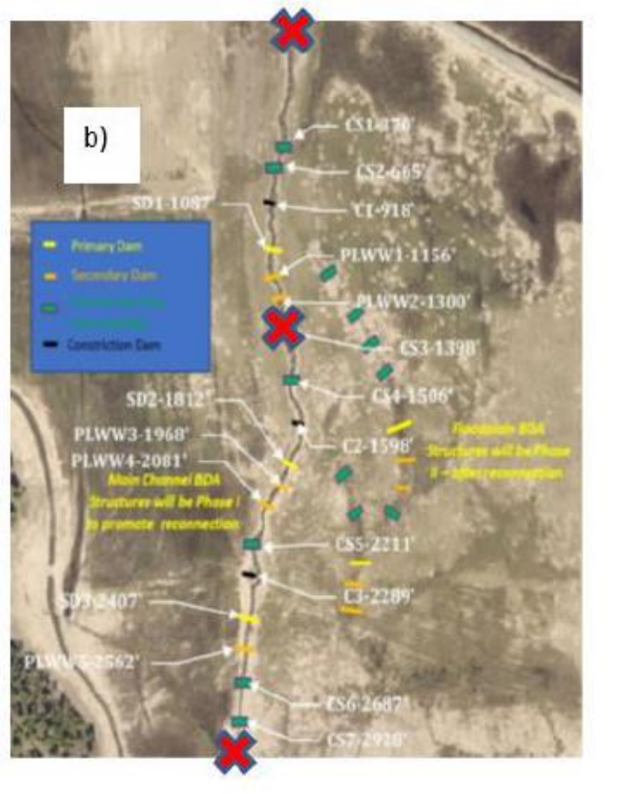


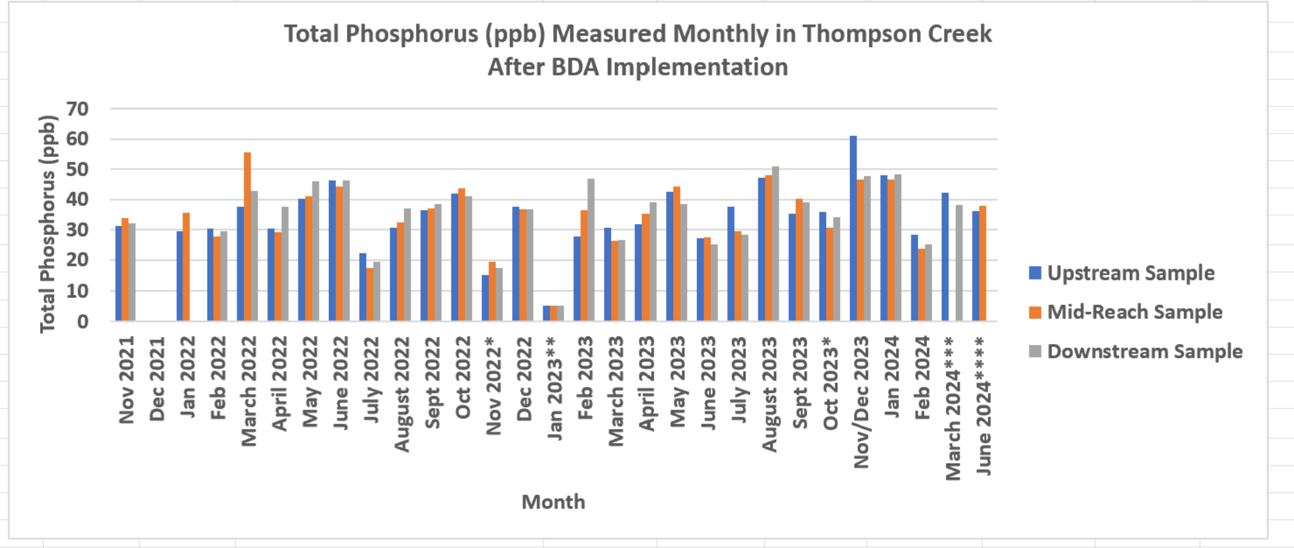
Figure E.20. Comparison of Cross Section #1C, located 30 ft upstream of Starter Dam #1

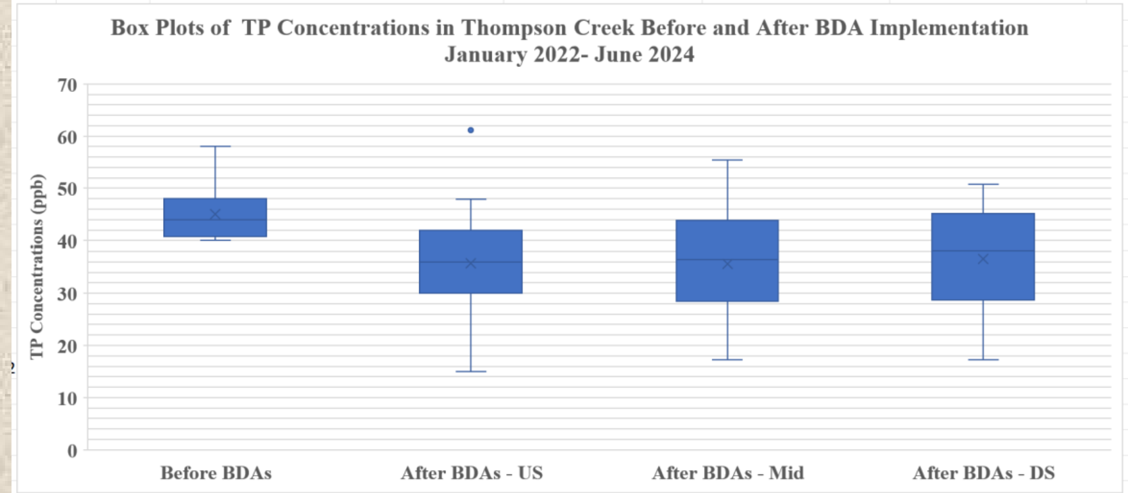
Channel widening by BDA Starter Dam is leading to sediment aggradation in main channel.

Floodplain Reconnection – SD#3

Water Column Total Phosphorus Testing







- No significant change in water column TP over 3 years
  - Scour under BDAs allows for sediment and TP transport
- Could use more ponding to retain sediment and TP
  - Phase II Adaptive Management of BDAs

Sediment Total Phosphorus Testing

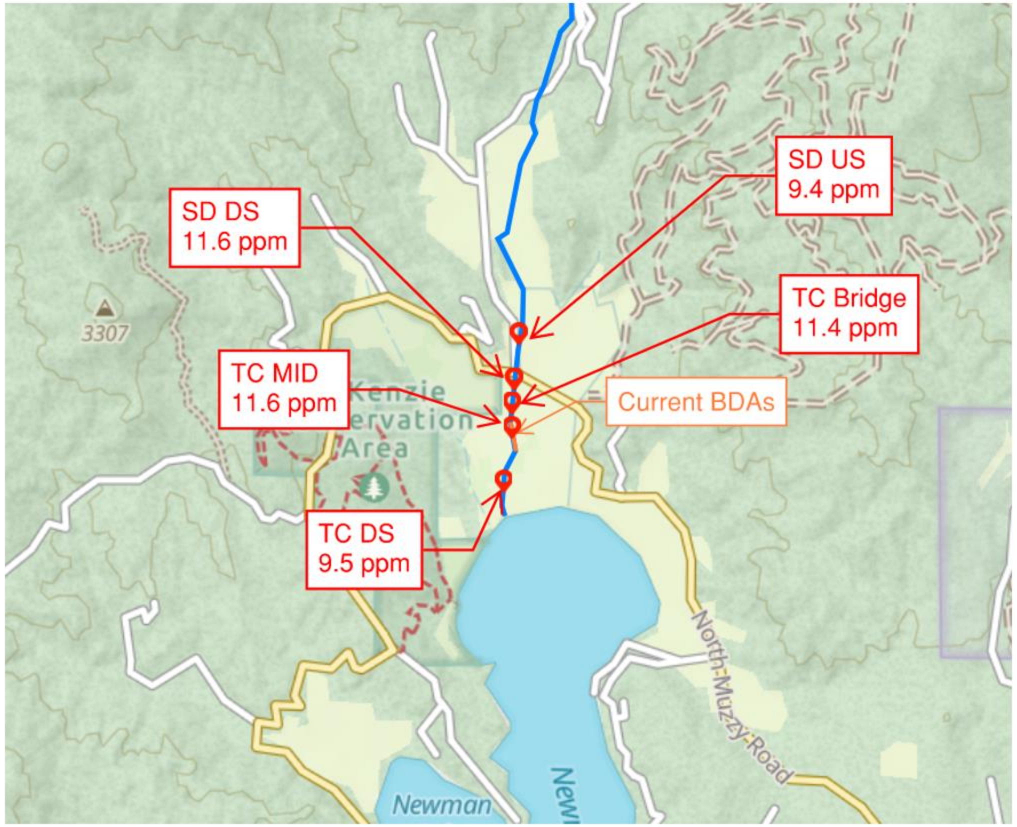
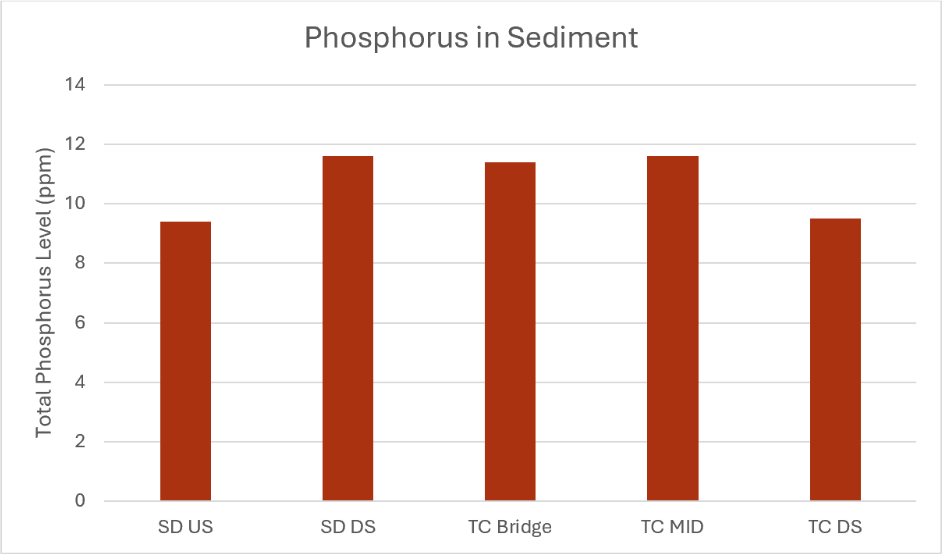


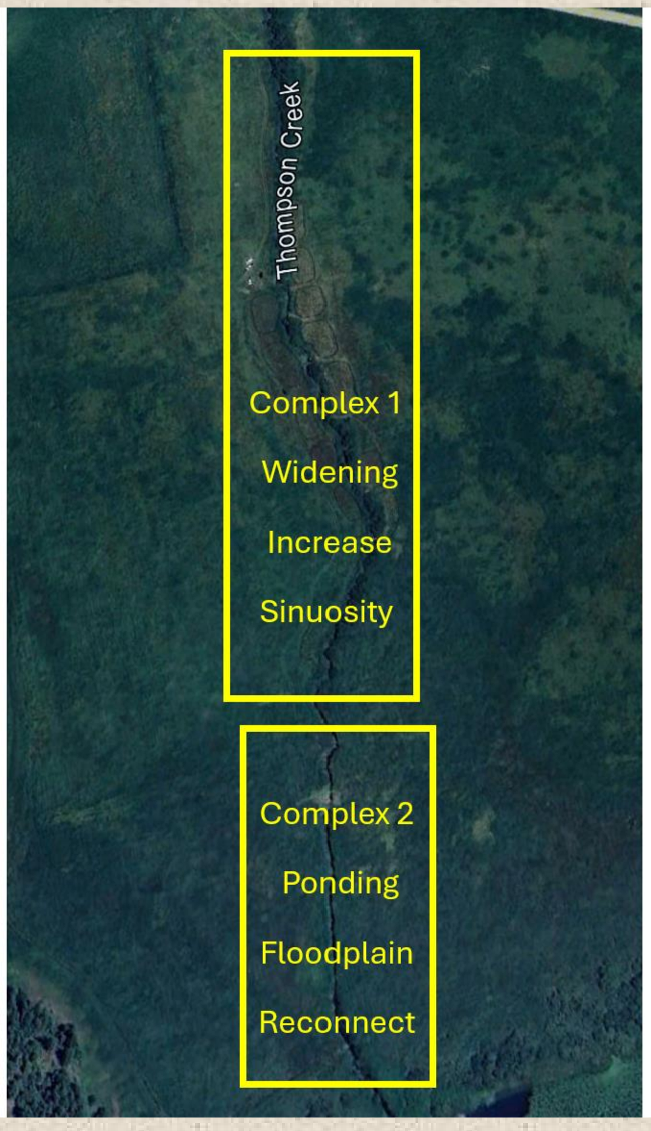
Figure 10: Location of the Sediment Samples



- Legacy sediment is loaded with TP!
  - Limits ability to adsorb TP from water column
- More ponding and vegetation needed to retain sediment and uptake TP
  - Phase II Adaptive Management of BDAs

Adaptive Management Plan for Thompson Creek BDAs

- Complex 1 - focus on widening and roughness
  - Post Assisted Log Structures (PALS), bank attached and mid-channel
  - Channel Spanning Dams add roughness
  - Constrictor Dams increase sinuosity
- Complex 2 - focus on ponding and floodplain reconnection
  - Starter and Secondary Dams Sealed to Pond
  - Channel Spanning Dams add roughness to protect SD



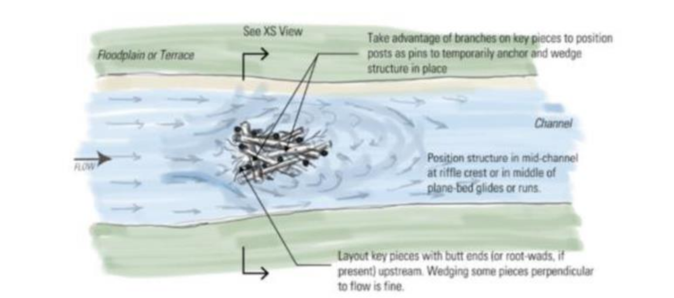


Figure 31 - Mid-Channel Post-Assisted Log Structures (PALS) plan view.

California Creek BDAs
Valleyford, WA

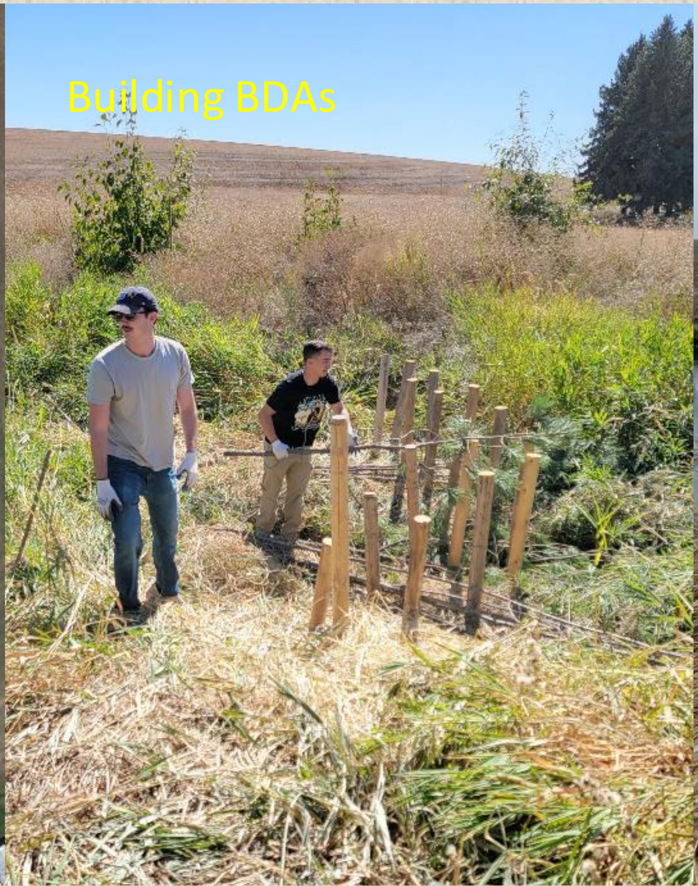
TLC, USFWS, Gonzaga

Project Goals:

- Sediment trapping
- Increased roughness and hydraulic diversity
- Reduce erosion on outside banks
- Improve habitat conditions for macros and fish
- Pilot project - Learn from BDA application

Rattler Run Creek BDAs
Fairfield, WA
TLC, USFWS, Gonzaga

Project Goals:
- Promote ponding and sediment trapping (Palouse Ag Sediments)
- Increase roughness and hydraulic diversity
- Floodplain reconnection and increase groundwater table to feed vegetation
- Improve habitat for macros and fish



Spangle Creek BDAs
Spangle, WA
TLC, USFWS, Gonzaga

All these beaver restoration projects contribute to the greater river restoration work being done in the Spokane River watershed

Project Goals:
- Promote ponding and sediment trapping (Palouse Ag Sediments)
- Retain water longer in the creek (dries up) – feed the floodplain vegetation
- Increase roughness and hydraulic diversity
- Improve habitat for macros and fish


Questions?
Beaver are Bloody Brilliant!