

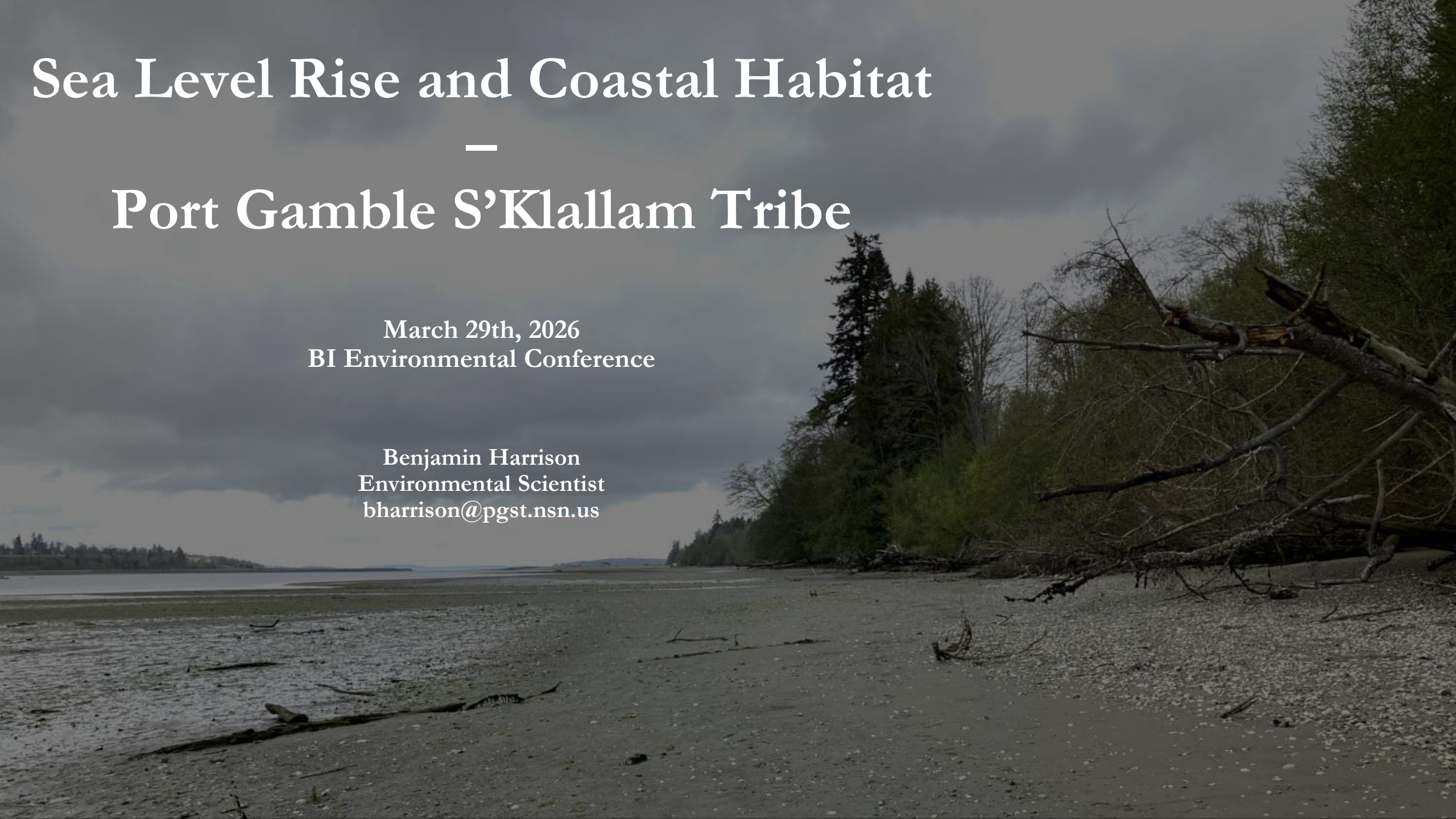
Sea Level Rise and Coastal Habitat

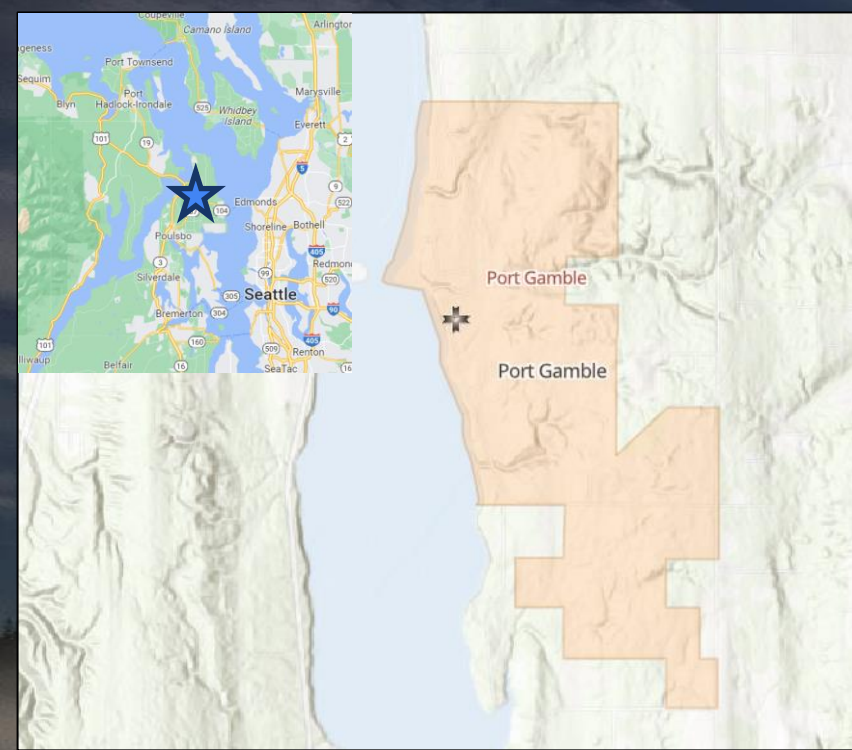
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Port Gamble S'Klallam Tribe

March 29th, 2026
BI Environmental Conference

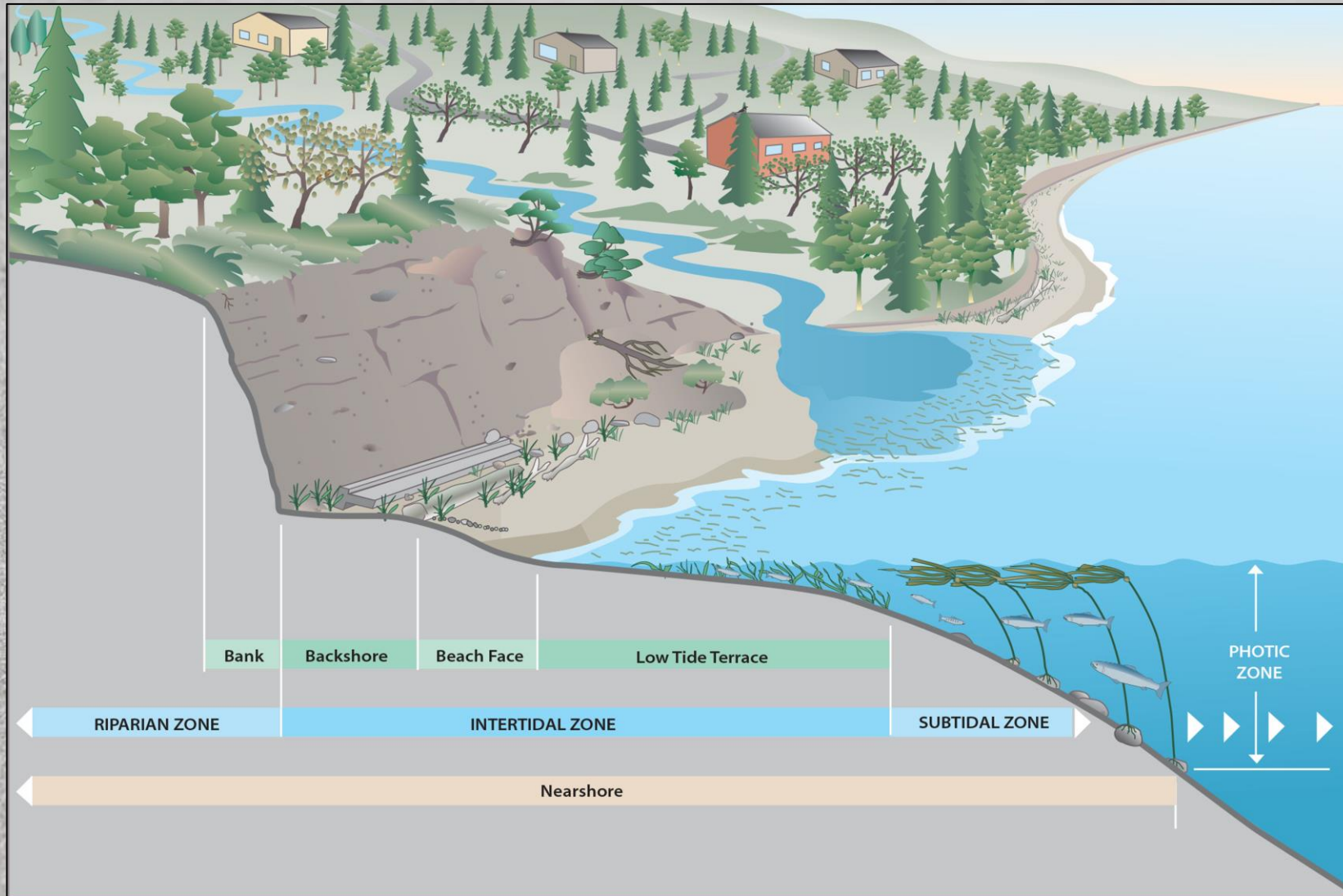
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Port Gamble S'Klallam Tribe

Nearshore habitats and coastal squeeze



- **Diverse habitats along the shoreline are defined by salinity, elevation, geology**
- **Coastal squeeze changes the distribution and connectivity of these habitats with rising sea level.**
- **Where is there room to migrate?**

King County

Point Julia – a foreland salt marsh (barrier lagoon)



Coastal Forest

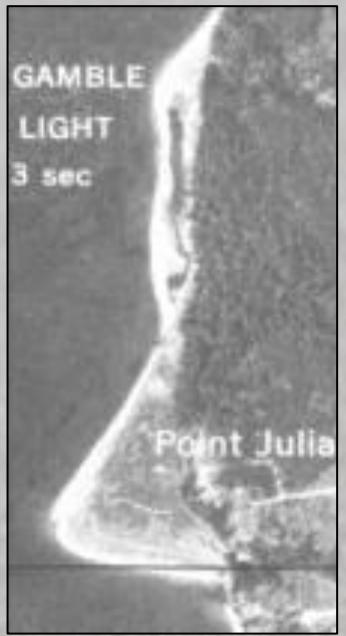
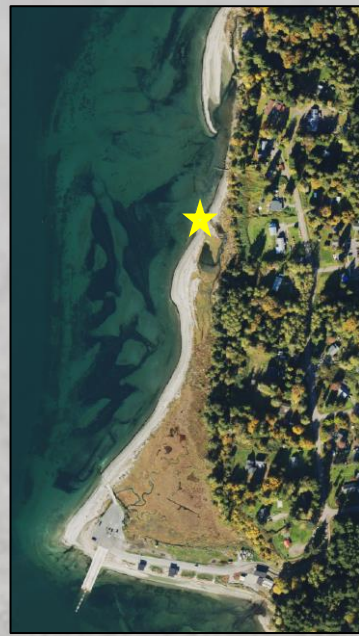
Wetland Grasses/Shrubs

Insects

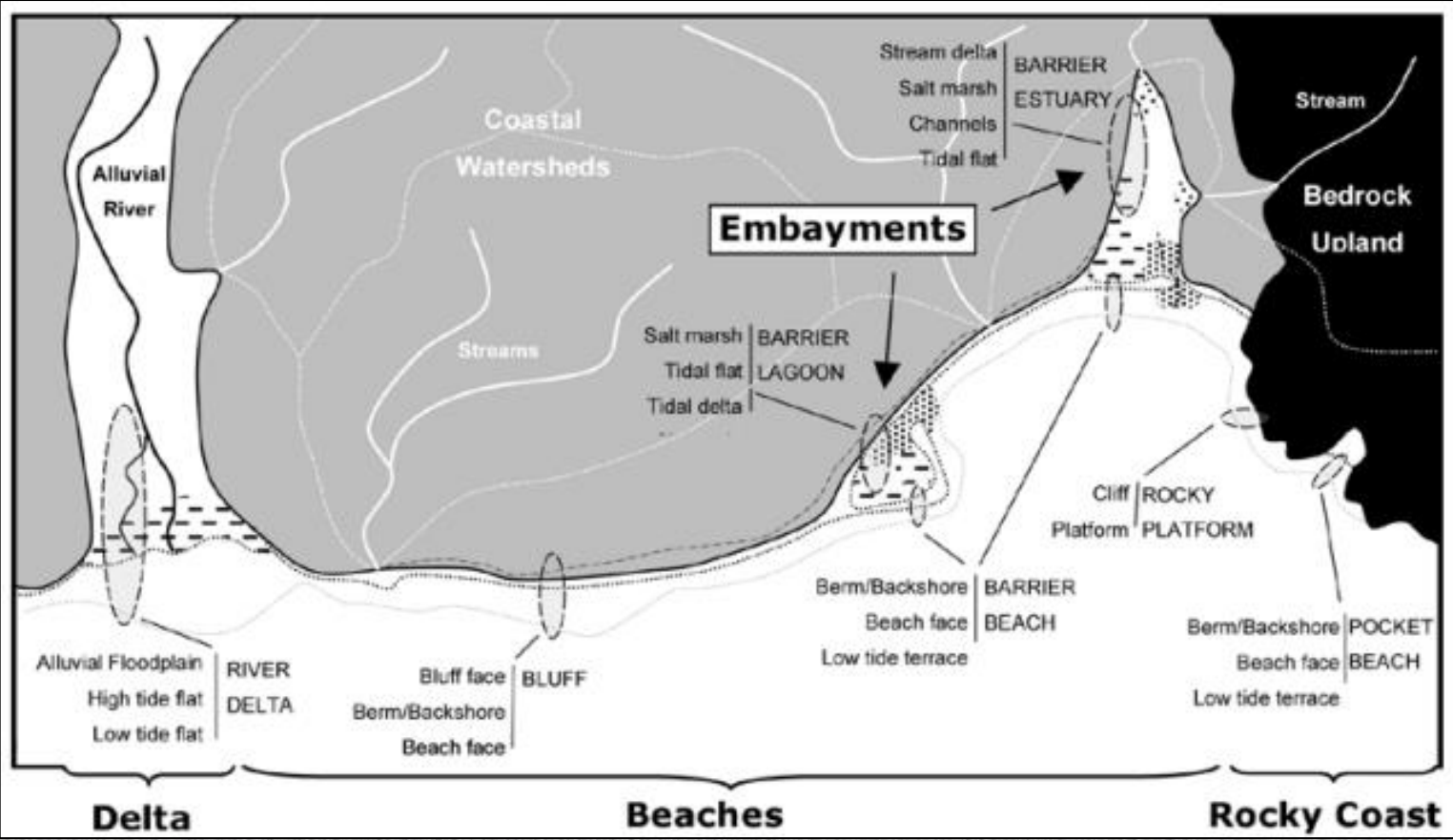
...also fish.

Oysters

Clams

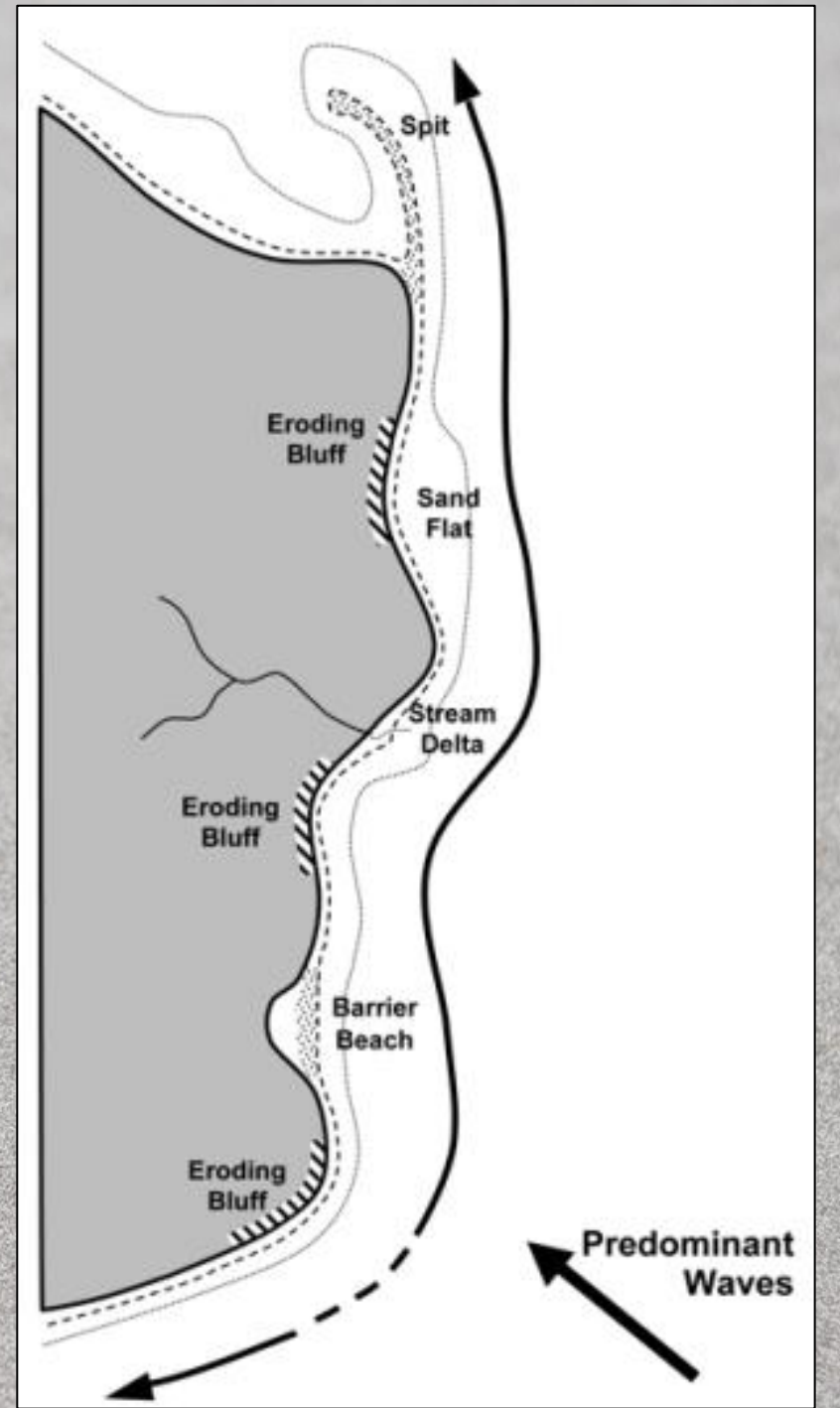


Sediment transport builds (or erodes) habitat



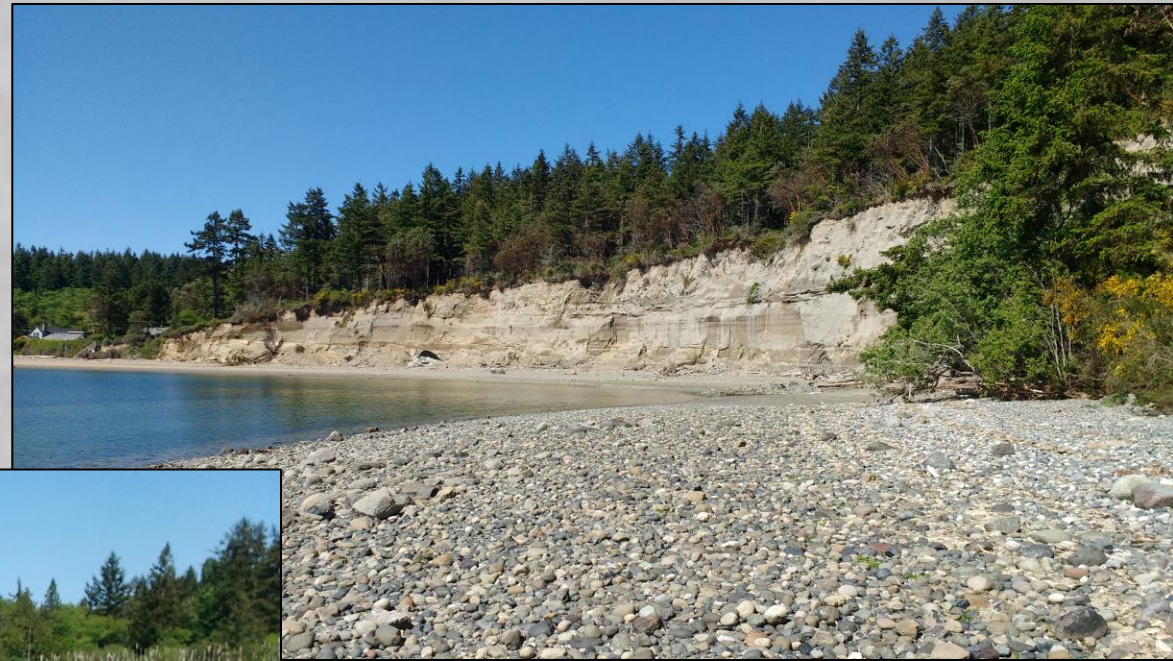
Shipman 2008

- In Kitsap, generally, wave action erodes glacial sediment from bluffs
- Streams contribute sediment from upland areas
- Wave action transports sediment along the shoreline



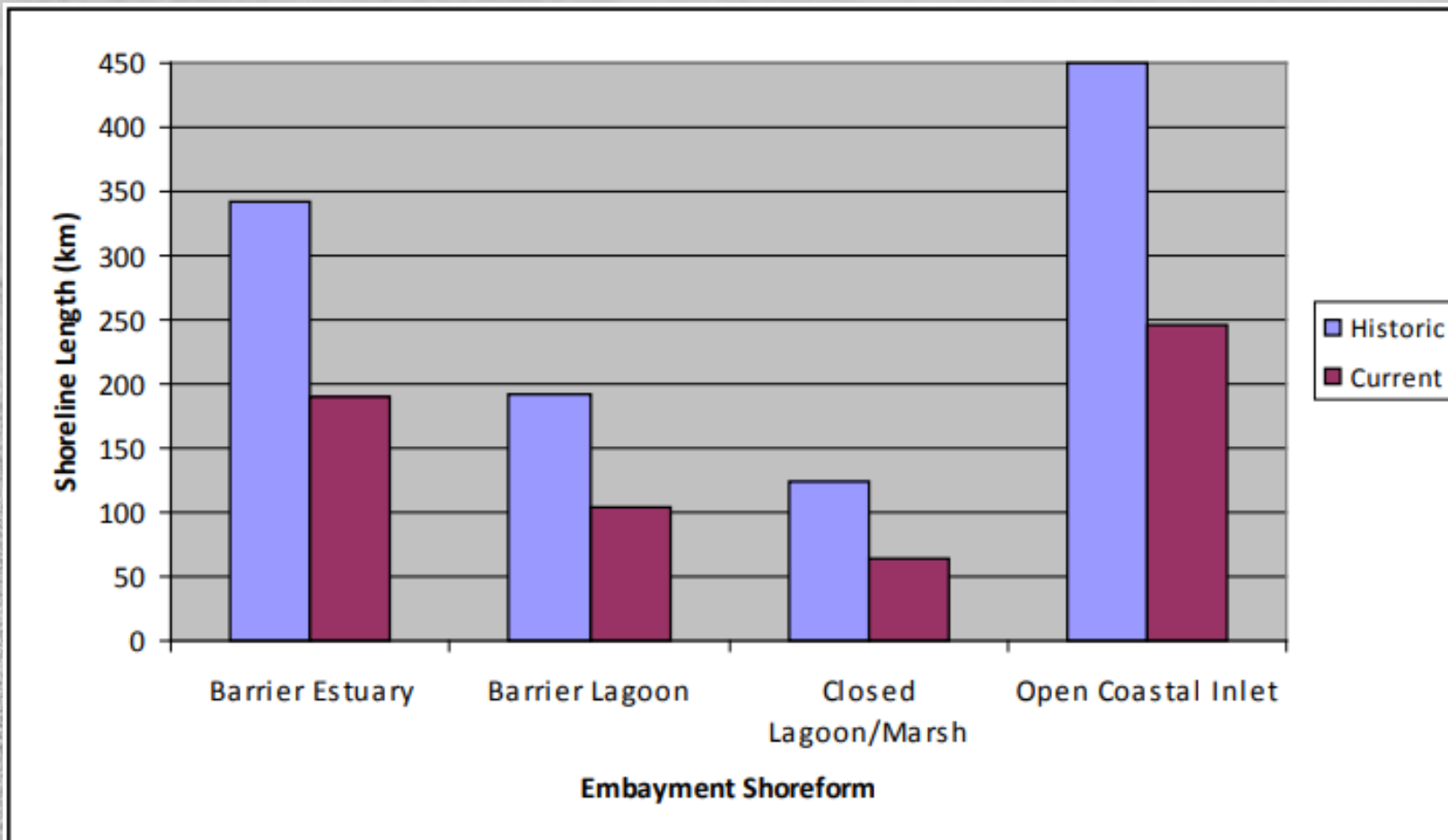
Physical complexity leads to diversity

- **Foulweather Bluff Preserve, near Hansville, has a broad, closed lagoon behind a barrier beach.**



- **Lacking a permanent channel to the Sound, interface between seeps and saltwater supports unique ecology**
- **Beaches are generally built from bluff material**
- **What remains in place also determined by waves/tides (as with cobbles above).**

Historical loss of Puget Sound wetlands



Schlenger et al 2011

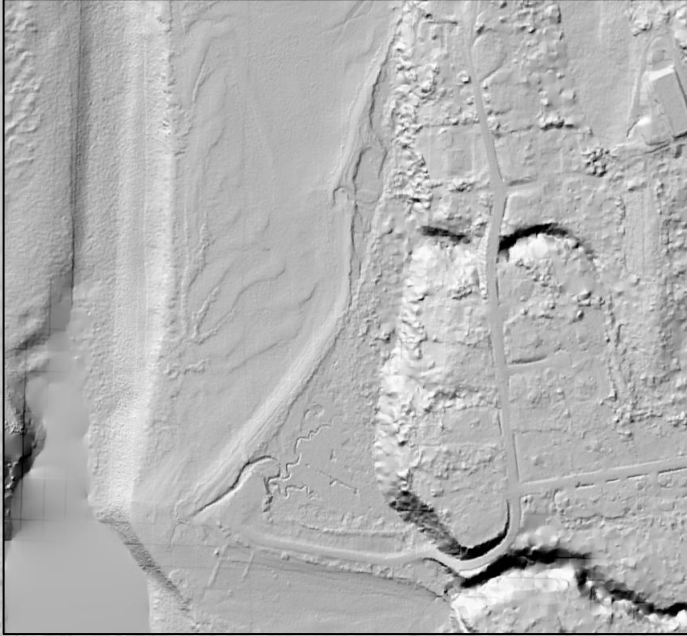
- **Stabilization of shorelines for development (~30% of sound shorelines are armored)**
- **Draining/filling of wetlands for construction or agriculture**
- **Modification to streams and rivers reducing sediment input**
- **Sea level rise is impacting wetlands that have already been diminished and isolated**

King tides – January 2026

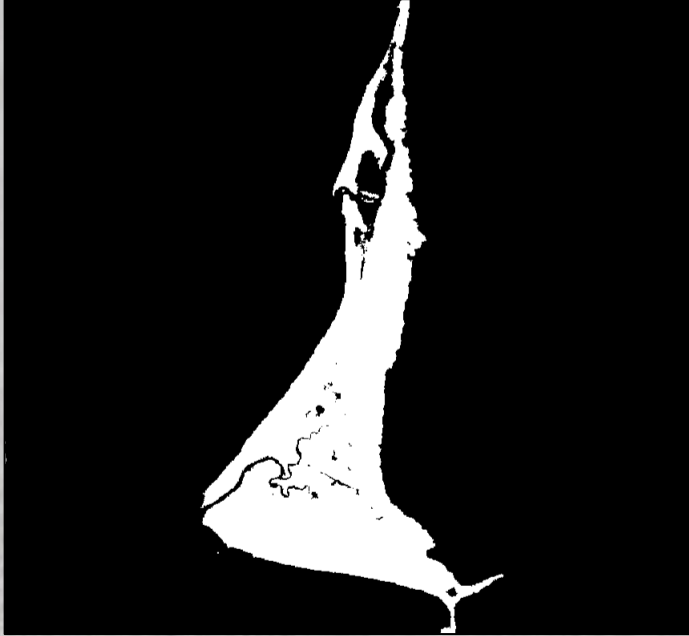


- **The main impact of sea level rise on coastal marshes is frequency of inundation, stressing vegetation and exposing materials to wave erosion.**
- **We can already see and monitor impact of king tides and coastal flooding.**

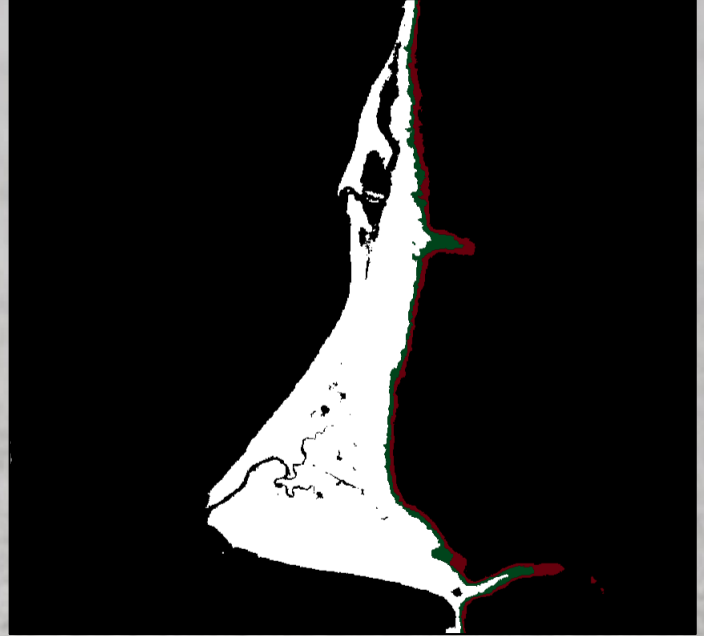
Point Julia



2.5-5.0ft



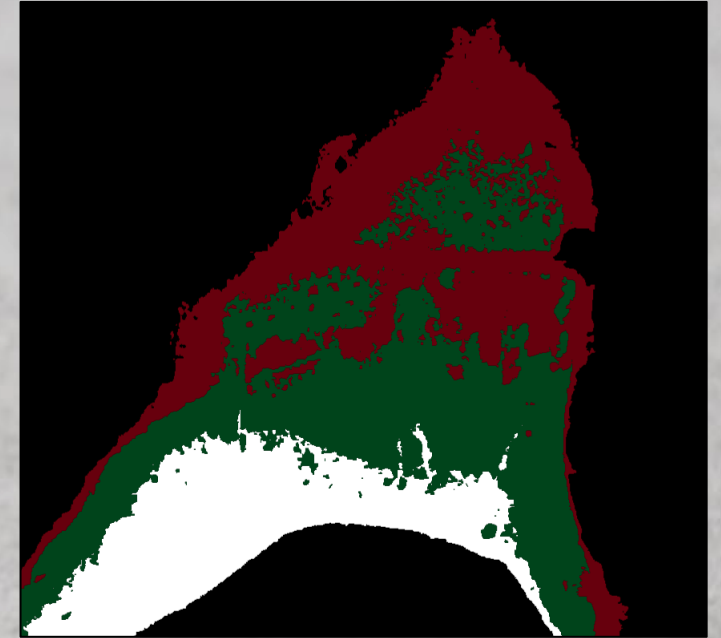
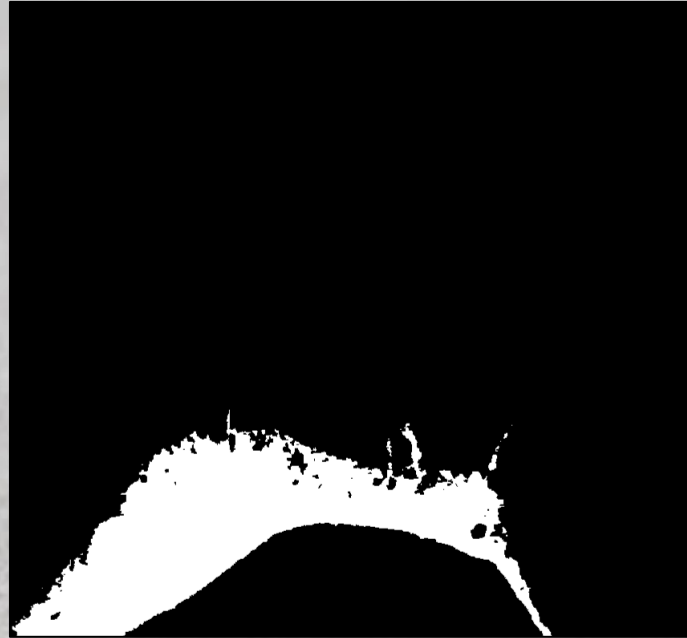
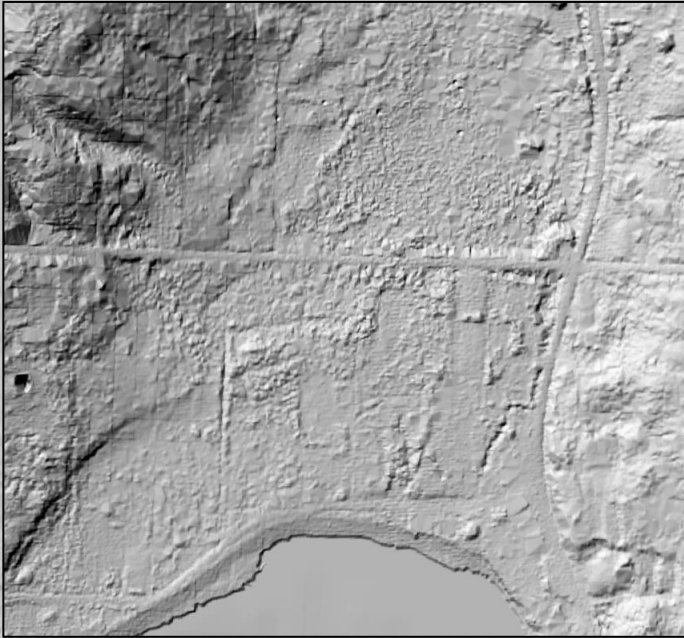
5-7.5, 7.5-10



Foulweather Bluff

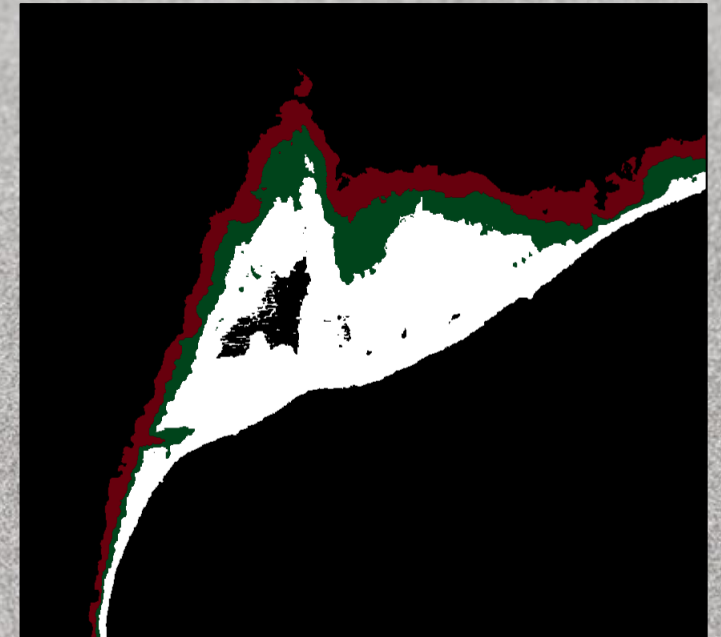
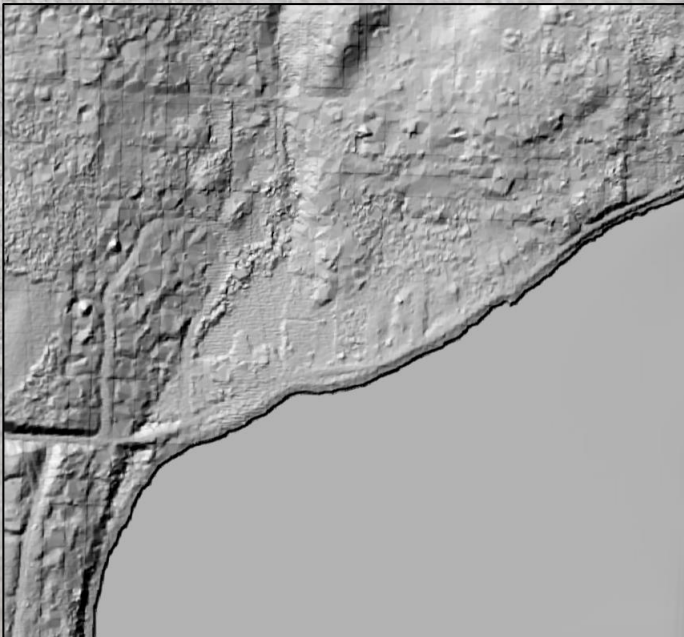


Schel Chelb



Terrain analysis

Manitou Beach



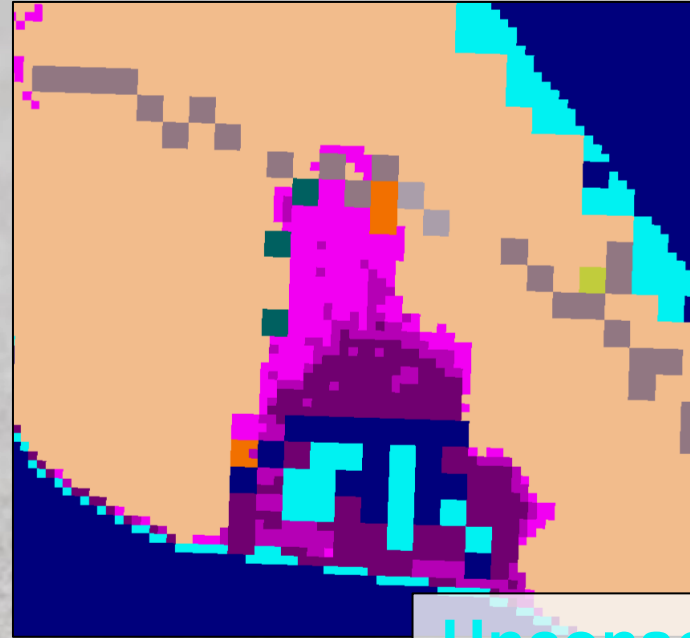
Foulweather Bluff



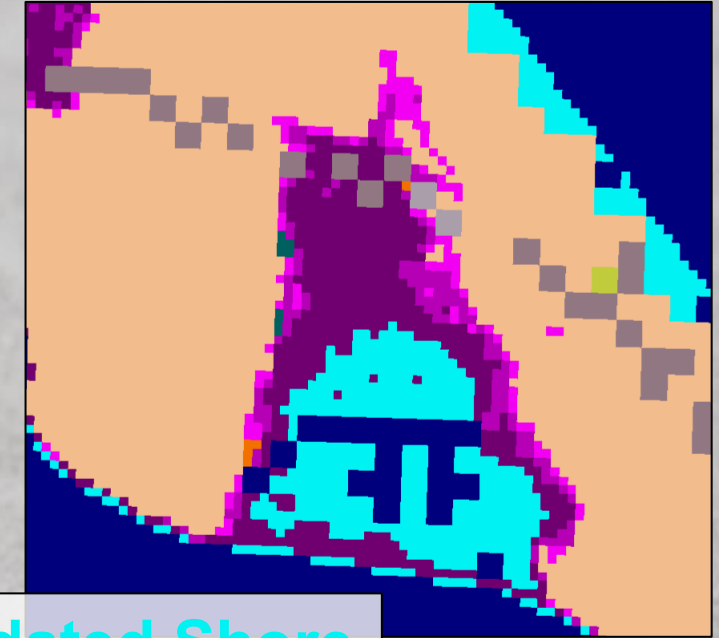
Schel Chelb



0.5ft SLR

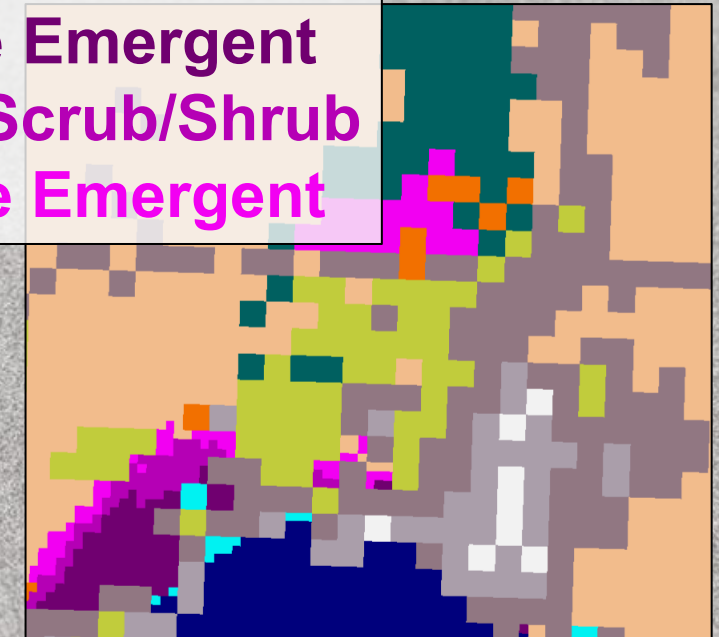
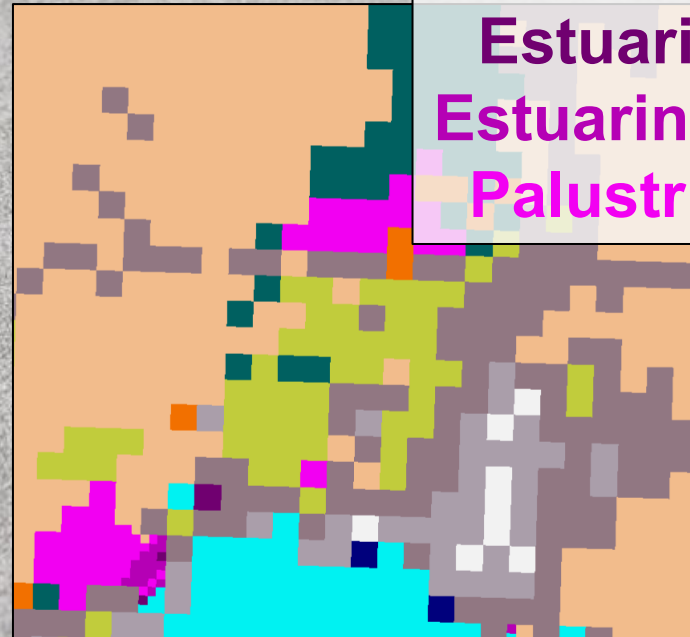


5.0ft SLR

















Marsh migration

Unconsolidated Shore
Estuarine Emergent
Estuarine Scrub/Shrub
Palustrine Emergent



Interventions

DESIGN TECHNIQUE TYPE		DESIGN TECHNIQUE	COST	PROJECT COMPLEXITY
	Natural	LEAVE NATURAL	N/A	N/A
		 VEGETATION	\$	
		 DRAINAGE	\$ - \$\$	
		 LOCATING STRUCTURES	\$ - \$\$\$	
	Natural	 LOG PLACEMENT	\$	
		 BEACH NOURISHMENT	\$\$	
		 RESLOPE AND REVEGETATION	\$ - \$\$\$	

WDFW

- Management may negatively impact downstream systems, but the same also holds true for improvements. Individual sites may benefit broader shoreline ecology.
- Natural and “soft” solutions to concerns of slope stability are often more cost effective than hard armor, and technical assistance available (get to know ShoreFriendly!)
- Adopt a drift cell (with cooperative neighbors and/or communities).

Interventions

- Restoration of the Port Gamble Mill Site includes removal of contaminated sediment from intertidal, restoration.
- PGST research and management also conducts beach seeding and nourishment, species monitoring.
- PGST supports research and regulation to protect shoreline ecosystems, conducts permit review



Questions?

