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April 4, 2023

MEMORANDUM

TO: Fish and Wildlife Committee Members

FROM: Mark Fritsch

SUBJECT: Columbia River Delta Assessment for the Wind, White Salmon, and Klickitat Rivers

BACKGROUND:

Presenter: Bill Sharp, Yakama Nation Fisheries, Klickitat Coordinator
Charles Seaton, Columbia River Inter-Tribal Fish Commission, Coastal Margin Observation and Prediction (CMOP) Program Coordinator

Summary: Bill and Charles will provide an overview of a Technical Assistance Agreement between the Yakama Nation and the U.S. Army Corps of Engineers - Portland District in partnership with Columbia River Inter-Tribal Fish Commission and others to assess local hydraulic conditions within the sediment fan/delta of the Wind, White Salmon, and Klickitat River tributaries (Bonneville Pool). The project is in the early stage of compiling existing information and building a team of subject matter experts to inform management options for improving impaired aquatic habitats in areas of the delta in order to reduce high juvenile salmon mortality due to predation and diminishment of cold water plumes for returning adults.

Relevance: This activity is associated with Project # 1997-056-00, *Yakama Southern Territories Habitat Project (STHP)*. The STHP addresses the following

elements listed in the ESA MCR Steelhead Recovery Plan¹ by Protect and restore tributary habitat and Columbia River mainstem habitat, through strategies and actions. In addition, this effort supports the 2014 Fish and Wildlife Program and the 2020 addendum, under the Strategy of Ecosystem.

Workplan: Fish and Wildlife Division work plan 2023; Program planning & coordination.

Background: The initial effort associated with the Columbia River Delta Assessment was the identification of a problem set and understanding key considerations and restoration opportunities that existed at each of the river deltas. This planning effort focused on gathering information from tribes, state and federal resource agencies, and local governments to better understand the area and provide necessary input in the refining of the team's scoped activities. The compiled outputs from the effort have provided a framework to develop the data collection and monitoring strategy.

During the 2022 summer field season NOAA-Office of Coast Survey conducted bathymetric surveys of the Columbia River from Little White Salmon to the Klickitat Delta. Oregon State University assisted with shallow water bathymetry of the Klickitat Delta to also inform our future modeling efforts.

A two-year Klickitat River smolt survival study published in 2021 by YKFP and USGS has indicated that a high degree of predation occurs across the delta and out into the Columbia River confirming the implications that the deltas contribute to juvenile salmon mortality.

More Info:

- NOAA-OCS coverage: OPR-N338-NRTSE-22 Columbia River, Oregon and Washington <https://storymaps.arcgis.com/stories/ffaae163a1054ef2880dcdd492bb5ec1>
- Environmental Protection Agency - Columbia River Cold Water Refuges Plan <https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges-plan>
- Evaluation of Movement and Survival of Juvenile Steelhead (*Oncorhynchus mykiss*) and Coho Salmon (*Oncorhynchus kisutch*) in the Klickitat River, Washington, 2018–2019. <https://pubs.er.usgs.gov/publication/ofr20211083>

¹ Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan 2009.

Delta Assessment of the Wind, White Salmon, and Klickitat Rivers (Bonneville Pool).



Northwest Power & Conservation Council – April 11, 2023

Bill Sharp, Research Scientist, YN Fisheries

Charles Seaton, CRITFC, Program Coordinator
Coastal Margin Observation and Prediction

Presentation Outline:

Need for Assessments

YN & COE- Technical Assistance Agreement

Actions Taken – White Salmon Delta.

CRITFC - NOAA-OCS & OSU Partnership

Acknowledgments:

YN Tribal Council, CTBWSR, CRITFC,
COE-Portland, NOAA-OCS, OSU, EPA



Klickitat River Delta at Bonneville Pool.

Tribal Treaty Fishing Rights on the Columbia River



The 1855 treaties negotiated between the U.S. and the Native American groups that now comprise the Yakama, Umatilla, Nez Perce, and Warm Springs tribes contained a substantially identical provision securing to those tribes **"the right of taking fish at all usual and accustomed places in common with citizens of the Territory."**

Treaty fishing rights include the right to have fish present for purposes of harvest. *United States v. Washington*, 853 F.3d 946, 964-66 (9th Cir. 2017), *aff'd Washington v. United States*, 138 S. Ct. 1832 (2018).

Columbia River Hydrosystem Sediment Issues



Klickitat Delta.

- Prior to Bonneville Dam (1935) the Columbia River transported 16.4 million tons of sediment each year.
- Despite a significant increase in soil runoff from agriculture and other human development, only around 8 million tons of Columbia River sediment reaches the Pacific Ocean each year.
- These changes are particularly noticeable at the mouths of tributaries in the impounded pools.
- Where still water of a reservoir can no longer carry much sediment, which quickly settles, creating a sediment fan or delta.
- Significant deltas have formed at mouths of the Klickitat, Hood, White Salmon, Wind, and Deschutes Rivers.
- Fishing sites are filling in as well as access at some in-lieu and TFAS sites.

Sediment Negatively Impacts Treaty Fishers

- Sediment can impede both scaffold-based and boat-based tribal fishers.
- Traditional fishing holes become filled in.
- Navigation hazards are created:
 - Sand bars appear in new locations.
 - Changes to the river flow create unpredictable currents, increasing risk for fishers.
- Build-up at traditional and in-lieu Treaty fishing access sites restricts critical access to docks and boat launches.

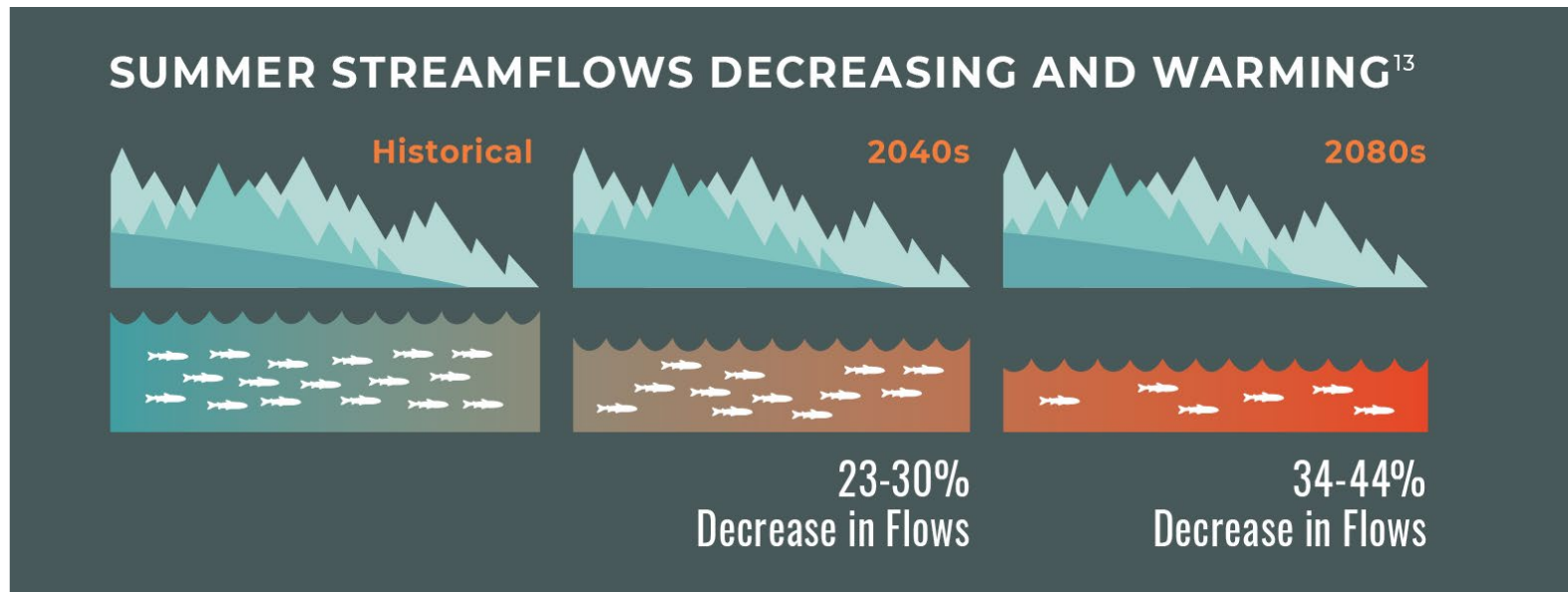


Sediment Negatively Impacts Anadromous Fish

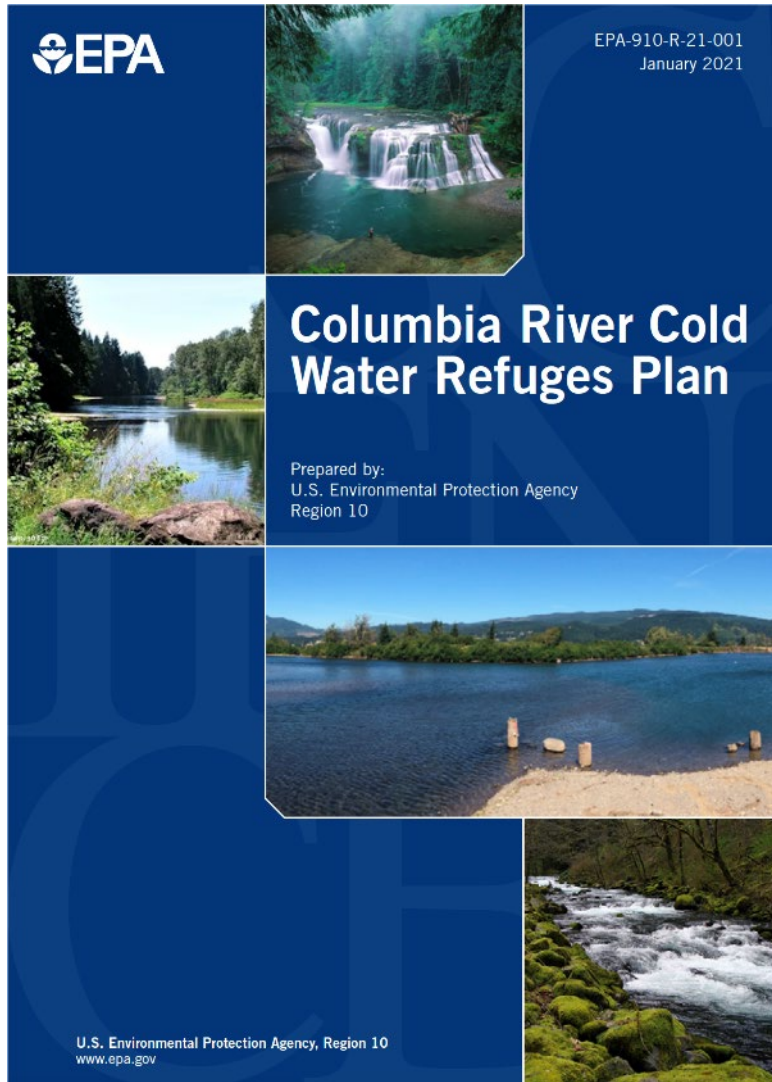


Sockeye Salmon with lesions. Photo: Columbia Riverkeeper

- Shallow, simplified habitats strand and kill juvenile salmonids and lamprey during hydropower ramping events.
- "Hot spots" increase predation opportunities for warm water-fish and avian predators.
- Thermal dams at shallow, sedimented river mouths impede and delay spawning fish.
- Prolonged exposure to warm water = stress, increased susceptibility to disease.
- In 2015, more than half the sockeye salmon run was lost due hot water temperatures.



Proposed Actions: Research to Inform Restoration Options to Improve Salmon and Lamprey Survival



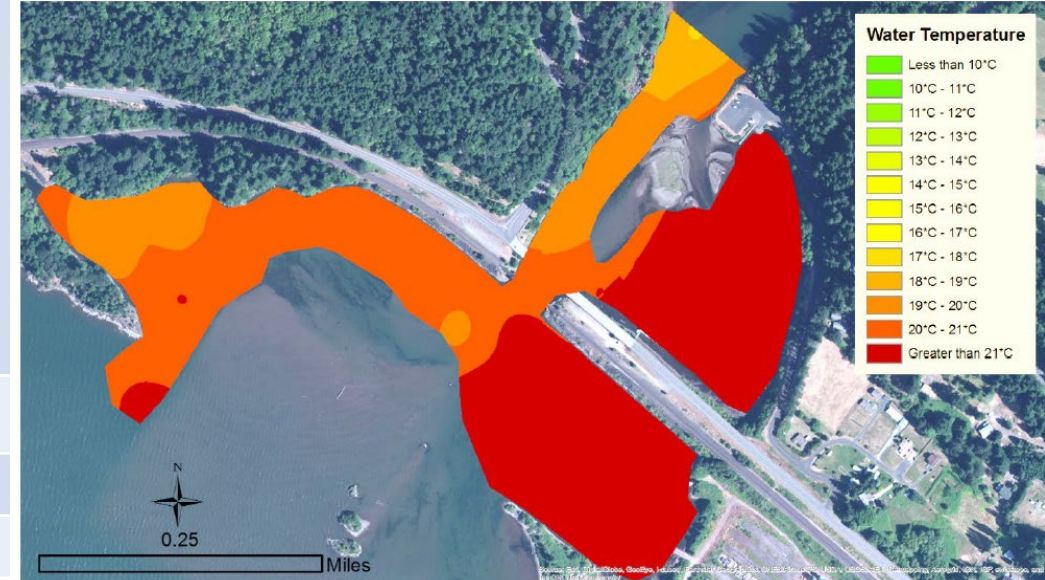
- Assess impacts to treaty fisheries due to reservoir conditions.
- Assess compound impacts of sediment and climate change
- Identify and implement opportunities for habitat restoration to increase fish survival (e.g. coldwater refugia, delta restoration)
- Identify locations with a high probability of providing an aquatic habitat “lift” over current conditions

EPA's Columbia River Cold Water Refuges Plan – 13 primary

| Zone 6 Hydro Dams | River Mile | Dist. to upriver dam | EPA Priority CWR w/in Zone 6 Refuge Volume– ranking (1-13) |
|-------------------|------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bonneville Dam | 146 | 46 | Little White Salmon River (2 nd) Klickitat River (5 th) Herman Creek (6 th) White Salmon River (7 th) Wind River (8 th) Hood River (11 th) |
| The Dallas Dam | 192 | 24 | Deschutes River (3 th) |
| John Day Dam | 216 | 76 | None |
| McNary Dam | 292 | | |

Figure 16. Wind River and Columbia River Confluence – Model Water Temperature at Various Depths for August, 15, 2016.

Depth - 0.5 m



Zone 6 Col. River summer temps. are predicted to continue to get warmer. August mean temps are predicted to be near **23°C by 2040 and approximately 24°C by 2080.**

- Optimal adult migration, 12-16°C. Adverse effects begin above 18°C and w/ exposure time.
- State water quality criteria, 20°C max. for Zone 6 of the Columbia River.
- Sockeye most susceptible, significant mortality at 20-21°C.

Technical Assistance Agreement
US Army Corps of Eng. – Portland District
Yakama Nation, August 2022

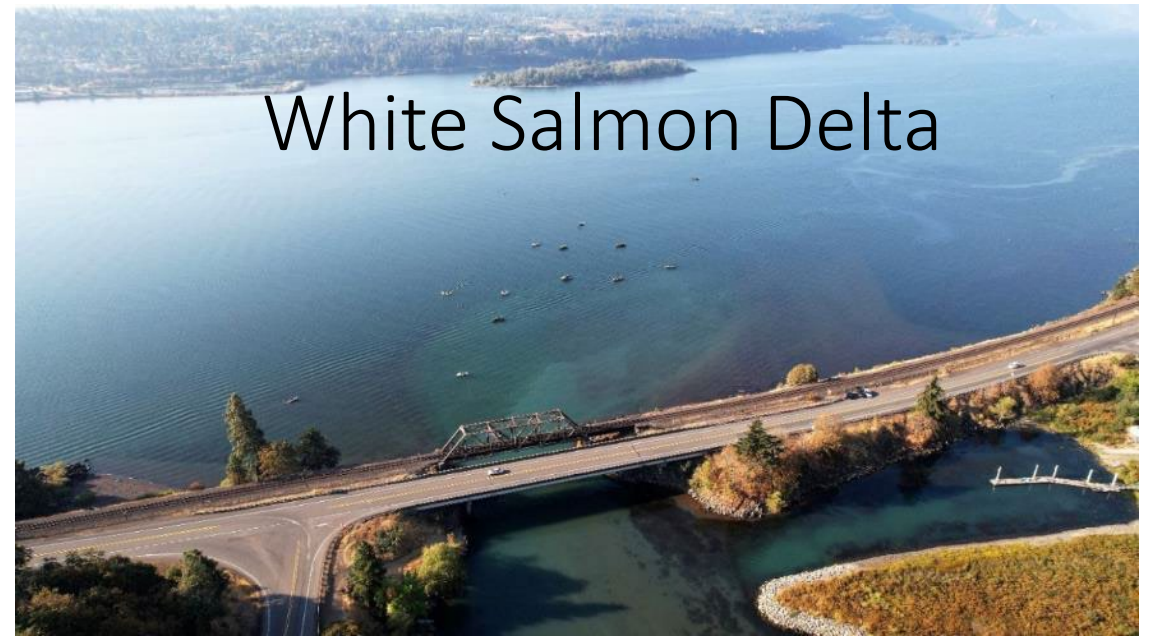
Section 22 of the Water Resources Development Act of 1974, as amended (42 U.S.C. 1962d-16), authorizes the Secretary of the Army to provide technical assistance related to the management of State water resources



Wind River Delta



Klickitat River Delta



White Salmon Delta



TECHNICAL ASSISTANCE SCOPE



The study will examine the changes in sedimentation, and its impacts on salmonids, Pacific lamprey, and cold-water refuges at the confluences of the Klickitat, White Salmon and Wind River tributaries.

1. Develop delta specific problem statements
2. Conduct a literature review
3. Conduct a geomorphic assessment
4. Coordinate bathymetric data collection with NOAA and OSU
5. Compile existing data sets and identify further data needs
6. Develop a monitoring plan for each delta
7. Execute monitoring and data collection plans
8. Develop a long-term monitoring and modelling strategy for each delta



Wind, White Salmon and Klickitat River Deltas



PLANNING CHARETTE



Develop a joint understanding of the study area and identify problems, opportunities, objectives, and goals for each tributary.

Identified Problems

- Dams on the Columbia have altered natural river flow and have changed historic geomorphic processes at the deltas
- Changes in the rate of sedimentation due to watershed changes (bank erosion, landslides, climate change) or large depositional events (dam removal, wildfires)
- Shallower, warmer deltas increase the threat of avian and warm water fish predation of salmon and lamprey
- Loss of cold-water habitat for out migrating juvenile and returning adult salmon

Key Questions

- How has the river changed from a pre-dam state and how does that influence delta characteristics?
- What are the key sources of sediment within each basin and how is sediment in the Columbia impacting these deltas?
- How are deposition patterns different between the deltas?
- How are dam operations affecting the sediment plume? Can operations be modified to improve conditions at the deltas?



LONG TERM GOALS



- Identify ways to improve safe egress for juveniles and expanded cold water refugia for adult salmon
- Modify channels and sandbars in the delta areas to fill in warm shallow areas and/or excavate areas to concentrate cold water
- Identify sediment sources to support riparian and headwater restoration strategies
- Develop a sediment budget for the Columbia River and tributaries to better understand long term maintenance needs
- Develop sediment transport and water quality models to understand how deltas will develop and change over time in support of planning and implementation of restoration measures

Condit Dam Decommissioning - Oct. 26, 2011

Est. 2.4 million cu. yds. of sediments behind the dam

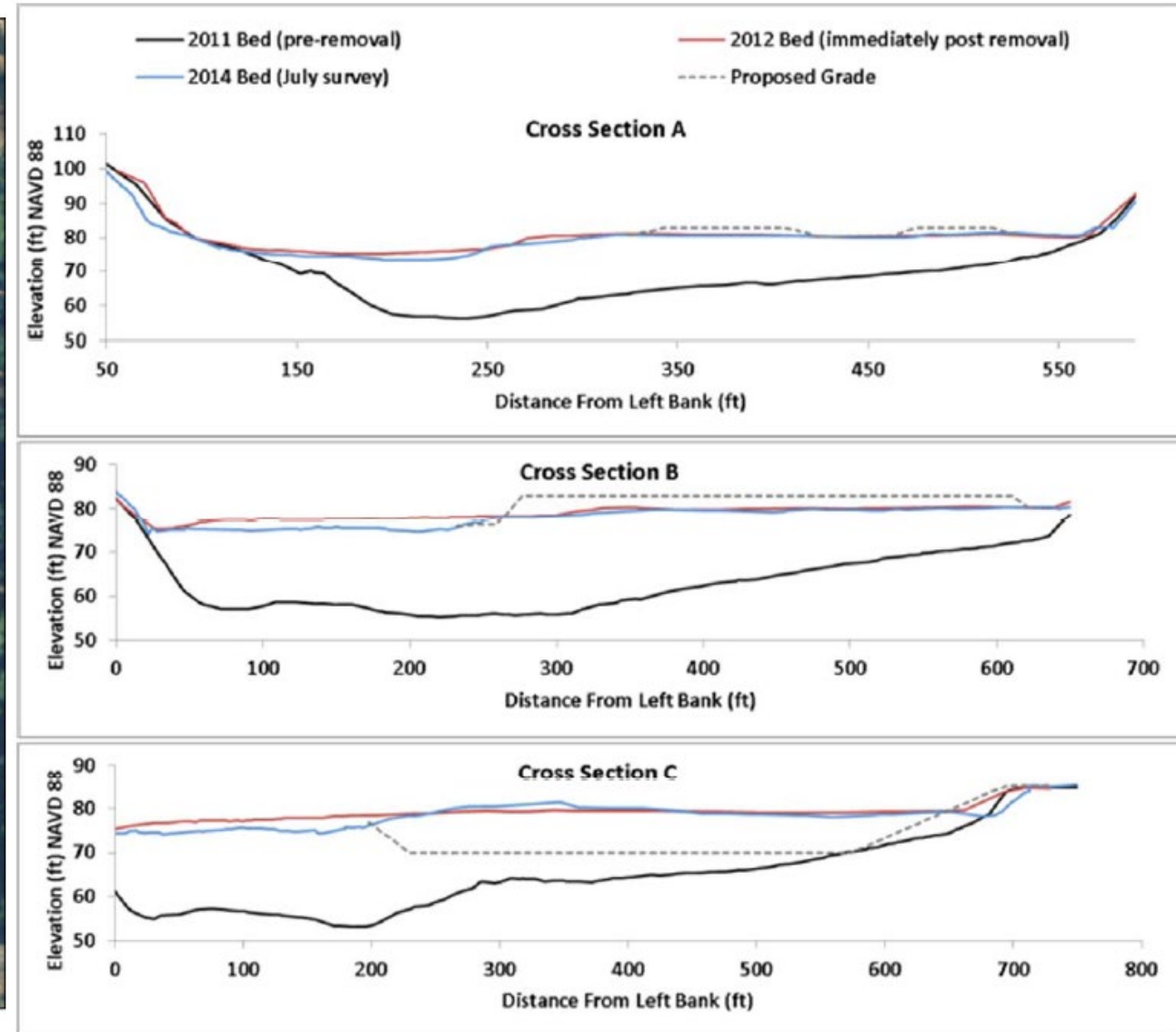
~1.3 million cu. yds. deposited in the WS channel

~450,000 cu. yds. deposited riverward of Hwy 14/RR Br.



Underwood Navigation & Onsite Mitigation Project

Cross section transect data, showing bed profiles



Underwood In-Lieu Site

Volume change study -
Cross Sections and Area

Elevation Analysis Cross Sections
Volume Analysis Area

100 50 0 100 Feet



Figure 11 - Project area bed elevations at 3 cross sections locations (see Figure 10). Elevations show prior to removal (2011 USGS), immediately post removal (2012 USGS) and 2 years post removal (2014 Inter-Fluve).

White Salmon River Delta

- Pool/Landform Relationship Project
- Target a four foot rise using dredged materials for vegetative growth.

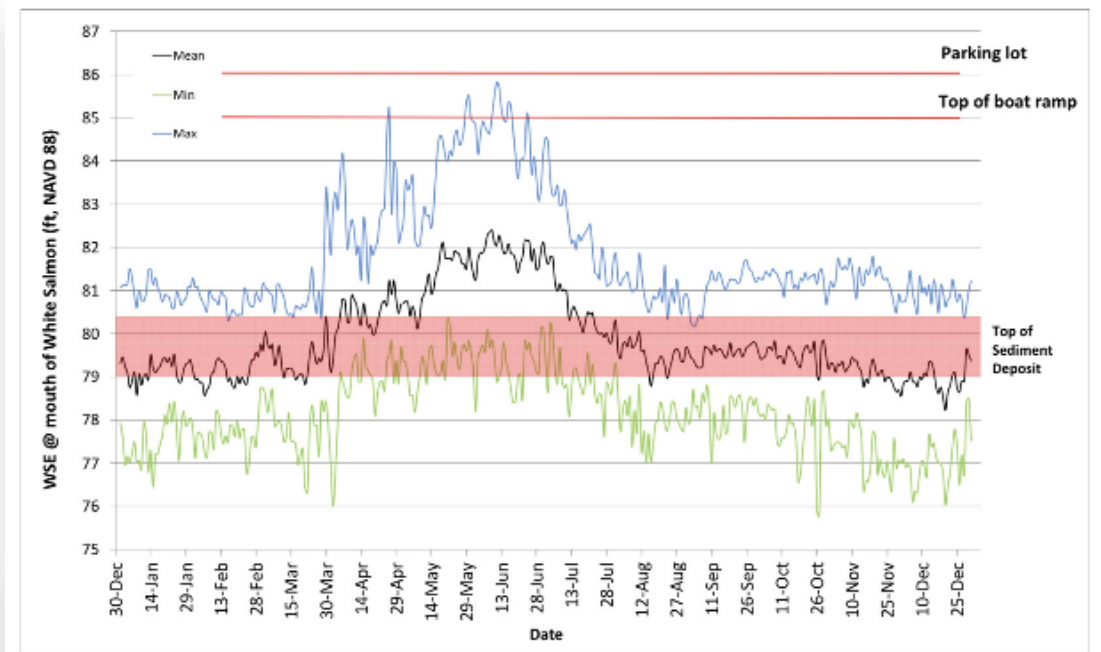
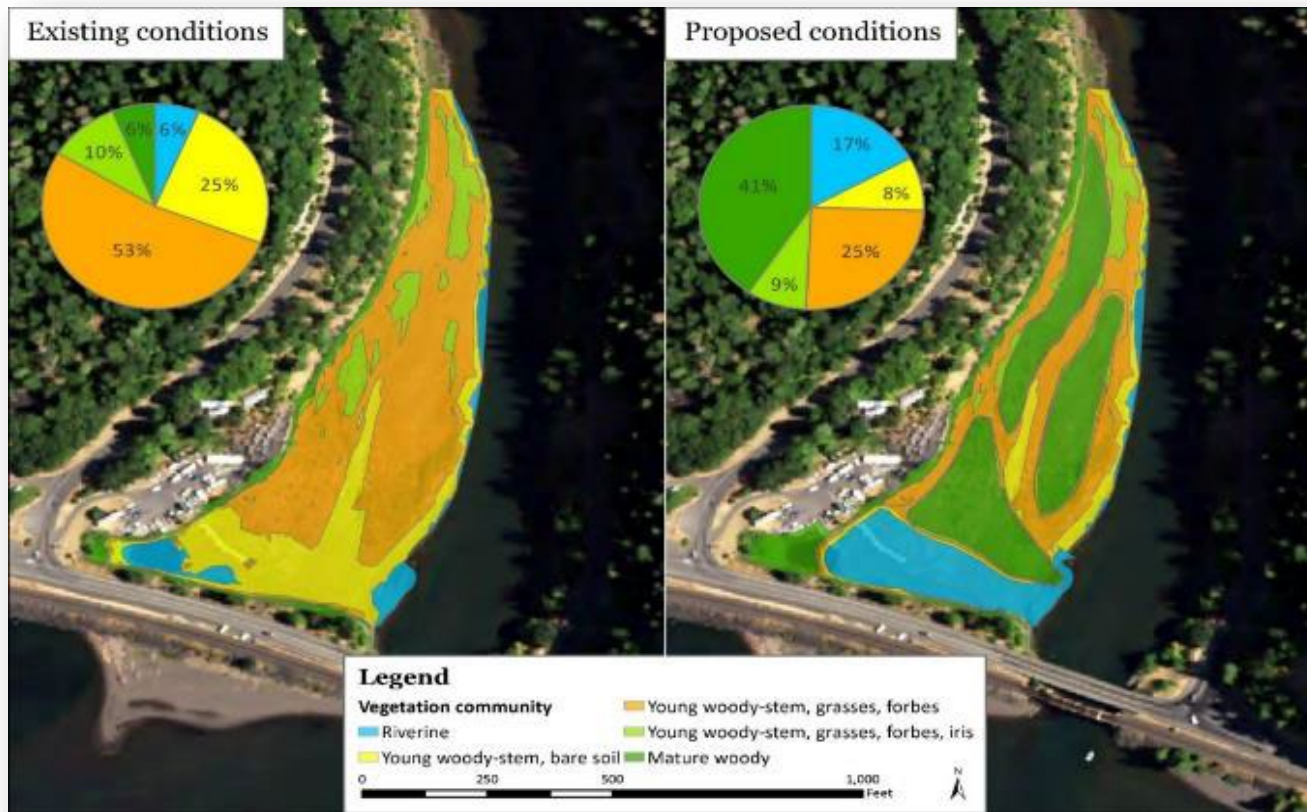
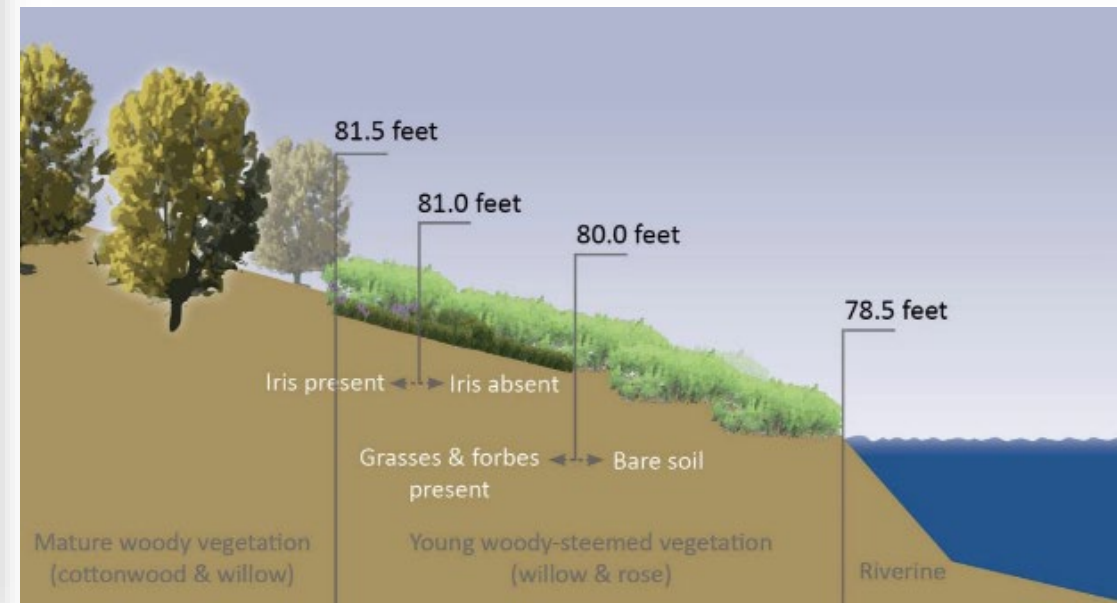


Figure 16. Mean, minimum and maximum average daily water surface elevations based on interpolation of USGS gage data. Note project site elevations shown, including the top of bank, the parking lot and the sediment deposit.



White Salmon River – Boat Basin Dredging and Restoration 2018

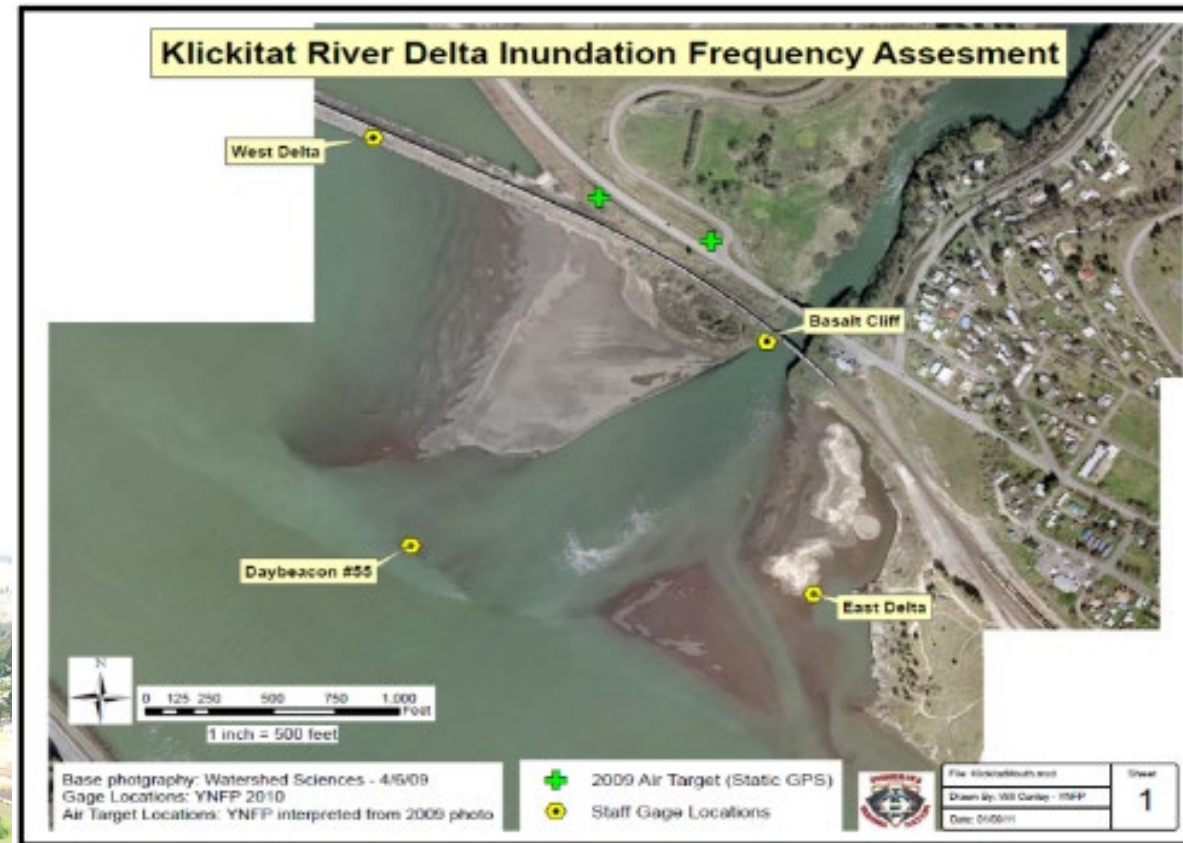
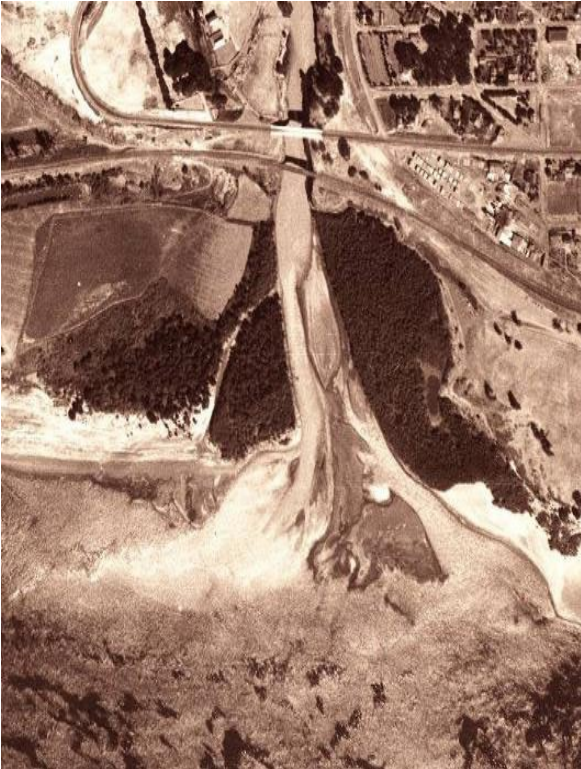


- ~15,000 Cubic yards excavated from boat basin
- ~ 5.5 Acres of riparian wetland / uplands restored
- Salmon-friendly river cobbles, and minimal riprap



Klickitat River – Delta Studies

- **Pool stage/landform**
- **Water temps. across delta**



Lower Klickitat River Smolt Survival Study

- Determine reach-specific travel times and survival of tagged natural-origin juvenile steelhead and hatchery-origin juvenile coho
- Determine how long hatchery-origin juvenile coho remained in the river after hatchery release



Klickitat River – Delta Study

- **Smolt survival study**



Project Approach:

Collect and tag *O. mykiss* at YN operated rotary screw trap (rkm 4.5) with PIT tag and acoustic radio transmitter.

Release tagged fish upstream of screw trap (rkm 17).

Detect fish at telemetry arrays: Klickitat (rkm 0.8), Klickitat/Col. River confluence, Delta exit/Memaloose Island, and near Bonneville Dam.

Preliminary *O. mykiss* survival estimates from release to Bonneville Dam was **0.56** (0.26-0.86) and **0.54** (0.33-0.75) in 2018 and 2019, respectively.

Next Steps:

Narrow in on lower Klickitat River/Delta survival (predation hot spots).

Further investigate species assemblage and abundances in lower Klickitat River



Harmful Algae Bloom (HAB) Management in WA.

The WA State Association of Conservation Districts

HAB Workgroup - September 2022

Table 1. Summary of suspected or confirmed human and animal exposure events to cyanotoxins in Washington in 2021 (data source: Laurie Stewart, WA DOH).

| Type | Number | Outcome | Water Body | Month 2021 | Toxin Detected |
|-------|--------|---------------|----------------------|------------|--------------------------------------------------------------|
| Dog | 3 | Death | Little Spokane River | Jul | Anatoxin-a |
| Human | 1 | Rash | Yale Reservoir | Aug | Anatoxin-a Saxitoxin |
| Dog | 1 | Illness | Spokane River | Aug | Microcystin |
| Bats | 2000+ | Death | Pass Lake | Aug | Anatoxin-a |
| Cows | 10 | Death | Skamokawa Creek | Aug | Microcystin |
| Dog | 1 | Death | Columbia River | Aug | Anatoxin-a Microcystin Saxitoxin Cylindrospermopsin |
| Dog | 1 | Illness | Clarke Lake | Sep | Unknown |
| Dog | 6 | 2 ill, 4 died | Columbia River | Sep | Anatoxin-a |

Public health actions to prevent exposure to toxic cyanobacteria blooms in fresh surface water

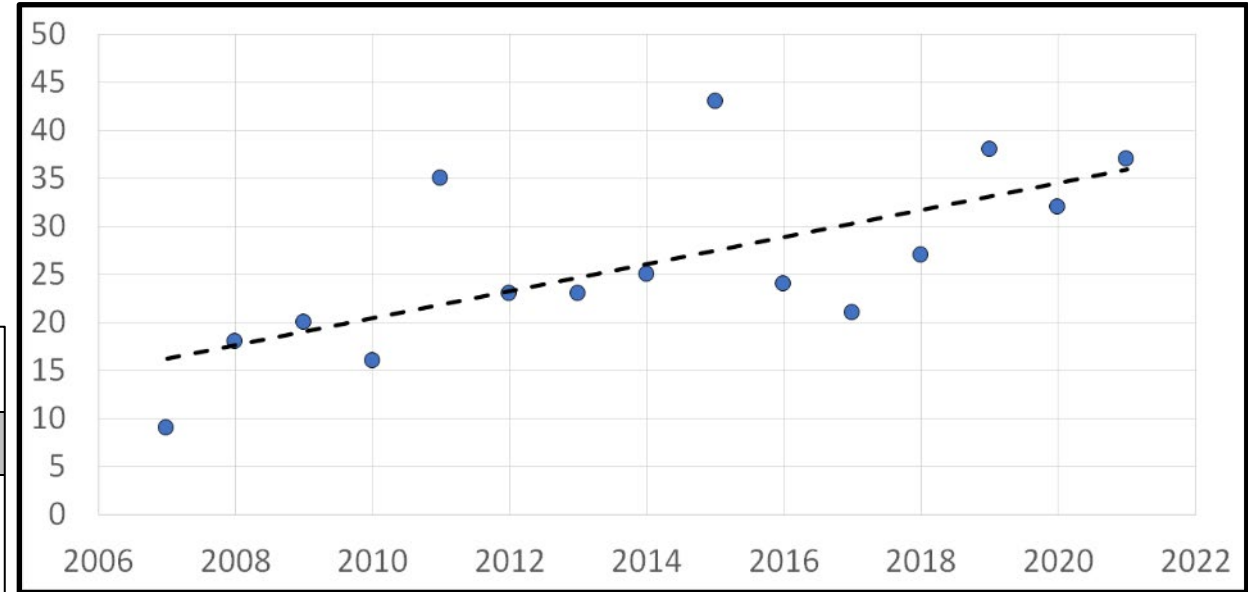
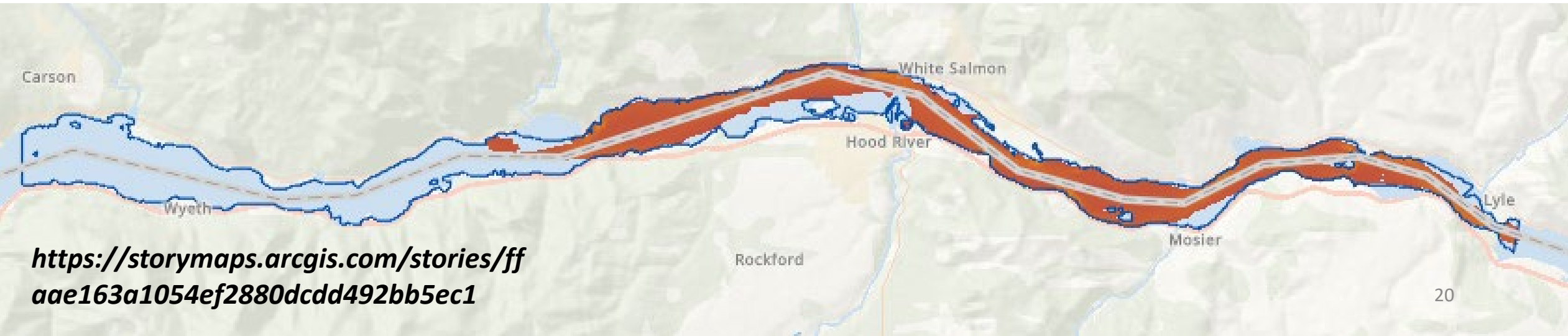


Figure 1. Number of water bodies with microcystin concentration greater than 6 µg/L (state recreational guidance value = 8 ug/L) detected in water samples (2007-2021) (source: NWToxicAlgae.org).

NOAA-Office of Coast Survey. 2022 bathymetry coverage.

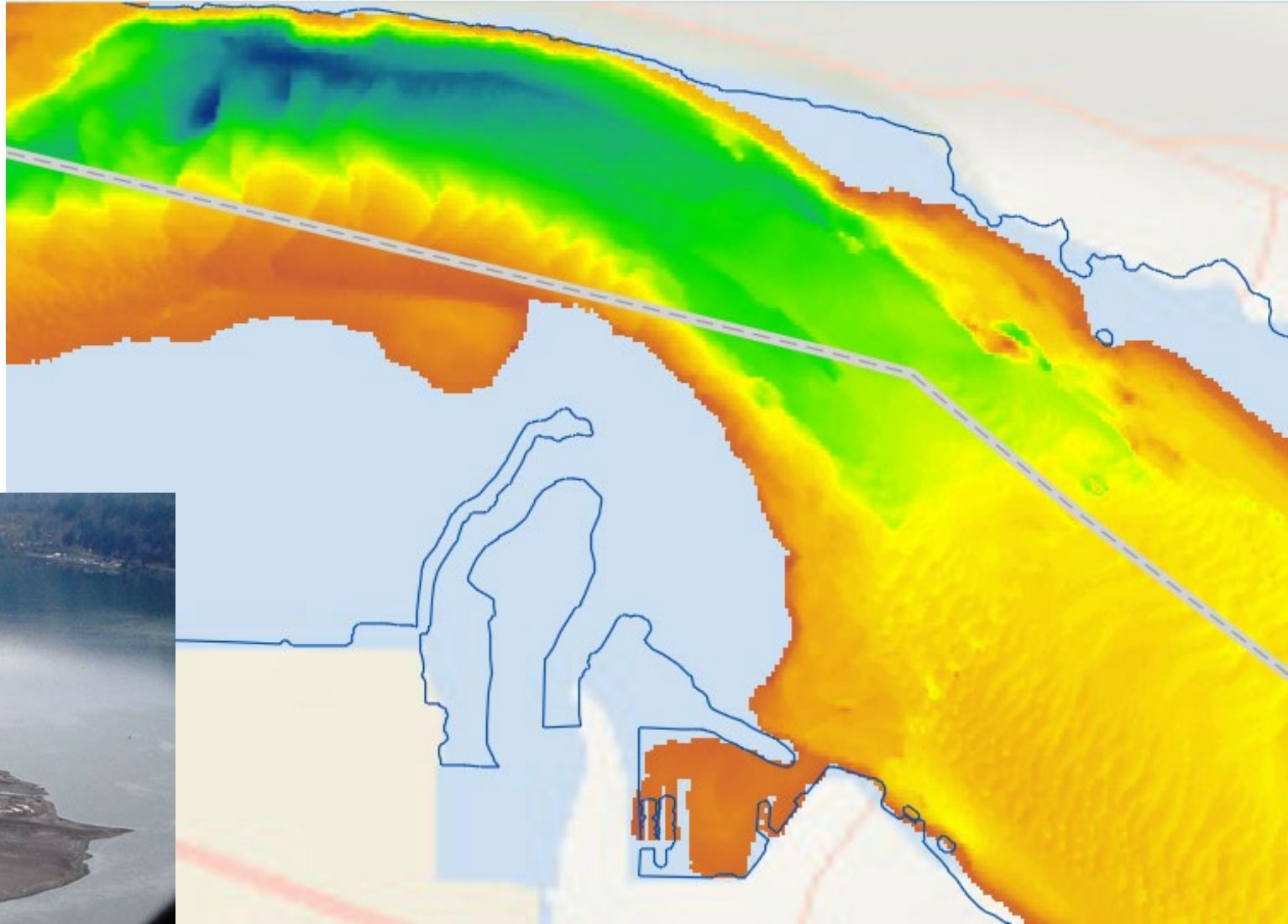
OPR-N338-NRTSE-22
Columbia River, Oregon
and Washington



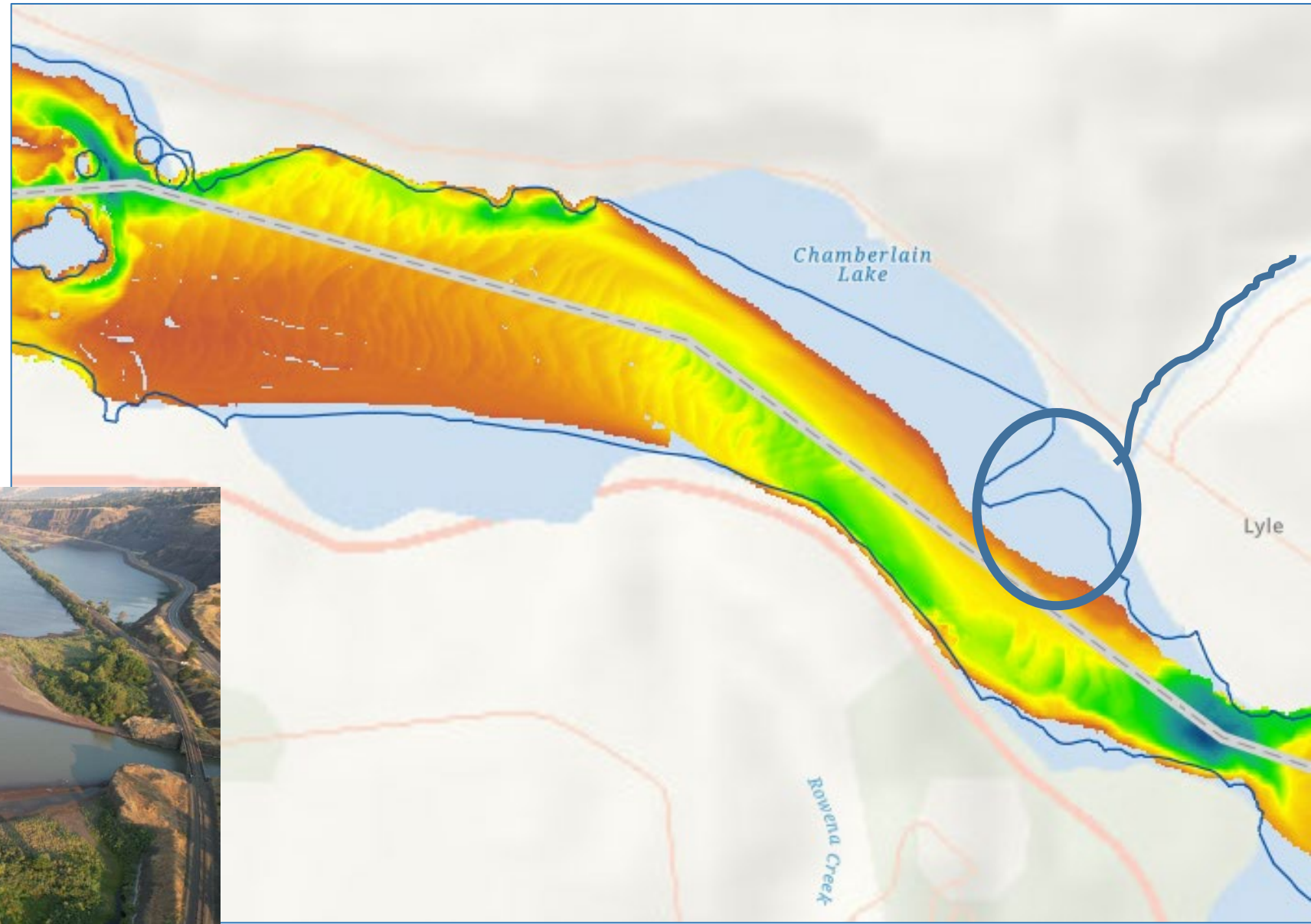
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Hood River Delta

CTBWSR & COE-Portland
Juvenile Survival Study
Technical Assistance Agreement



Klickitat River Delta



Klickitat River Delta Shallow Water Survey



Questions

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