

ESTUARY CLUSTER

ASRP PROGRESS & PLANNING WORKSHOP

October 14, 2026

CHEHALIS BASIN STRATEGY

DEPARTMENT OF ECOLOGY
State of Washington
OFFICE OF CHEHALIS BASIN

Estuary Overview



Restoration & Protection Planning

Chehalis RM 13-20 Planning/Assessment
- Sponsored by Grays Harbor CD
- Identifies project opportunities to initiate long lead time actions in priority GSUs in forested tidal surge plain

Protection Planning
- Sponsored by Forterra NW
- Identifies habitat protection priorities and opportunities in the Estuary Ecoregion

Key 2025 Takeaways & Next Steps

- In-progress planning and mapping efforts
- Identified next step: coalesce around priority planning / project developments to continue moving forward → Land Protection LS
- Next potential large planning effort: Aberdeen Shoreline Softening Local Strategy → GHCD to lead?
- "Low-hanging fruit" project opportunities will likely still be challenging

Filling Information Gaps

Creosote Piling Inventory Update (DNR)

Eelgrass Mapping & Restoration Proposal (DNR)

Chinook/Steelhead Survival Study (USGS) = acoustic receivers
- Survival: Where in the basin are we losing individuals? Are there estuary-specific sources of mortality that have a bearing on returns?
- Residence time in the estuary: how important is estuary habitat quality to the survival of out-migrating Chinook and steelhead?

Pinniped Abundance Assessment
- First step toward assessing predation impacts on salmonids

Water Quality Sampling (ECY)

Habitat Mapping (Anchor)
- Opportunity to provide feedback on ASRP Webmap, refine this tool

Coastal Resilience and Other Projects (CCA $):
- Coastal erosion & SLR
- WSDOT, ECY, WDFW, Flood Authority, EMD
- Transportation Infrastructure + Habitat

West Fork Hoquiam Dam Removal
- ECY Streamflow Restoration Grant: $3,599,892
- City of Hoquiam

North Shore Levee
- Flood protection, Hoquiam & Aberdeen
- Funded at $17mil

Chehalis RM 14.5-17.5
- Protection/acquisition, reach-scale restoration, landowner outreach
- High priority riparian planting above surge plain (sea level rise preparation)
- Potential structure elevation(s) / relocation(s)

Elk River RM 10 Protection
- Protect rare salt marsh and surge plain forest
- Increase footprint; direct adjacency to the DNR NAP
- Development threat extinguished
- Restore shrub and forest tidal wetlands that are currently rare and expand upstream to accommodate sea level rise

Cosmo Specialty Fiber Plant
- ECY Toxic Removal
- In progress, not ASRP

Chehalis RM 13-67 Brazilian Elodea Removal (GHNWB)
- Remove Brazilian Elodea

Peels Slough & Trib. + Alder Grove
- Protect and restore 87 acres of floodplain
- Adjacent to DNR land; increases footprint
- Allows floodplain and wetland connectivity
- Extinguishes development threat

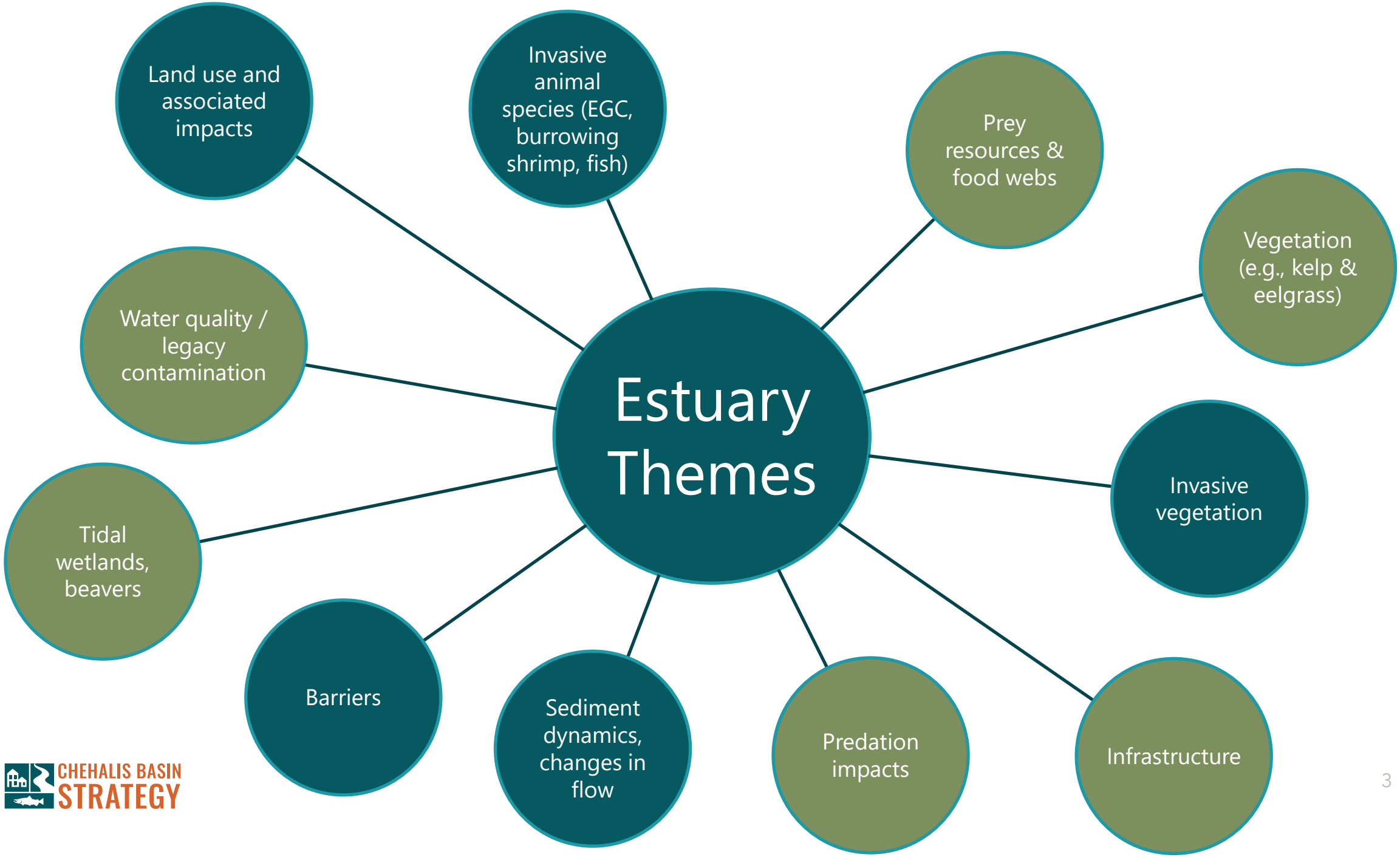
Intertidal flats
Aquatic Vegetation Bed
Waters
Estuarine Emergent Wetland
Estuarine Forested Wetland
Estuarine Scrub Shrub Wetland
Palustrine Emergent Wetland
Palustrine Forested Wetland
Palustrine Scrub Shrub Wetland

Open spaces with little or no vegetation
Scrub and/or herbaceous vegetation associations
Forests
Arable land
Pastures
Artificial non-agricultural vegetated areas
Urban fabric
Mine dump and construction sites
Industrial commercial and transport units

Priority Knowledge:
tide gate barriers
eulachon population dynamics and habitat use
smooth cordgrass distribution
salmonid prey abundance in varying habitat types
water quality: seasonality of concerns in shallow and shoreline habitats
identify potential cold-water refugia
project effectiveness monitoring for large wood placements

ASRP Implementation Projects Funded

Project(s) Name & Symbol	Sponsor(s)	Project Cost	Current Status	Project End	River miles/ Acres
Camp Creek at Schafer Boom Road	CBFTF	$877,800	Complete	June 2026	5.65 mi access
Surge Plain Protection: Peels Slough & Tributary + Alder Grove	Forterra	$638,000	In Progress	April 2027	96-102 acres
Elk River RM 10 Protection	Forterra	$452,400	In Progress	March 2027	40 acres
Protection Local Strategy Planning	Forterra	$139,668	In Progress	Aug 2027	In Planning
Chehalis RM 14.5-17.5	GHCD	$250,352	Concept	June 2027	2-7 mi
Oyhut Proposed Acquisition	Forterra	$699,500	Non-ASRP	2026	18.7 acres
Elodea Removal RM 13-67	GHNWB	$1,331,700	In Progress	2029	54 mi



CHEHALIS BASIN STRATEGY

BUILDING FROM FOUNDATIONS

Past Work

Documentation of estuary habitat conditions

Understanding estuaries more broadly

Community engagement

Current Work

Studies / modeling

Collaborative planning efforts (flood, EMD, surge plain)

Protection projects

Future Work

Finish strategic plans

Implement plans, including prioritized restoration / protection actions

CHEHALIS BASIN STRATEGY

2025 CLUSTER SYNTHESIS RECOMMENDATIONS (TAG)

- Expand estuary monitoring
  - In-river WQ to understand nutrients, sediment, and food web dynamics
  - Habitat coverage change detection
- Support community-led engagement
- Extend and expand salmonid survival study for 3 years
- Develop a comprehensive estuary prioritization framework
  - Include TAG and communities in the process
- Clarify how to reconcile mismatches between modeling outputs and on-the-ground conditions

ACTIVE SCIENCE & PLANNING EFFORTS IN THIS CLUSTER

- Estuary EDT – Anchor / ICF
- Habitat Mapping – Anchor*
- Salmon and steelhead survival study – USGS
- Pinniped abundance estimate update – WDFW
- Water quality sampling – ECY
- Creosote piling inventory update – DNR*
- Eelgrass mapping – DNR*
- Community science and engagement - CIC
- Salmonid prey resource assessment – USFWS

CHEHALIS BASIN STRATEGY

What's missing?

ESTUARY EDT EFFORT

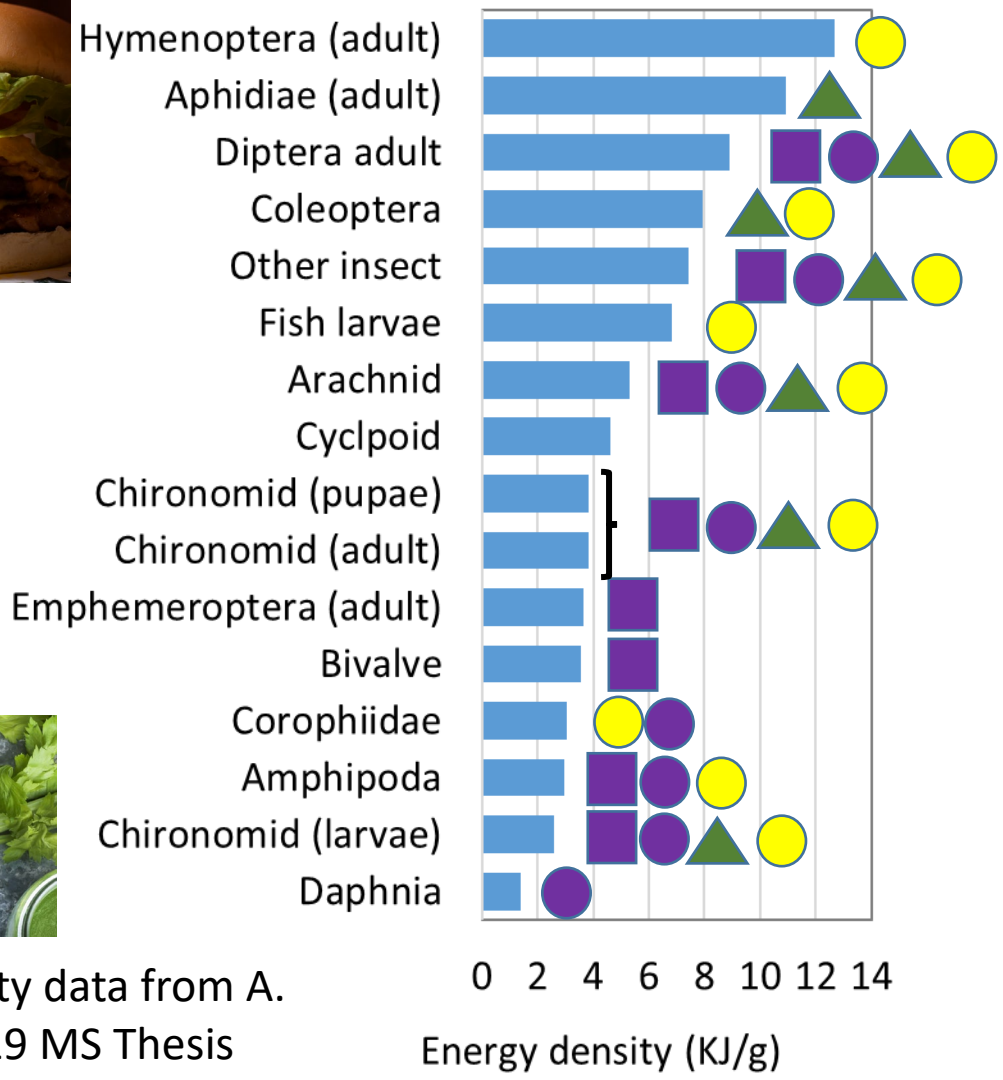
- Recommendations for future monitoring (to inform modeling)
  - Habitat mapping and condition monitoring
  - Integrated food web monitoring
  - Quantify predation pressure
  - Water quality and temp. monitoring
  - Monitor habitat response to climate stressors
  - Expand juvenile and adult salmon monitoring in estuarine habitats: distribution, growth, survival

Many prey produced in wetlands are energy rich







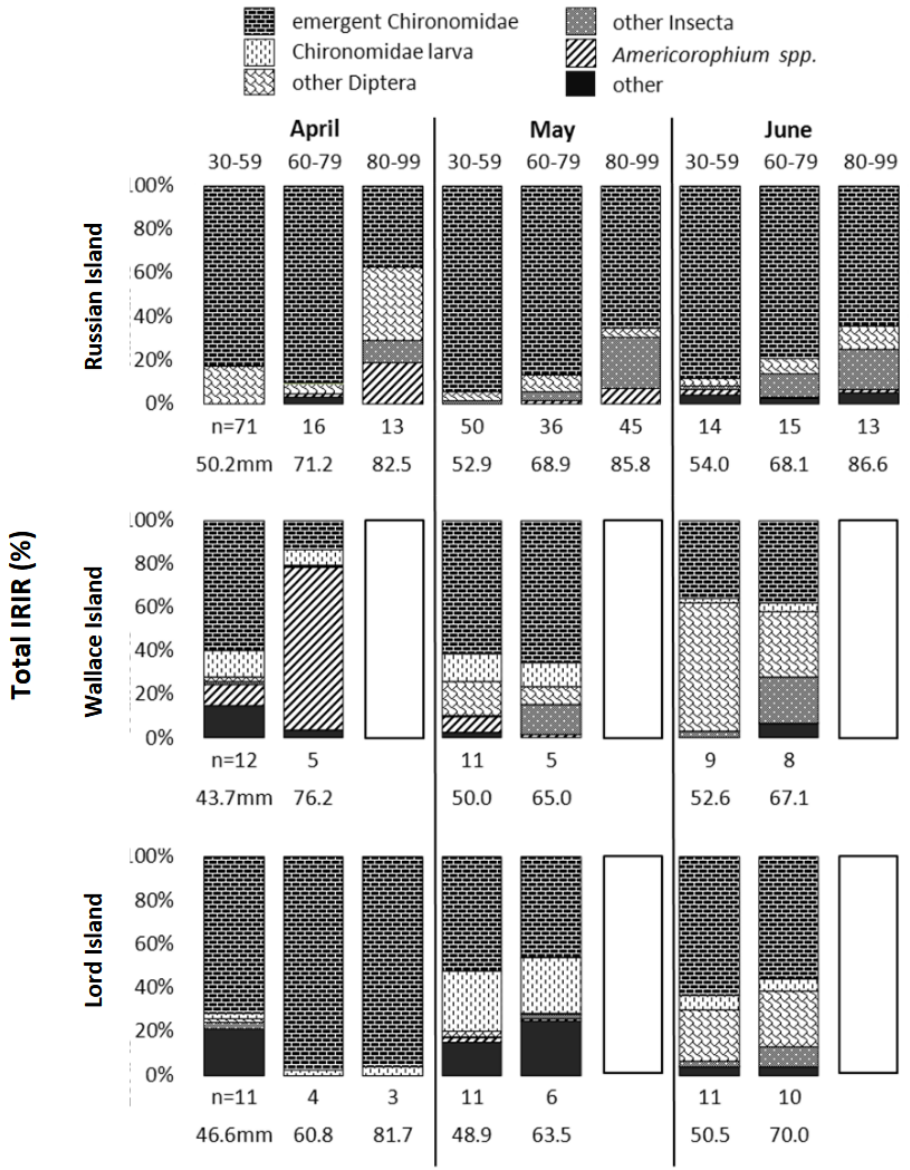


Energy density data from A. Munguia 2019 MS Thesis

Important for:

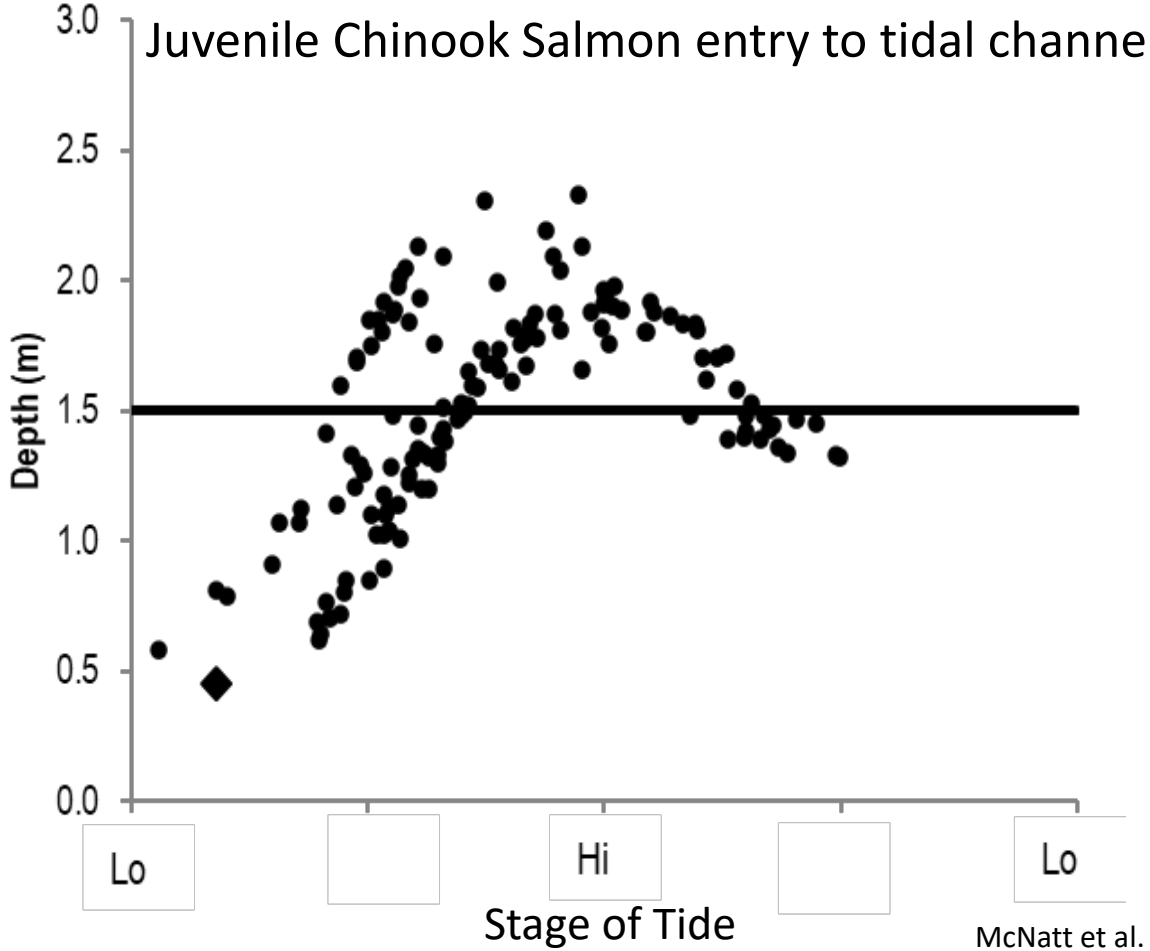
- Wetland production
- Wetland diets
- Flux/export
- Mainstem diets

Juvenile Chinook Salmon diets (tidal wetlands)



Bottom et al. 2011

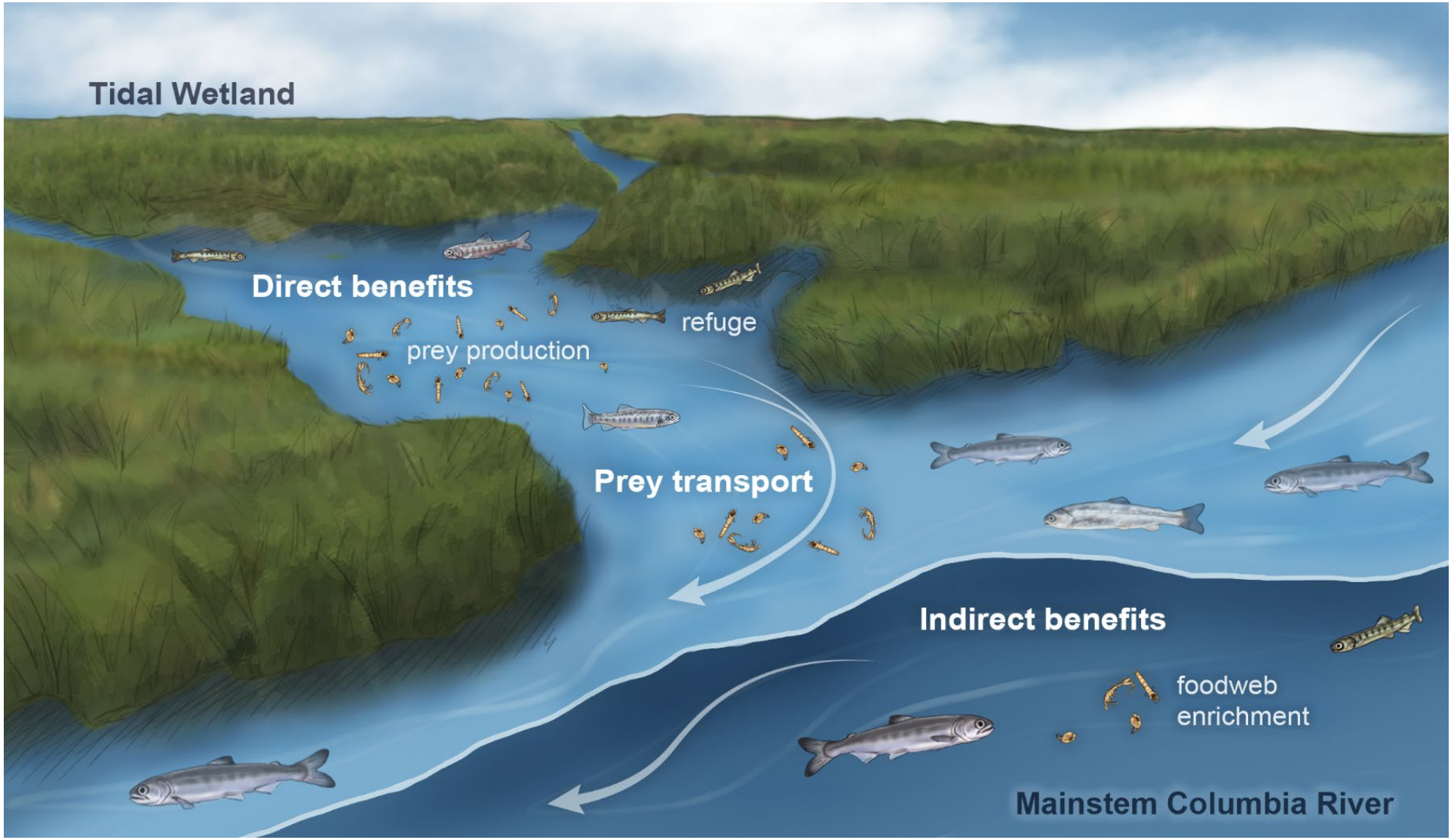
Juvenile Chinook Salmon entry to tidal channel



McNatt et al. 2016

- High quality prey are produced in tidal wetlands
- Juvenile salmon in these habitats are eating these prey
- Juvenile salmon will swim against the tide to access areas with these prey

Conceptual model of direct and indirect benefits of tidal wetland restoration



PNNL and NMFS 2020

Diversity

- Life history/migration diversity → population resilience
  - Protects against adverse environmental conditions



- Habitat diversity → supports life history/migration diversity
  - Many rearing/migration options





Kelsey Hunter & Breana Downs

October 14, 2026

Citizen Science Macroinvertebrate Sampling in Grays Harbor County

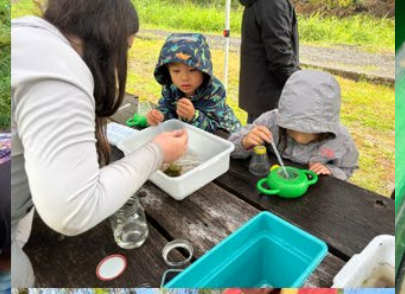
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Grays Harbor Stream Team

Grays Harbor Conservation District







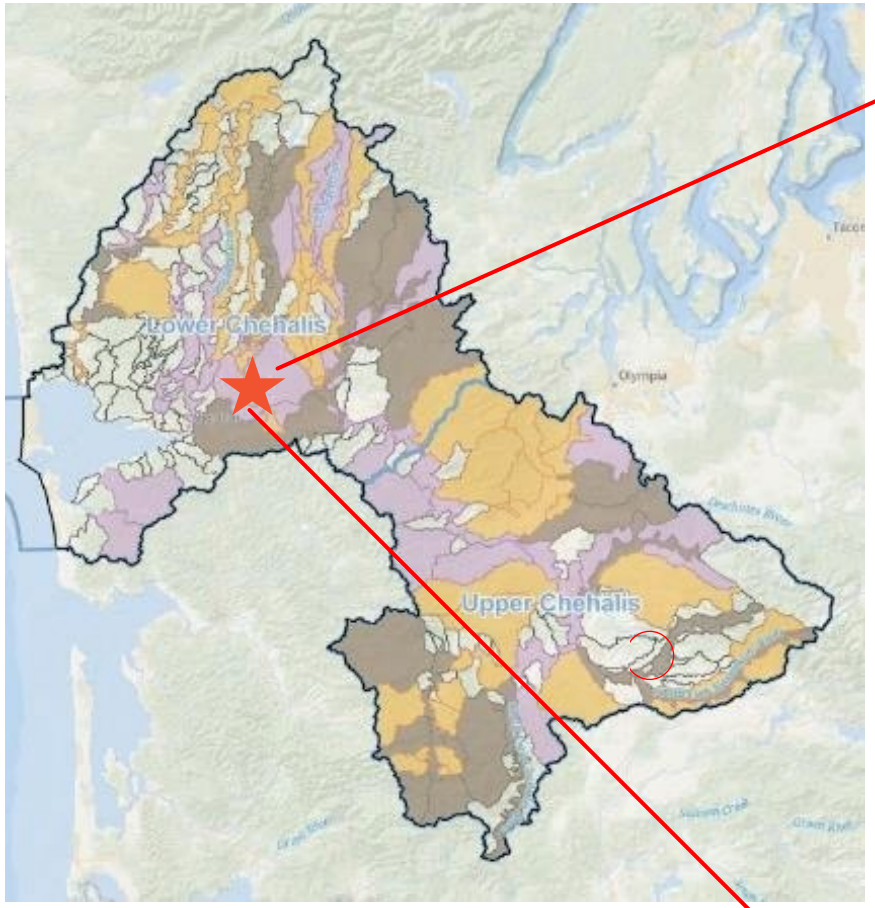










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GRAYS HARBOR STREAM TEAM

GRAYS HARBOR CONSERVATION DISTRICT

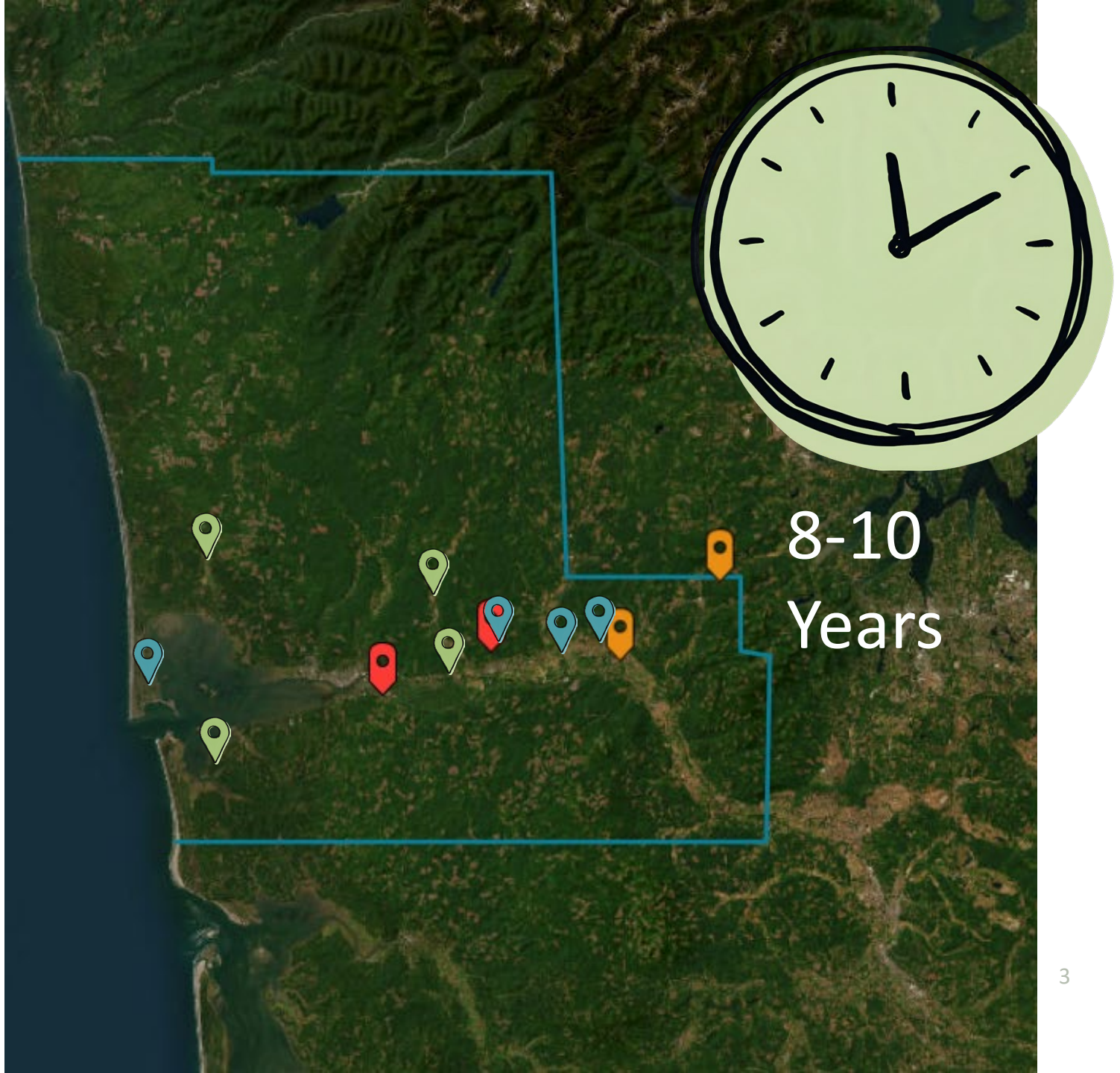
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Key Takeaways

Sampling must continue

More sites must be added

Site diversity is essential



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A STRATEGIC FRAMEWORK FOR PRIORITIZING RESTORATION IN THE CHEHALIS BASIN

SCOTT COLLYARD, EDWARD KRYNAK, CHAD LARSON, DANIEL NELSON

October 14, 2026

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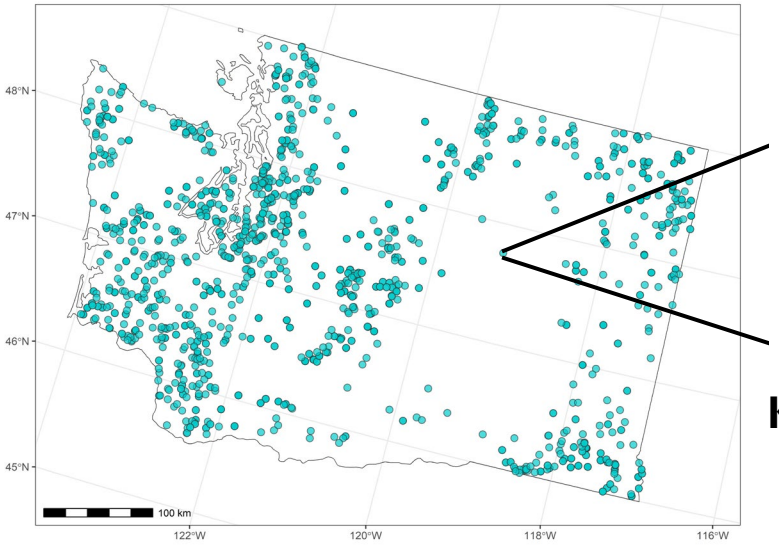


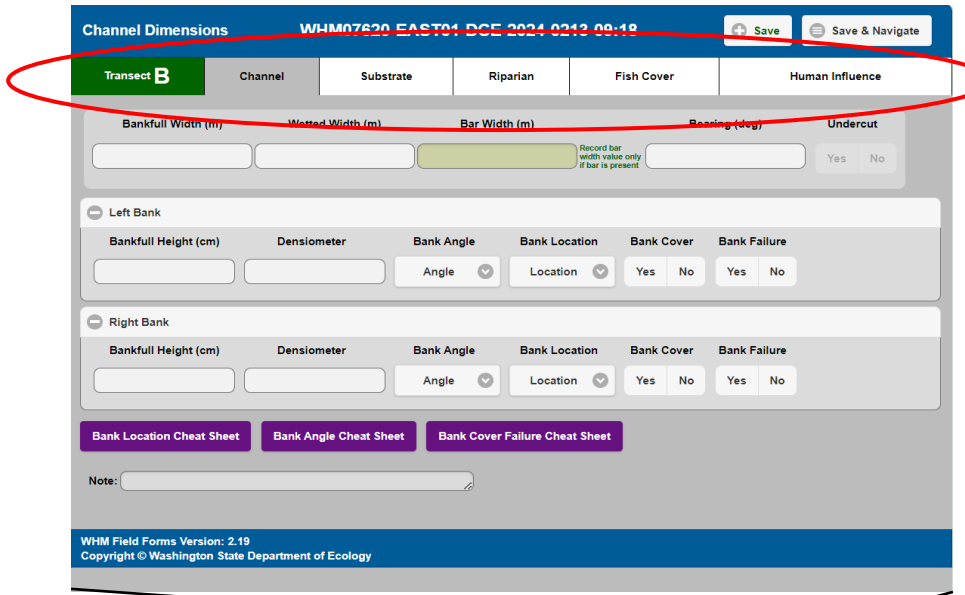


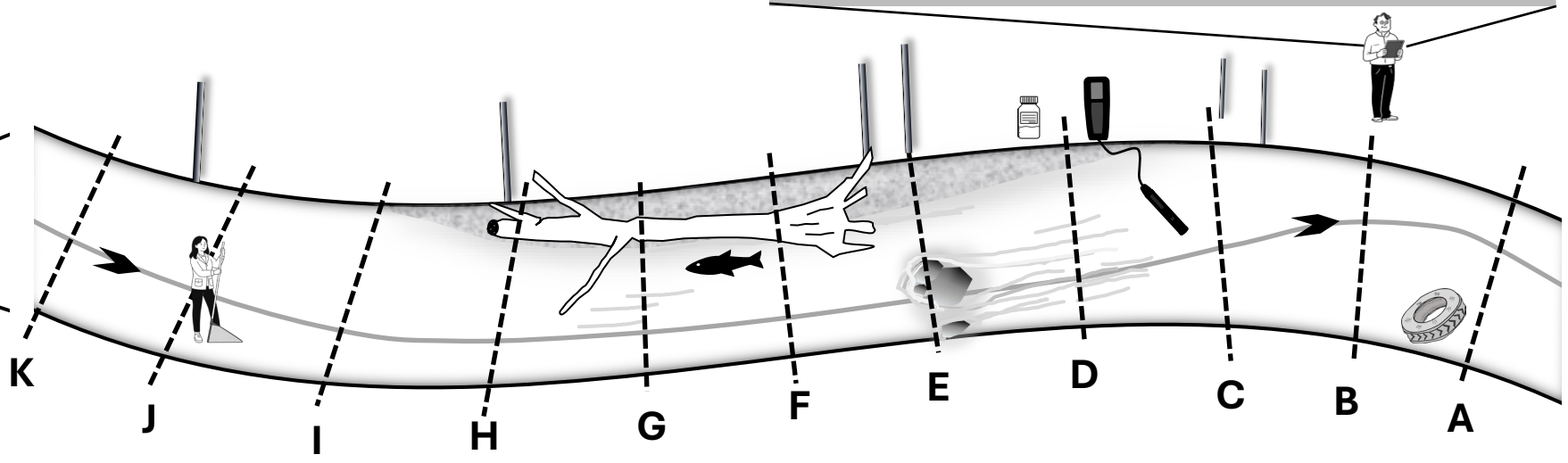
- Identify **stream reaches where restoration/protection** will most benefit anadromous salmonids using stream macroinvertebrates
- Highlight **key habitat constraints**: temperature, availability of pools and spawning substrate with existing habitat data
- Provide a **transparent, science-based framework** for strategic conservation decisions

WATERSHED HEALTH & EFFECTIVENESS MONITORING

- Statewide monitoring
- Standardized habitat and biological protocols
- Electronic field data collection
- Data QA/QC
- Open data, freely accessible online
- 200+ habitat metrics produced for every site



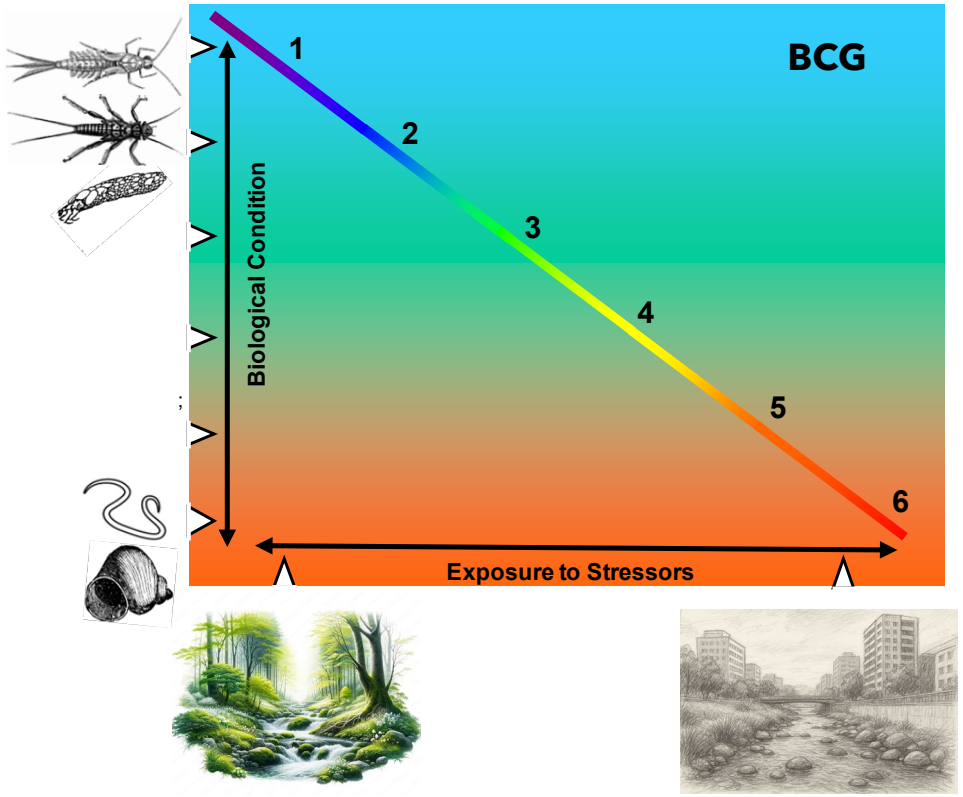


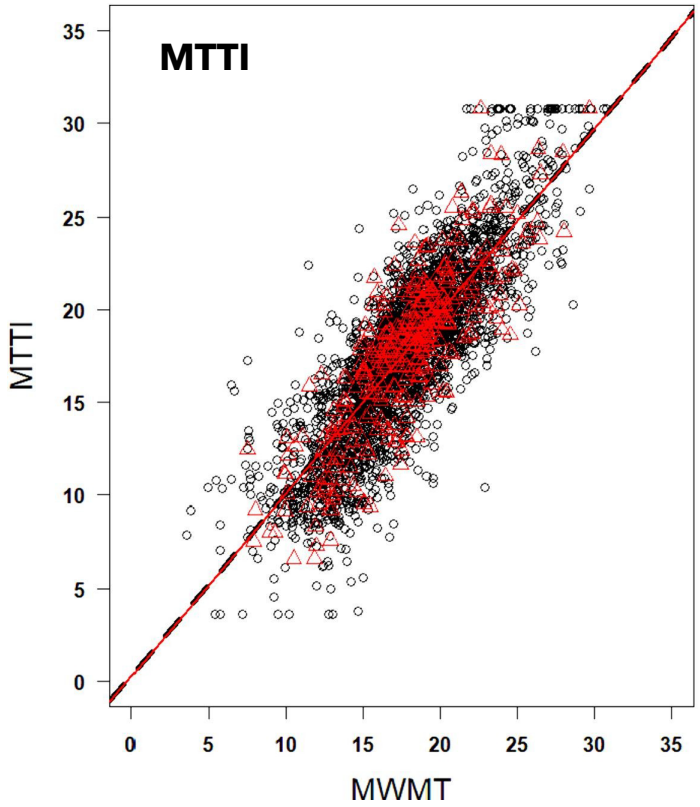


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Biology | **Fish Cover** | **Large Wood** | **Riparian Structure** | **Channel Morphology** | **Water Quality** | **Human Influence** | **Substrate**

MACROINVERTEBRATE RESPONSE



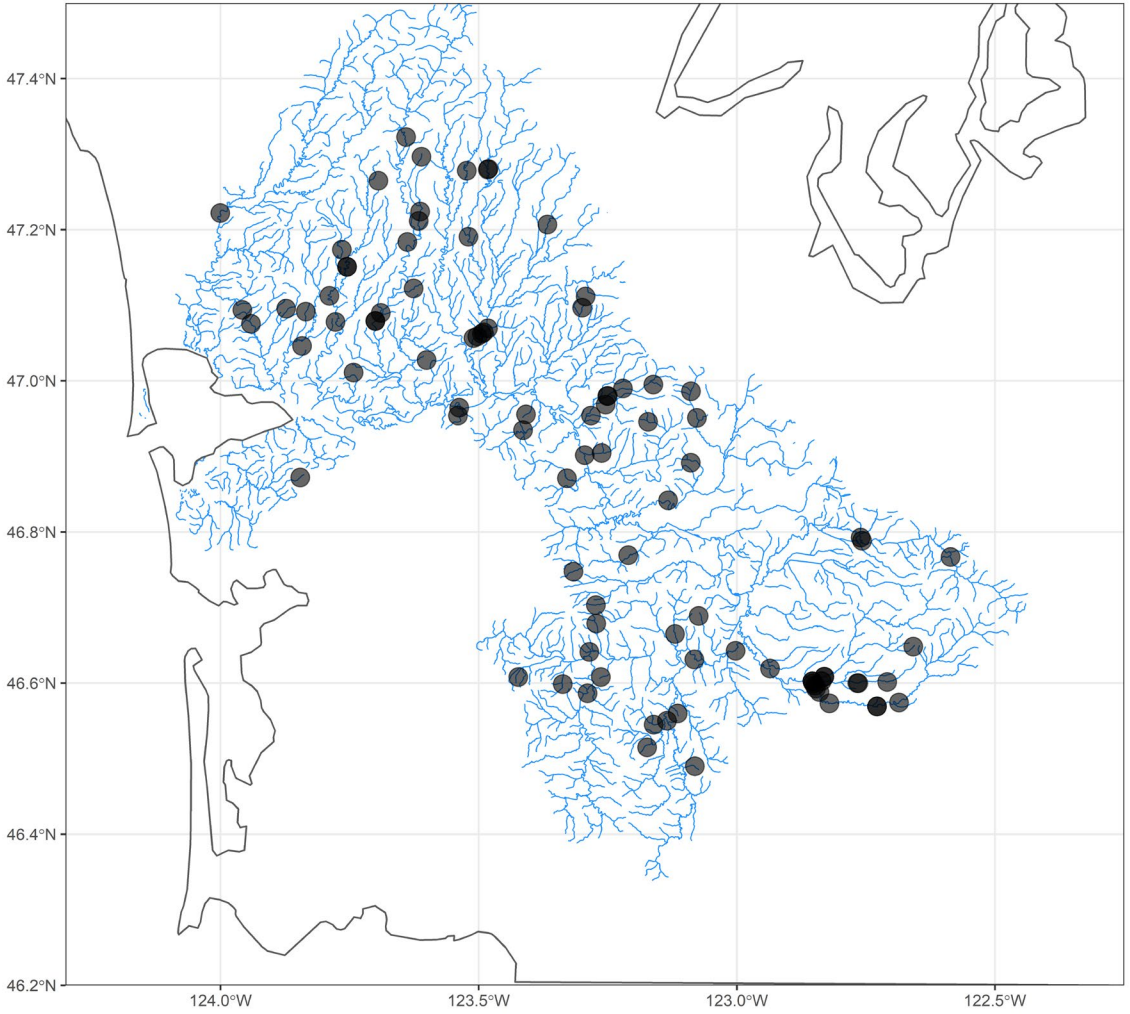


- Utilized existing **Status & Trends** monitoring data
- Calculated **Biological Condition Gradient (BCG)** and **Macroinvertebrate Thermal Tolerance Index (MTTI)**
- Visualized BCG and MTTI to evaluate **biological health** and **thermal regimes**
- Applied a **decision tree framework** to prioritize management actions

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EXISTING DATA IN THE CHEHALIS BASIN

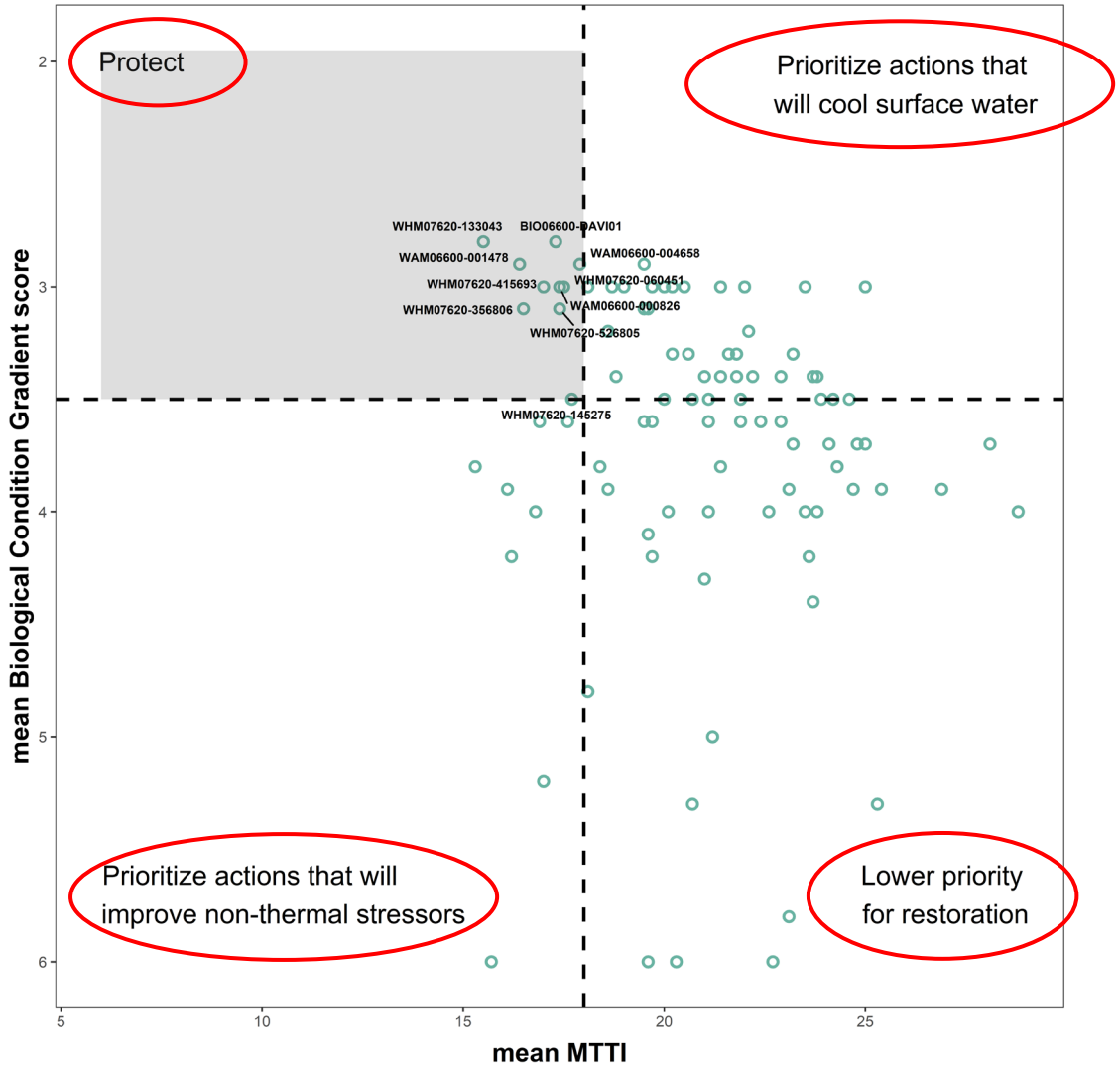
- 92 sites with existing data



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APPROACH TO PRIORITIZING RESTORATION EFFORTS

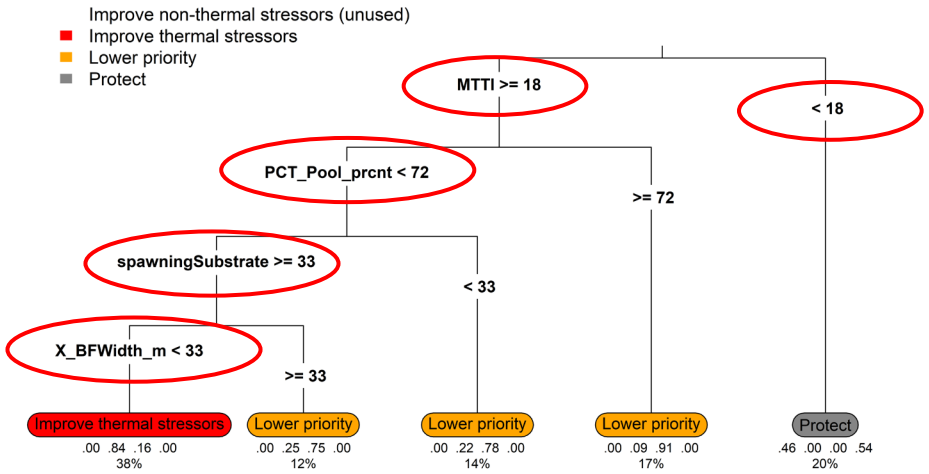
- Protection
- Improve thermal stressors
- Improve non-thermal stressors
- Lower priority for restoration

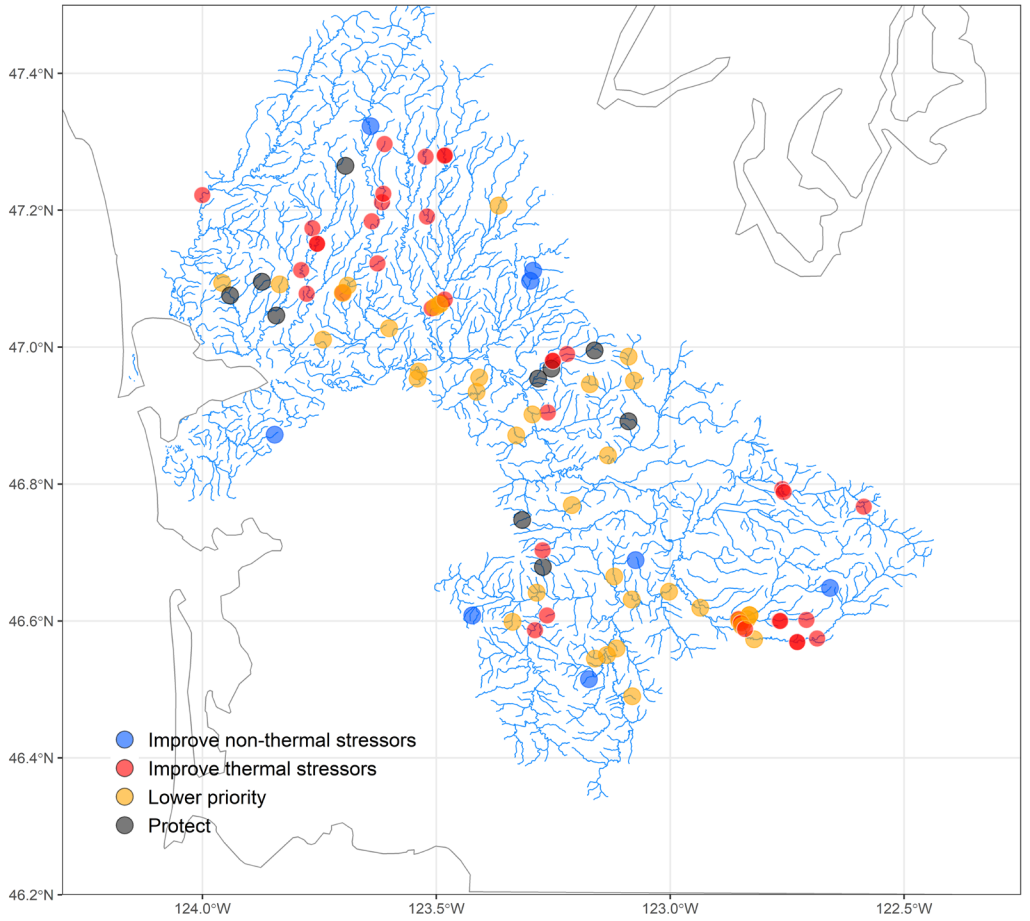


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RECOMMENDED RESTORATION EFFORTS

Decision tree





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LESSONS LEARNED/ REMAINING QUESTIONS

- Established a **transparent**, **science-based framework** for strategic conservation
- Approach can **enhance restoration effectiveness** for anadromous fish
- BCG and MTTI serve as benchmarks to **assess biological improvement** after restoration
- Working with ASRP to refine and adapt the framework for the Chehalis Basin

JUVENILE SALMON SURVIVAL STUDY

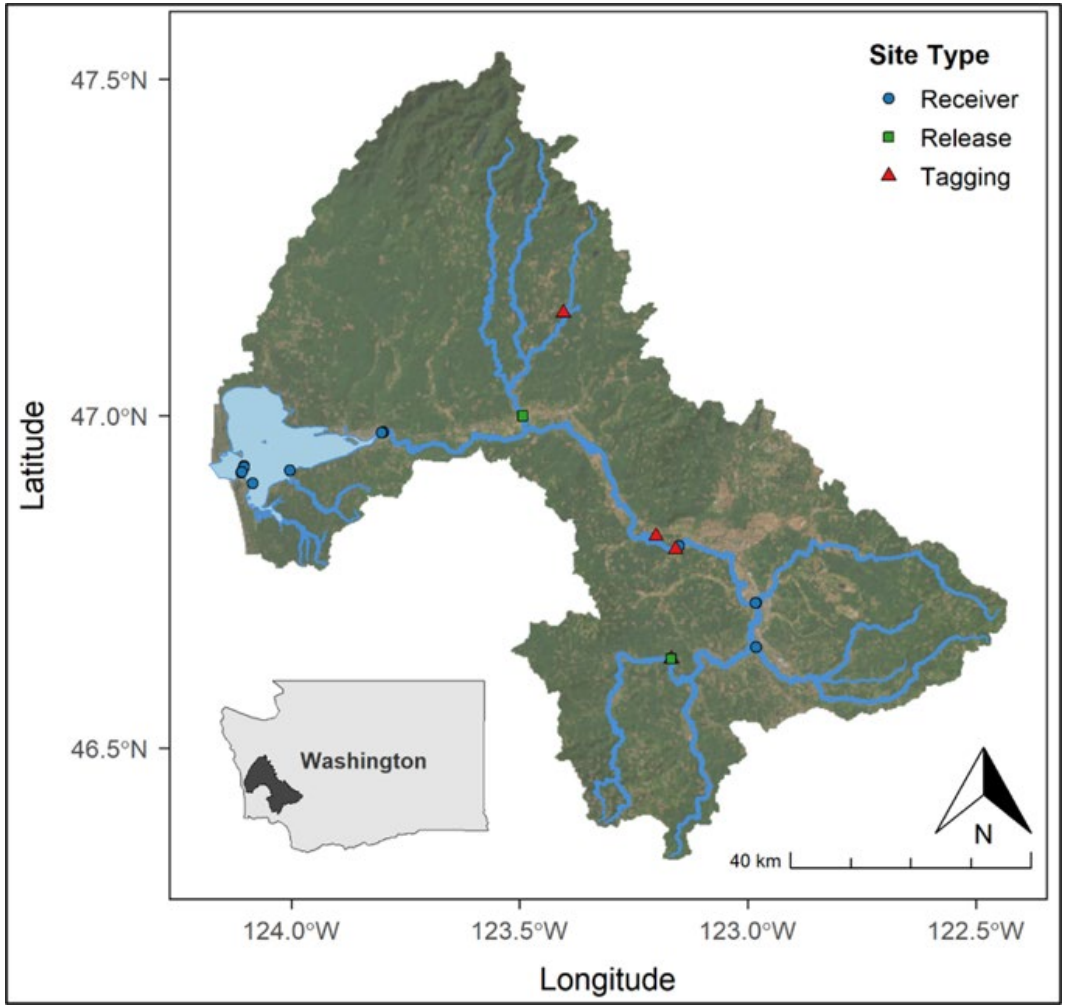
TOBY KOCK, RANDI BOWMAN, BRIAN EKSTROM, CLAIRE COUCH, U.S. GEOLOGICAL SURVEY
SYDNEY GONSALVES, JOHN FERGUSON, ANCHOR QEA
COLLEEN PARROT, SHAWN ORTIVEZ, TODD DELAMETER, HECTOR CANALES, JAKEB HOYLE, JESSE MCMAHAN, TARA LIVINGOOD-SCHOTT, CHEHALIS TRIBE
MARISA LITZ, KATIE CLARK, JONATHAN SCHROEDER, WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
REGAN MCNATT, ROGER PETERS, JEFF JOHNSON, U.S. FISH AND WILDLIFE SERVICE

*Preliminary results available Oct 2026

DOWNSTREAM MIGRATION BEHAVIOR AND SURVIVAL OF JUVENILE SALMON AND STEELHEAD IN THE CHEHALIS RIVER AND GRAYS HARBOR, WASHINGTON (APRIL 22 – JUNE 25, 2026)

- Describe outmigration behavior and develop survival estimates in river *and* estuary environments?
- Identify if/where survival bottlenecks occur at the reach level?
- Chinook salmon, coho salmon, and steelhead. Lamprey in the future?

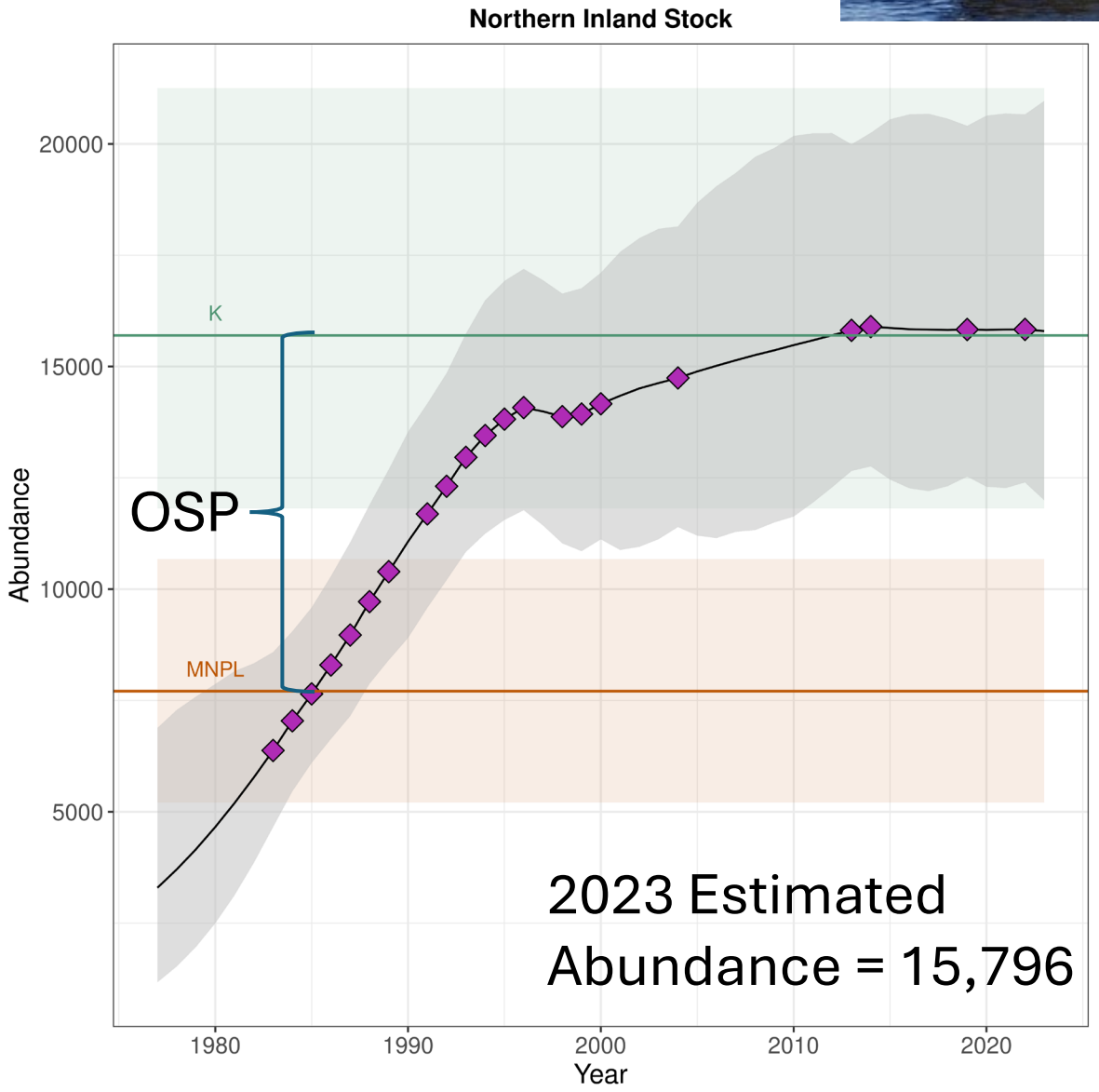
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Species	# Released
Coho (HOR)	202
Coho (NOR)	131
Steelhead (NOR)	61
Chinook (NOR	11

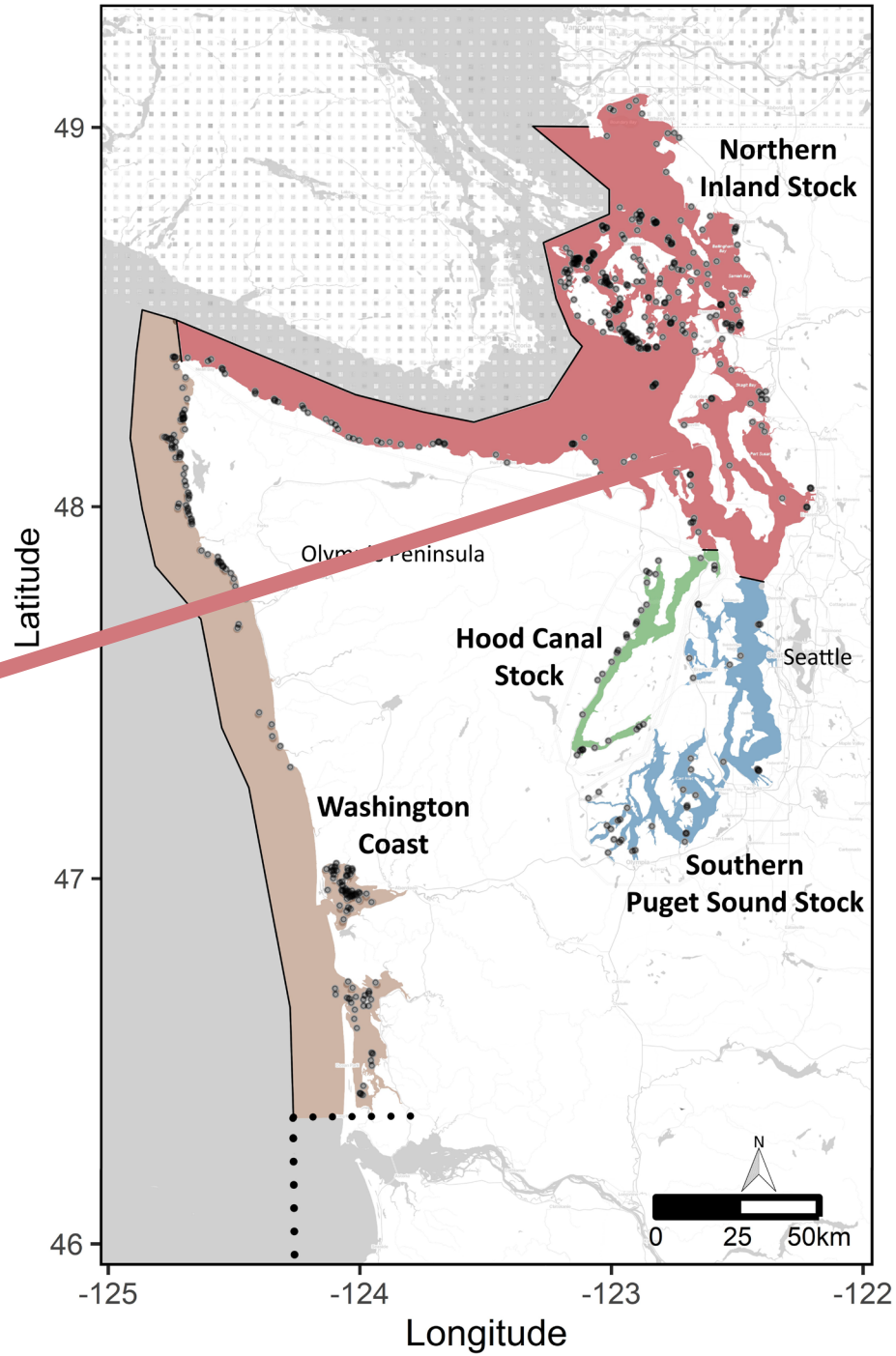
Harbor Seals





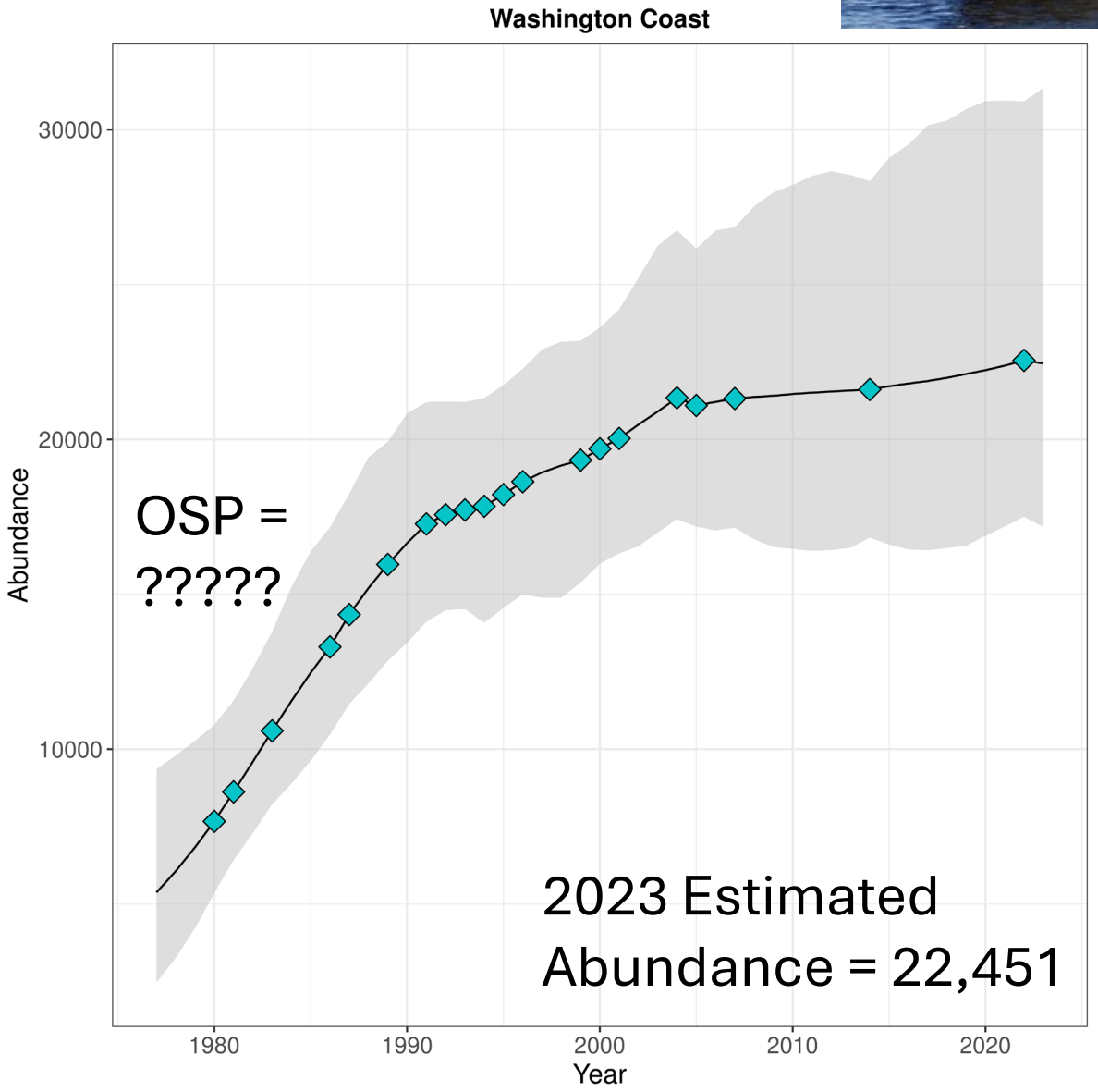
K = 15,699

MNPL = 7,711



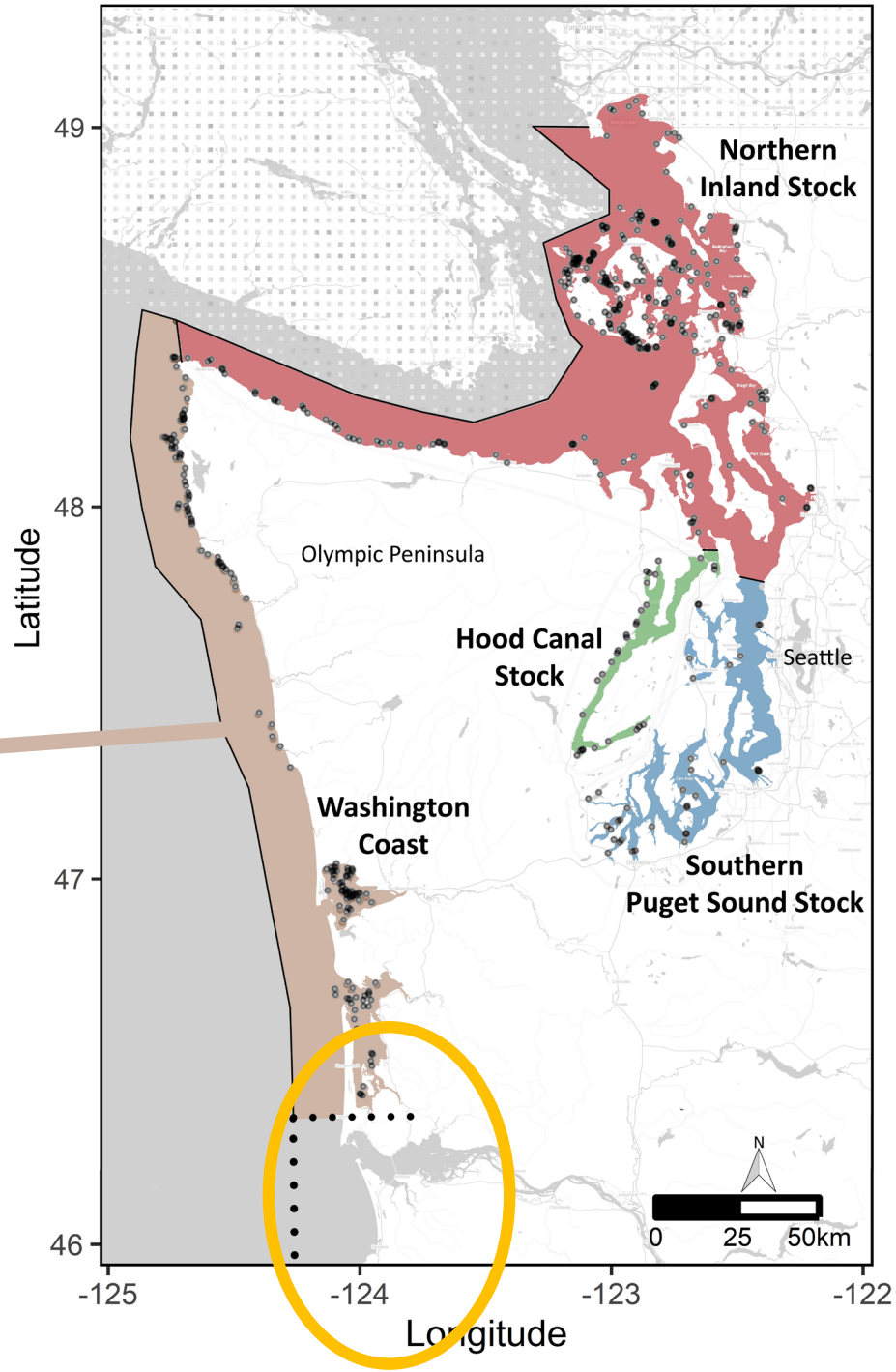
Harbor Seals





K =
?????

MNPL =
?????



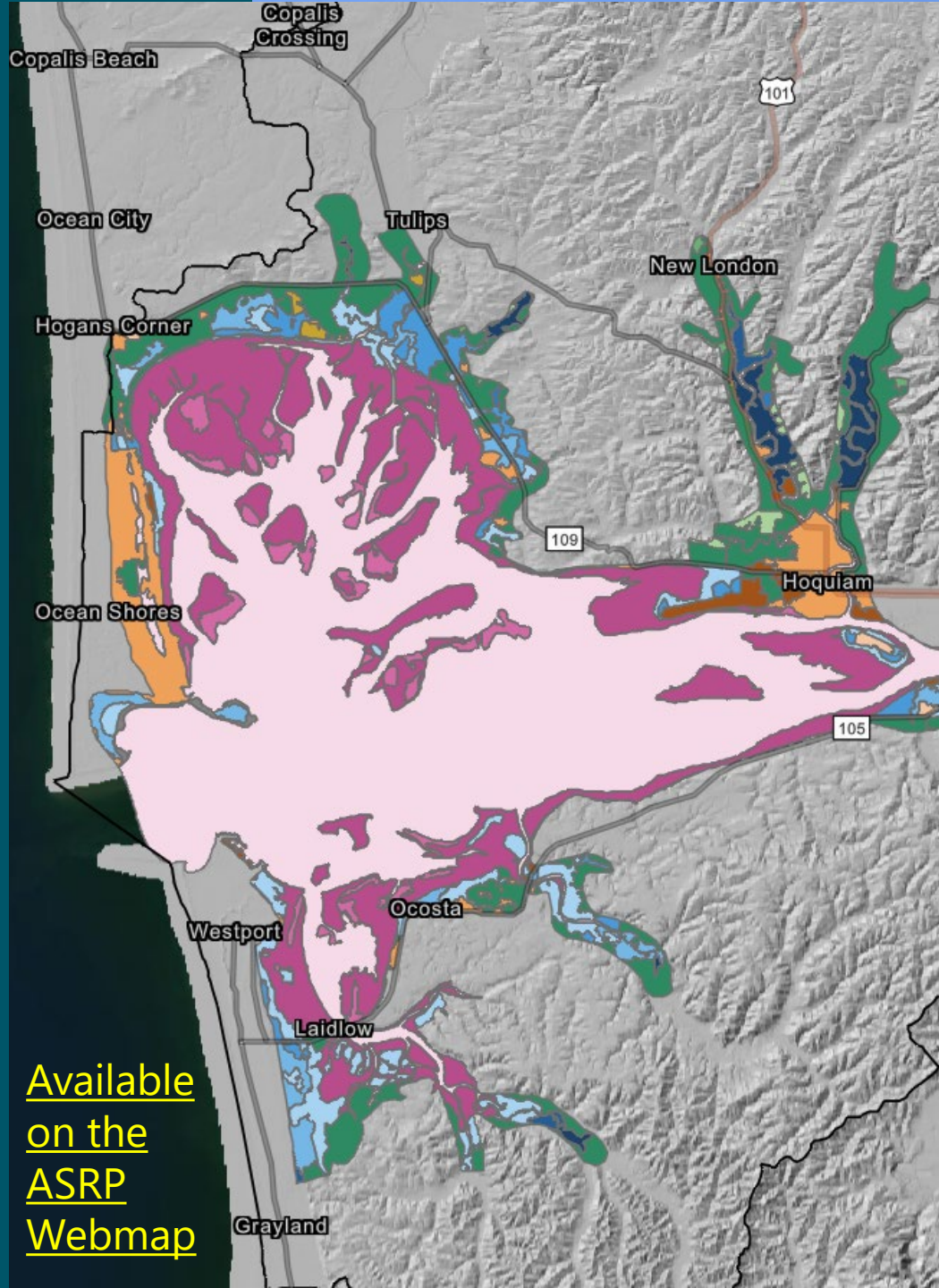
Novel Approach to Mapping Habitat in the Estuary and Tidal Ecoregion

Presented by Larissa Rohrbach, Merri Martz (Anchor QEA), Gregory Stewart (Collective Betterment)

ASRP Joint RIT-TAG Meeting:
Estuary Ecoregion Cluster

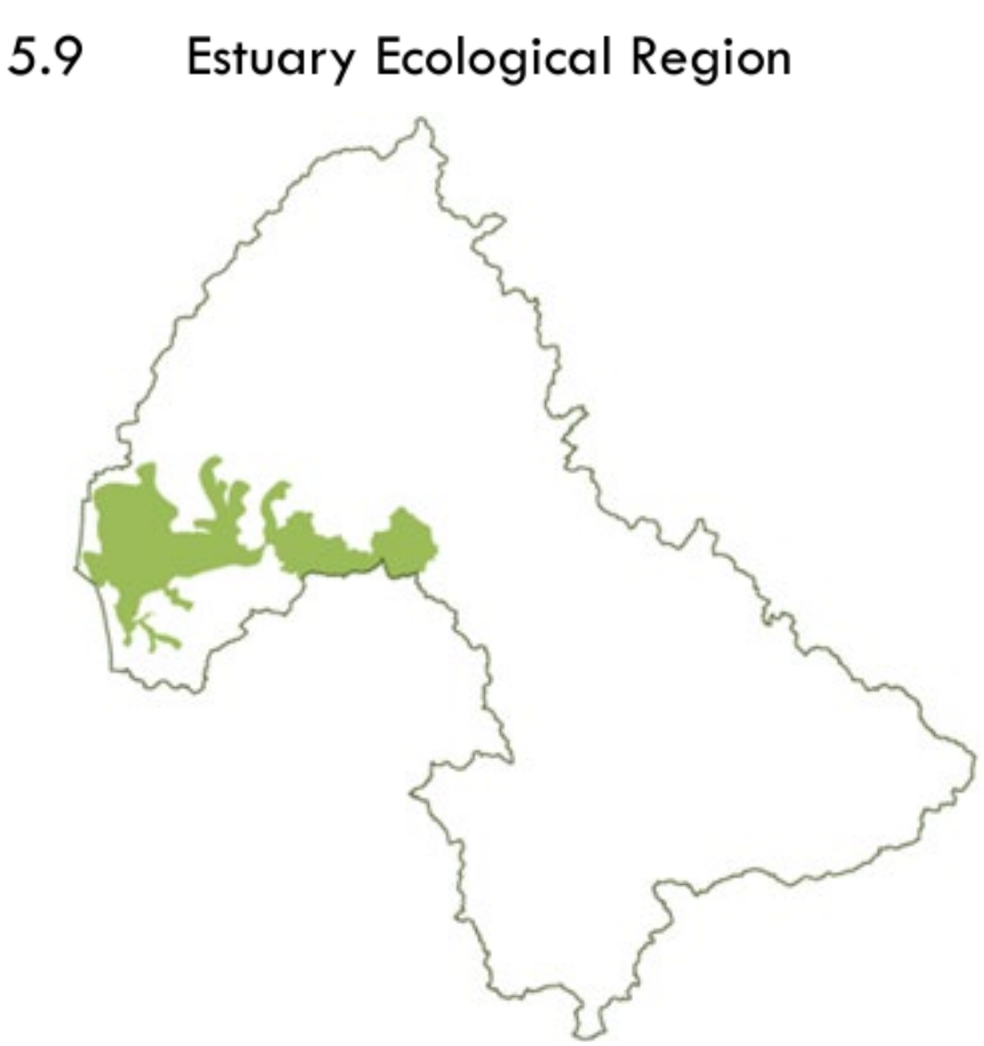
September 17, 2026

ANCHOR QEA



Background and History

- Coverage of habitats and land use is a data gap for the Grays Harbor Estuary and Chehalis Tidal Ecoregion (GHE) planning
- Historical habitat mapping efforts are a good start; limited to wetlands and based on information that is several decades old (e.g. NWI, PMEP)
- GHE has an 8 ft tidal range (avg); changes the extent and character of habitats daily, seasonally
- Estuary and tidal habitat difficult to access and sample comprehensively (182 square mile extent)
- Mapping habitat from above is controlled by what is visible. Clouds, fluctuating tide, and bandwidth obscure habitat boundaries



Purpose

- Develop a current and spatially explicit map of physical habitats
- Pilot use of satellite imagery and machine learning to efficiently create a map and update it periodically
- Synergize with ongoing efforts by developing a habitat map suitable for supporting ASRP planning and restoration activities

Building the Image Catalog

- The Sentinel-2 satellite system collects imagery across a large swath
  - Eliminates within-image tidal variation
  - For GHE, imagery within any 10-day window
  - 10-meter resolution.
- Image catalog for GHE
  - Filtered out images with incomplete coverage or cloud cover (7-10 usable images per year)
  - Final catalog of 57 images from 2017-2025
  - Synchronized images for low and high tide
  - Used for habitat classification steps



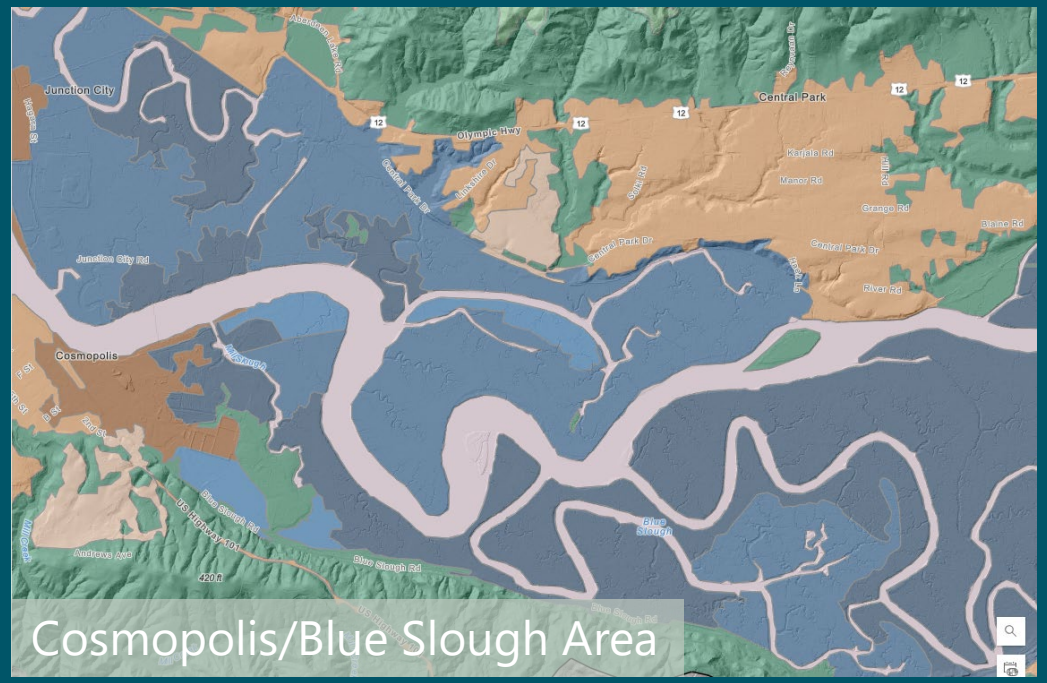


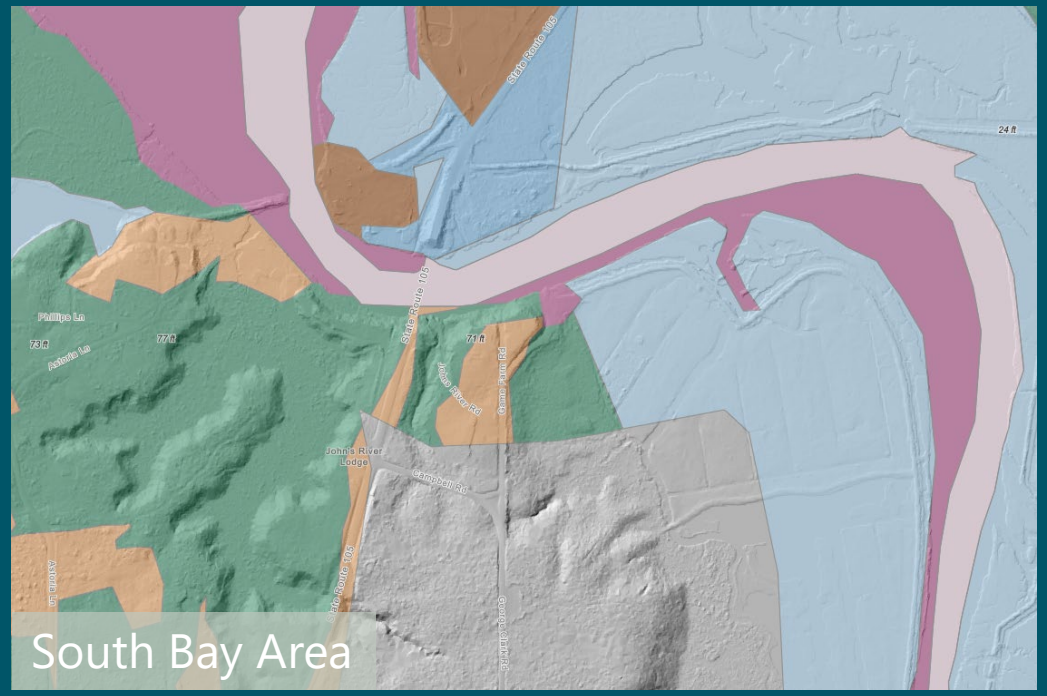
Use Deep-Learning Models to Classify GHE Habitat

- Explored deep-learning models to recognize patterns in image pixels, then classify land cover automatically and consistently
- Adapted existing models to the GHE
- Applied habitat classes from existing resources[1]
  - C-CAP 10-Meter BETA scheme
  - NWI wetland classification system used by PMEP
  - Adapted to make relevant to ASRP planning goals



[1] NOAA Coastal Change Analysis Program (C-CAP)
Pacific Marine and Estuarine Fish Habitat Partnership (PMEP) Estuary and Nearshore Habitat classification





Future Analytical Improvements

- Incorporate Recent Lidar
  - Use elevation data to greatly improve accuracy of habitat class boundaries
- Expand Sentinel-2 image catalog as new imagery becomes available
- Update model with new data
- Coordinate across estuaries, across research efforts

ANCHOR QEA

Potential Uses: Planning and Prioritization

- **A first step to fill major gaps in local strategy planning efforts**
- Quantification of different habitat types
- Identify high-priority areas for protection, restoration
  - Estuary Ecoregion Supplement identified importance of:
    shrub/forested tidal wetlands,
    tidal sloughs,
    marshes as "stepping stones"
    re-establish habitat connections
- Support EDT modeling

5.9 Estuary Ecological Region

Table 5-2

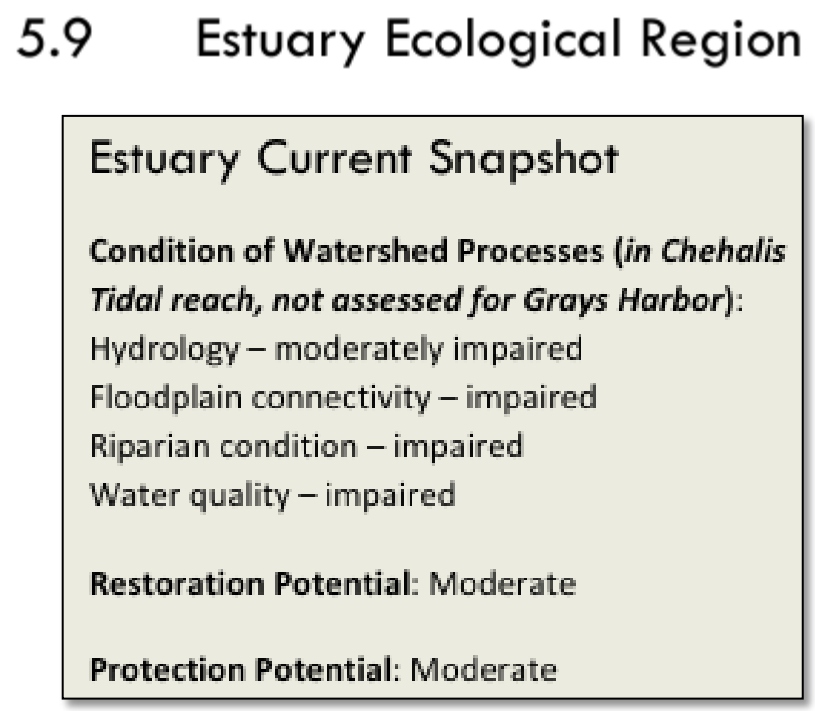
Changes in Grays Harbor Tidal Zones and Habitats from Late 1800s to Mid-1900s

TIDAL ZONE/HABITAT TYPE[1,2]	LATE 1800S/EARLY 1900S AREA (ACRES)	MID-1900S AREA (ACRES)	MID-1980S AREA[3] (ACRES)	% CHANGE
Below extreme low water (subtidal)	14,072	15,083		+7%
Potential eelgrass habitat (MLLW to extreme low water; approximately 1.2-m MLLW)	3,227	7,658		+137%
Tidal flat (MHW to MLLW)	38,874	30,243		-22%
Tidal marsh (MHW to extreme high water)	3,580 (loss of at least 500 acres by this time)	4,690	3,130	-23%
Total	59,753	57,674		-3%

Habitats. The most recent estimate of intertidal habitat area within the estuary ecoregion is 14,277 acres of mudflat; 3,469 acres of sandflat; 245 acres of eelgrass, 5,713 acres of emergent marsh; 257 acres of scrub-shrub wetland; and 6,074 acres of forested wetland (this includes the tidally influenced lower ends of all tributaries to Grays Harbor, WFC 2014). Habitats that have been most affected or reduced by

Other Potential Uses

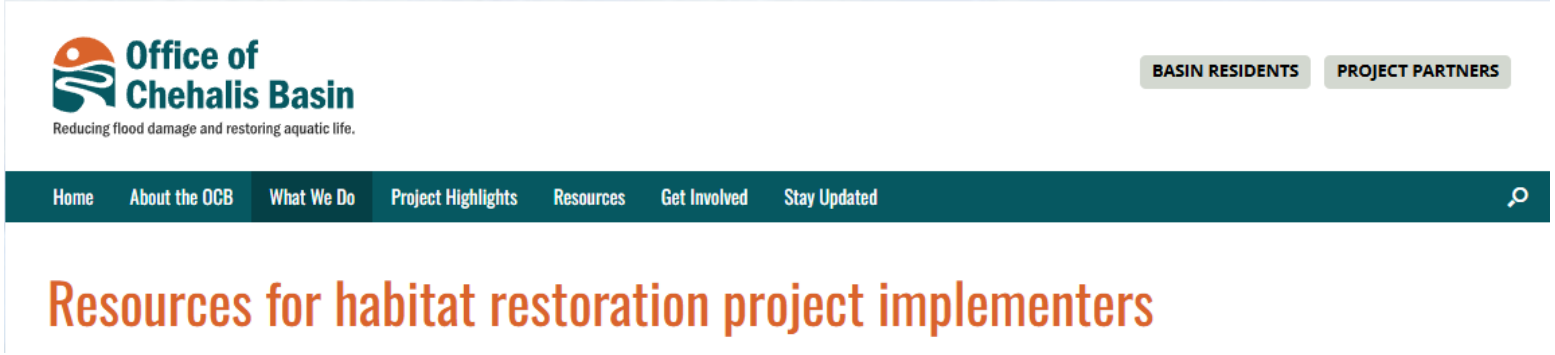
- Change Detection
  - Monitor limiting factors from Estuary Ecoregion Supplement: cumulative loss of estuarine swamp, shrub, marsh, mudflats; dredging and sea level rise
  - Identify change due to climate change
  - Support eelgrass, kelp habitat conservation and prioritization
- Site Investigation – *yes, but use with caution*
  - Recent existing conditions
  - Coverage of large areas, below high tide line
  - Treat modeled habitat polygons as preliminary, verify with other resources



Questions for RIT and TAG

- How can this information help with local strategy development (ER-scale)?
- Do you see yourself using this information in other ways?
- What habitat data gaps discussed today are the highest priority for you in the GHE-Chehalis Tidal Ecoregion?
- Are these C-CAP-based habitat class definitions useful to you (did we get the classes right)?
- Do you see yourself using this information? In what ways?
- Do you have data that could inform the habitat classifications? E.g. actual wetland delineations, information near the ESU boundary, salinity measurements
- Identifying invasive or other vegetation types: difficult at this resolution; would this be a valuable future add?

ASRP Webmap



- Available at OCB.com > Resources for Habitat Restoration Project Implementers
  - https://officeofchehalisbasin.com/implementing-projects/
  - Project development and implementation resources > Basin Wide > Chehalis Basin Strategy ASRP Webmap (https://gis.ecology.wa.gov/portal/apps/mapviewer/index.html?webmap=65915c558e76446d9d71554bb24827cb)
  - Feedback and follow up with Larissa Rohrbach (lrohrbach@anchorqea.com)

ANCHOR QEA

FORTERRA NW PROJECT UPDATE

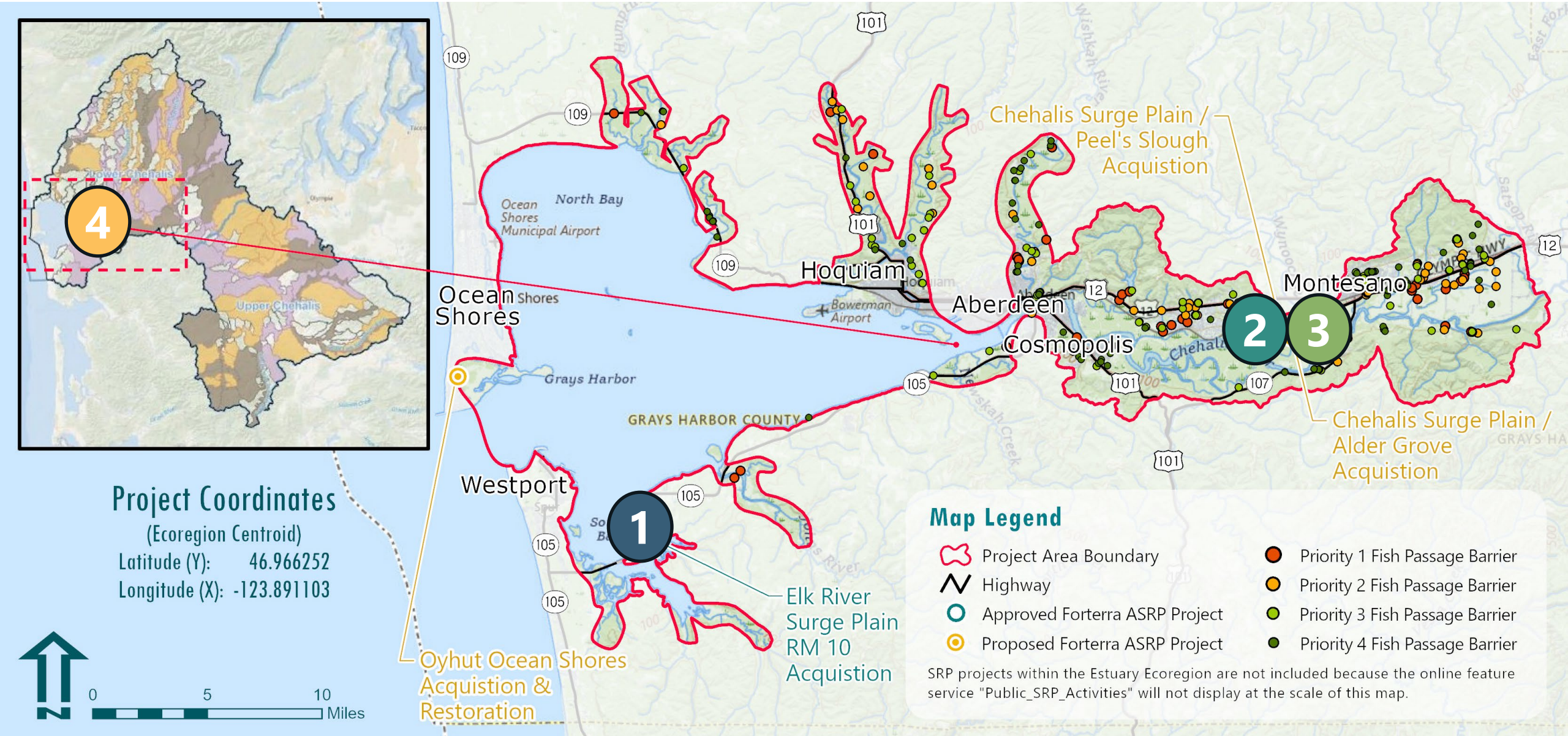
JACOB STONE, PROJECT MANAGER

October 14, 2026

ASRP Progress & Planning Workshop

Office of Chehalis Basin

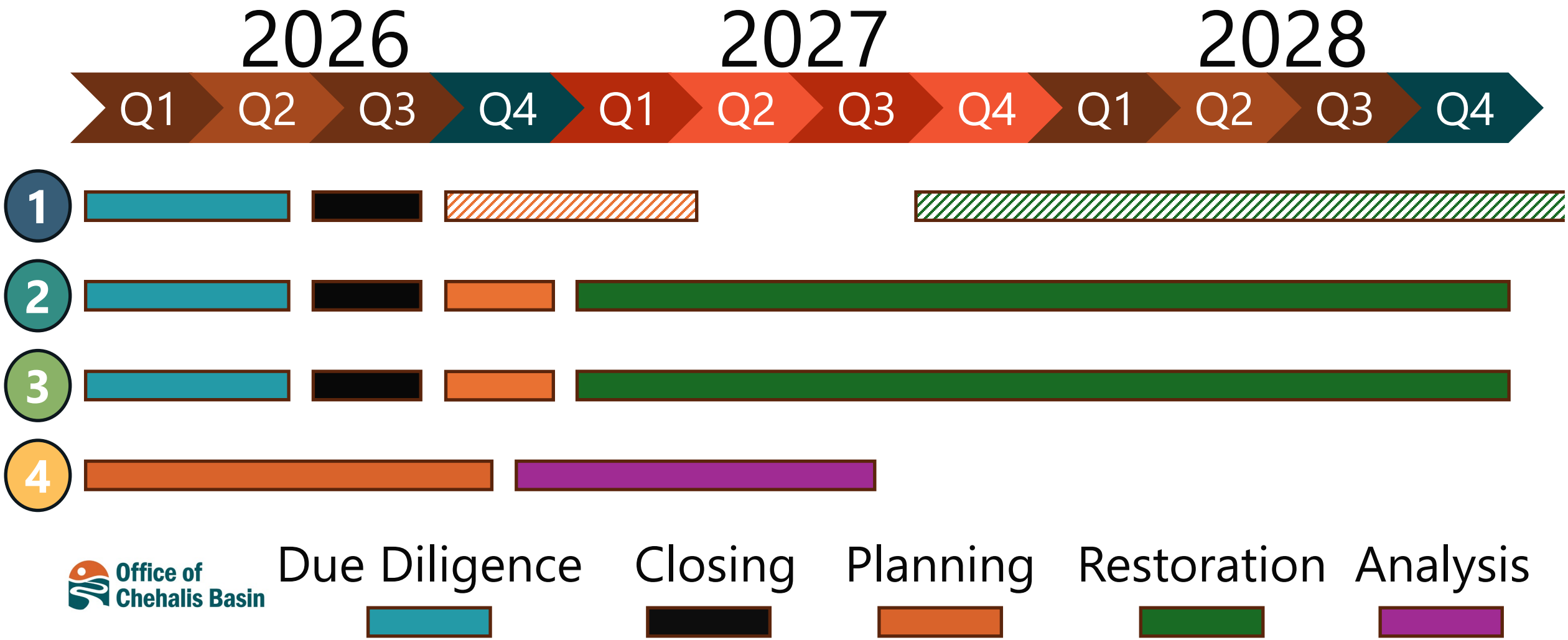
ACTIVE PROJECTS



Project Name	Status	Project Cost	Next Steps
Elk River RM 10 Acquisition 1	Closed 8/10/26	$452,400	Restoration: Seeking grant funding
Peels Slough Acquisition 2	Closed 9/30/26	$454,500	Restoration: NCWC funding
Alder Grove Acquisition 3	Closing 10/20/26	$183,500	Restoration: NCWC funding
Chehalis Basin Estuary Protection Prioritization 4	Planning Phase	$139,668	Advisory Group & Analysis Development

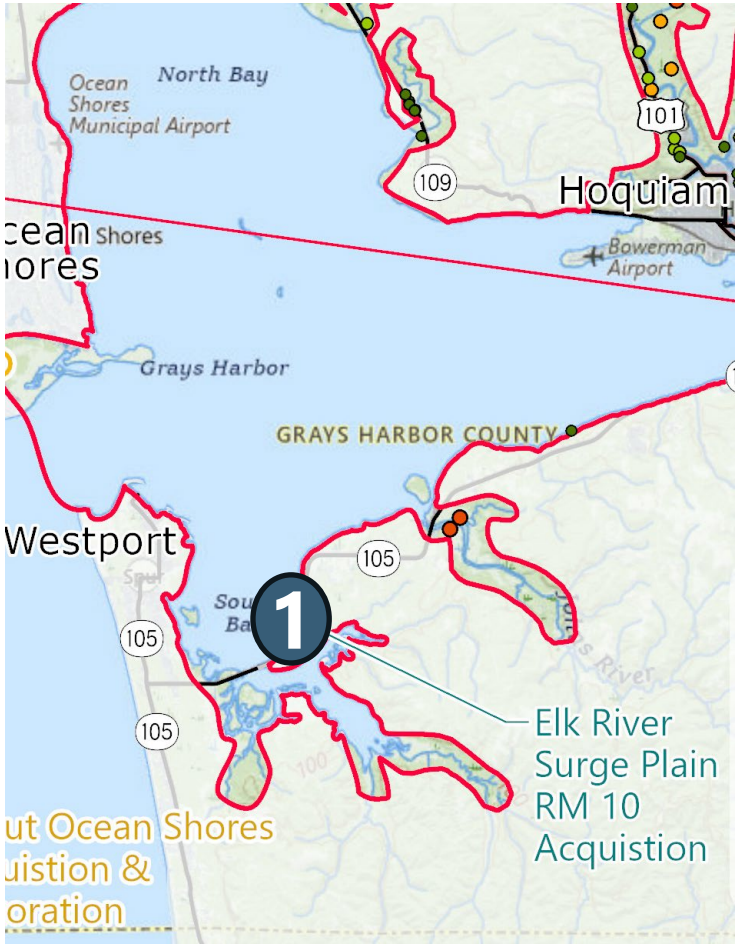
	Elk River RM 10 Acquisition 1	Peels Slough Acquisition 2	Alder Grove Acquisition 3
Property Acres	38.4 acres	87.0 acres	17.57 acres
Stream Habitat	0.67 miles	0.61 miles	0 miles
Wetland Acres	Scrub-shrub: 3.11 acres Salt Marsh: 2.87 acres	Forested: 45.0 acres Scrub-shrub: 23.5 acres Emergent: 9.2 acres	Forested: 6.4 acres Scrub-shrub: 7.0 acres Emergent: 4.7 acres

PROJECT TIMELINE

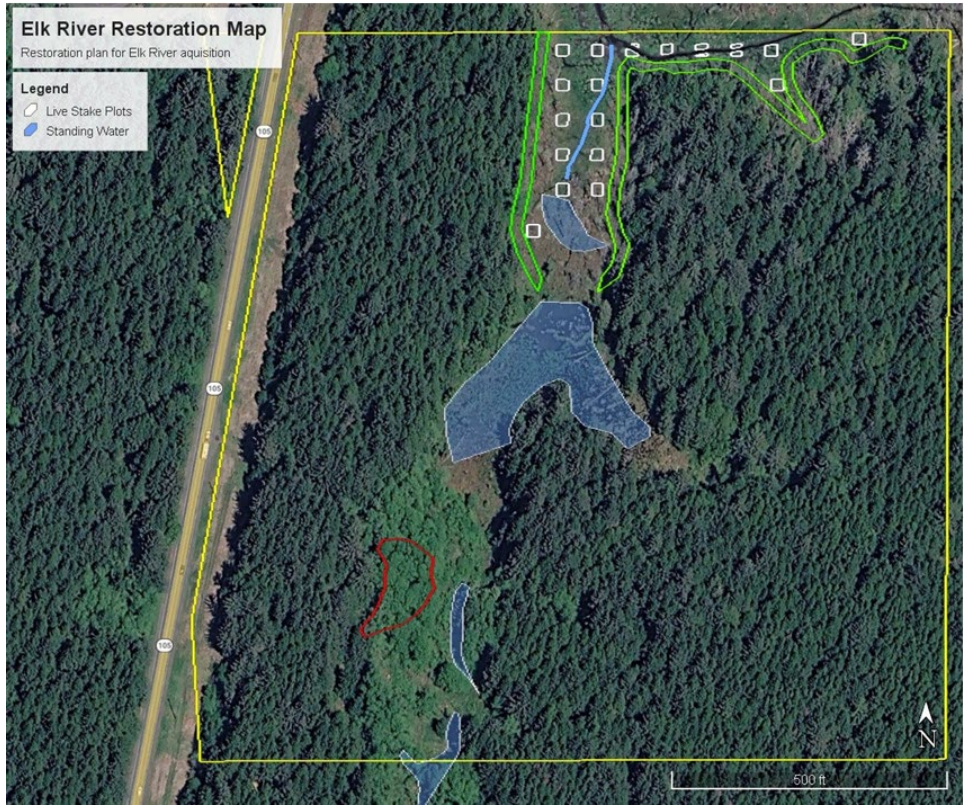


Office of Chehalis Basin

Elk River



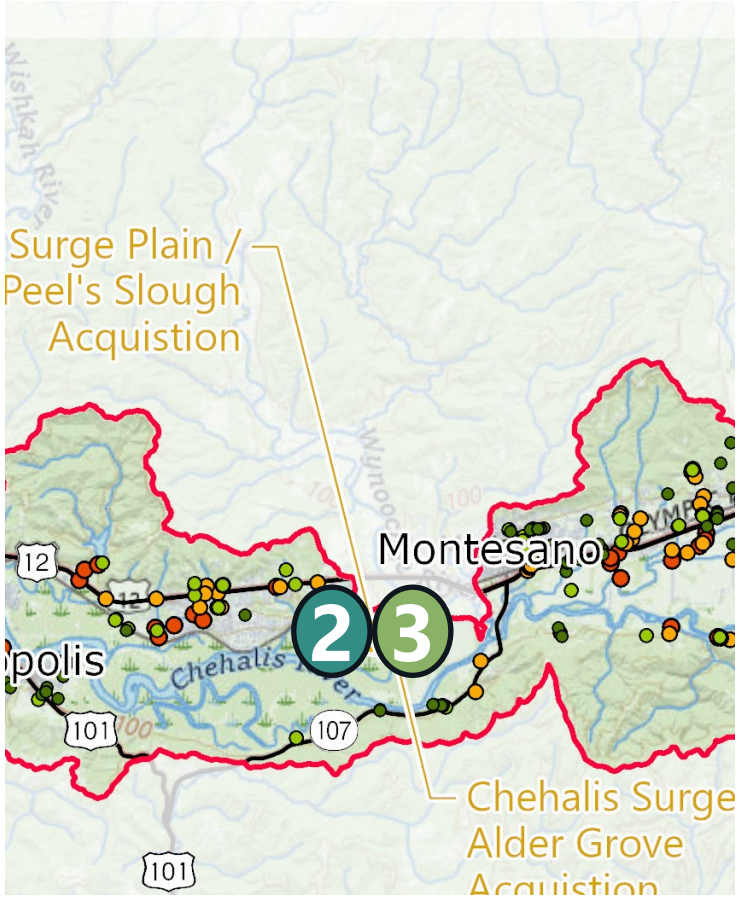
Office of Chehalis Basin







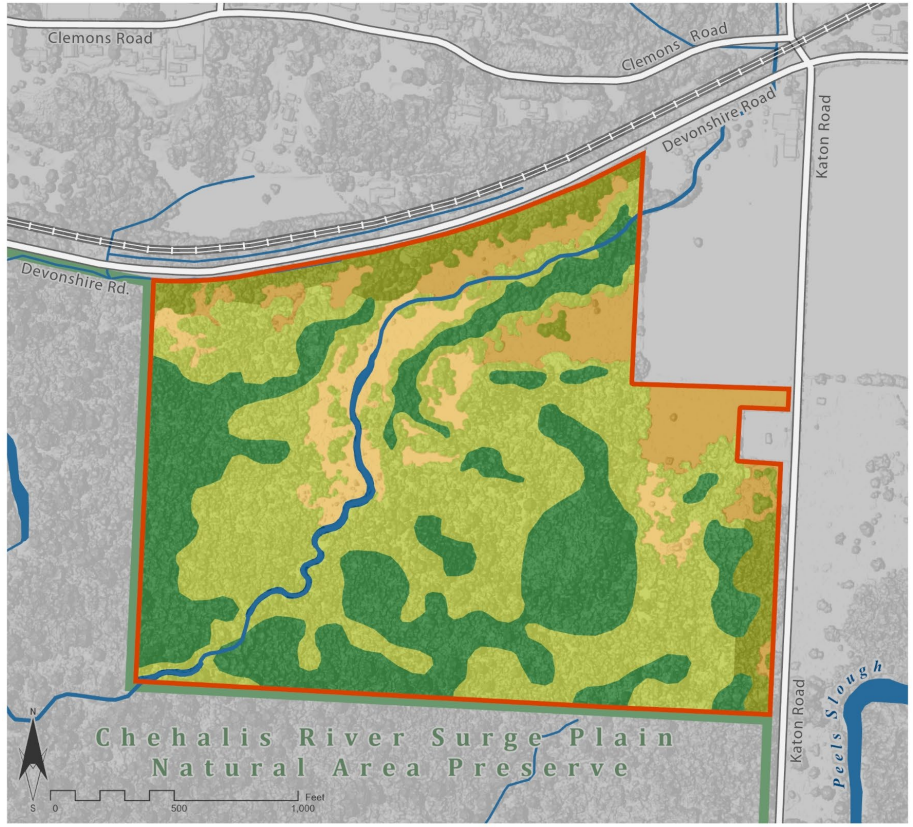
Alder Grove & Peels Slough



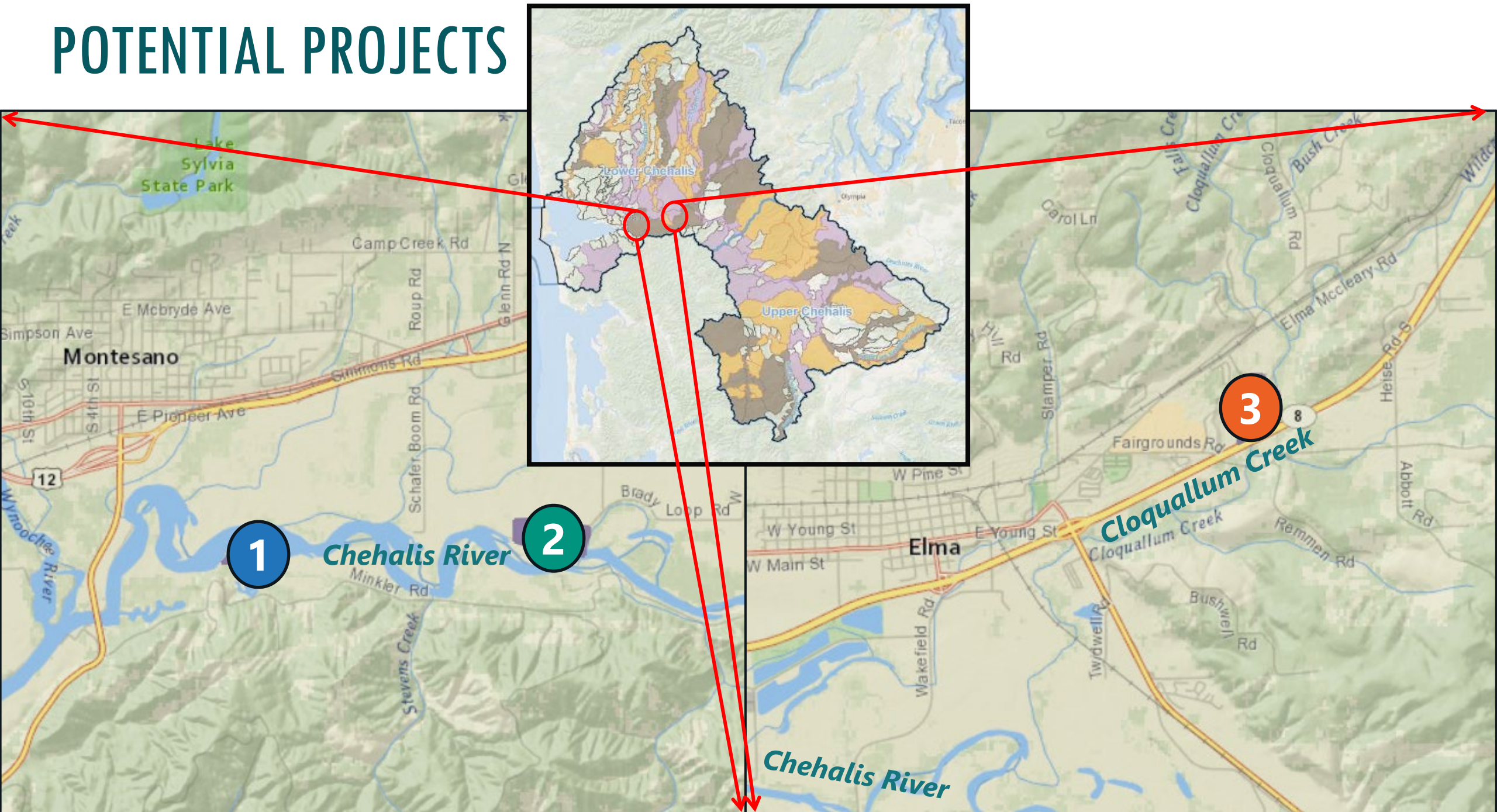
Office of Chehalis Basin







POTENTIAL PROJECTS



Project Name	Estimated Cost	River Miles & Acres	Status & Next Steps
Chehalis River RM 16.5: Mudd Acquisition 1	$440,000	.43 Miles 24.69 Acres	Addressing legal access
Chehalis River RM 16.5: Raymond Acquisition 2	$255,000	.46 Miles 45.05 Acres	Landowner negotiations on willingness
Cloquallum Creek: Gonzales Acquisition 3	$1,100,00	.33 Miles 24.4 Acres	Negotiation w/ potential partners

LESSONS LEARNED/ REMAINING QUESTIONS

- Expect full cultural resource evaluation and extended timeline for that work
- Expect extended timelines for reviews from Attorney General's office



CHEHALIS RIVER BRAZILIAN ELODEA CONTROL

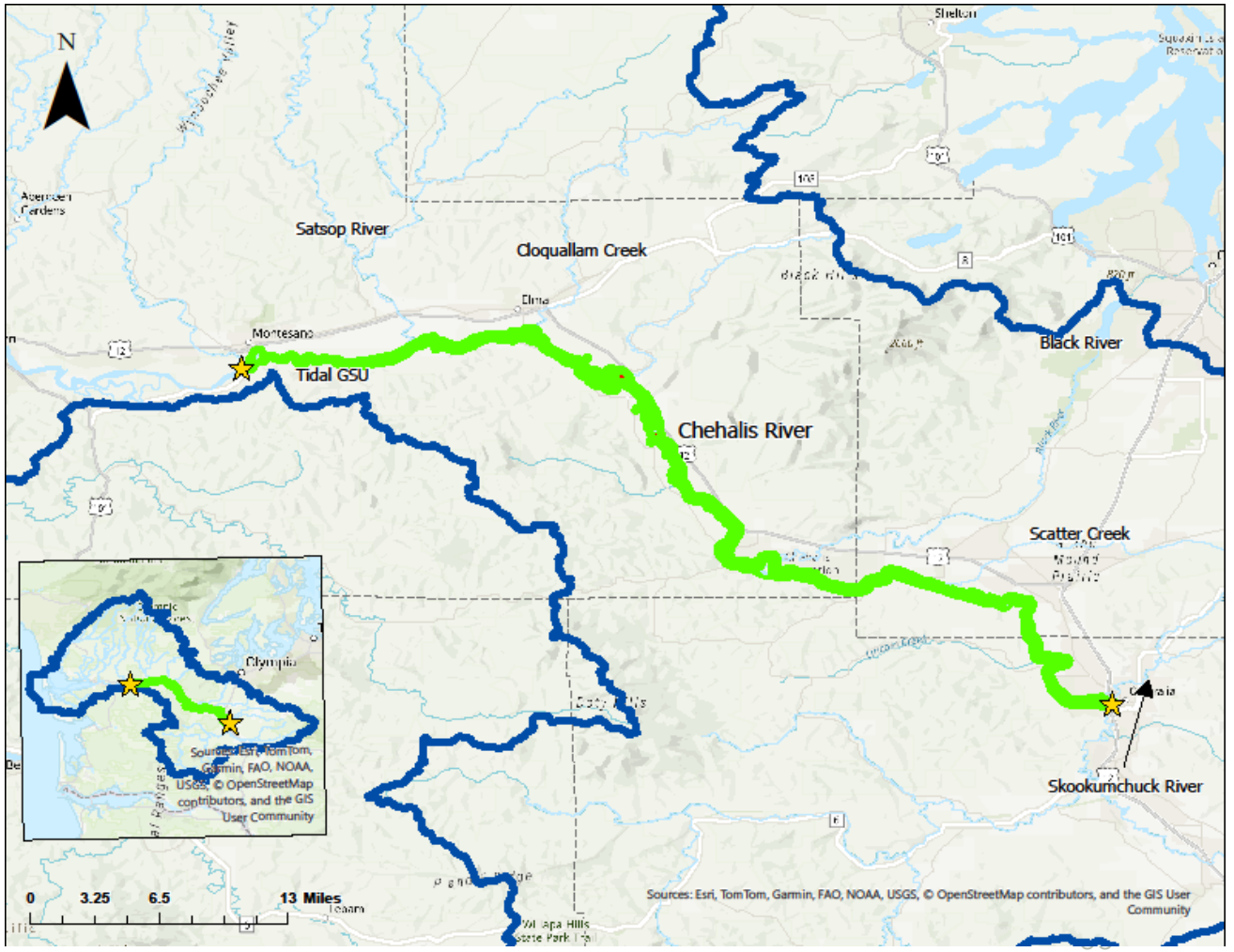
CONTACTS: SOFIA SHERMAN, CONFEDERATED TRIBES OF THE CHEHALIS RESERVATION; DANIKA DAVIS, GHNWCB

CHEHALIS RIVER BRAZILIAN ELODEA CONTROL: OVERVIEW

- **Sponsor/Budget**: Grays Harbor Noxious Weed Board**/$1,331,700**
- **Landowner type:** State, tribal, private residences
- **EcoRegion and** GSU**: Lower Chehalis River/**Mainstem Chehalis and Tidal GSU (RM 67-13)
- **ASRP Grant Category:** Priority
- **ASRP Project Scope:** Aquatic noxious weed removal
- **ASRP Project Tasks:** Construction
- **Short Description**: Treatment of Brazilian elodea (*Egeria densa)* from the Chehalis River between Centralia and Montesano (RM 67-13)
- **ASRP Priority GSU: Tidal GSU**
- **ASRP Priority Actions for this location:** Place large wood, Remove fish barriers, Reconnect/restore floodplain, Riparian restoration (medium)
- **ASRP Species: Spring Chinook;** Winter steelhead, Coho, Fall Chinook, Fall Chum, Mountain Whitefish, Eulachon, Pacific lamprey, Olympic Mudminnow, largescale sucker, riffle and reticulate sculpin, Western toad, Northern red-legged frog, Western ridged mussel

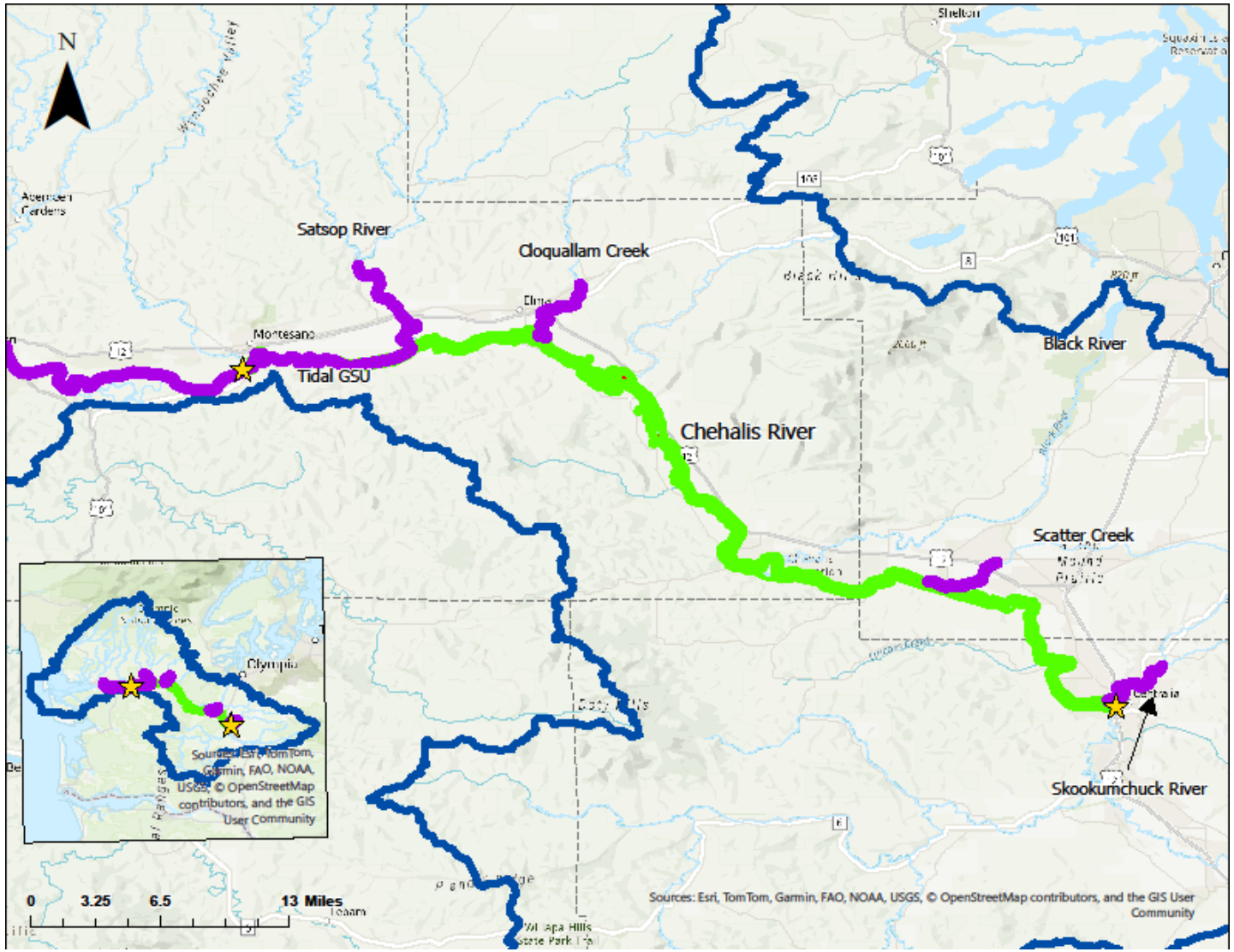
BRAZILIAN ELODEA CONTROL: CHEHALIS RIVER

- Proposed project area is 54 river miles (RM 67-13) of the mainstem Chehalis between Centralia and Montesano
  - Known extent of Brazilian elodea in the Chehalis Basin from 2024 surveys



BRAZILIAN ELODEA CONTROL: CHEHALIS RIVER

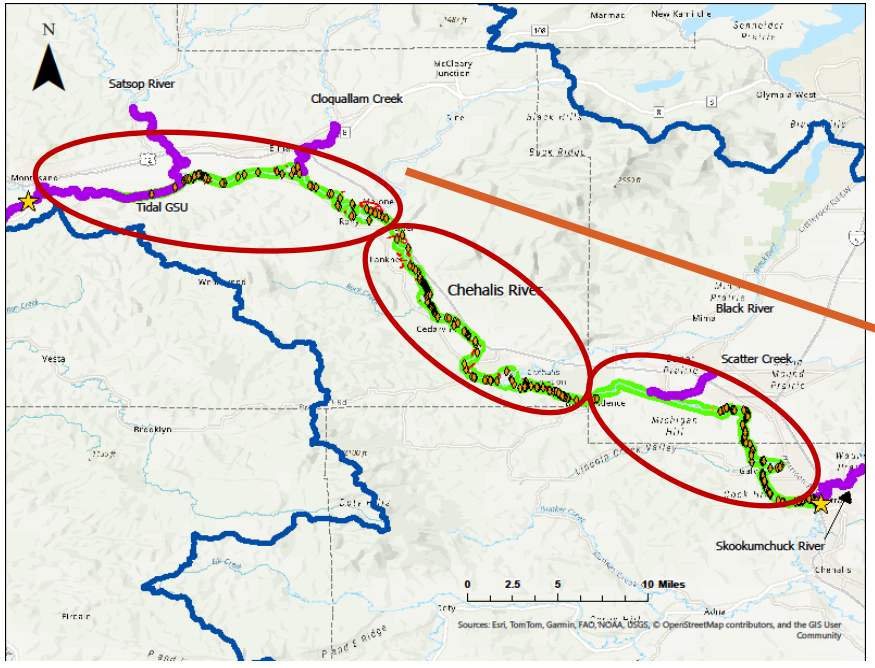
- Includes 8 miles of the Tidal GSU near-term priority area and the confluence with four other priority areas, Scatter and Cloquallam Creek GSUs and lower Skookumchuck and Satsop River GSUs



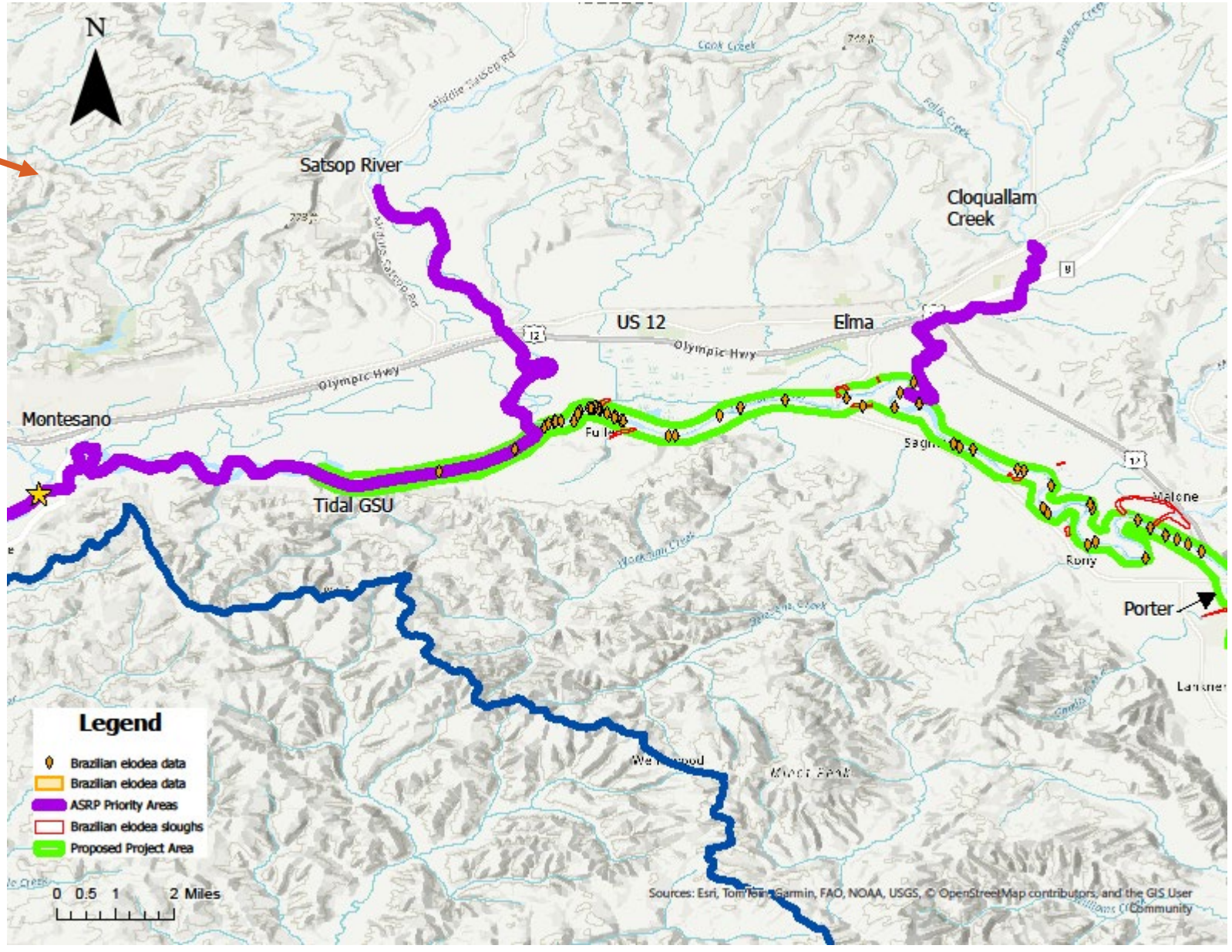
PROJECT DESCRIPTION

- Manual removal of Brazilian elodea *(Egeria densa)*, annually for four years
  - 12 weeks of snorkeling with 6-person crew
    - When accessible, deposit removed Brazilian elodea on banks, covering other invasive plants when possible
    - In areas with inaccessible banks, removed biomass will be boated to a nearby bank
  - Scuba deeper areas as needed

BRAZILIAN ELODEA CONTROL: REACH 3



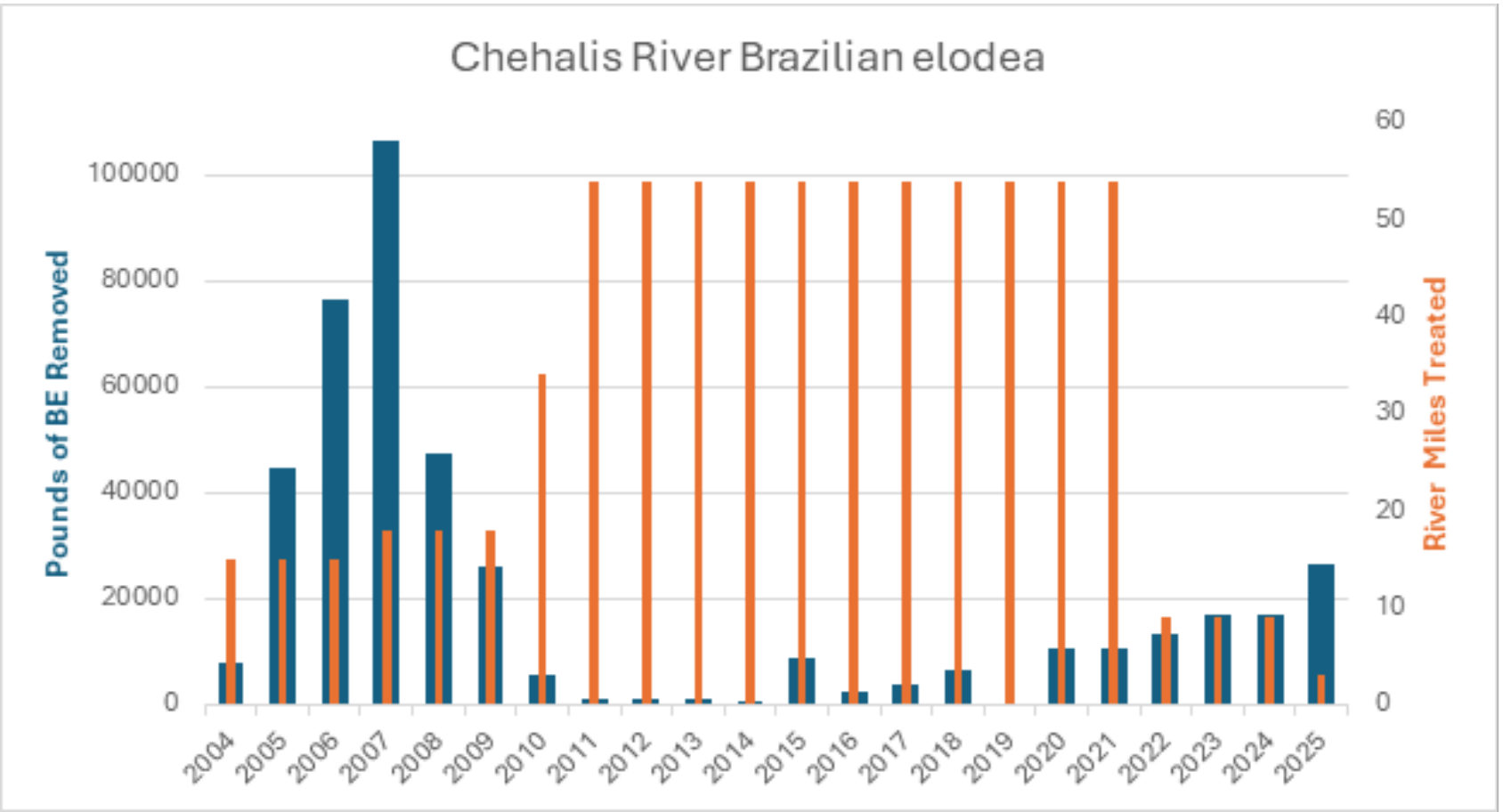
Project area is split into three reaches:
Reach 3—RM 32-13 , Grays Harbor County lower reach



CHEHALIS RIVER BRAZILIAN ELODEA CONTROL: SITE PHOTOS



Project Updates:
Discussion with ASRP Steering Committee resulted in development of BMP for elodea removal, including plan for biomass management and post-treatment surveying.



Chehalis River RM 15.5-17.5
Restoration Design Update



Chehalis Advisory Group Meeting
June 16, 2025

Summary

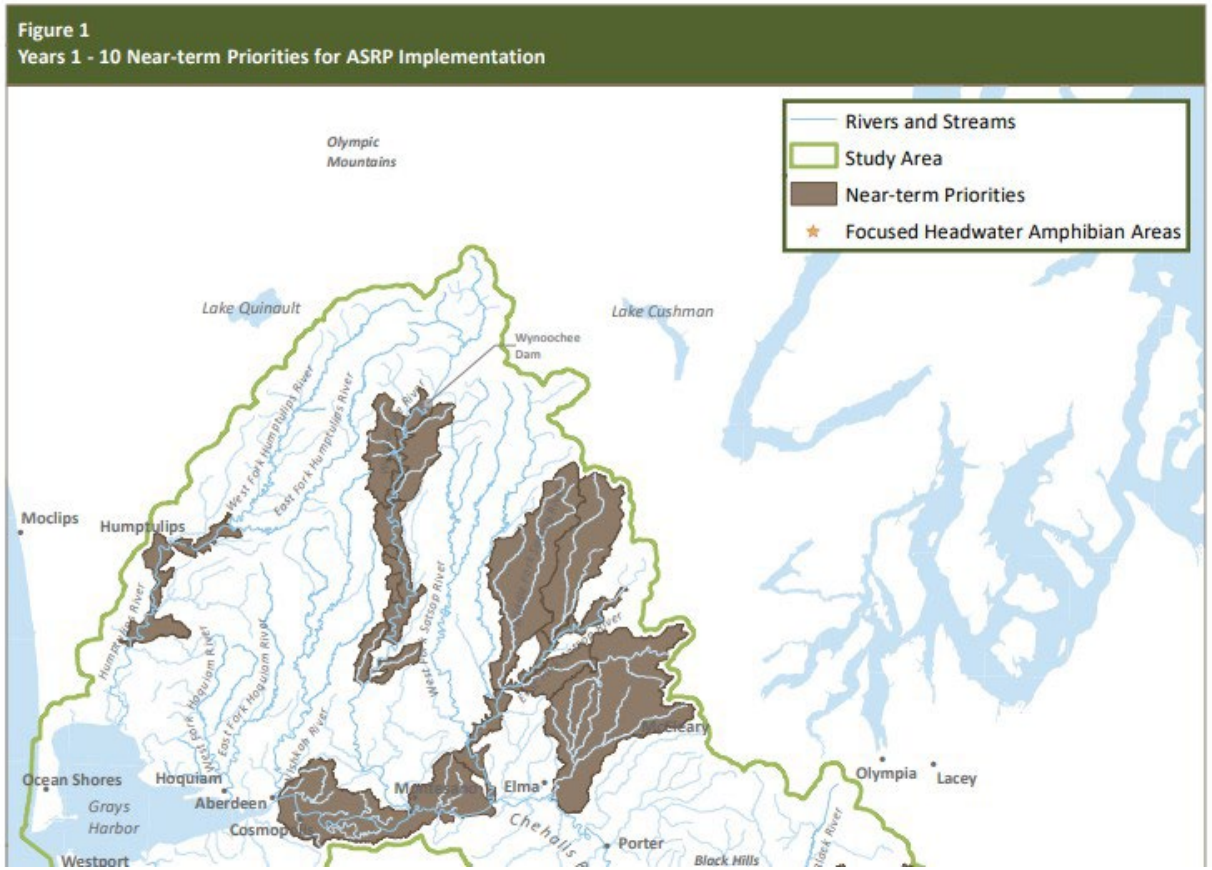
- Project Update
- Project Background & Goals
- Alternatives Analysis
- Preliminary Design



Project Development Efforts

2019/2020 ASRP Grant Round

- Grays Harbor CD grant to conduct landowner outreach and develop projects in the Chehalis Mainstem Tidal GSU



Project Development Efforts

Objective: Initiate long-lead-time actions in selected GSUs including planting riparian buffers and re-establishing the forested tidal surge plain.

Several GSUs were selected for early implementation of riparian buffer restoration based on salmon species showing a strong positive response to riparian restoration (in the EDT model) and detailed analysis of riparian condition (in the NOAA model). Benefits of riparian buffers include shade and the input of material from the buffer that falls into the stream channel such as food (insects), leaf litter, and woody material. To realize the benefits, riparian plantings in the selected GSUs need to be initiated as soon as possible because tree growth, shading, and wood supply to stream channels from riparian buffers requires many decades (i.e., 80 years or more) to fully develop. The Middle Humptulips River Mainstem GSU in the Grays Harbor Tributaries Ecological Region, and the Scatter Creek and Beaver Creek GSUs in the Black River Ecological Region were selected for early riparian restoration. Implementation Teams should seek locations where sun angle (i.e., south bank) and stream orientation support effective stream shading. The GSUs selected for early riparian restoration are in addition to GSUs in the Willapa Hills and Cascade Mountains ecological regions where both riparian buffer restoration and in-channel restoration actions are prioritized for at-risk species.

The existing tidal surge plain is prioritized because the forest-shrub vegetation type is largely intact and it is a highly used and productive habitat for juvenile salmon migrating downstream. However, it is expected to transition to emergent marsh habitat under projected sea level rise later this century due to climate change. Actions need to be initiated in the near-term period to identify willing landowners in the largely agricultural area upstream of the existing surge plain and determine how to establish forested freshwater tidal swamp vegetation for a future tidal surge plain where one does not currently exist.

Grays Harbor Estuary Salmonid Conservation and Restoration Plan



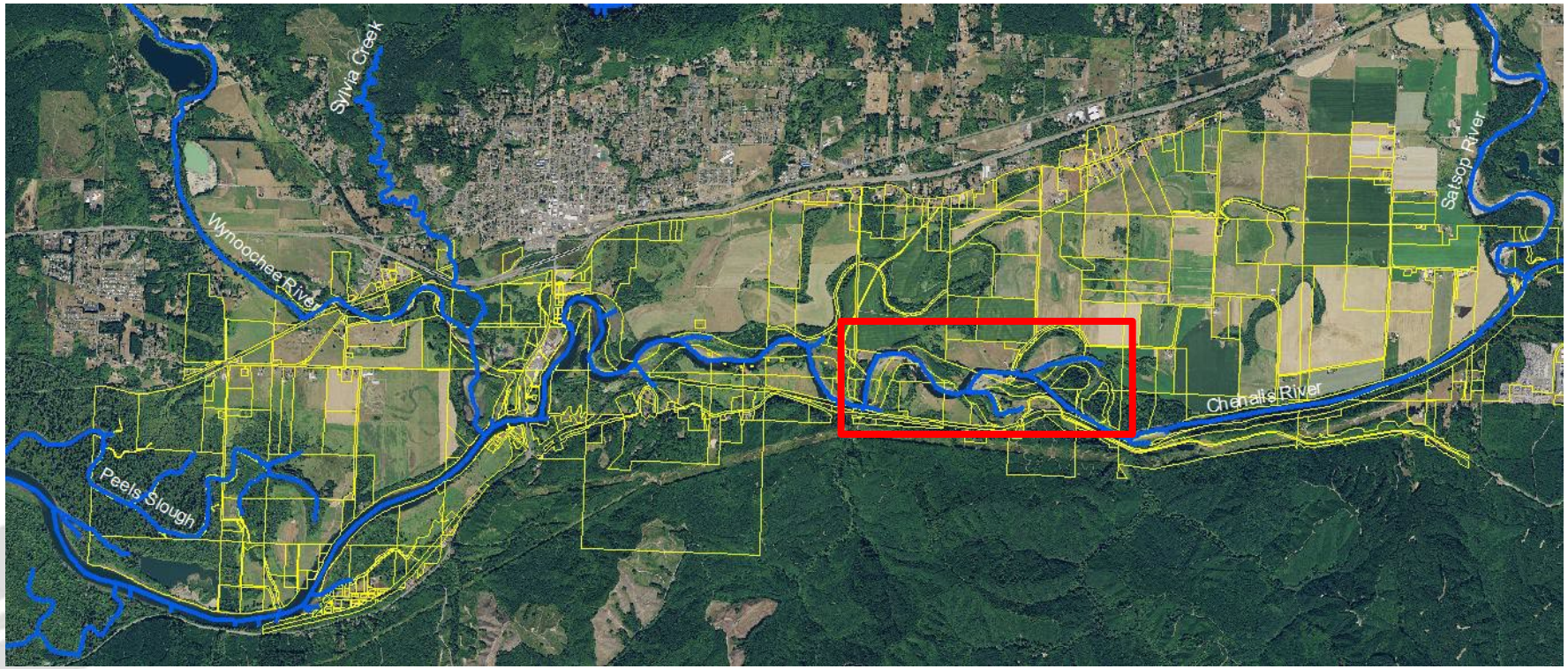
Prepared by Todd Sandell, James Fletcher, Andrew McAninch, and Micah Wait
May, 2015

Wild Fish Conservancy
NORTHWEST
SCIENCE EDUCATION ADVOCACY

		Restoration Actions							Geospatial Unit Information					
Ecological Region	Geospatial Unit	Place Large Wood	Remove Fish Barriers	Reconnect/ Restore Floodplain	Riparian Restoration	Beaver Ponds/ BDAs	Wetland Restoration	Acres of OSF* Habitat Protection/ Restoration	Total Number of Barriers	Length of Primary River (miles)	Percent of Primary River Length Proposed for Restoration	Proposed Protection/ Restoration (miles)	Priority Species or Habitat Focus	Limiting Factors From Highest Priority to Lowest
Estuary	Tidal Zone GSU	●	●	●	●				72	19.8	33%	7	○ Early Riparian Restoration ○ Unique At-Risk Habitat (protection)	Habitat Diversity, Flow, Ch… Habitat, Predation, Sediment Load, Temperature, Obstructions/ Barriers, Channel Length

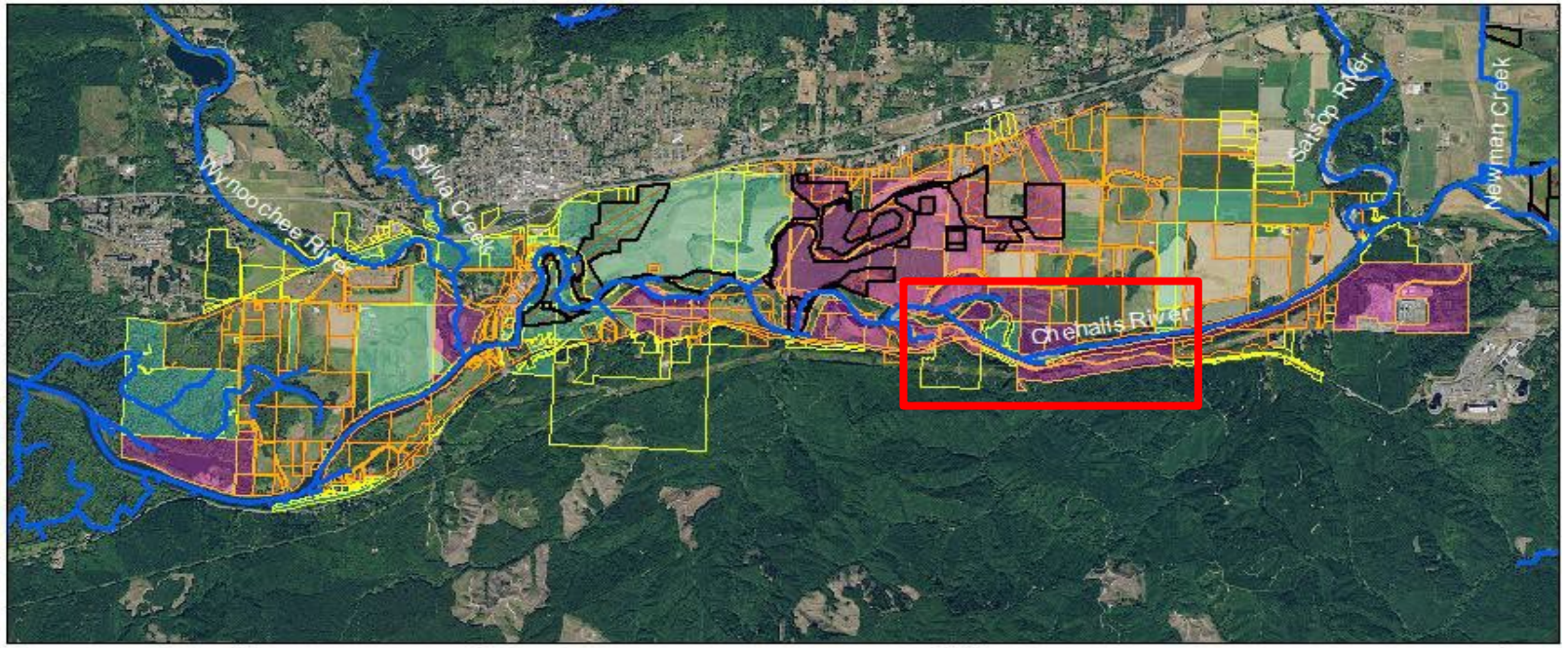
Project Development Efforts

- Letter and ASRP materials sent to 114 landowners upstream of the Tidal Surge Plain; focus on riparian reestablishment
- Direct outreach to Port of Grays Harbor, ag landowners with previous GHCD engagement, WDFW, and NRCS (easement holder throughout reach)



Project Development Efforts

Lower Chehalis Project Development - Landowner Outreach Results



Landowner Interests:

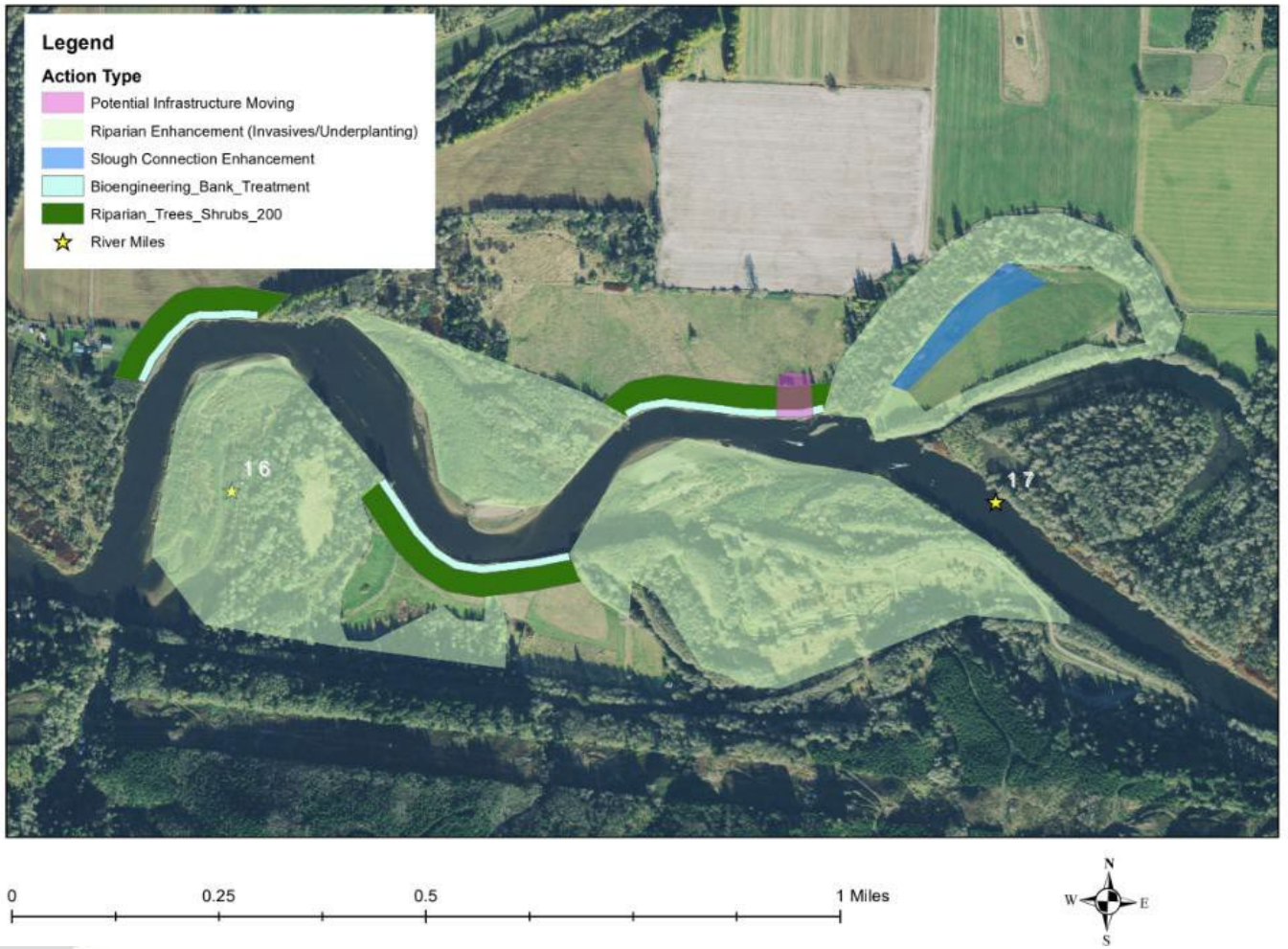
Invasive Plant Management
Erosion Reduction
Aquatic Habitat Enhancement
Agricultural Viability
Waterfowl Habitat
Drainage Ditch Maintenance
Conservation Easements

Landowner Types:

Public: Port of Grays Harbor; WDFW, Municipalities
Private: Large and small-scale agriculture; rural residential; recreation
Federal: NRCS Wetland Reserve Program Easement overlays

Project Development Efforts

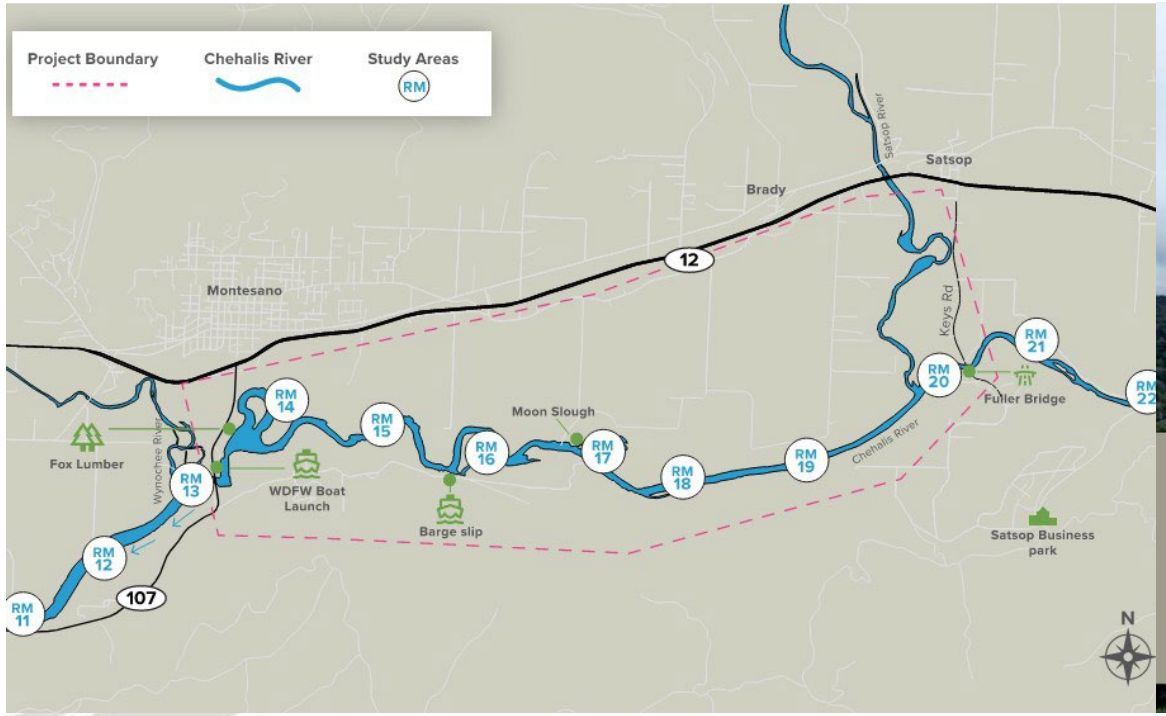
Chehalis RM 15.5-17.5 Concept Plan

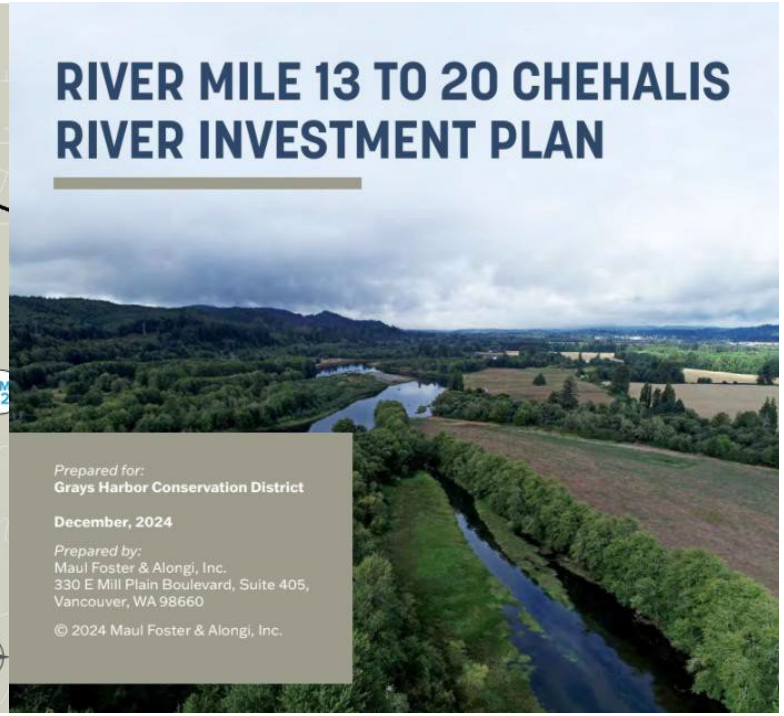


Early TRT feedback for Chehalis RM 15.5-17.5 Design Project: Look at bigger actions than just riparian reestablishment.

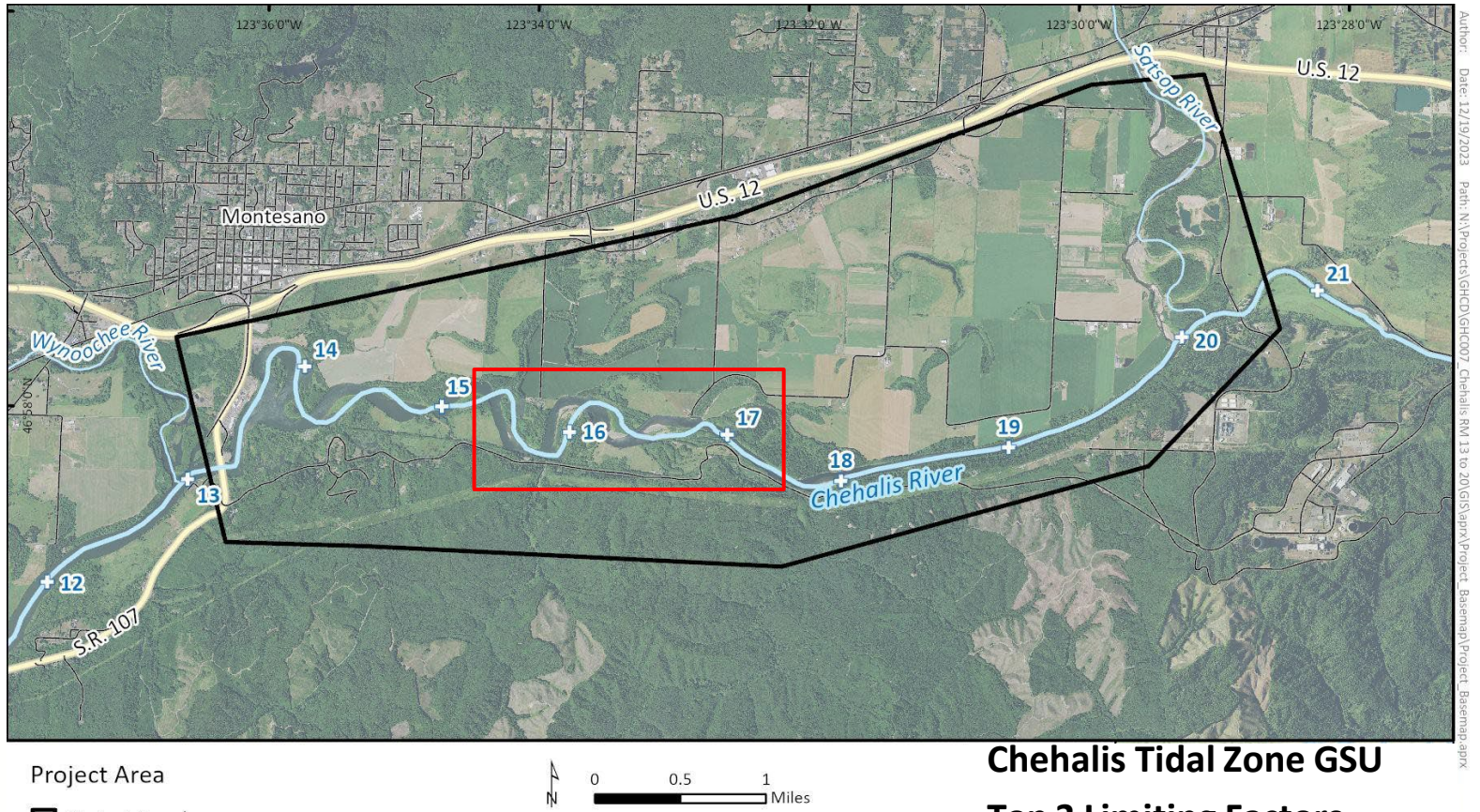
Project Development Efforts

Incorporated Chehalis RM 15.5-17.5 Design with Chehalis RM 13-20 Investment Plan Development (Chehalis Basin Flood Authority funded) to leverage funding for a more comprehensive hydrogeomorphic and habitat assessment





Project Location and Background



Chehalis Tidal Zone GSU

Top 3 Limiting Factors

- Habitat Diversity
- Flow
- Channel Stability

Goals and Objectives

- Address the factors limiting aquatic species productivity
  - Re-establish the processes that maintain aquatic habitat diversity by re-establishing native tree and shrub successional processes
  - Increase the quality and quantity of juvenile salmonid rearing habitat during key outmigration periods
  - Increase the quality and quantity of wetland habitat

Chehalis Tidal Zone GSU - Top 3 Limiting Factors

- Habitat Diversity
- Flow
- Channel Stability

Project Timeline

Preassessment Meetings, Data Collection, and QAPP Development
July through September 2023

Reach Scale Analysis and Assessment
September through December 2023

Reach Scale Conceptual (10% design) Plans
January through April 2024

Chehalis River Mile 13-20 Investment Plan
December 2023 through June 2024

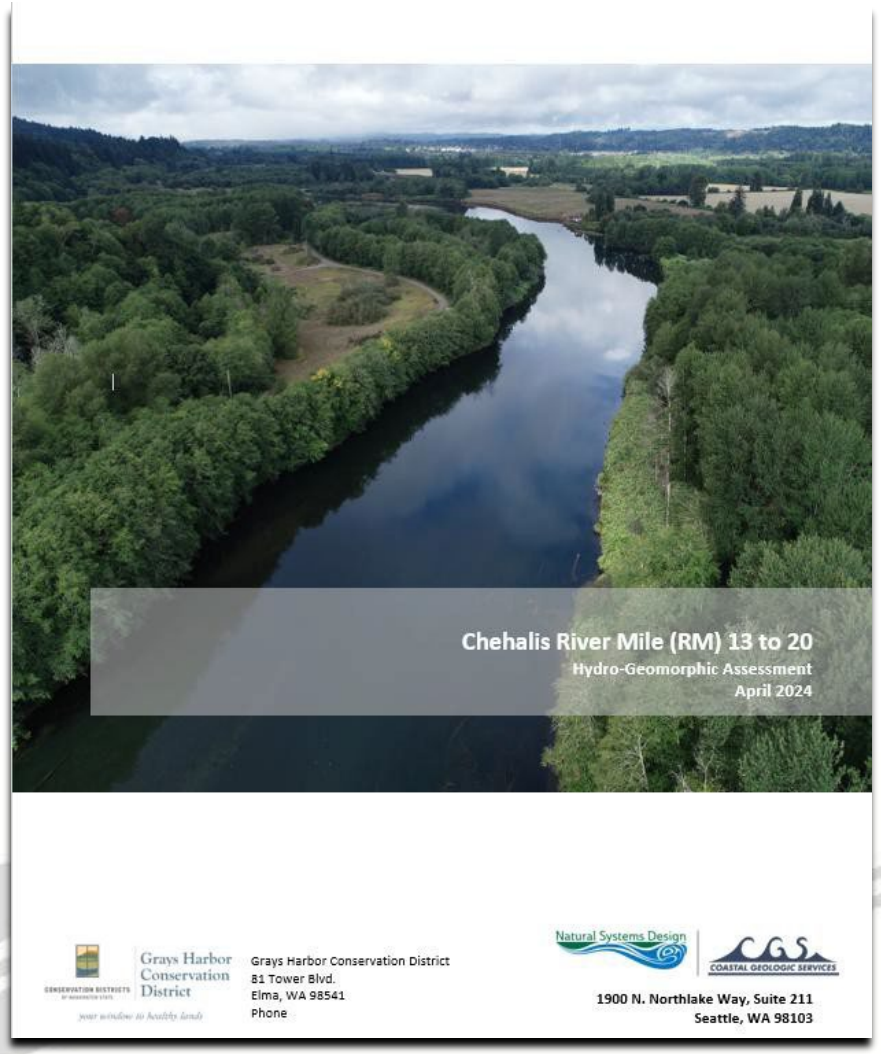
Chehalis River Mile 15.5 to 17.5 Alternatives Analysis & Preliminary Design
July 2024 through June 2025

Chehalis River Mile 15.5 to 17.5 Final Design
July 2025 through June 2026

Chehalis River Mile 15.5 to 17.5 Construction Phase 1/Phase 2
Summer 2027/Summer 2028

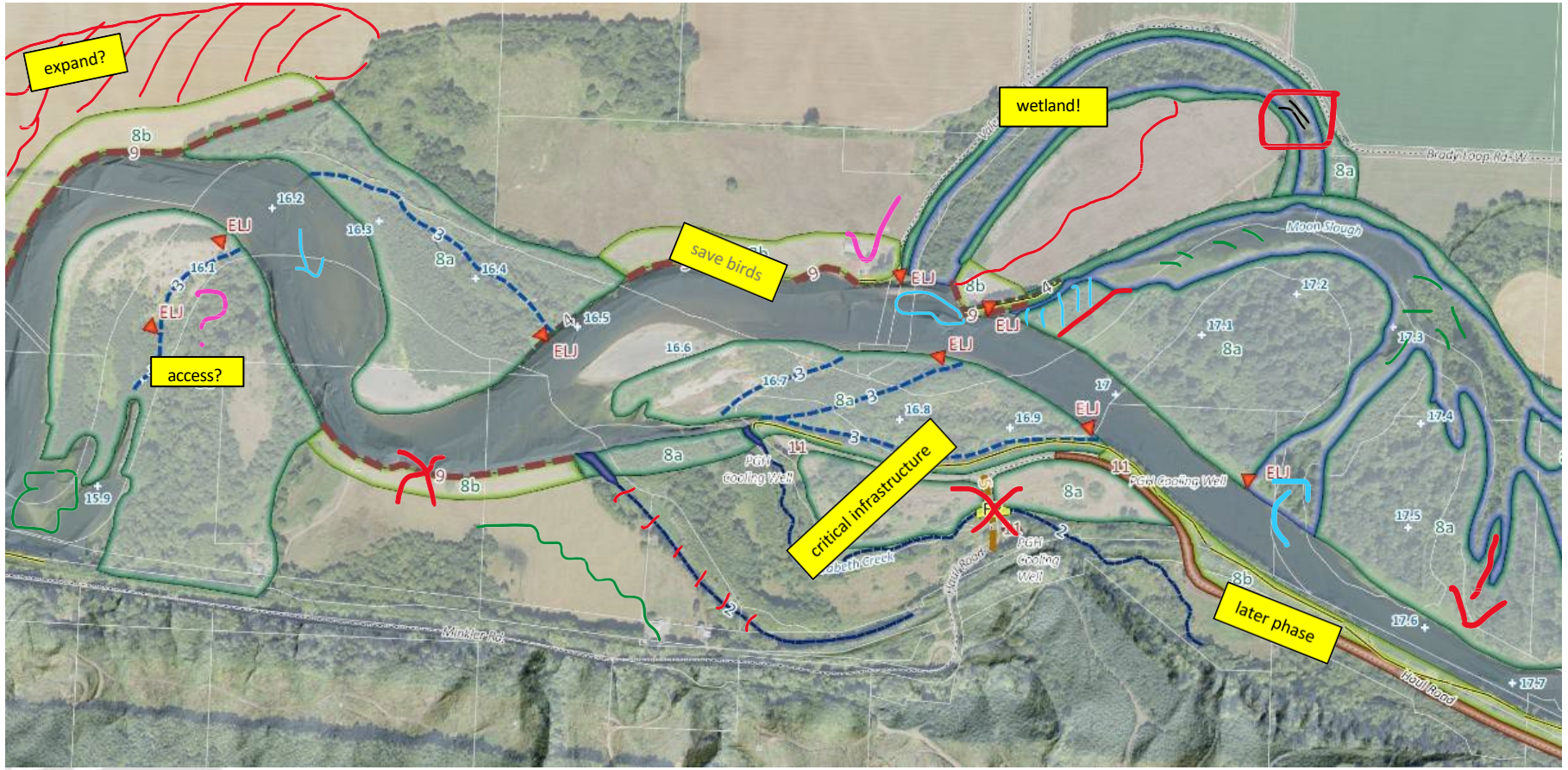
Public Outreach and Engagement
Throughout Project

2024 Hydro-Geomorphic Assessment



- Topographic/Geologic History
- Channel Migration Analysis
- Infrastructure and Bank Modifications
- Aquatic Habitats, Large Wood, Sediments
- Wetland and Slough Habitat Assessment
- Riparian Characterization
- Hydrology and Hydrologic Modeling
- Climate Change Scenarios
- Restoration and Resiliency Opportunities

Alternatives Analysis



Eroding Banks



NRCS plantings are being lost to erosion throughout the project reach.



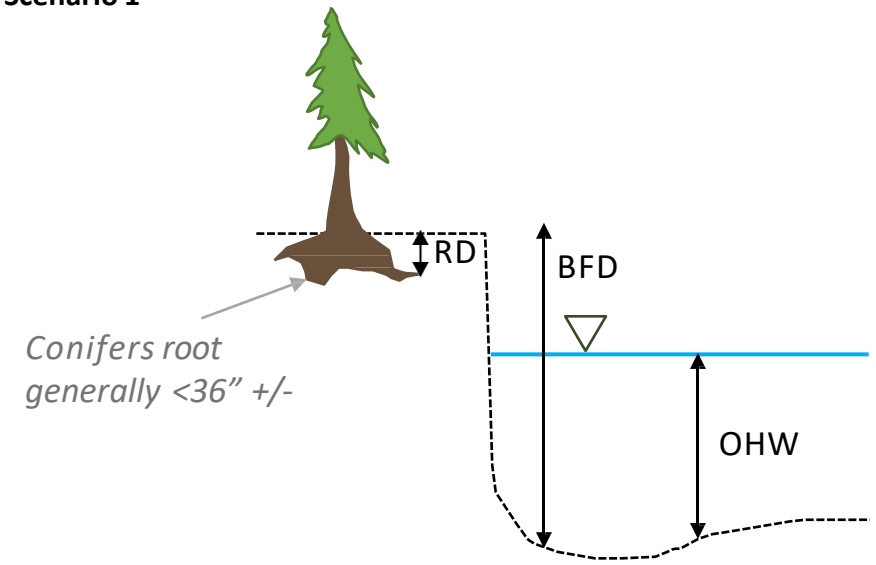
Average Chehalis bank heights are

- 6 to 10 ft above summer WSE
- 15 to 20 ft above thalweg
- 25 to 40 feet above observed scour

Eroding Banks

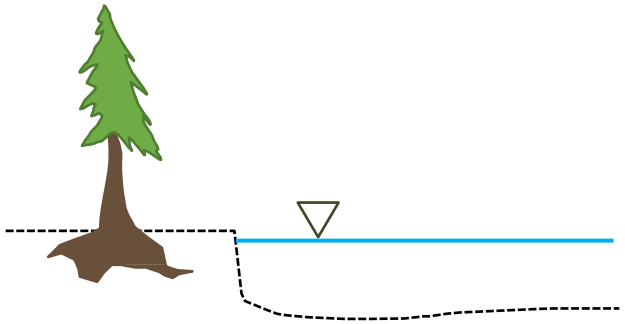
When characterizing existing bank stability, structure and rooting depth of riparian banks is important.

Scenario 1



Trees **likely do not** increase bank stability, unless they are large enough to form a natural spur or revetment (logjam) when recruited after the erosion. Furthermore, planting tops of banks does not provide erosion resistance.

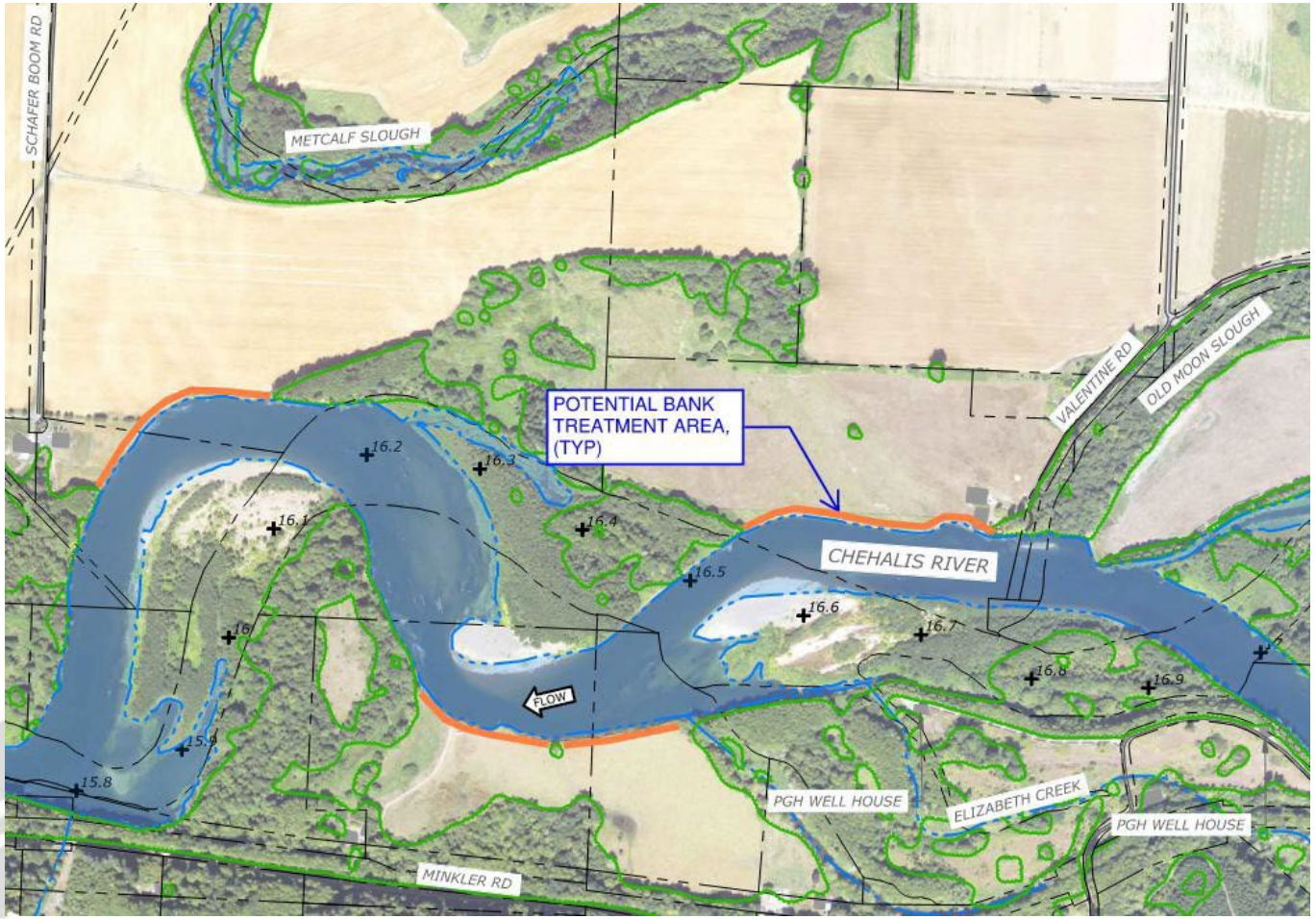
Scenario 2



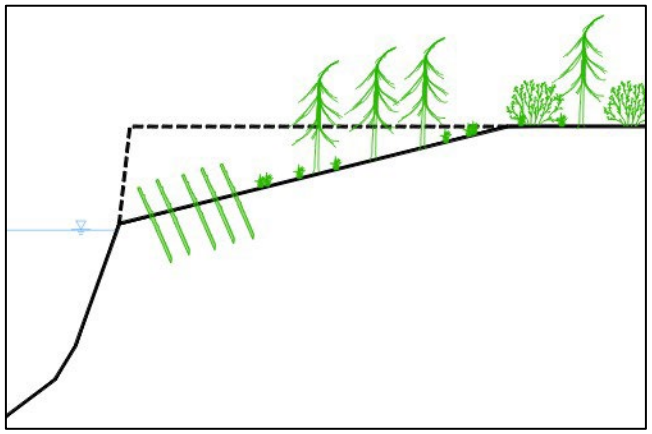
Trees **likely do** increase bank stability.

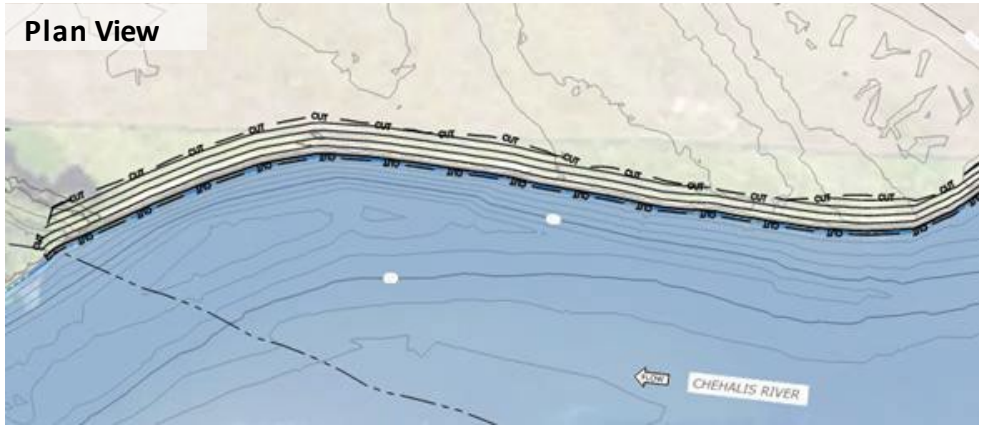
Bank Treatment Alternatives

Goal: Slow erosion to allow riparian vegetation to mature and add large wood along channel margins to provide cover and flow refugia for rearing and migrating salmonids



Bank Treatment Alternative 1 - Bank Layback and Planting





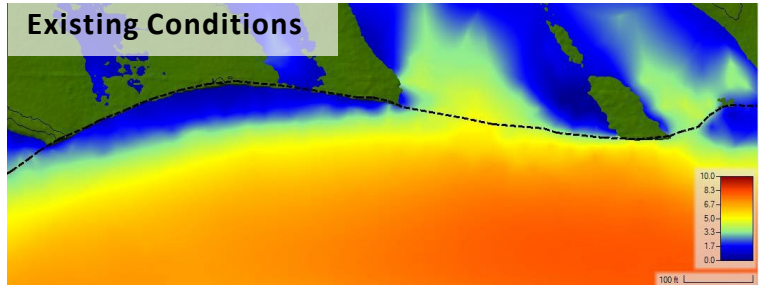
Instream Habitat Benefits: Low

Probability of long-term success: Low

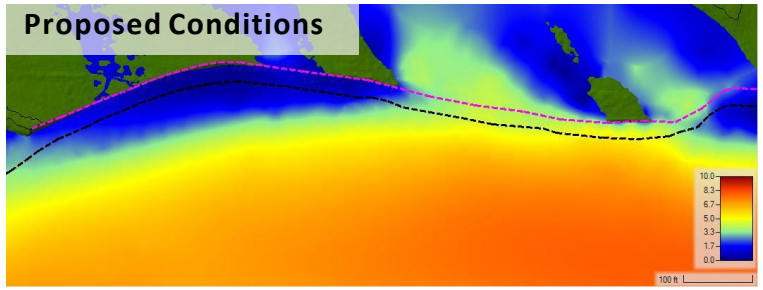
Cost: $95,000 – $210,000 per treatment area

NOT RECOMMENDED

Modeled 2-Year Flow Event Velocities

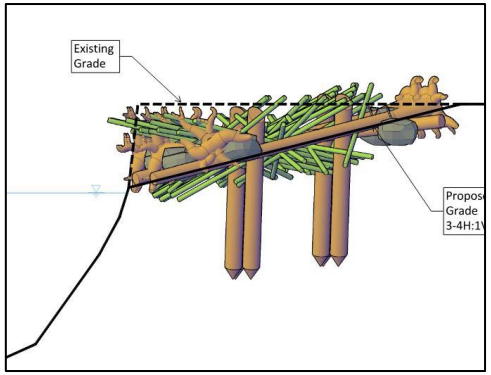


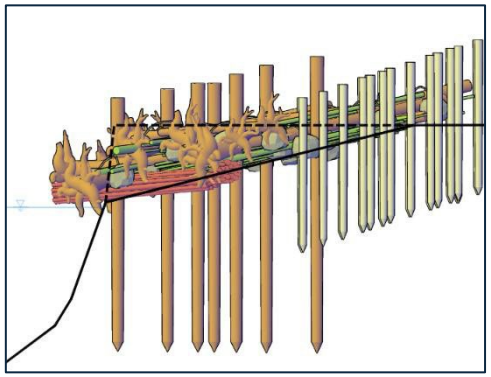
Existing Top of Bank Proposed Top of Bank

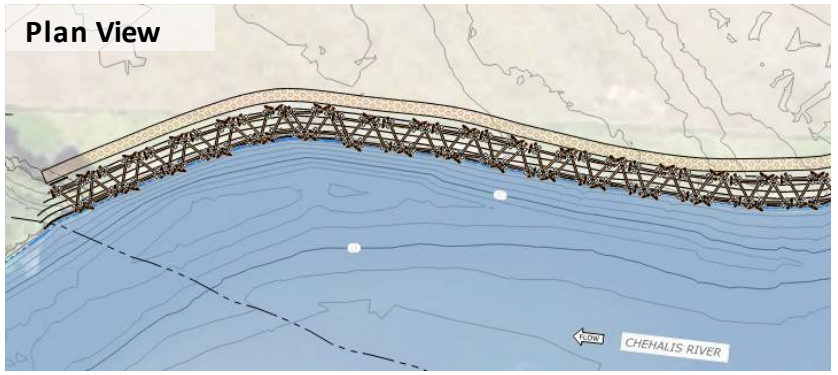


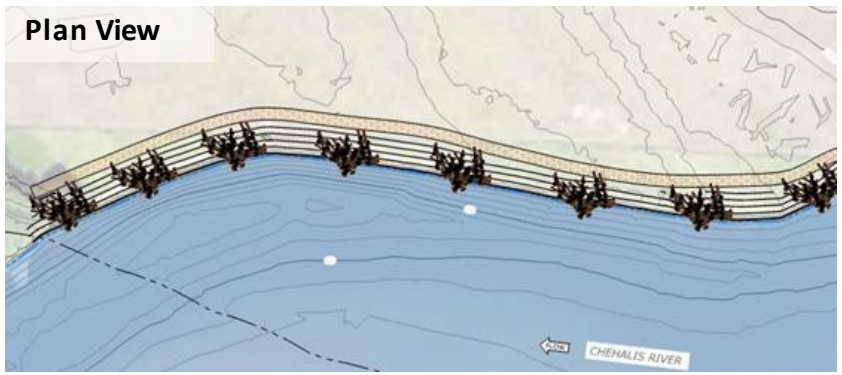
Hydraulic Effects: Minimal to no instream effects at any flow

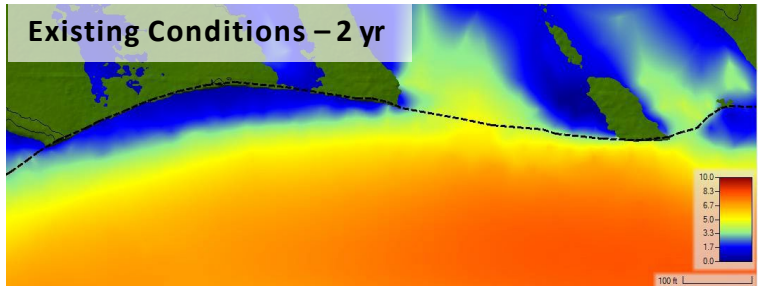
Bank Treatment Alternative 2a & b - Bank Layback with Wood

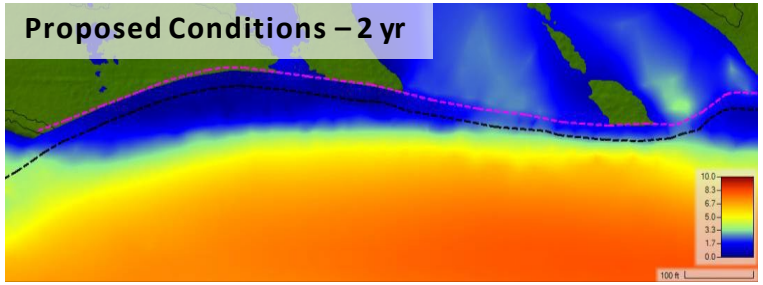












Existing Top of Bank Proposed Top of Bank

Hydraulic Effects: Slower velocities in the overbank only at the 2-year; Minimal to no instream effects at any flow

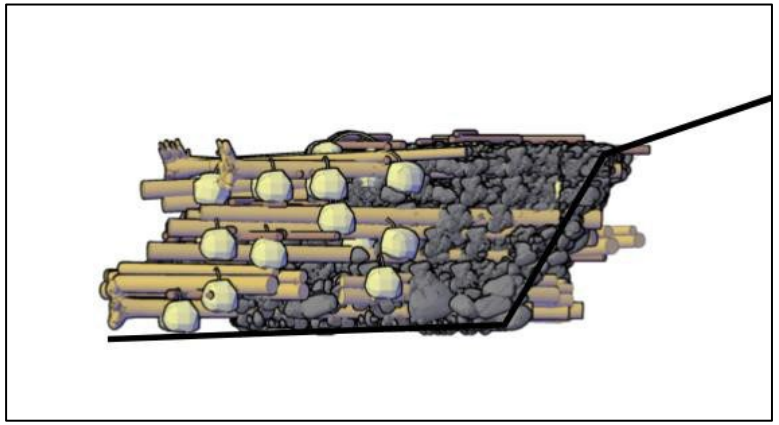
Instream Habitat Benefits: low to moderate

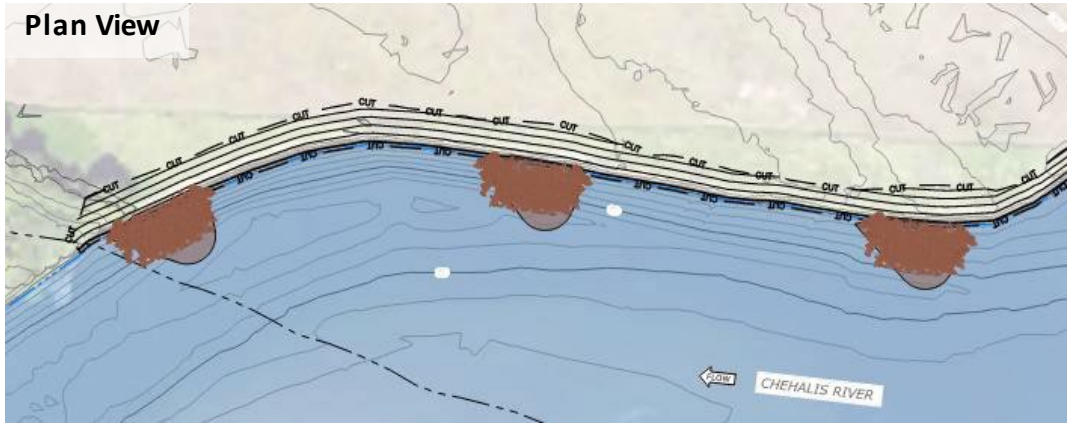
Probability of long-term success: low

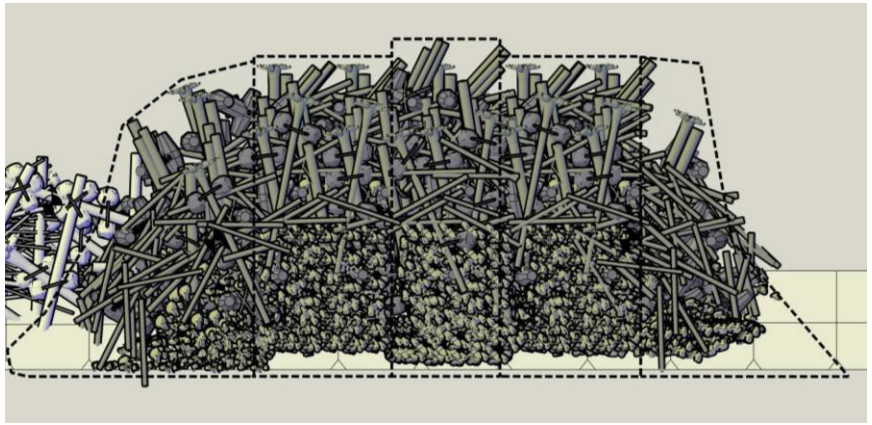
Cost: $805,000– $1,720,000 per treatment area

NOT RECOMMENDED

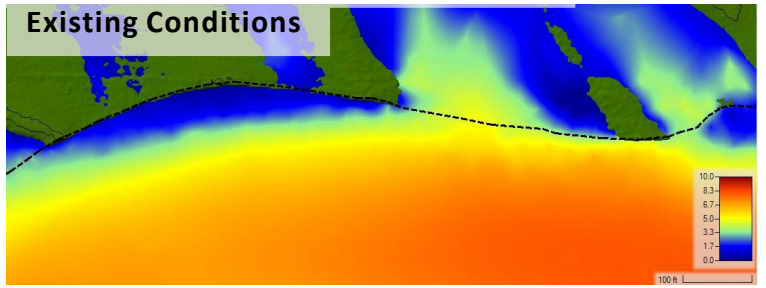
Bank Treatment Alternative 3 - Instream Toe Structures



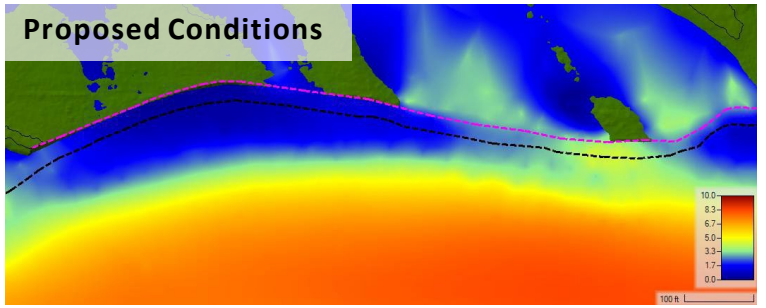




Modeled 2-Year Flow Event Velocities



Existing Top of Bank Proposed Top of Bank



Instream Habitat Benefits: moderate

Probability of long-term success: moderate to high

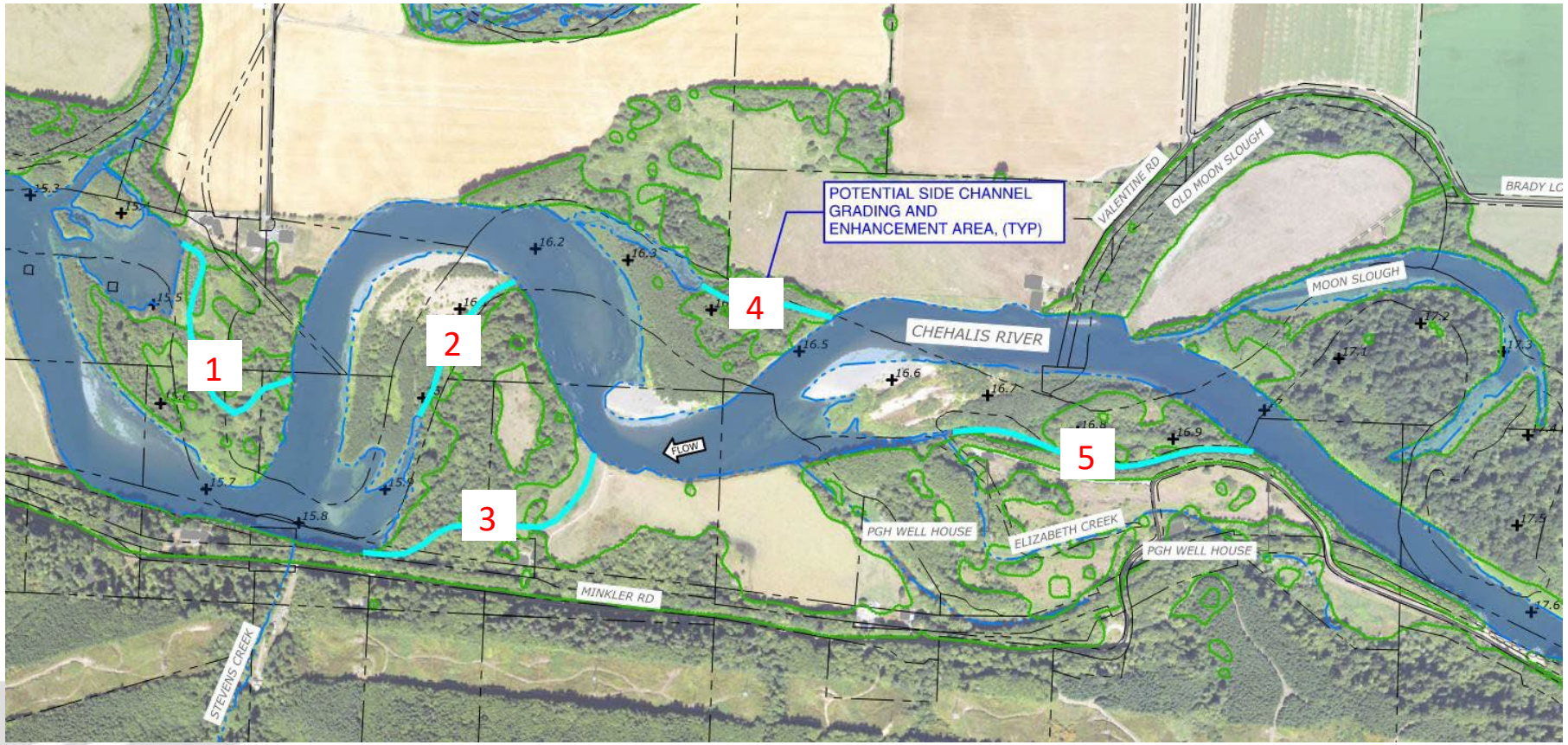
Cost: $4,620,000 – $6,930,000 per treatment area

NOT RECOMMENDED

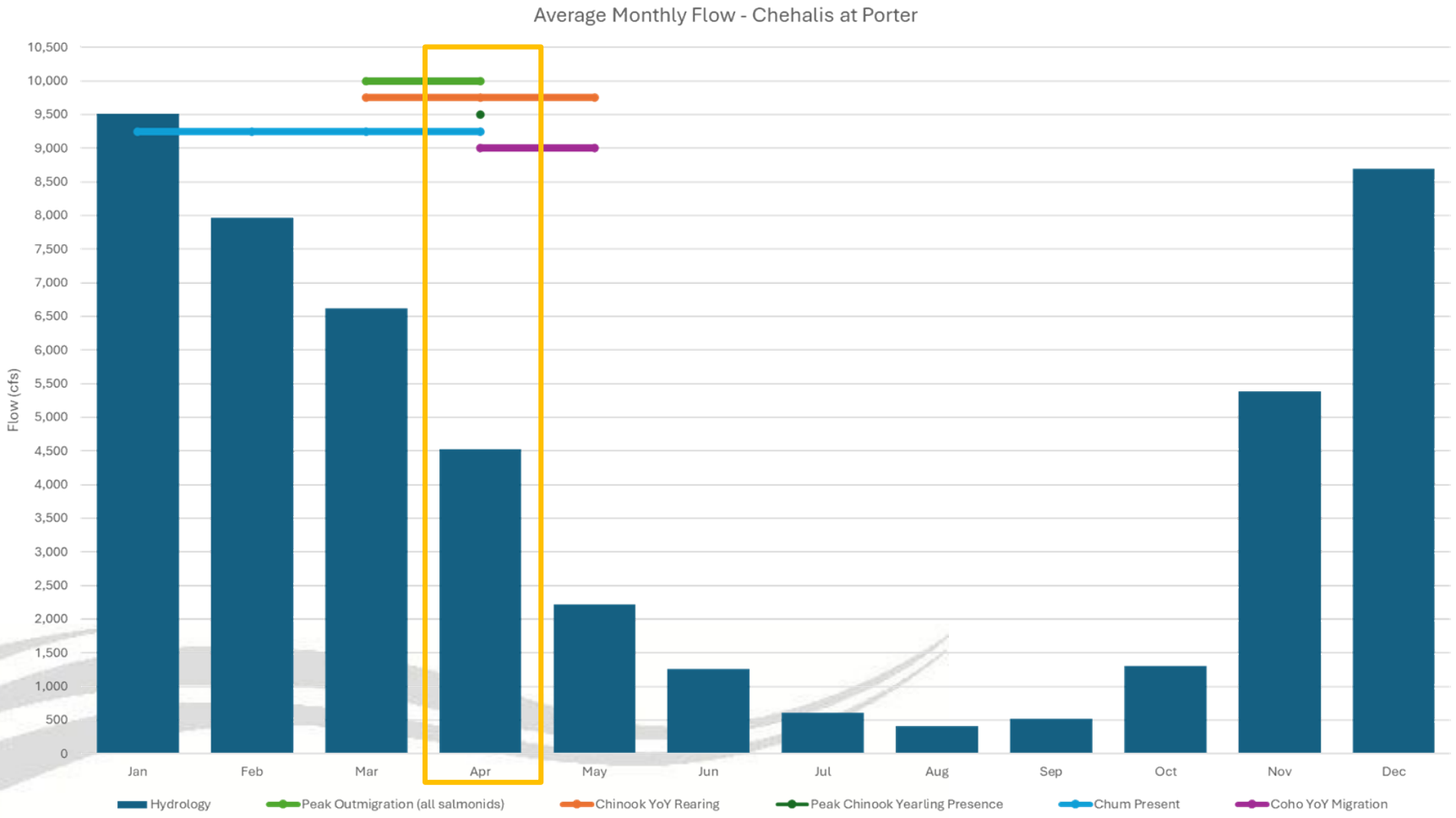
Hydraulic Effects: Pushes high velocities away from the bank line

Side Channel Alternatives

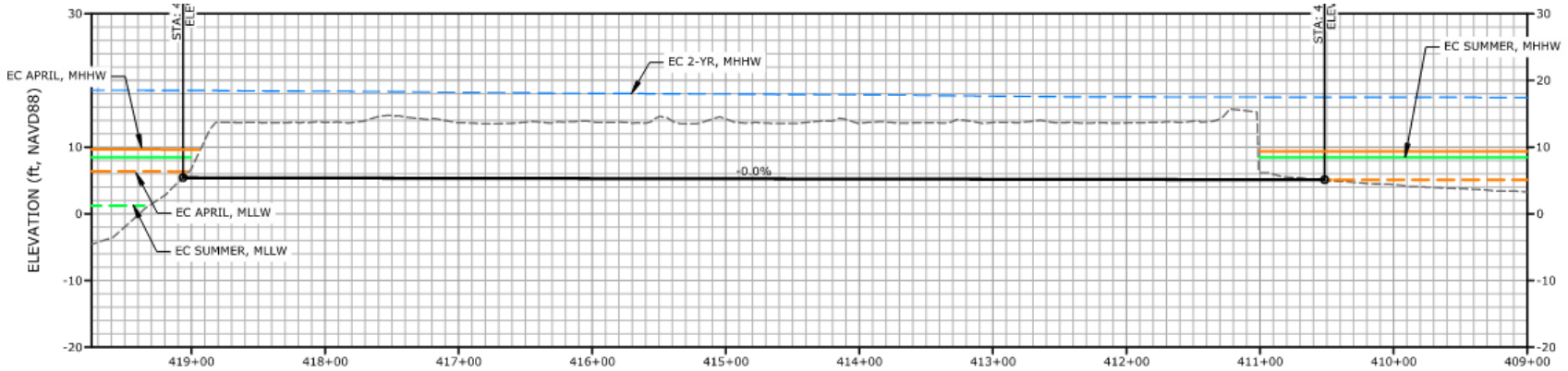
Goal: Improve rearing habitat availability and quality for YOY salmonids



Side Channel Enhancement

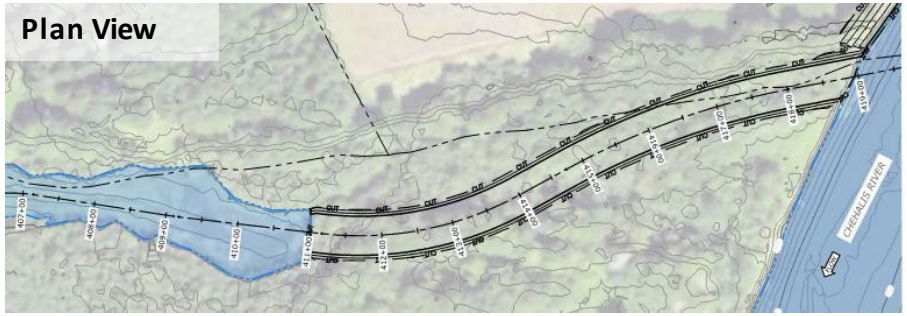


Side Channel Reconnection Grading





Hydraulic Effects: Increased wetted area; sustaining velocities in SC4



Habitat Benefits: moderate to high

Probability of long-term success: low to moderate

Cost: $500,000 – $2,000,000 per channel

SIDE CHANNEL 4 RECOMMENDED

Geomorphic Evaluation

Side Channel 1	May help with flushing flows
Side Channel 2	Depositional landform, expect sedimentation in the short term
Side Channel 3	Consider pilot channel over full cut here. Likely was the channel in 1930s, risk of filling in relatively lower, channel migration would affect this area as well.
Side Channel 4	With channel migration, naturally accepting more flow already; likely to sustain
Side Channel 5	Consider pilot channel over full cut here. Need to pair with something that creates scour at inlet; more than single ELJ

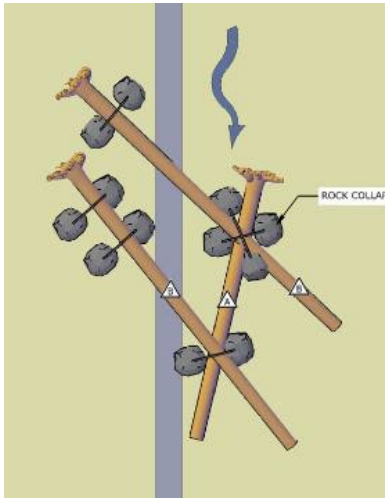
Instream Wood Placement

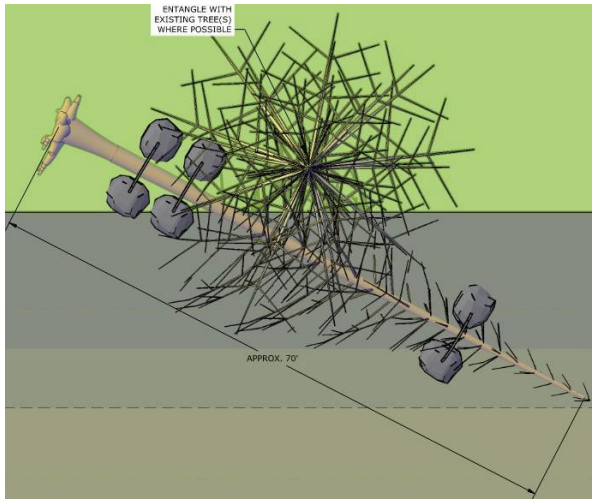
Goal: Enhance side channel connectivity and pool development; provide in-stream stability to allow for riparian vegetation to mature; provide in-stream cover and refugia for salmonids

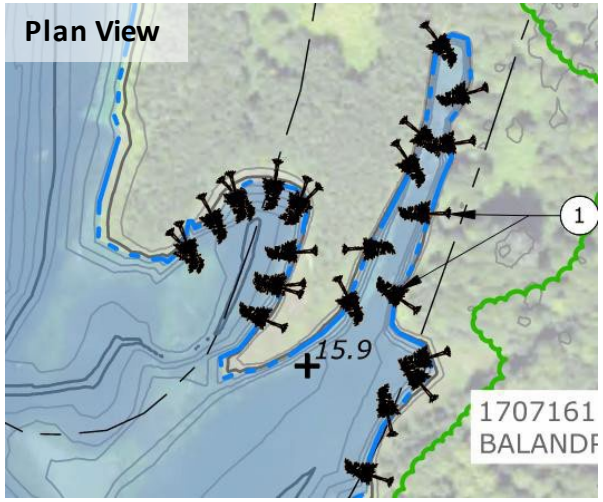


Cispus River, WA

Helicopter Wood Placement Alcoves & Side Channels









Hydraulic Effects: Reduced velocities in treatment areas

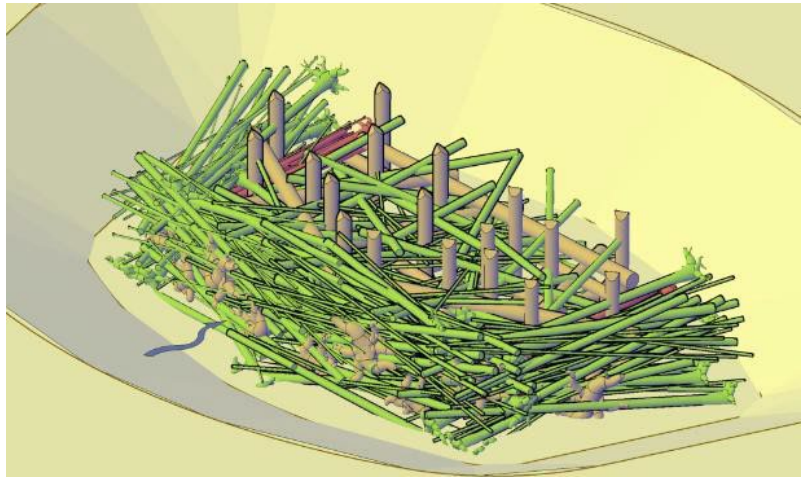
Habitat Benefits: moderate to high

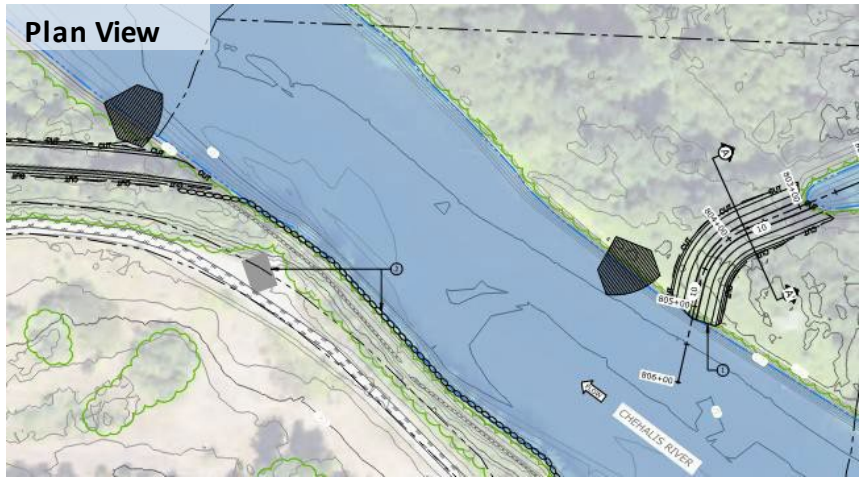
Probability of long-term success: high

Cost: $7,500 – $15,000 per structure

RECOMMENDED

Engineered Log Jams Bank-Oriented & Instream





Habitat Benefits: moderate

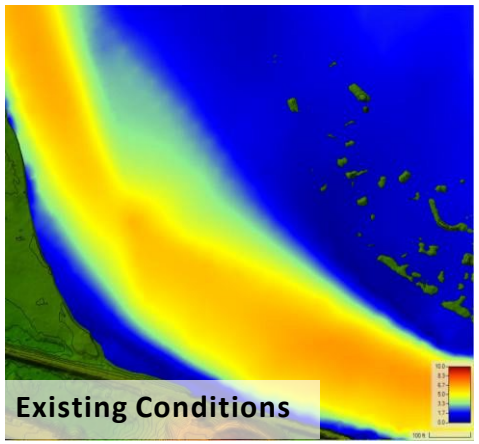
Probability of long-term success: low to moderate

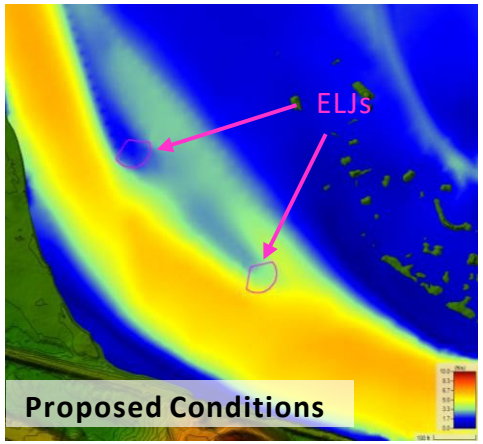
Flood Rise Impacts: net rise

Cost: $80,000 – $1,200,000 per structure

NOT RECOMMENDED

Modeled 2-Year Flow Event Velocities





Hydraulic Effects: Increased hydraulic complexity and low velocity shadows

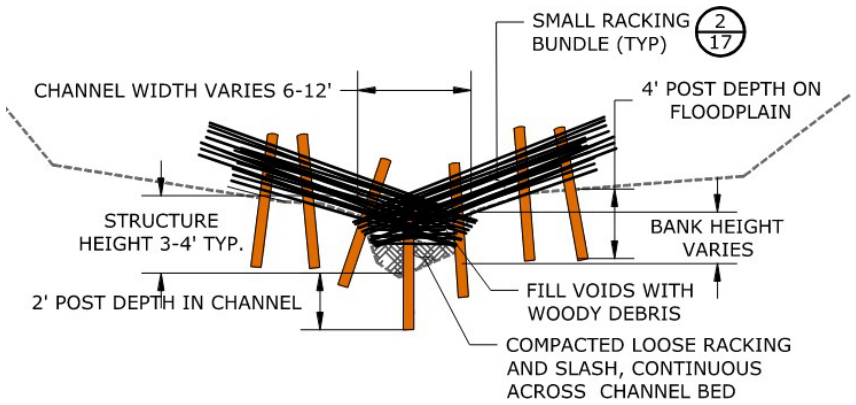
Tributary Restoration

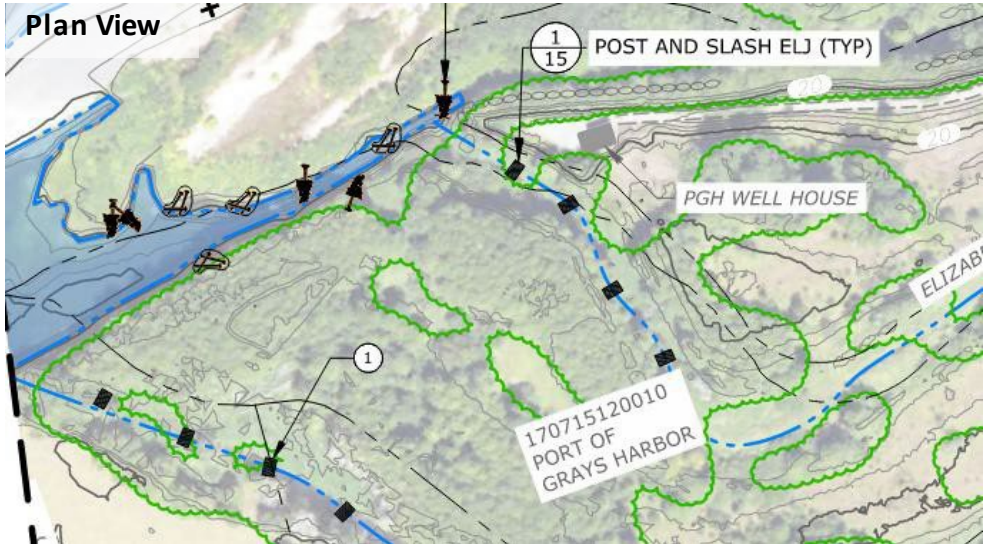
Goal: Improve conditions for rearing salmonids seeking off-channel refugia



Elizabeth Creek

Tributary Restoration Hand-built wood structures





Habitat Benefits: moderate to high

Probability of long-term success: moderate

Cost: $5,000 – $7,500 per structure

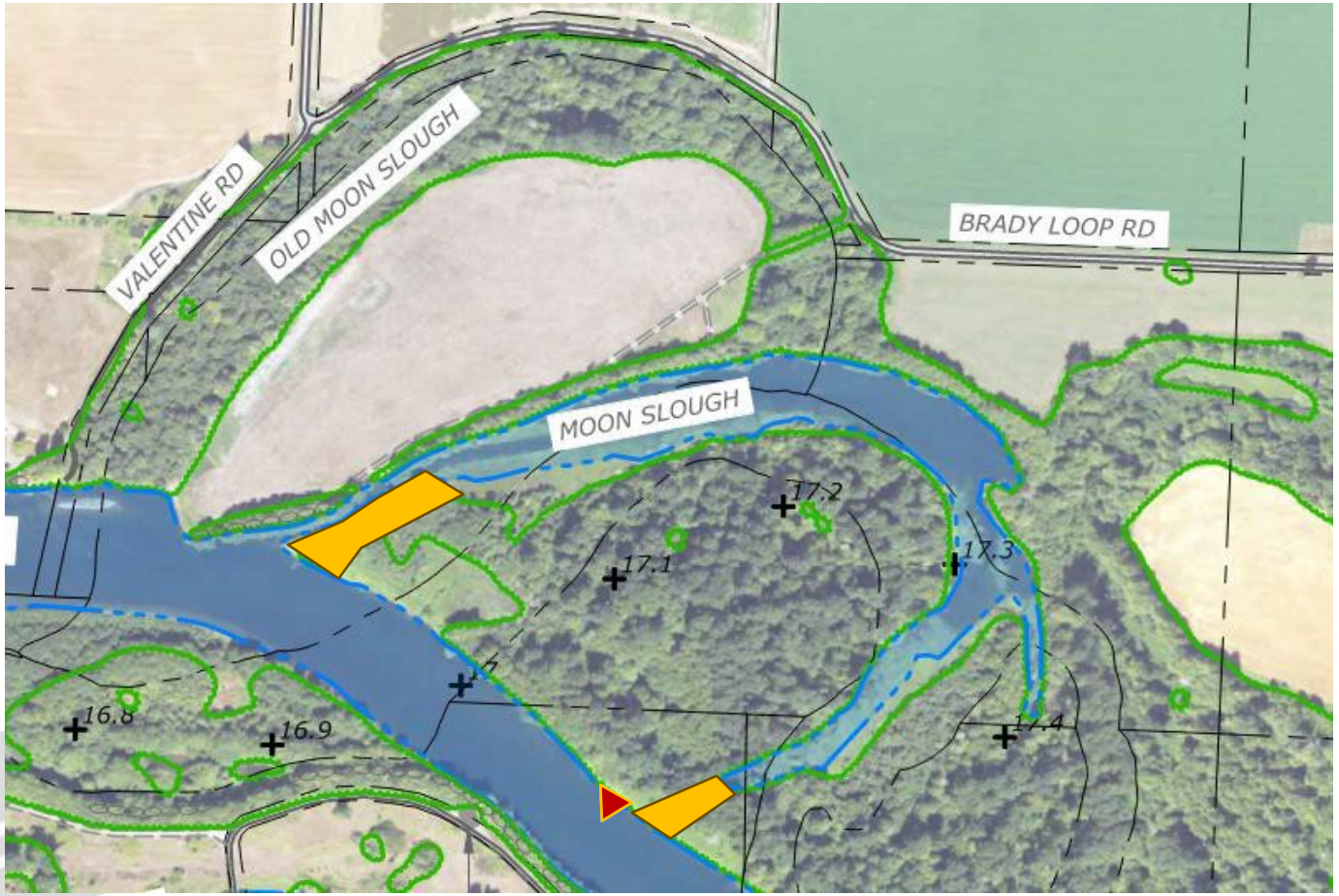
RECOMMENDED



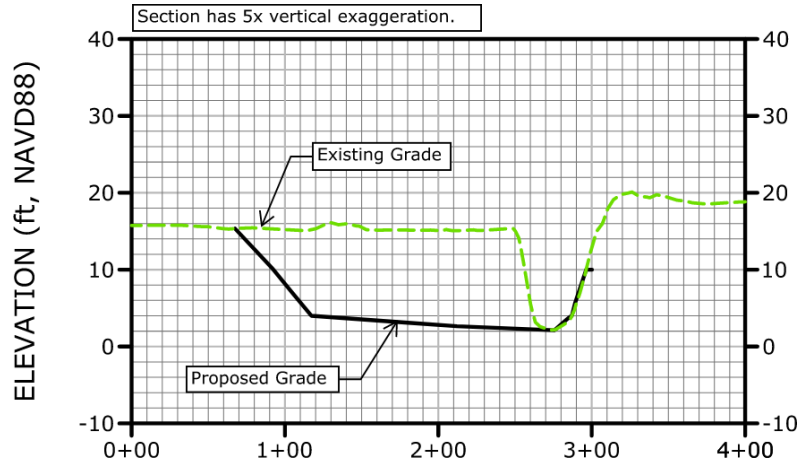
Hydraulic Effects: Reduced instream velocities; Backwater behind the structures

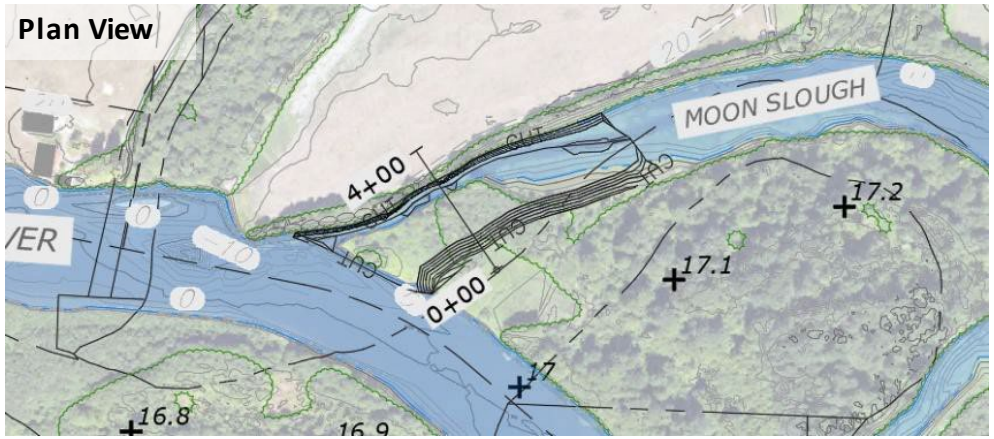
Moon Slough Connection Improvements

Goal: Improve the likelihood that Moon Slough will provide long-term off-channel rearing and migrating habitat for salmonids



Moon Slough Downstream Outlet Reconnection





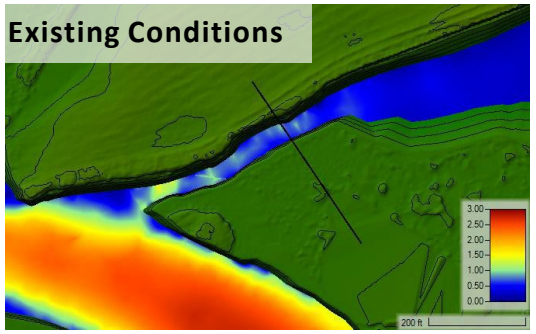
Habitat Benefits: low to moderate

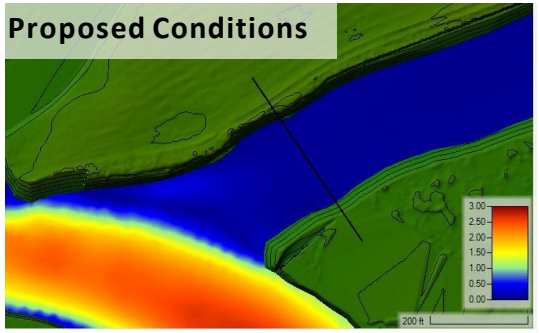
Probability of long-term success: low to moderate

Cost: $2,655,000

NOT RECOMMENDED

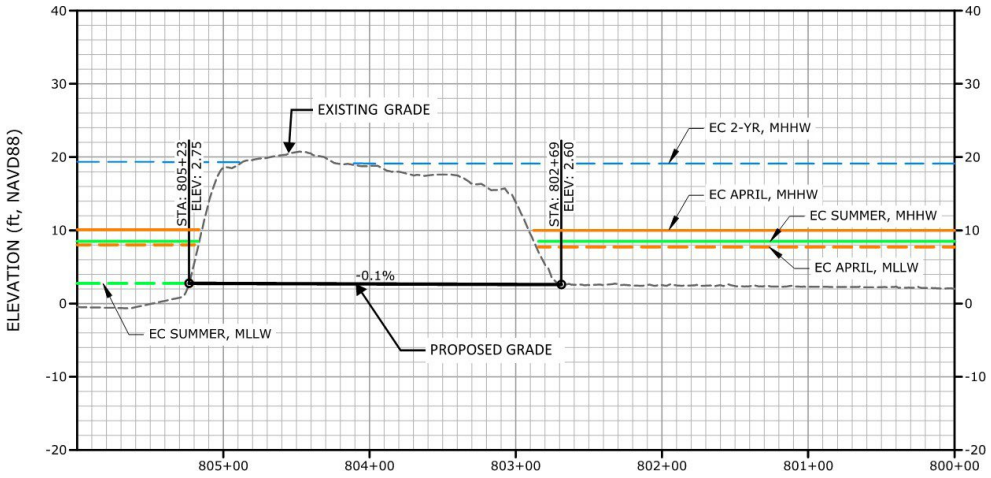
Modeled Velocities – April Flow-Real Tide Snapshot

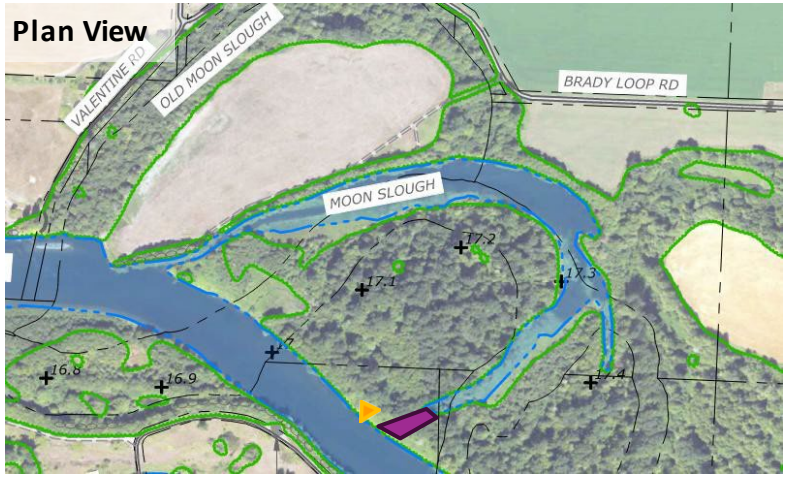




Hydraulic Effects: Reduced outlet velocities; Similar water elevations

Moon Slough Inlet & Outlet Reconnection





Habitat Benefits: low

Probability of long-term success: low

Cost: $320,000 – $465,000

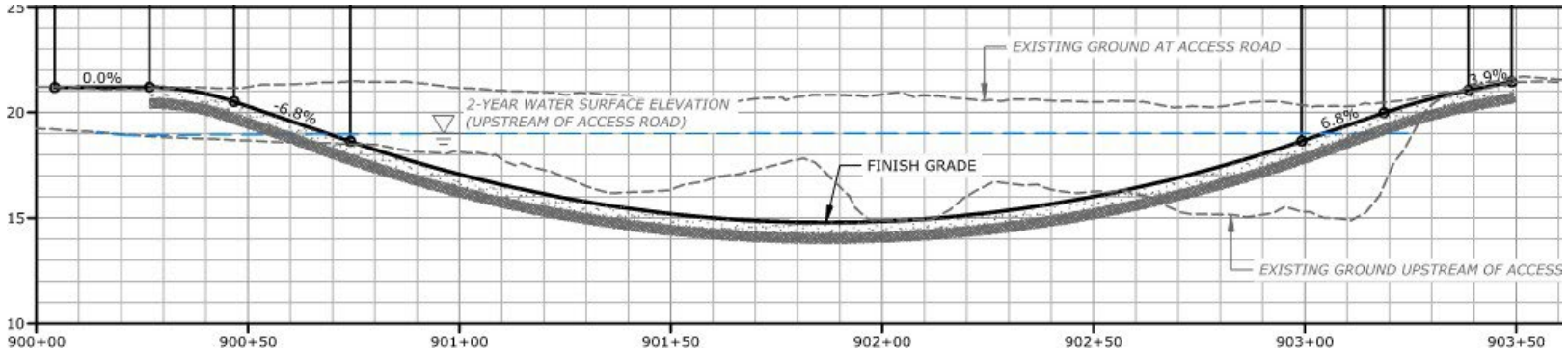
NOT RECOMMENDED

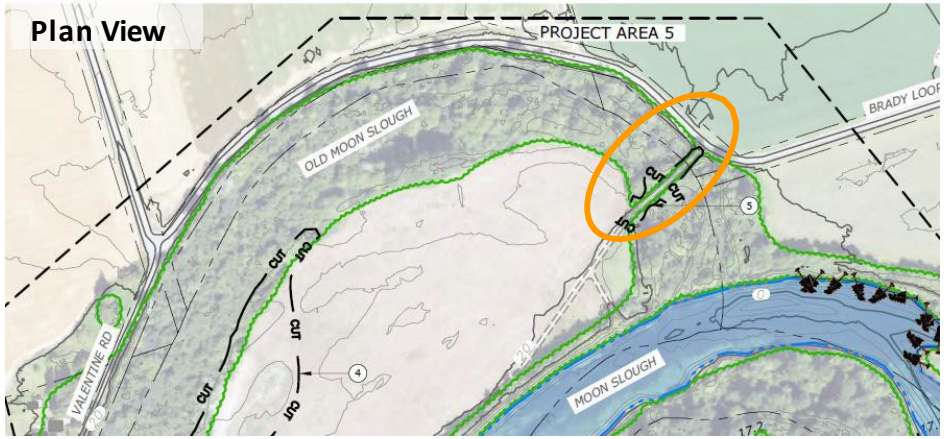
Model Results



Hydraulic Effects: Slight increase in circulation; Low velocities

Old Moon Slough Access Road Barrier Removal (Ford)





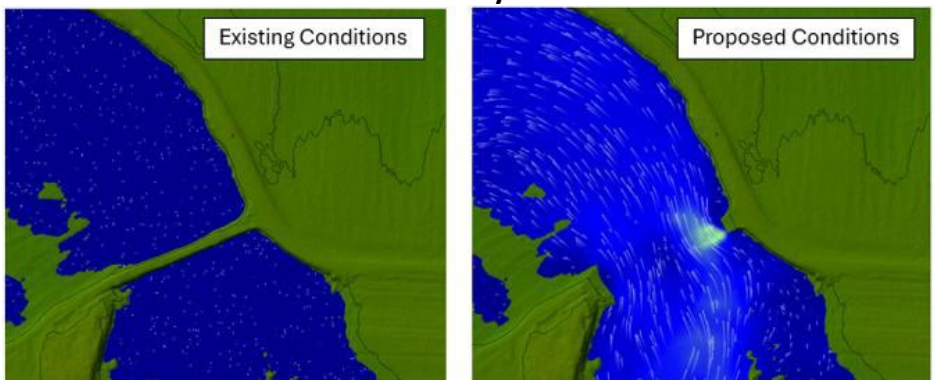
Habitat Benefits: moderate

Probability of long-term success: high

Cost: $185,000

RECOMMENDED

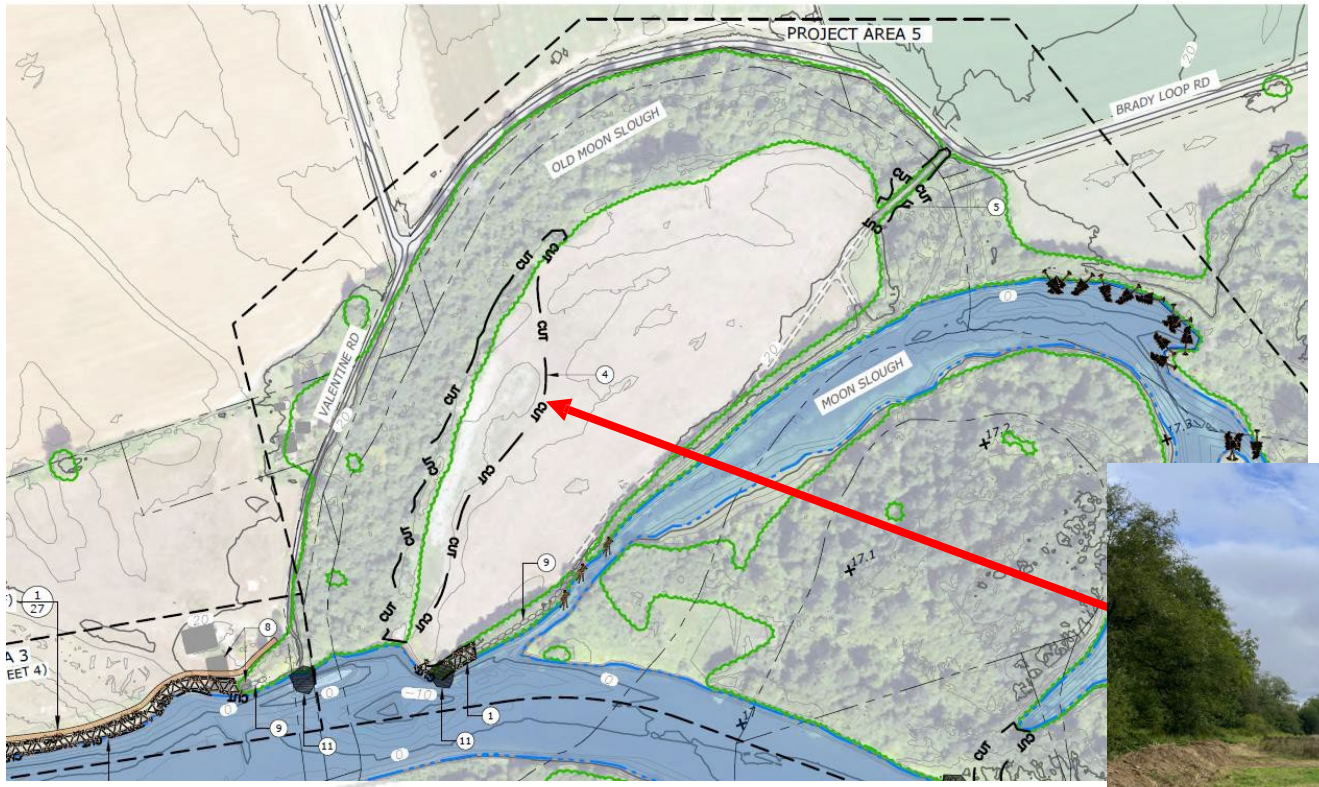
Modeled 2-Year Flow Event Velocity



Hydraulic Effects: Increased flow and velocity



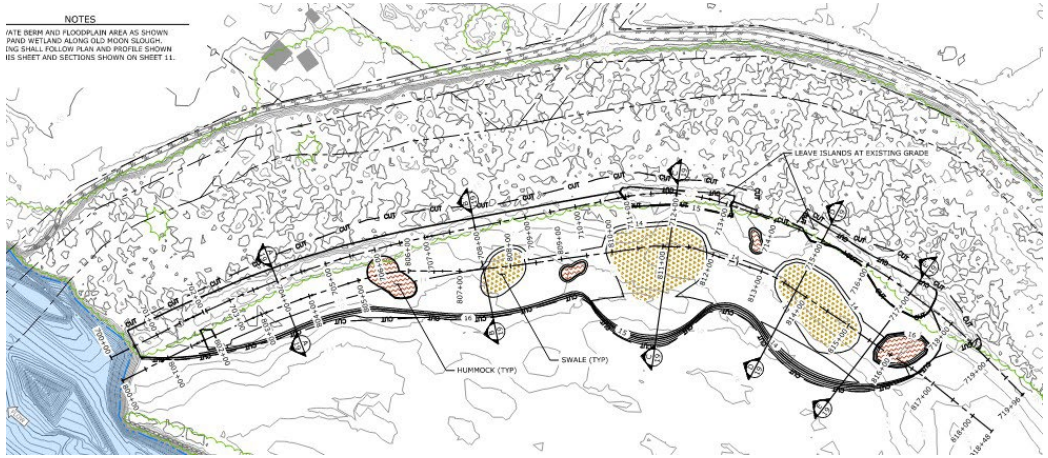
Wetland Creation at Old Moon Slough

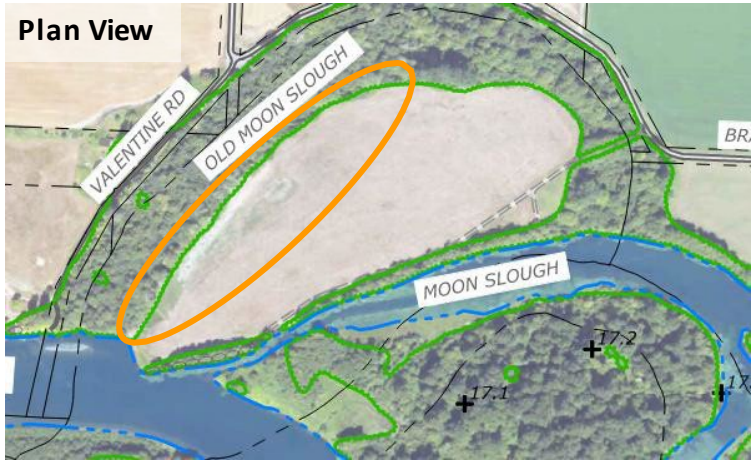




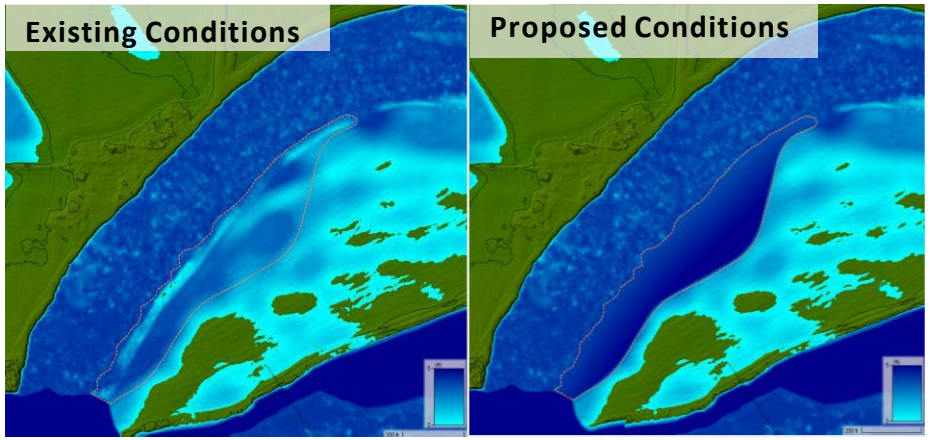
Goal: Improve seasonal wetland habitat for amphibians and potentially create additional off-channel rearing area for salmonids.

Wetland Creation Excavation and Grading





Modeled 2-Year Flow Event Depths



Hydraulic Effects: Increased seasonal inundation

Habitat Benefits: moderate to high

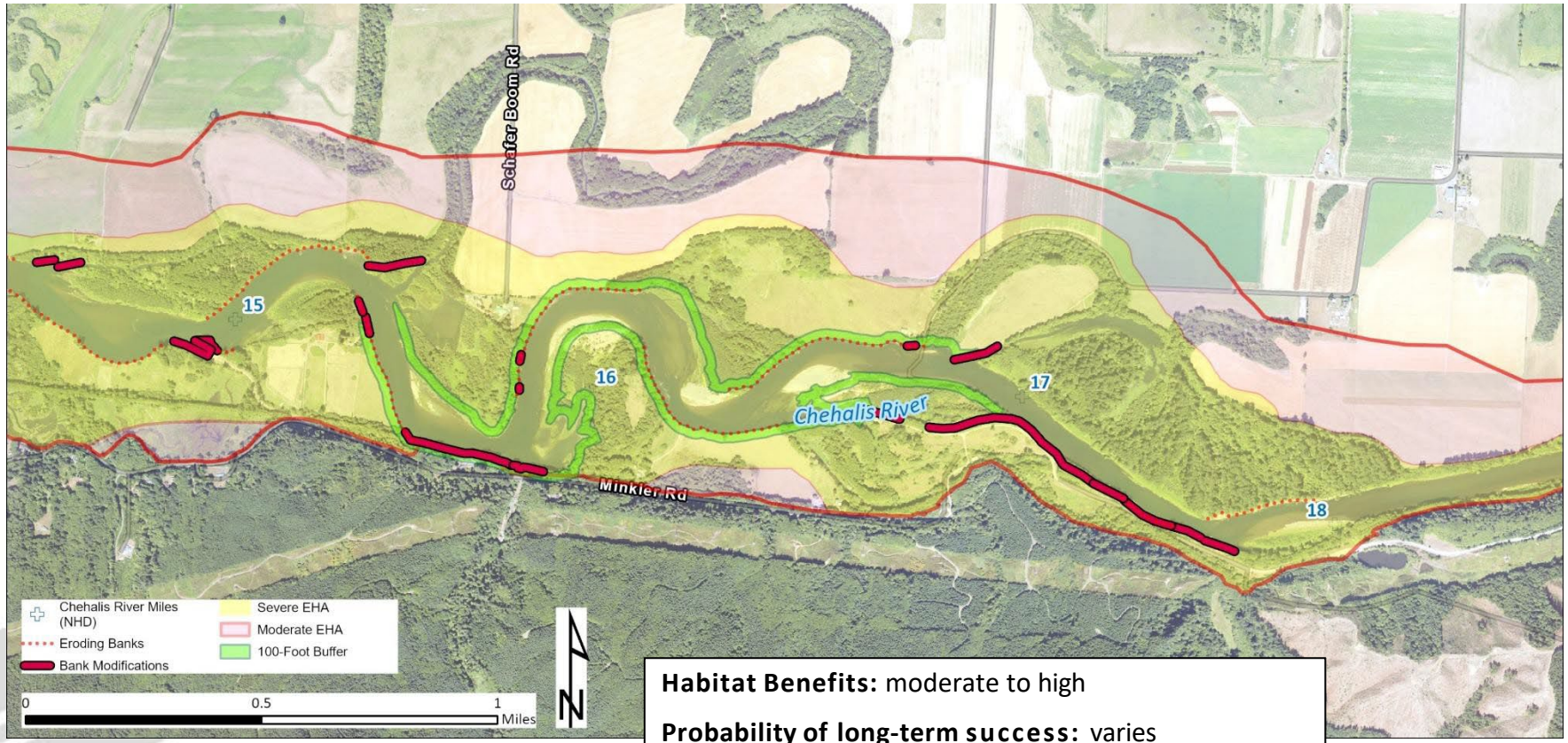
Probability of long-term success: high

Cost: $1,000,000 – $1,500,000

RECOMMENDED

Riparian Planting Approach – EHA Delineation

Goal: Improve extent and diversity of native riparian trees and shrubs to provide shade, increase biomass inputs for aquatic species food needs, reduce erosion, and increase the long-term large woody debris input



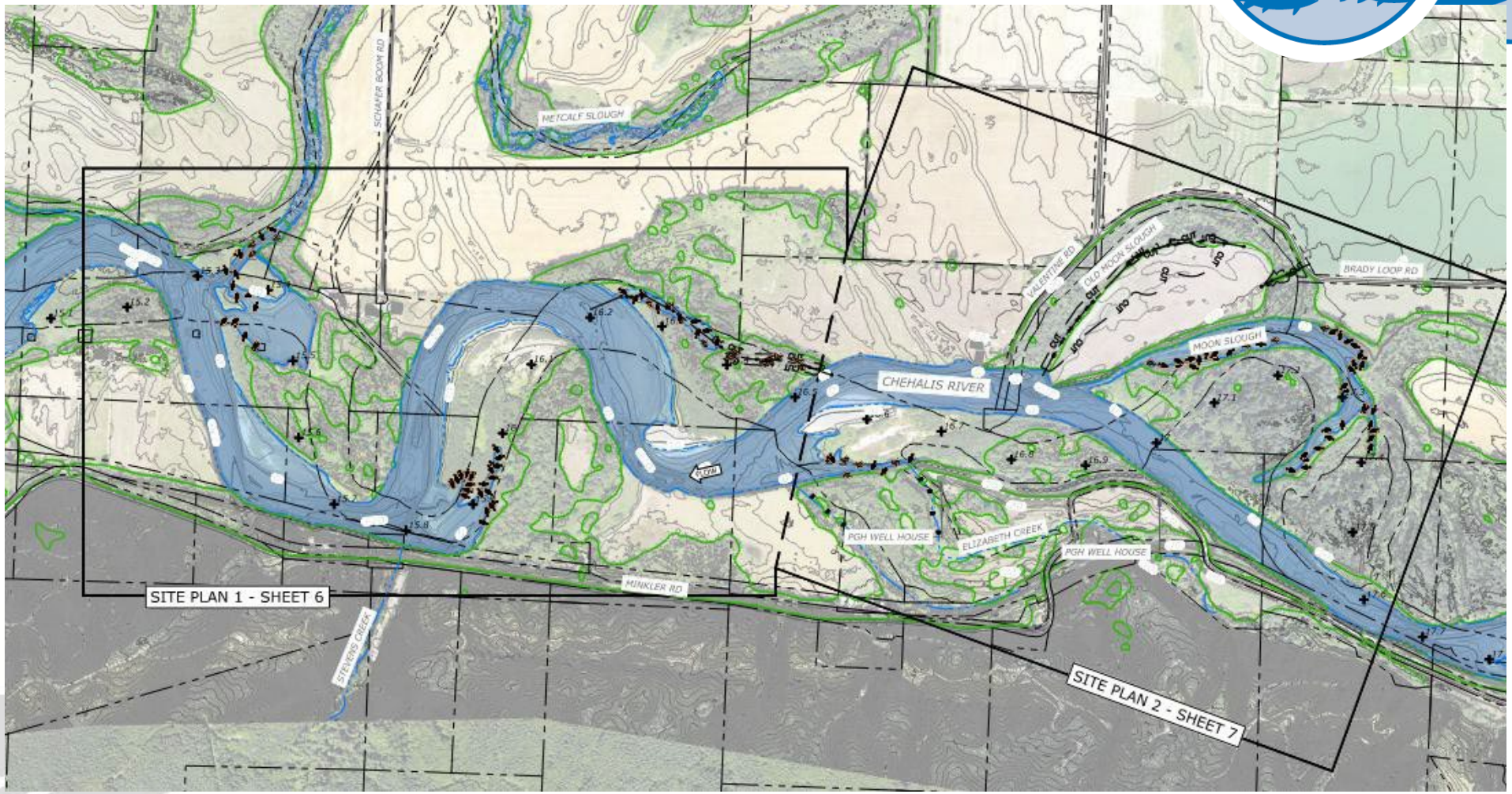
Habitat Benefits: moderate to high

Probability of long-term success: varies

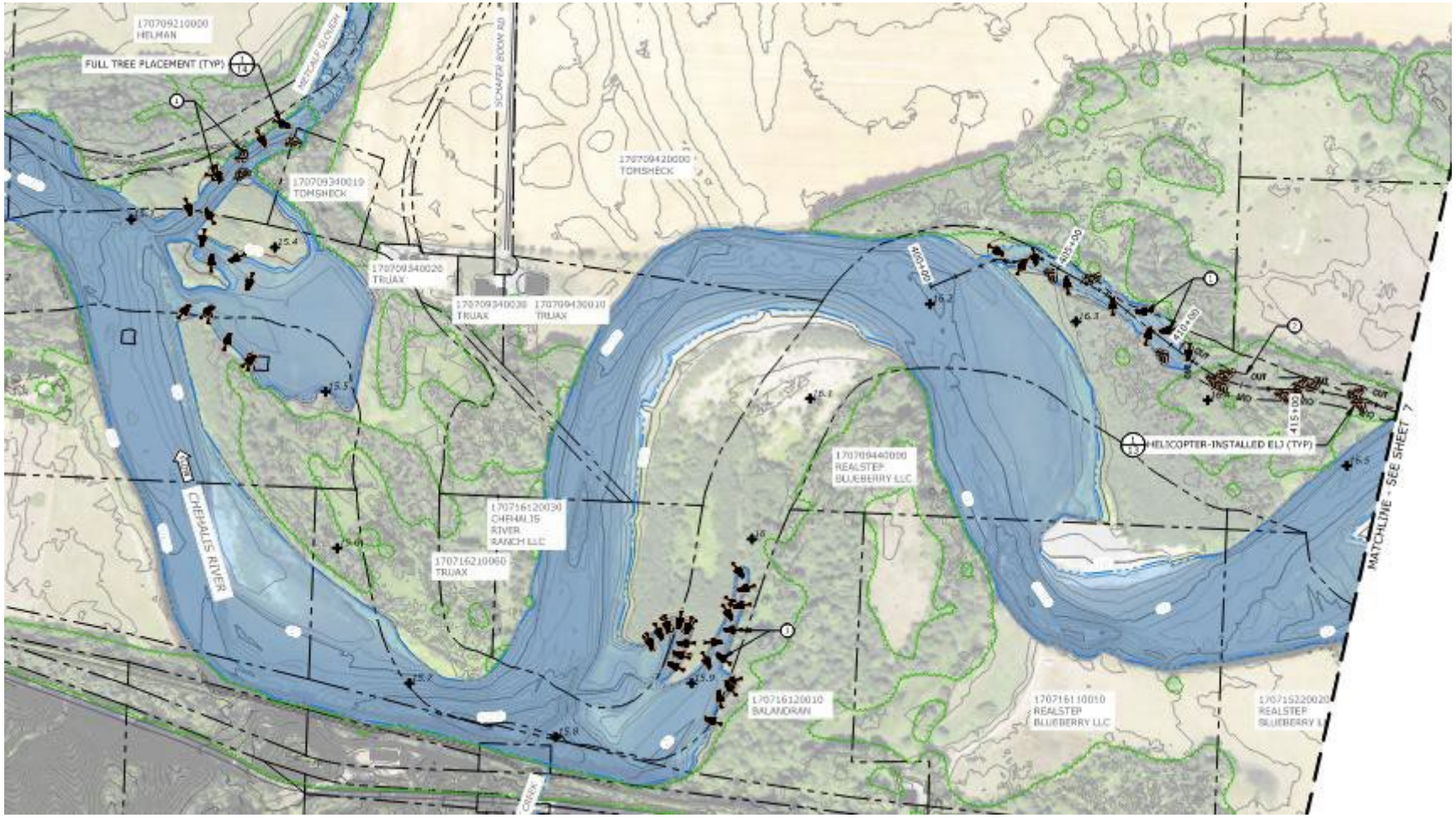
Cost: $10,000 – $14,000 per acre

RECOMMENDED

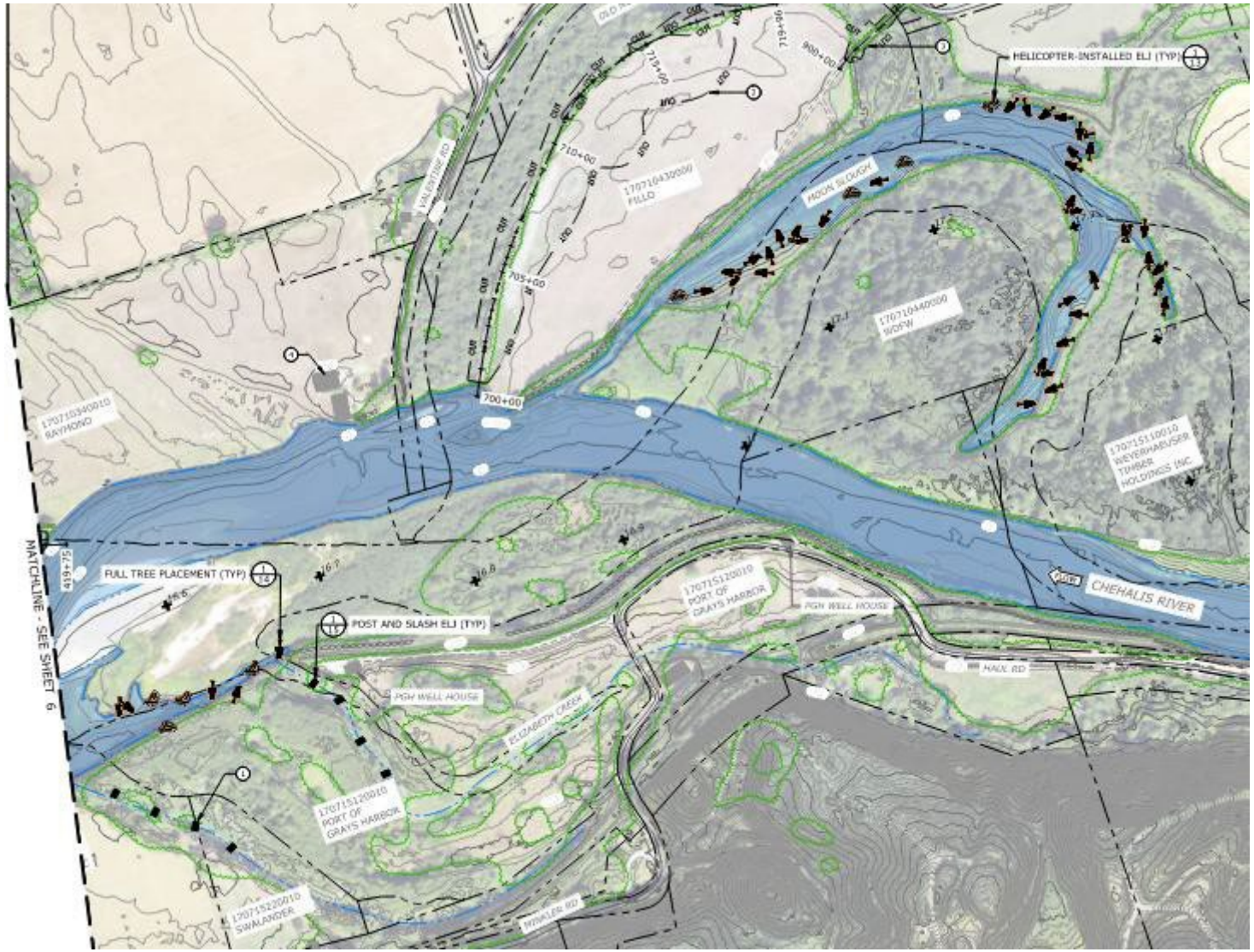
Chehalis River RM 15.5 - 17.5 Preliminary Design



Helicopter Wood Placement - West

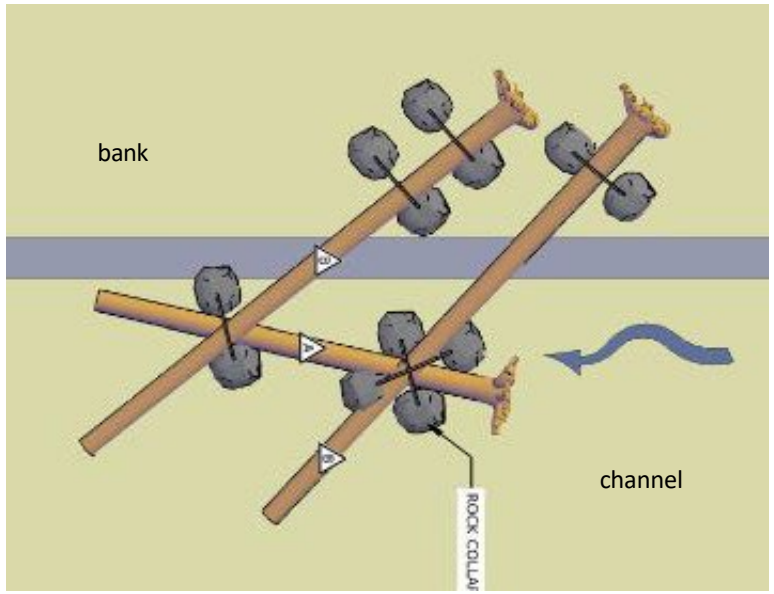


Helicopter Wood Placement - East

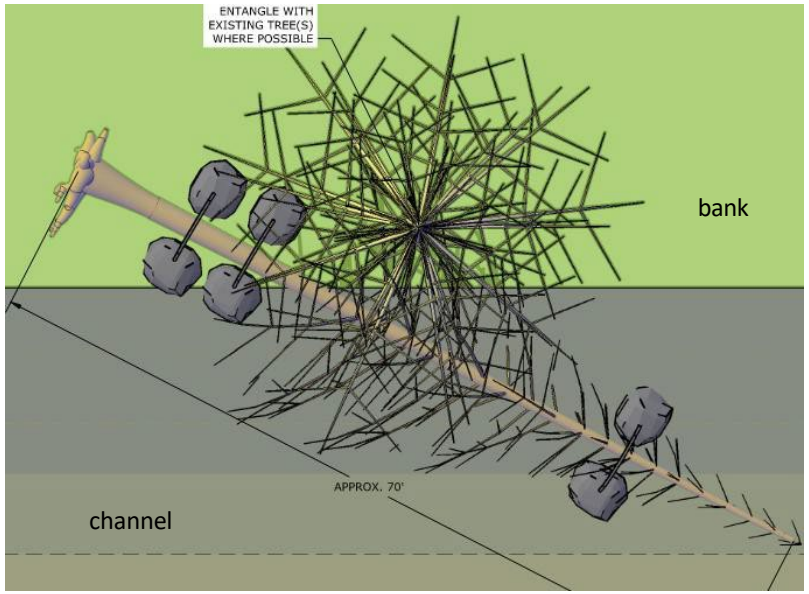


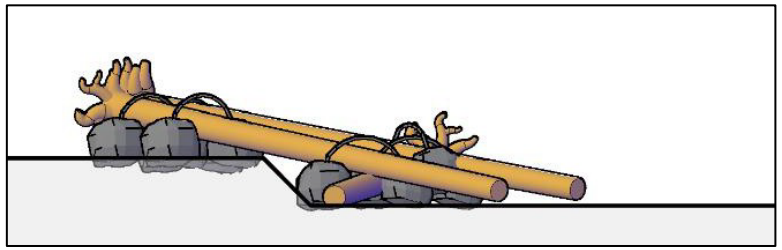
Helicopter Wood Placement Alcoves & Side Channels

Helicopter ELJ



Whole Tree Placement

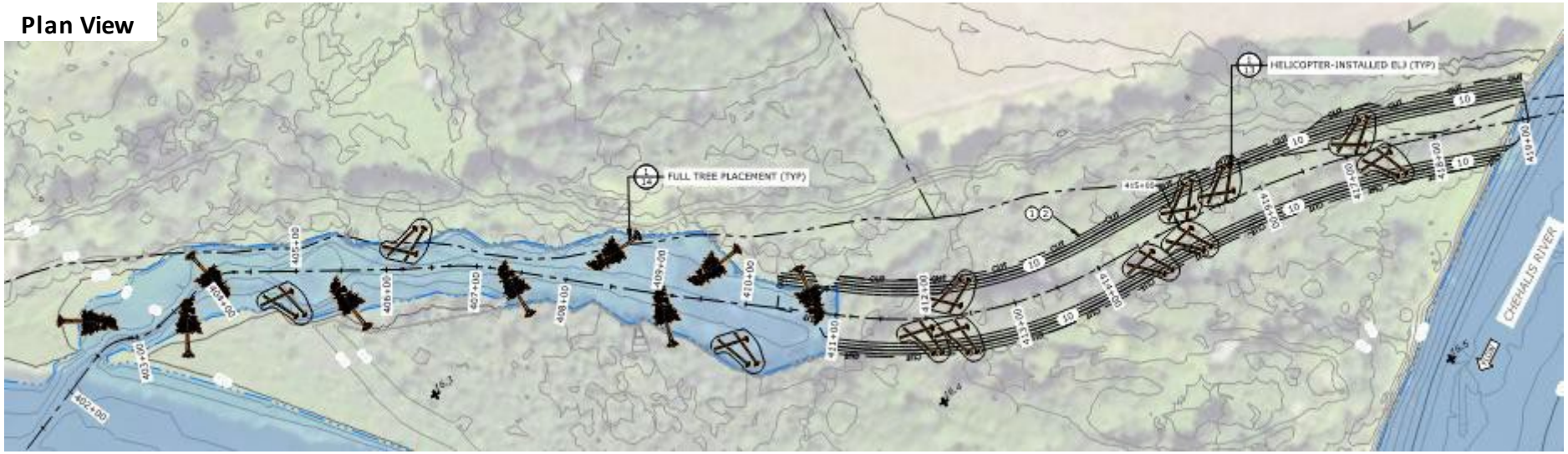




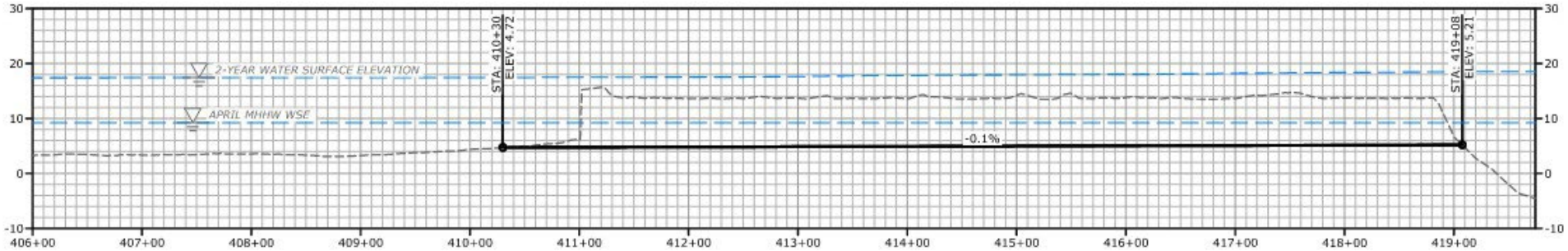


Side Channel #4 Reconnection

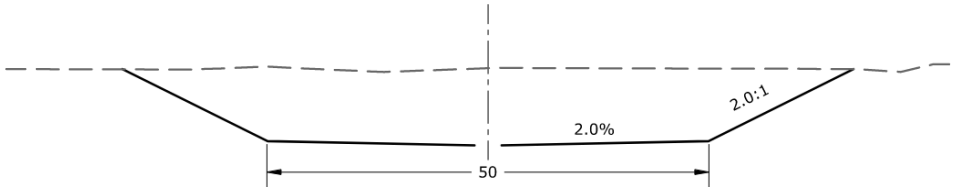
Plan View



Profile

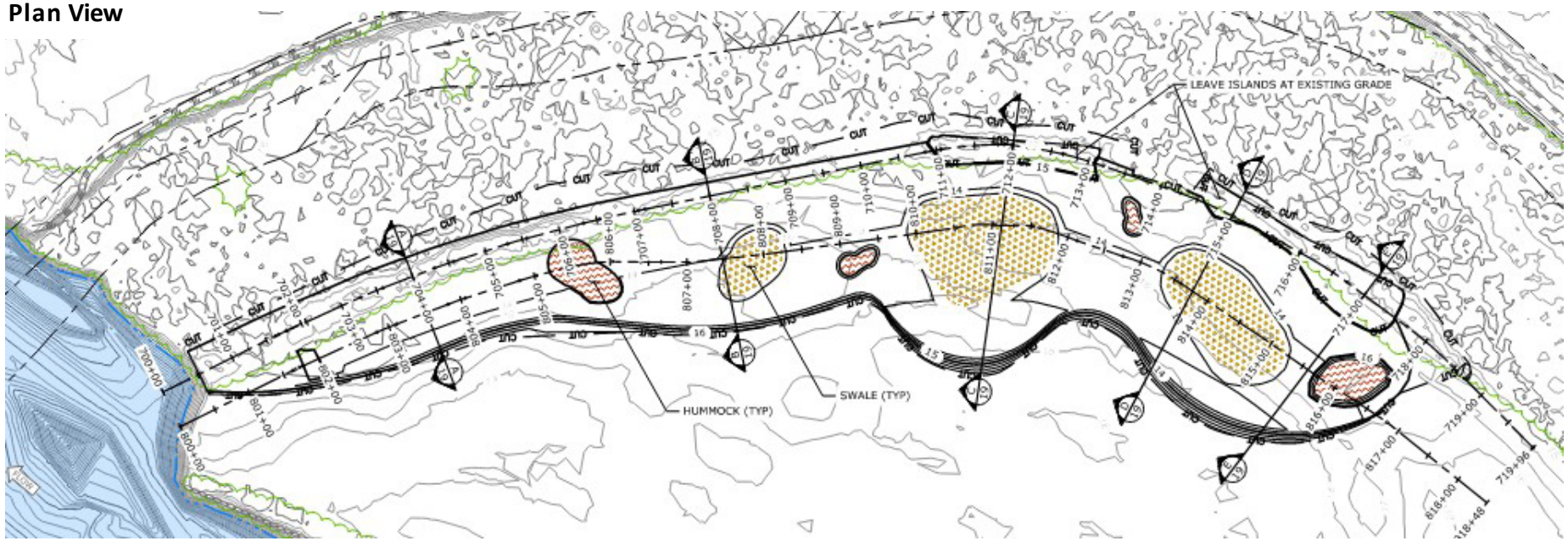


Section

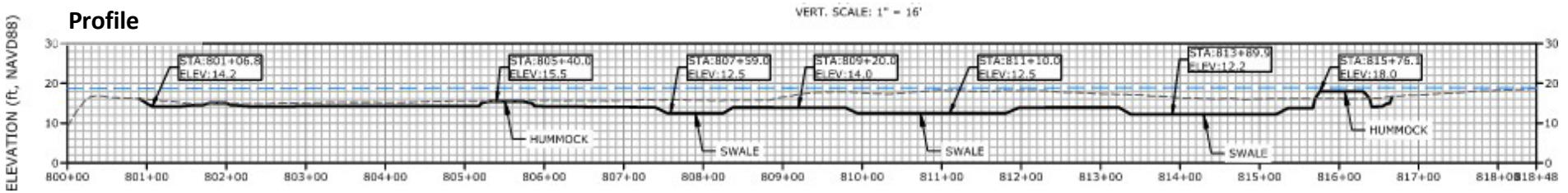


Wetland Creation – Old Moon Slough

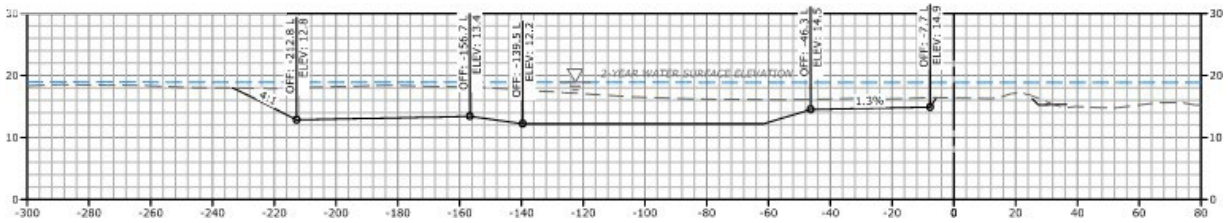
Plan View



Profile

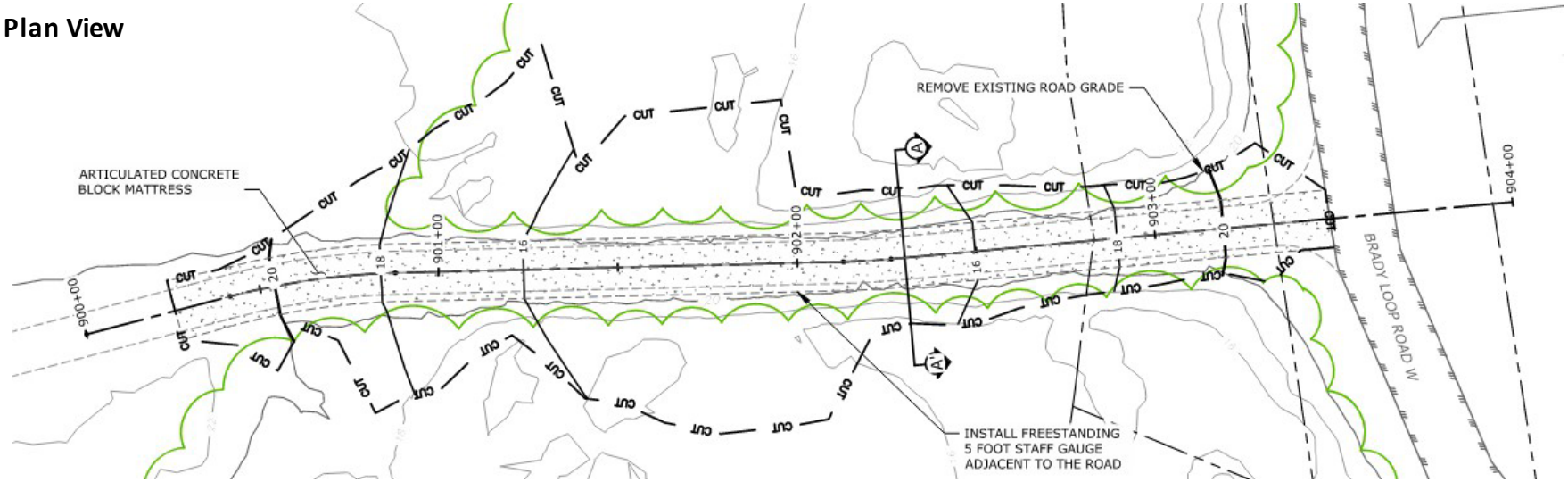


Section D

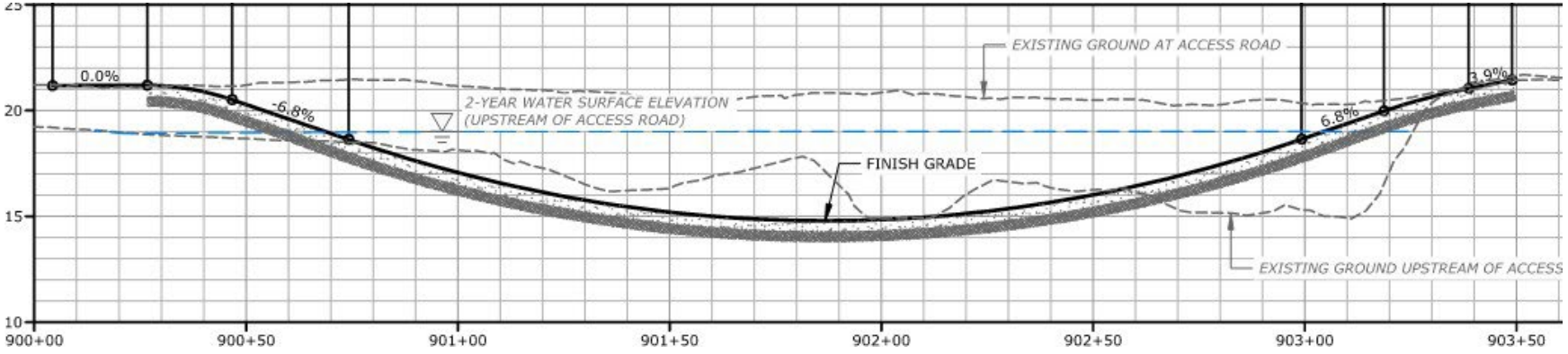


Old Moon Slough Ford

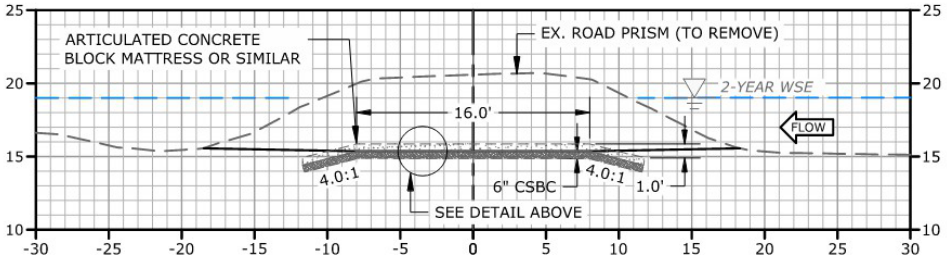
Plan View



Profile

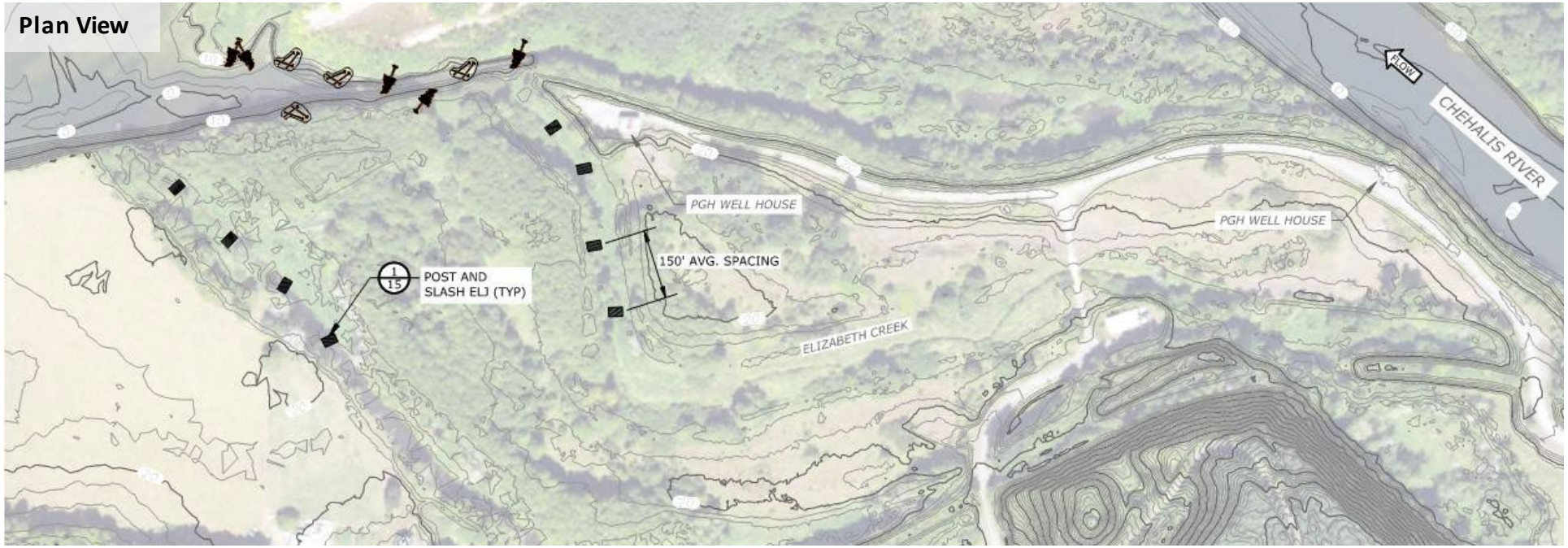


Section

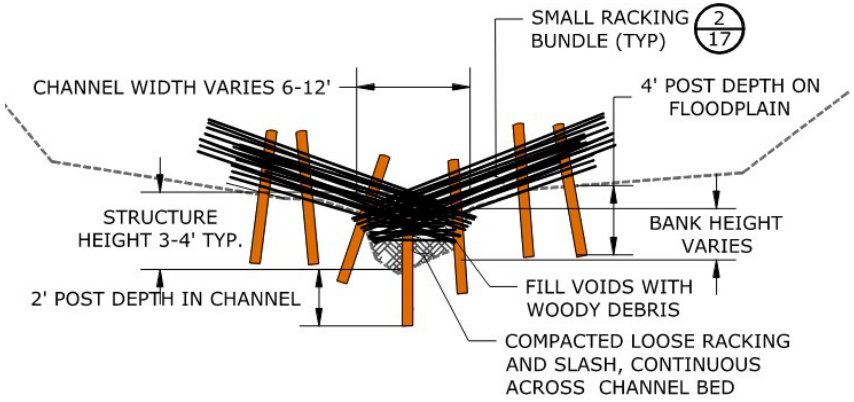


Tributary Restoration Hand-built wood structures in tidal influence

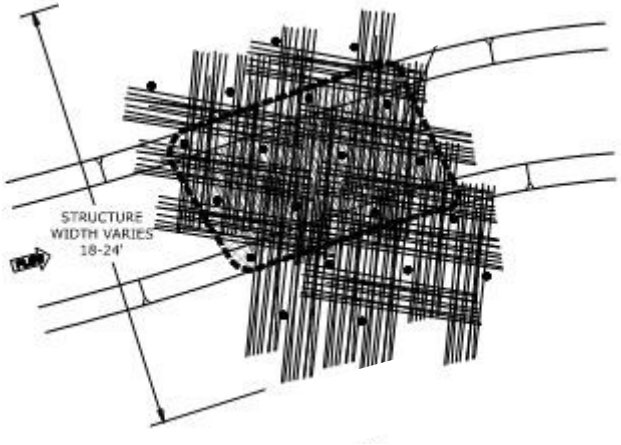
Plan View



Section



Plan



Contacts

Organization	
Grays Harbor Conservation District	Anthony Waldrop 360-590-4176 awaldrop@graysharborcd.org
Natural Systems Design	John Soden 360-746-1067 john@naturaldes.com Eleanor Bartolomeo eleanor@naturaldes.com Mary Pelkie mary@naturaldes.com

OTHER ACTIVE PROJECTS IN THIS CLUSTER

- **The North Shore Levee project**
- **The Hoquiam Dam Removal Construction**
- **Cosmo Specialty Fiber plant toxic removal**
- **European green crab** (and other invasive spp.) management – multiple partners
- The **Flood Authority** has several projects/potential projects in the estuary region:
  - Pump station construction/replacements in Hoquiam and Aberdeen
  - Ditch, culvert, and berm improvements in Hoquiam
  - Tide gate improvements on Mill Creek
  - Haul Road Erosion Protection Project

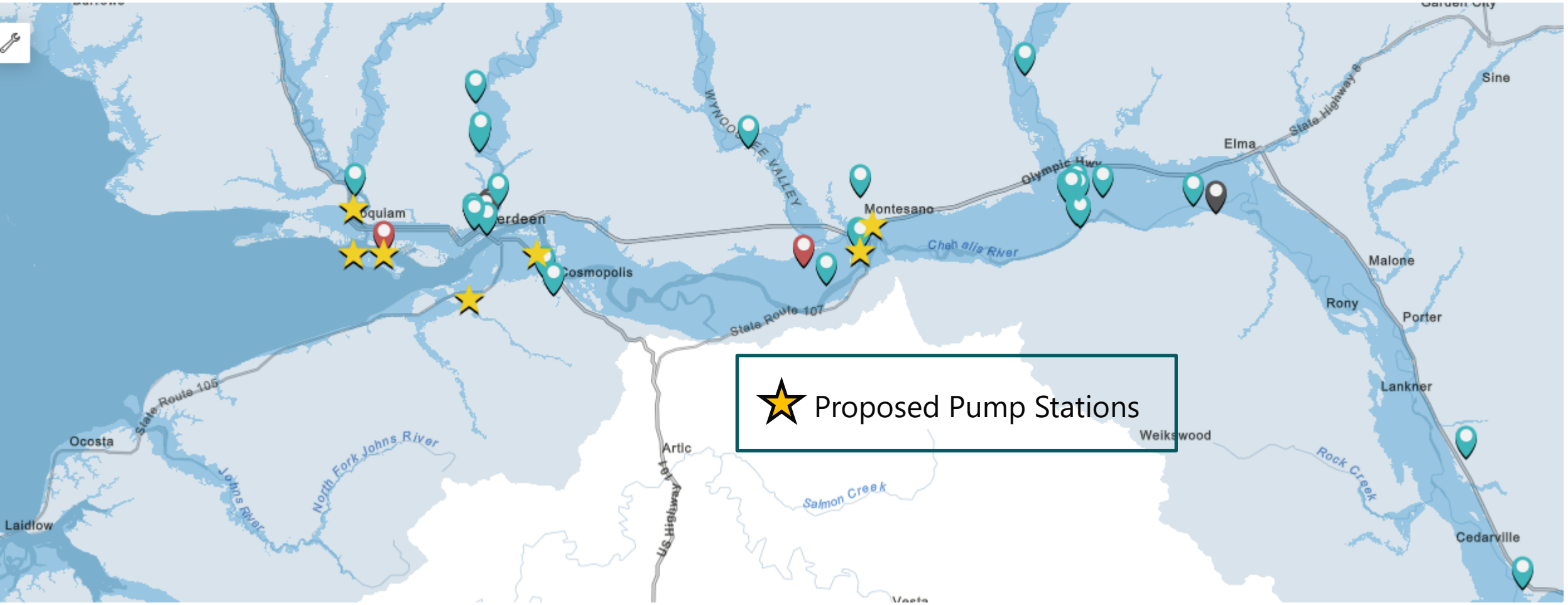
Chehalis River Basin Flood Authority

Local Projects Program

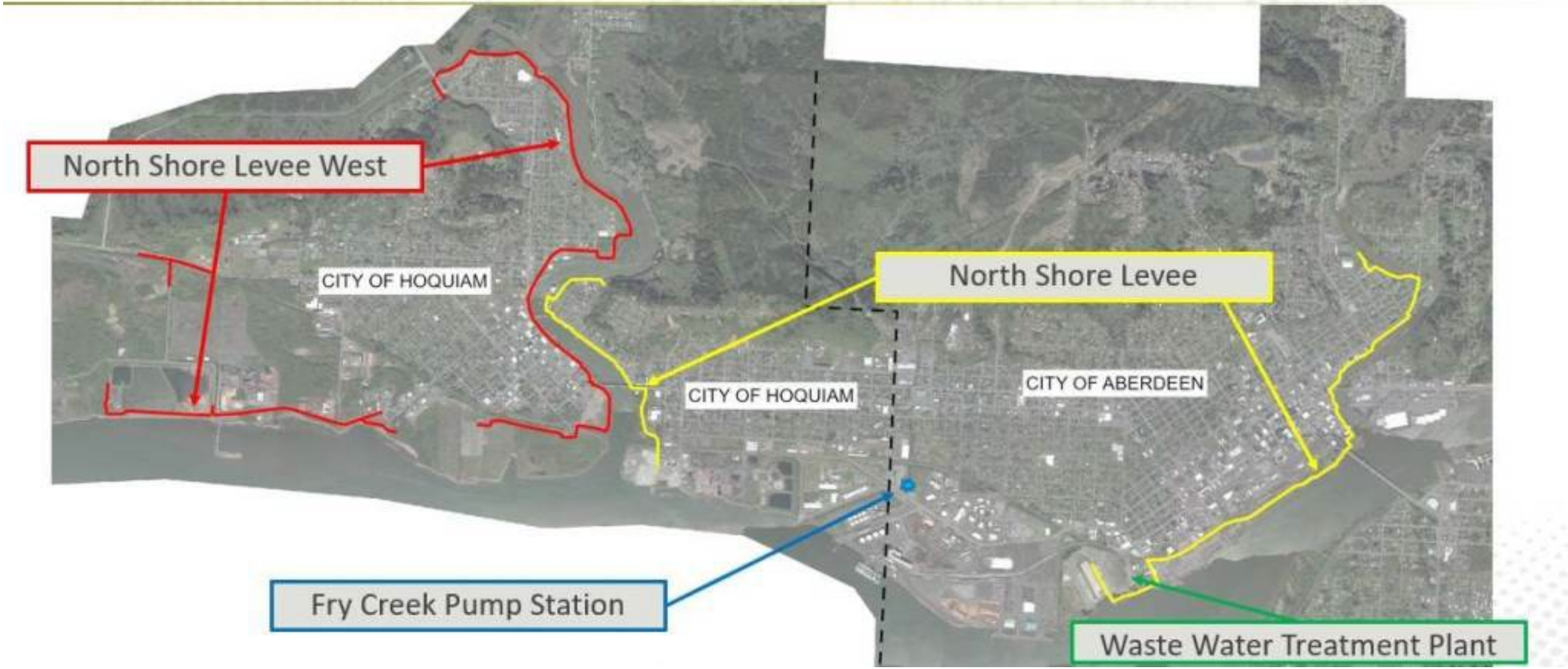
49
Selected Projects

727
Average Days to Project Completion

$46.9M
Combined Cost



North Shore Levee & North Shore Levee West



CHEHALIS BASIN STRATEGY

LUNCH

- Vote in the photo contest
- Return at 12:35

CHEHALIS BASIN STRATEGY

