

ECOSYSTEM PROCESSES AND HABITAT RESTORATION

Point No Point Estuary Restoration Project

Community Outreach Meeting

October 27th





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Area Habitat Biologist

Salmon habitat needs

The four C's

- Clean
- Cool
- Complex
- Connected



Salmon habitat needs

Juvenile out-migrating salmon

- Rearing
- Foraging



Estuaries

Where our rivers meet the sea...



- Estuaries are unique brackish water ecosystems where fresh and saltwater mix
- Estuaries provide unique ecosystem functions and processes
- Estuaries are biodiversity hotspots
- Specifically small and shallow “pocket” estuaries are vital for survival and success of anadromous fish
- The Puget Sound is the second largest estuary in the USA

Estuaries and fish

At freshwater and saltwater interface:

- osmoregulation
- provides low energy areas, shallow refuge from predators – nursery habitat
- prey production
- delivers detritus and prey such as terrestrial insects

Rest stops on their way out to the ocean!!!



Estuaries in Puget Sound

- Between 75% to 80% of small pocket estuaries in Puget Sound have been lost or degraded
- Estuaries are critical habitat for salmon as well as other fish and wildlife species
- For juvenile out-migrating salmon estuaries are the critical rest stops to forage and rear on the way out to the ocean
- The bigger and healthier juvenile out-migrating salmon can get in these estuaries, the greater their survival in the ocean



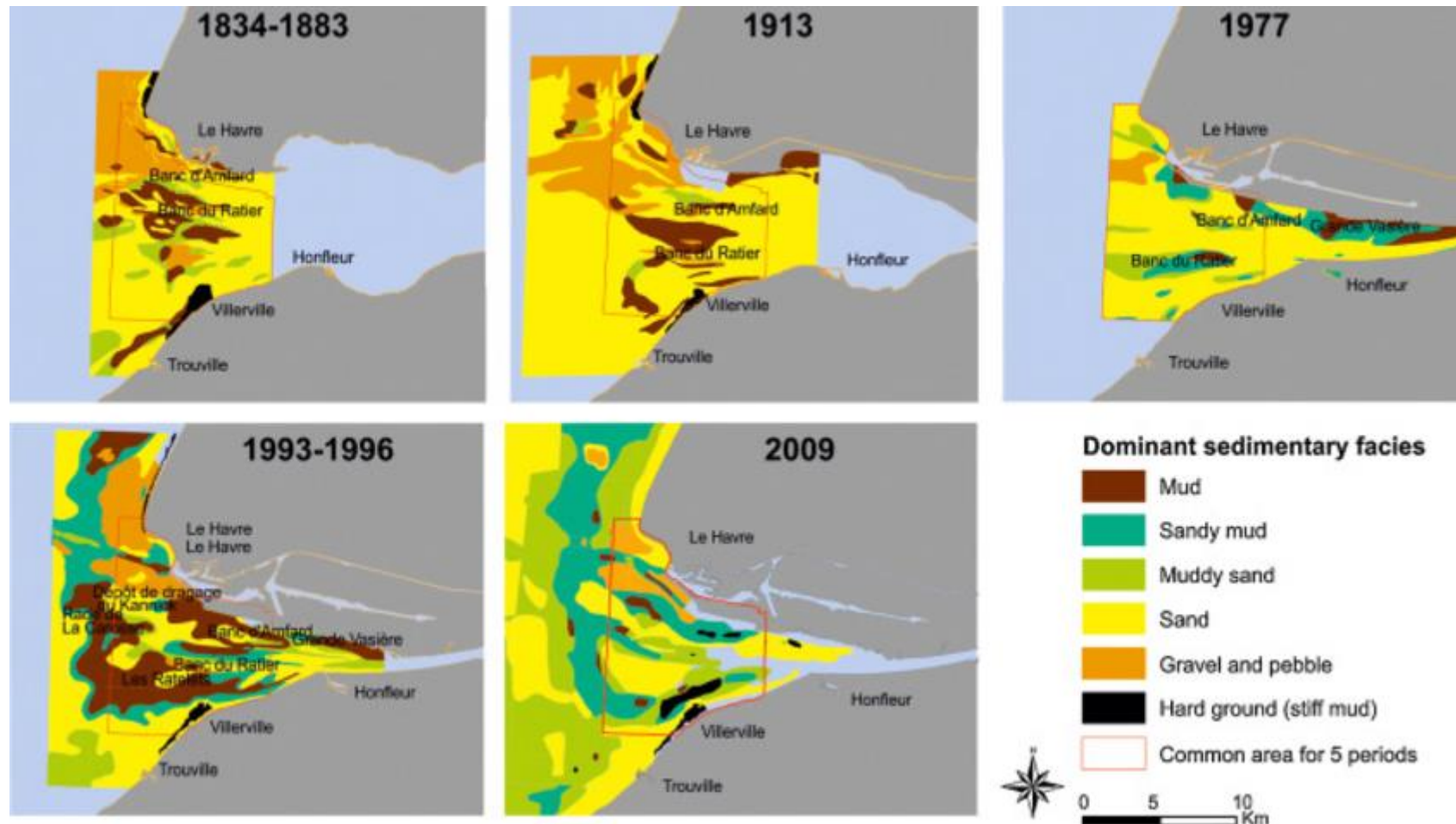
Estuarine Habitat-forming Processes

- The distribution and characteristics of deltas /estuaries are controlled by a complex set of interrelated fluvial and marine processes and environmental conditions. These factors include **climate, water and sediment discharge, river-mouth processes, nearshore wave power, tides, nearshore currents and winds** (Coleman 1981). Of these factors, sediment input, wave-energy flux, and tidal flux are the most important processes that control the geometry, trend, and internal features of the progradational framework sand bodies of deltas /estuaries.
- Deltas/estuaries are probably the most complex of depositional systems with more than a dozen distinct environments of deposition, or habitats. Through time, deltas change in form as they undergo constructional and destructional phases, depending on the degree of imbalance in the major controlling factors.

- WRIA 1 Salmon recovery plan 2019



Estuarine Habitat-forming Processes

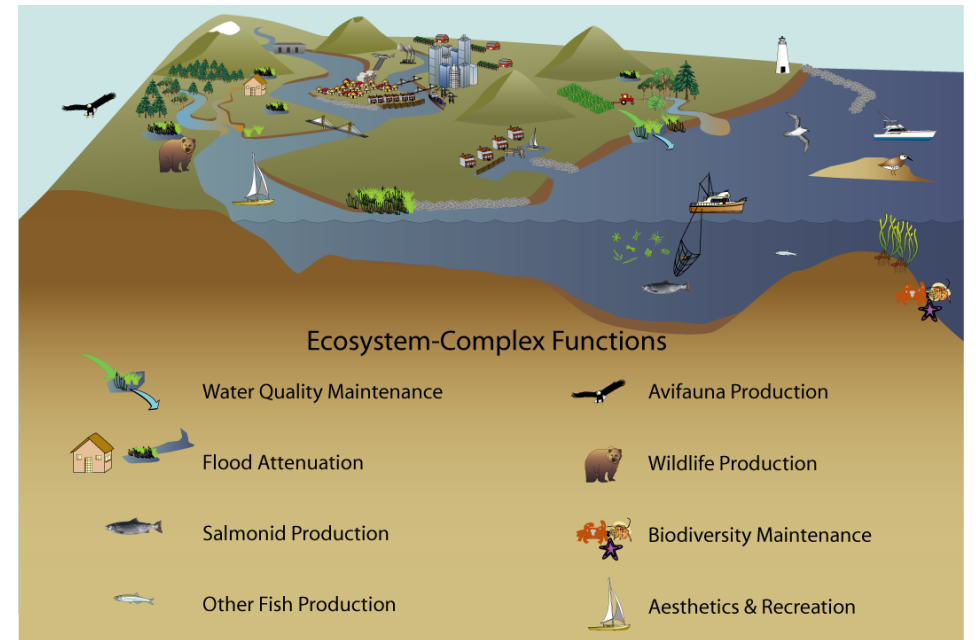


Highly dynamic!

Lesourd, Sandric & Lesueur, Patrick & Fisson, Cédric & Dauvin, Jean-Claude. (2015). Sediment evolution in the mouth of the Seine estuary (France): A long-term monitoring during the last 150 years. *Comptes Rendus Geoscience*. 348. 10.1016/j.crte.2015.08.001.

Estuary functions

- Habitat and connectivity
- Delivery of terrestrial nutrients and food source
- Salt marsh plant community
- Fresh and tidal water exchange
- Water quality
- Flood capacity and drainage
- Sediment dynamics, supply and transport

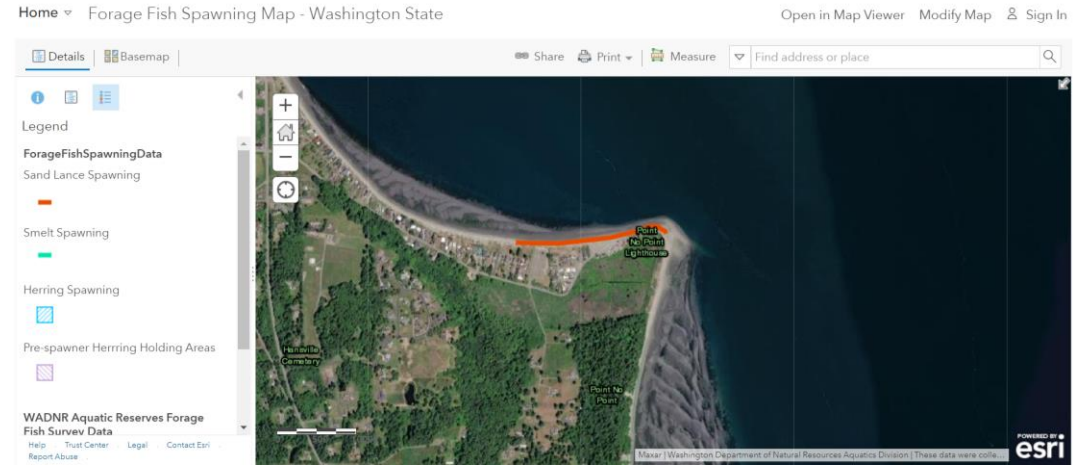


Benefits to fish and wildlife

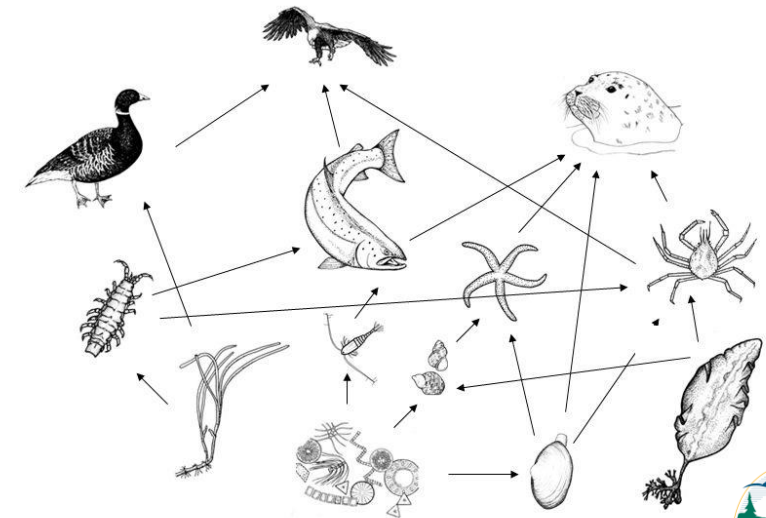
- Habitat and connectivity
 - Delivery of terrestrial nutrients and food source
 - Salt marsh plant community
 - Fresh and tidal water exchange
 - Water quality
 - Flood capacity and drainage
 - Sediment dynamics, supply and transport
- **Refugia**
 - **Forage**
 - **Biodiversity**

Others to benefit..

- Salmon (Pink, Chum, Coho, Chinook)
- Forage fish (Pacific Herring, Pacific Sand Lance, Surf Smelt)
- Various fish (Perches, Sculpins, Flatfishes, etc.)
- Various invertebrates and plankton
- Various wildlife (Birds, Mammals, Amphibians)
- Plant communities (Salt Marsh)



Estuary food chains often overlap, making food webs.



Ecosystem and process-based restoration

Restoration must not focus solely on an individual species as those species do not exist in a vacuum by themselves...

In order to successfully restore a species, efforts must address the other species they interact with, the habitat they utilize throughout their life cycle, and the ecological processes and functions that support their survival...

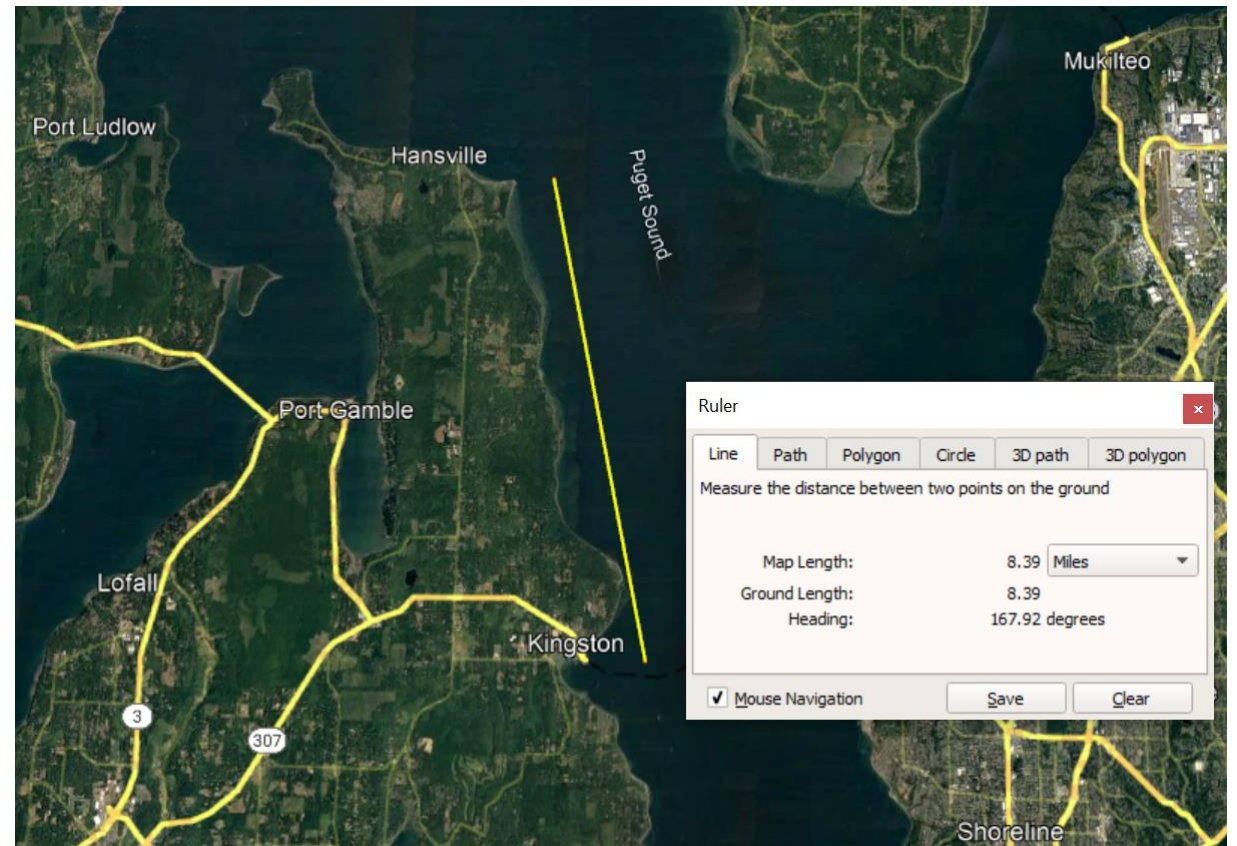
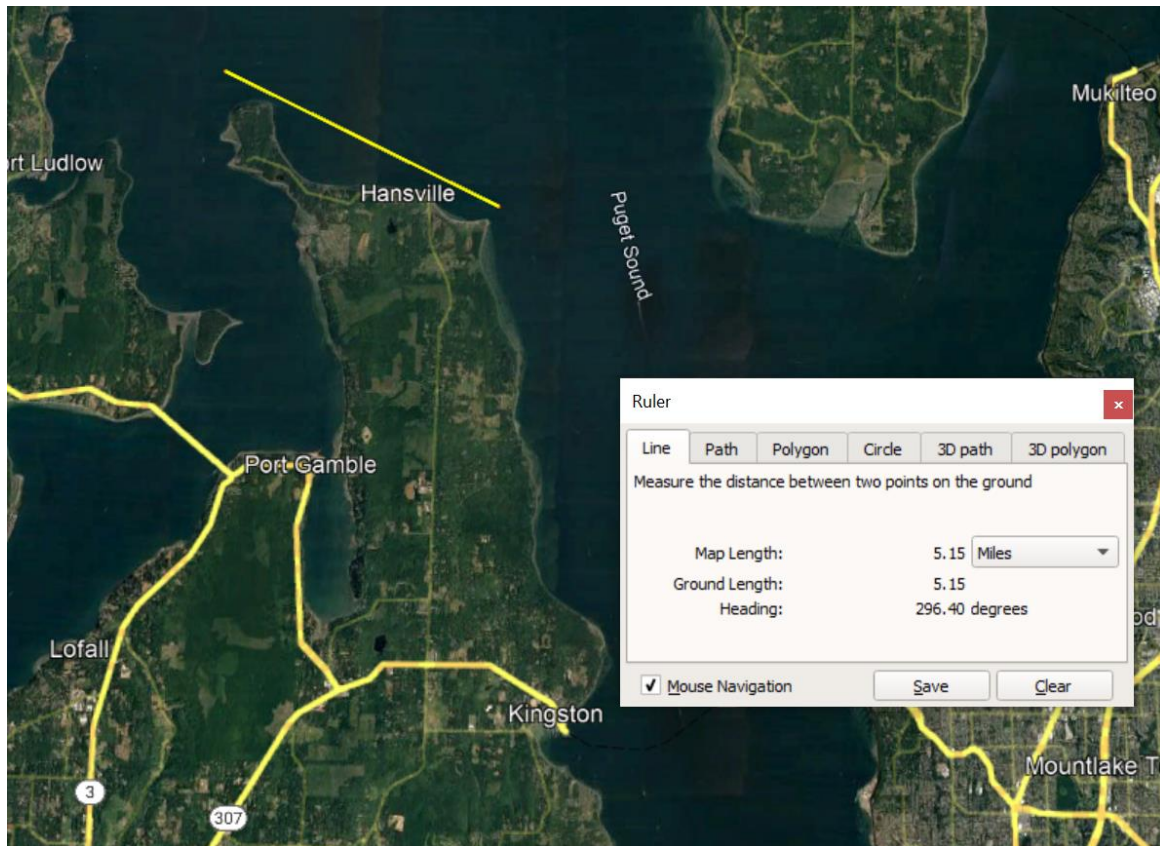
If you build it, they will come....

Point No Point Estuary Restoration

- Historically a tidally-influenced salt-marsh fed by a small stream
- Diked in the 1800s and turned into an impounded freshwater marsh
- A tide gate prevents fish and saltwater from entering, but also limits draining of freshwater
- Locked in a static non-natural state where ecological processes have stopped functioning



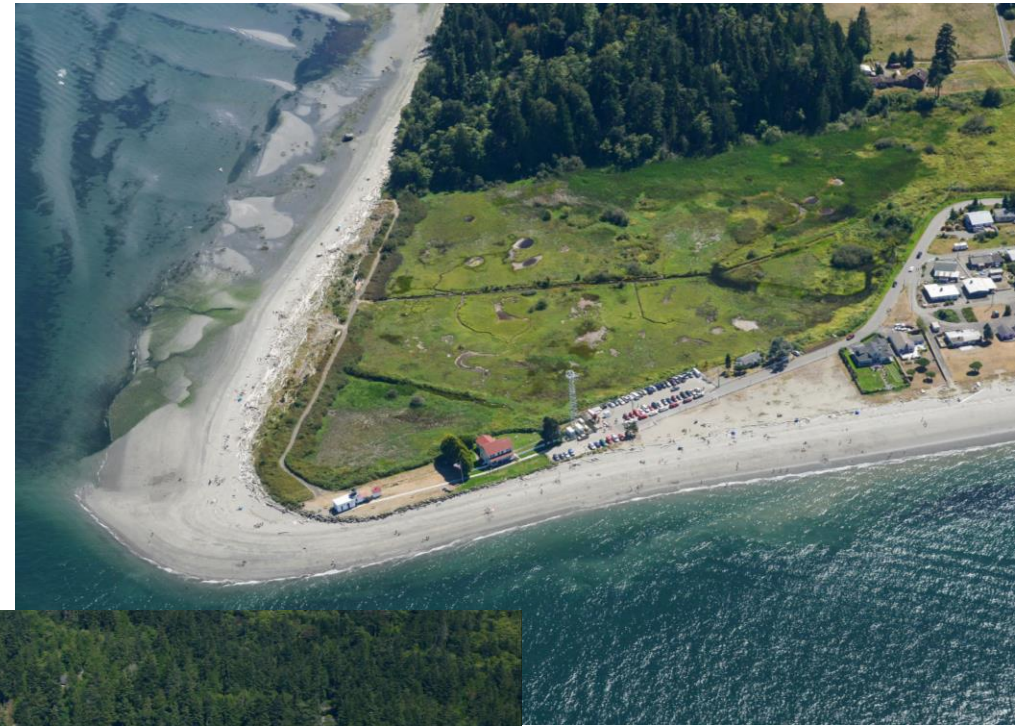
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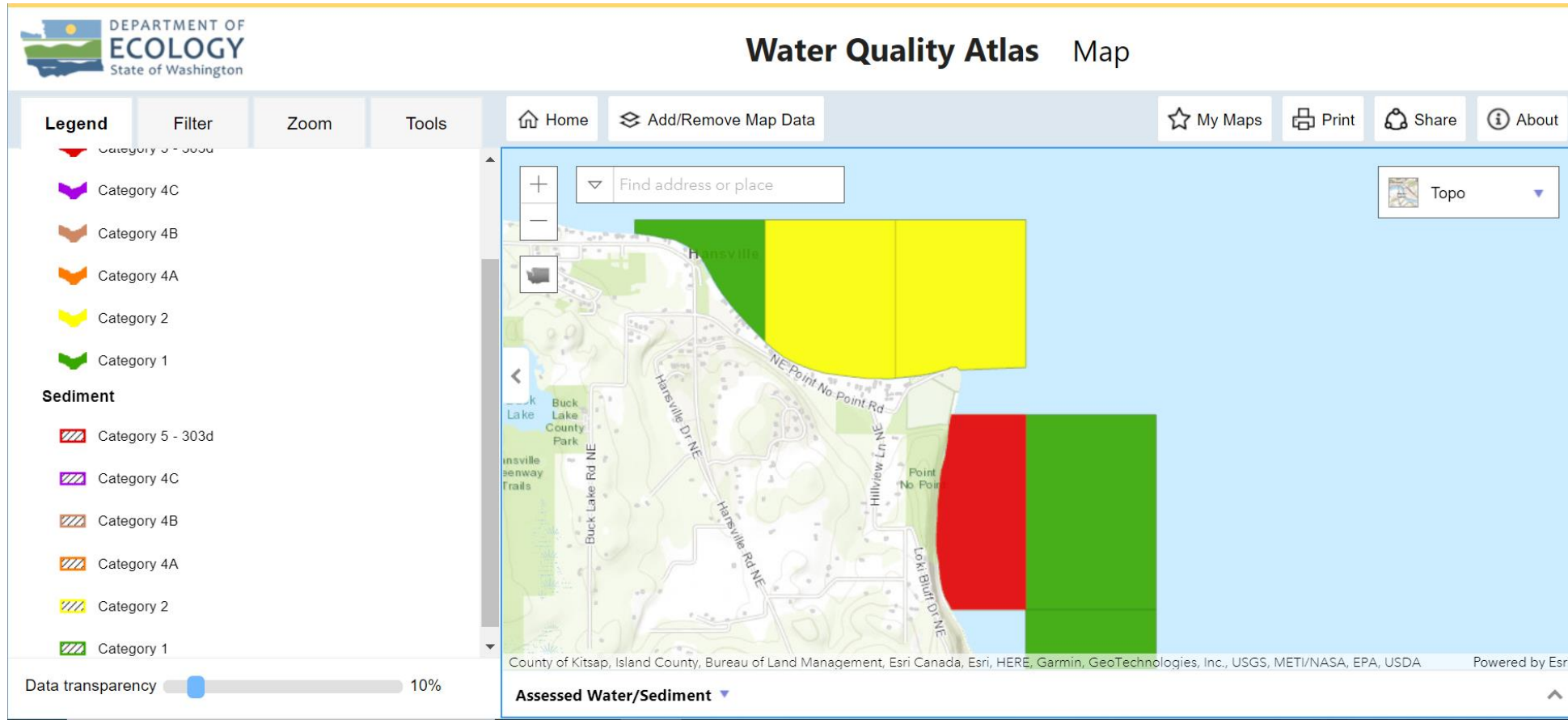
Salmon habitat needs

The four C's

- Clean
- Cool
- Complex
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Salmon habitat needs



<https://apps.ecology.wa.gov/waterqualityatlas/wqa/map>



Habitat Restoration Design Retaining or Restoring Natural Processes

Focusing on natural process restoration instead of species restoration will assure habitat conditions are sustainable & resilient

- **Direct & indirect utilization by species**
- **Building habitat for future fish populations**

