



# Climate Change and the **Blue Carbon Revolution!!**



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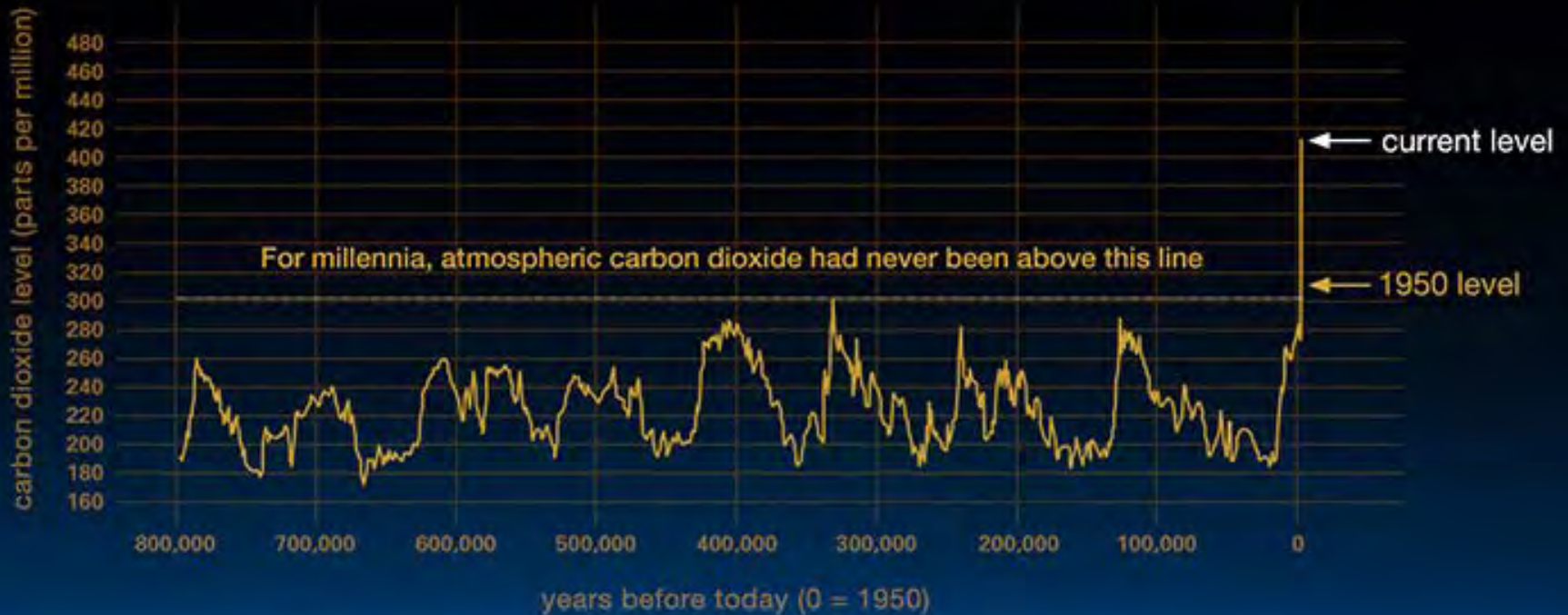
# Climate Change and Some Interesting Stuff About [Blue Carbon](#) and Coastal Wetland Restoration and How the Three Are Related



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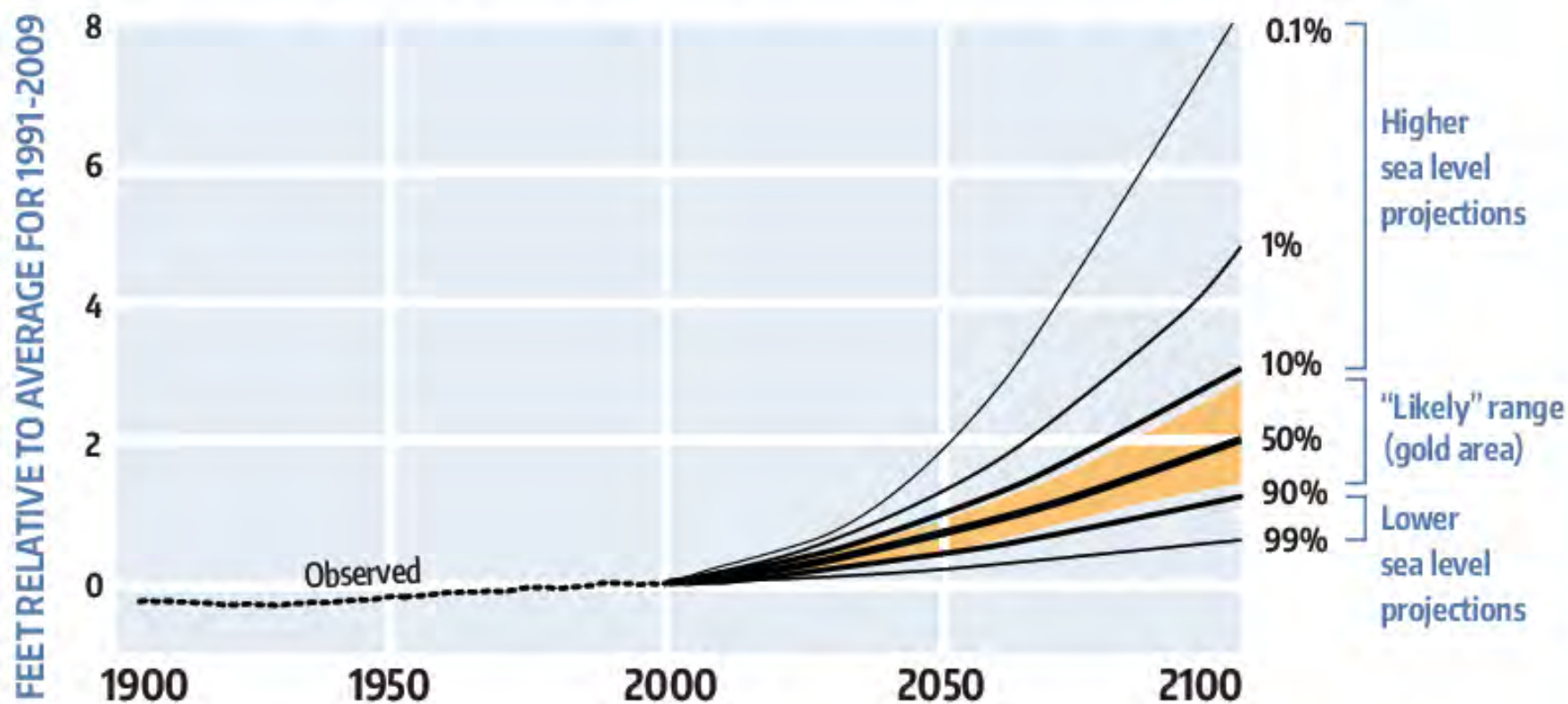


# Blue Carbon: Making our coasts resilient to SLR and mitigating climate change.

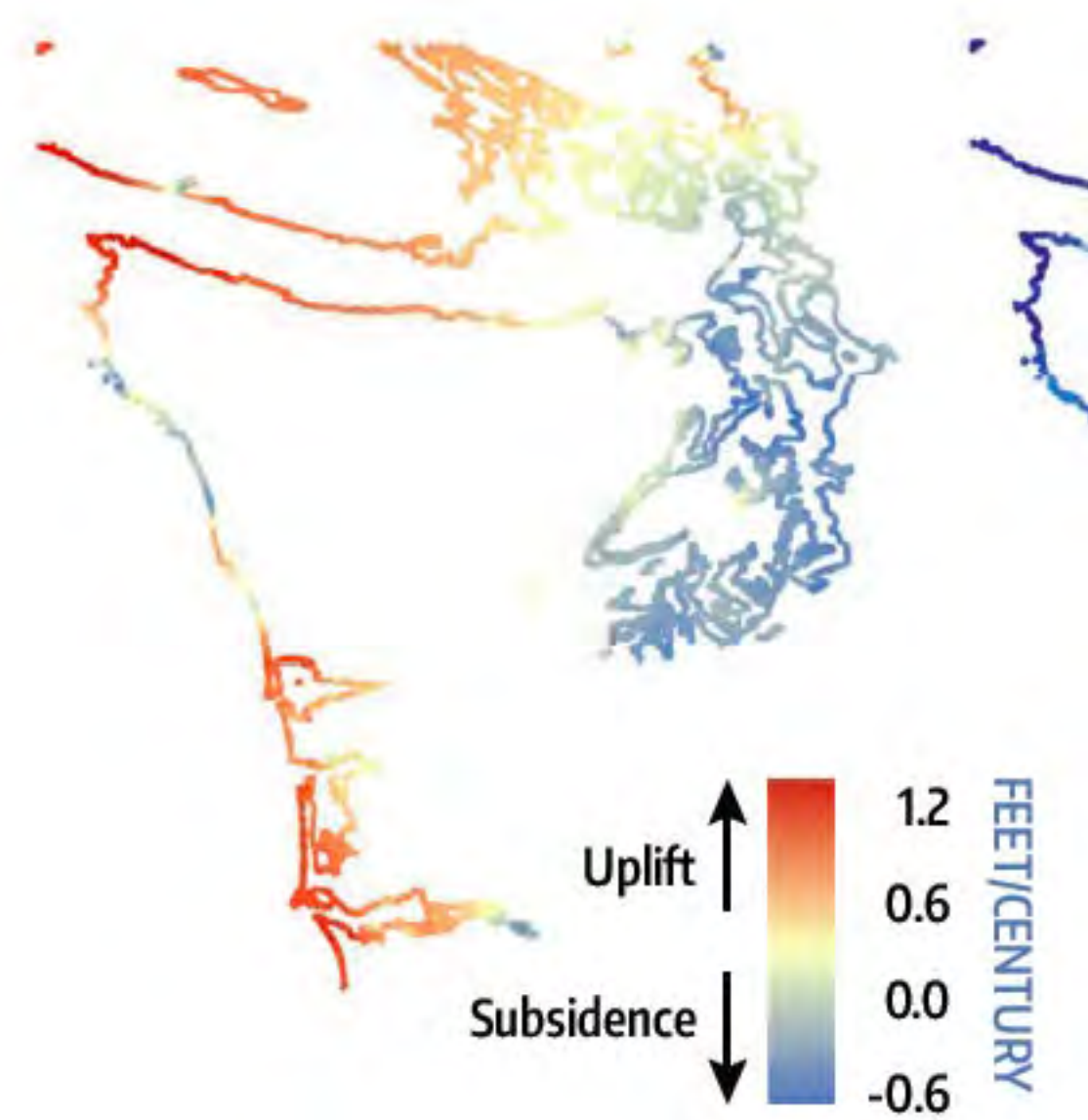


**FIGURE 2:** Absolute sea level rise projections, through 2100, for a high greenhouse gas scenario (RCP 8.5), for Washington State. Projections are based on Kopp et al. (2014) and observed variations in absolute sea level are shown for 1907-2007.<sup>4</sup> All results are shown relative to the average for 1991-2009. The probability values are “probabilities of exceedance”, i.e., the current best assessment of the likelihood that absolute sea level will rise by at least a given change in elevation.

### Projected Absolute Sea Level Rise Under a High Greenhouse Gas Scenario



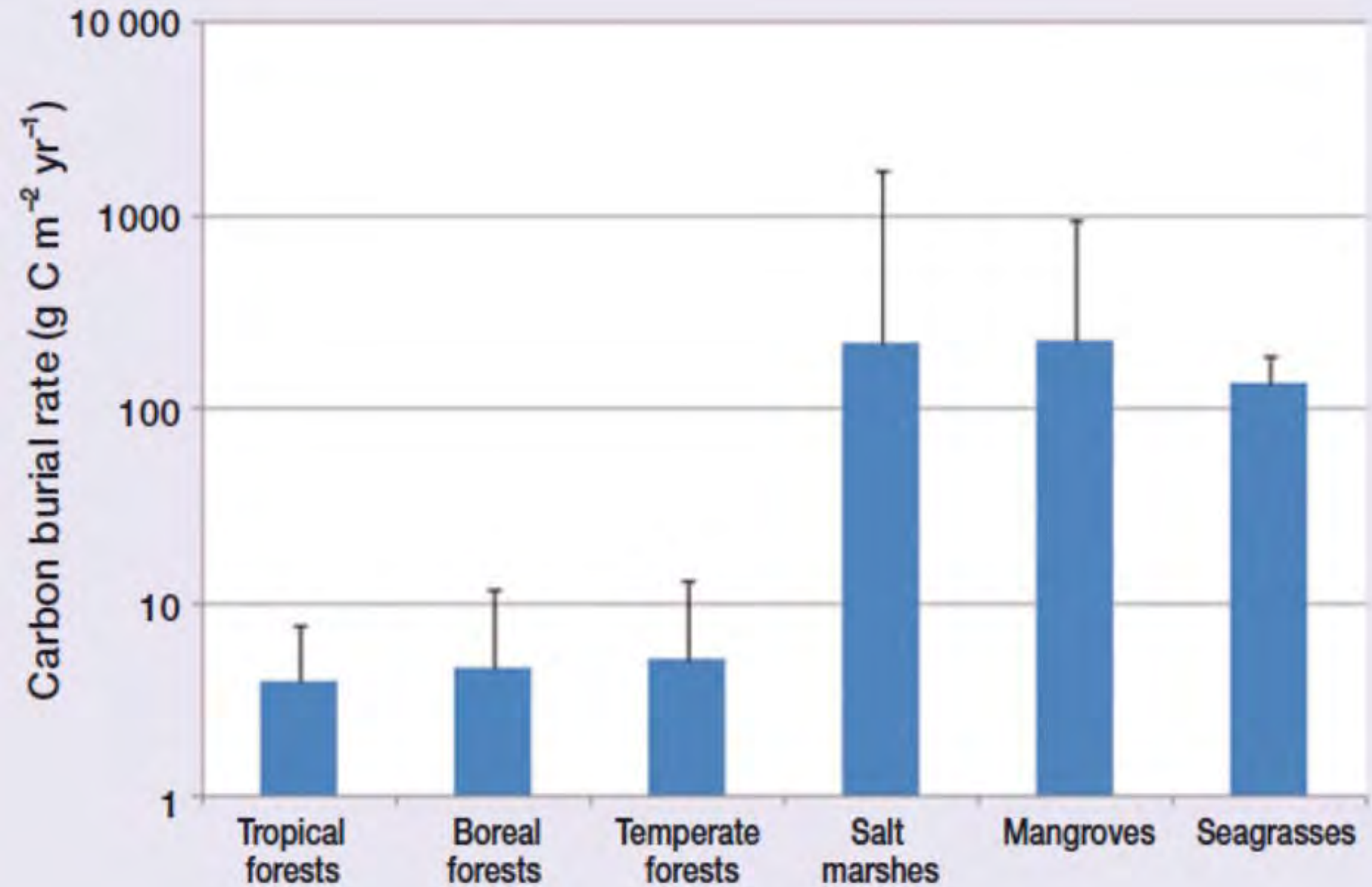
# Deep Land Subsidence or Uplift



## Shallow Processes (centimeters instead of millimeters)



This is the "blue carbon." Accreting in the face of SLR and taking carbon out of the atmosphere.





Why are wetlands, and coastal salt marsh wetlands in particular, so good at sequestering blue carbon?



# 1. Wetlands are very productive



# 1. Wetlands are wet



### 3. Wetlands accrete rapidly



## 4. Coastal wetlands are salty



# When the oxygen is gone...

## Freshwater Wetlands

Sediment bacteria breathe Carbon Dioxide and exhale Methane

## Saltwater Wetlands

Sediment bacteria breathe Sulfate and exhale Hydrogen Sulfide

# “Blue Carbon Revolution”

- Coastal Wetland Restoration and Resilience to SLR
- Climate Change Mitigation (carbon sink)
- Future Carbon Markets...Funding Restoration





# Stillaguamish Case Study





Service Layer Credits. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors. Esri, Garmin, GEBCO, NOAA NGDC, and other contributors.

Lake Ketchum

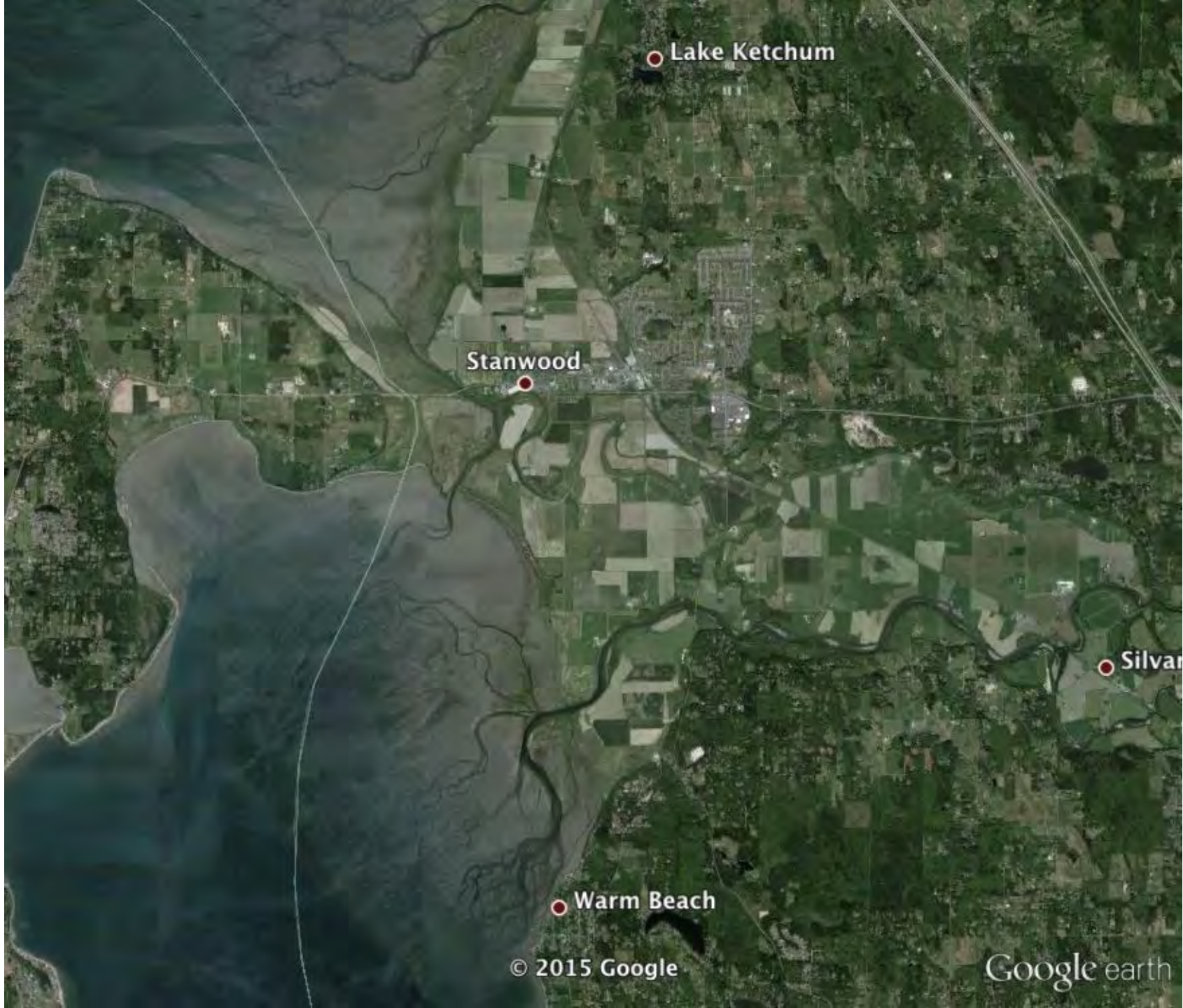
Stanwood

Silver Lake

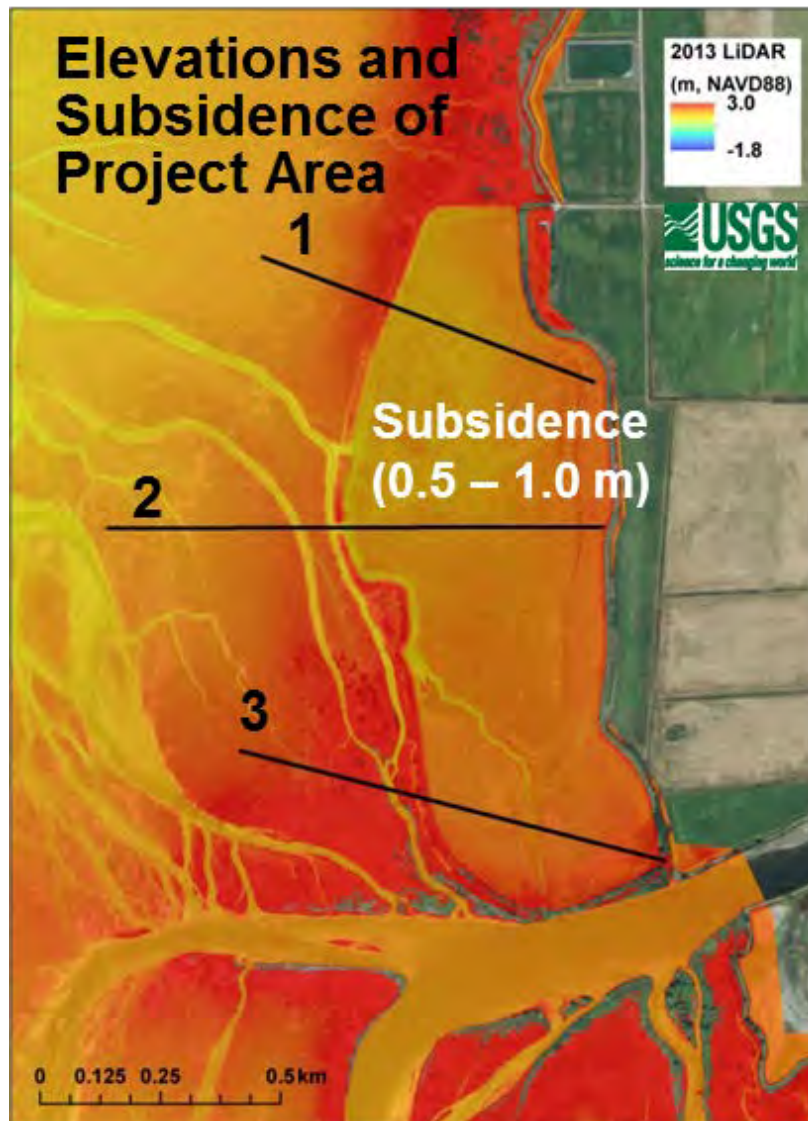
Warm Beach

© 2015 Google

Google earth







**0.5-1.0 m of subsidence inside project area relative to marsh outside old dike (Grossman and Fuller In Prep.)**



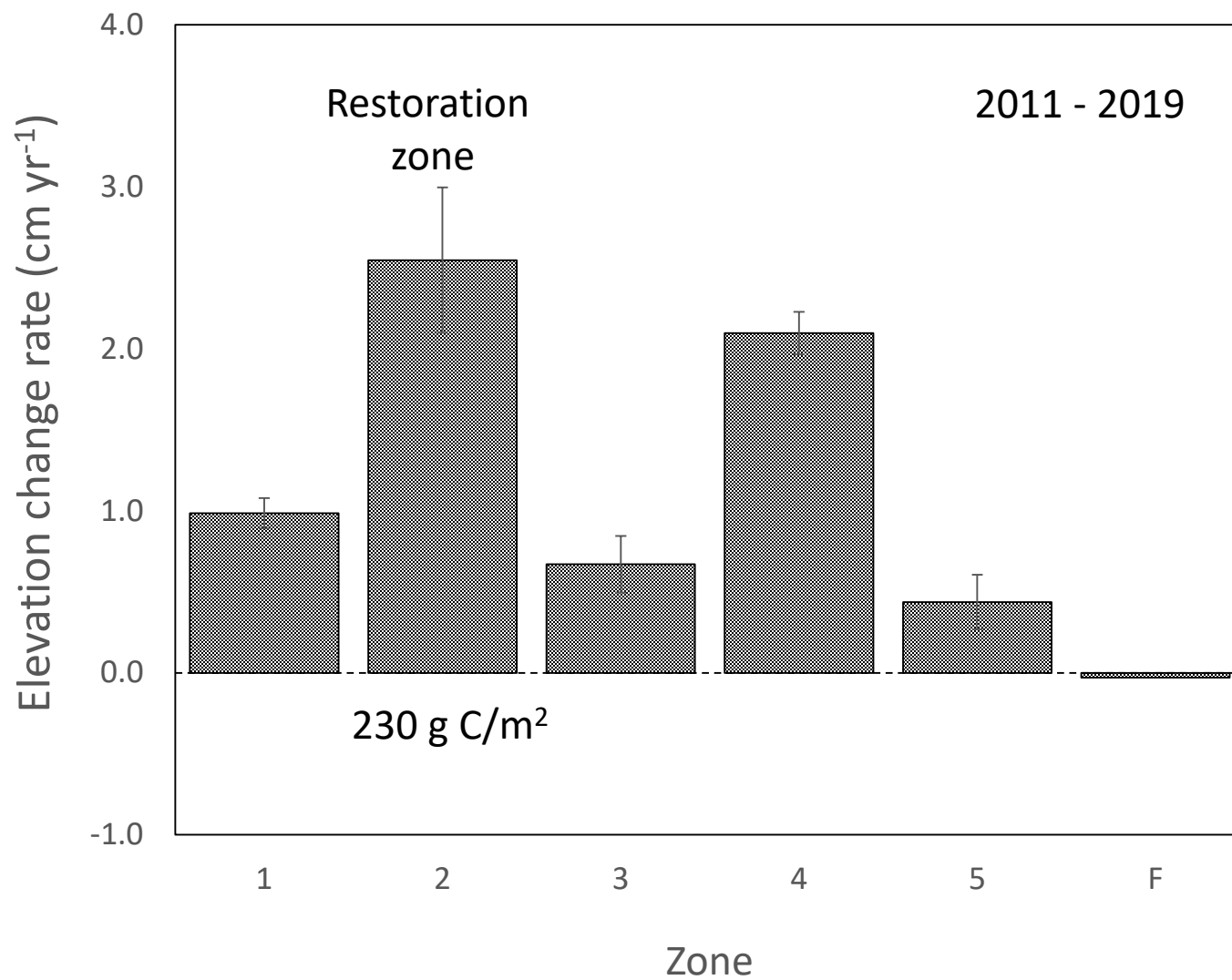












- Expected to accumulate approximately 9,000 tonnes of carbon before it reaches equilibrium with adjacent marshes (20 – 30 years)
- Equivalent to removing approximately 7,000 cars from the roads for one year.
- Valued at \$165,000 using a carbon offset price of \$4 to \$5 per tonne CO<sub>2</sub>

# Is this a **Blue Carbon Revolution?**



1. We've known for a long time that coastal wetlands are productive systems that accumulate organic matter... and carbon.
2. Current market price for carbon is low (social cost is estimated to be \$40 per tonne)
3. Coastal restoration sites are small.
4. Not enough \$\$ to fund restoration, but maybe enough to fund monitoring.
5. However...Carbon sequestration is only one of many ecosystem services that coastal wetland provide.

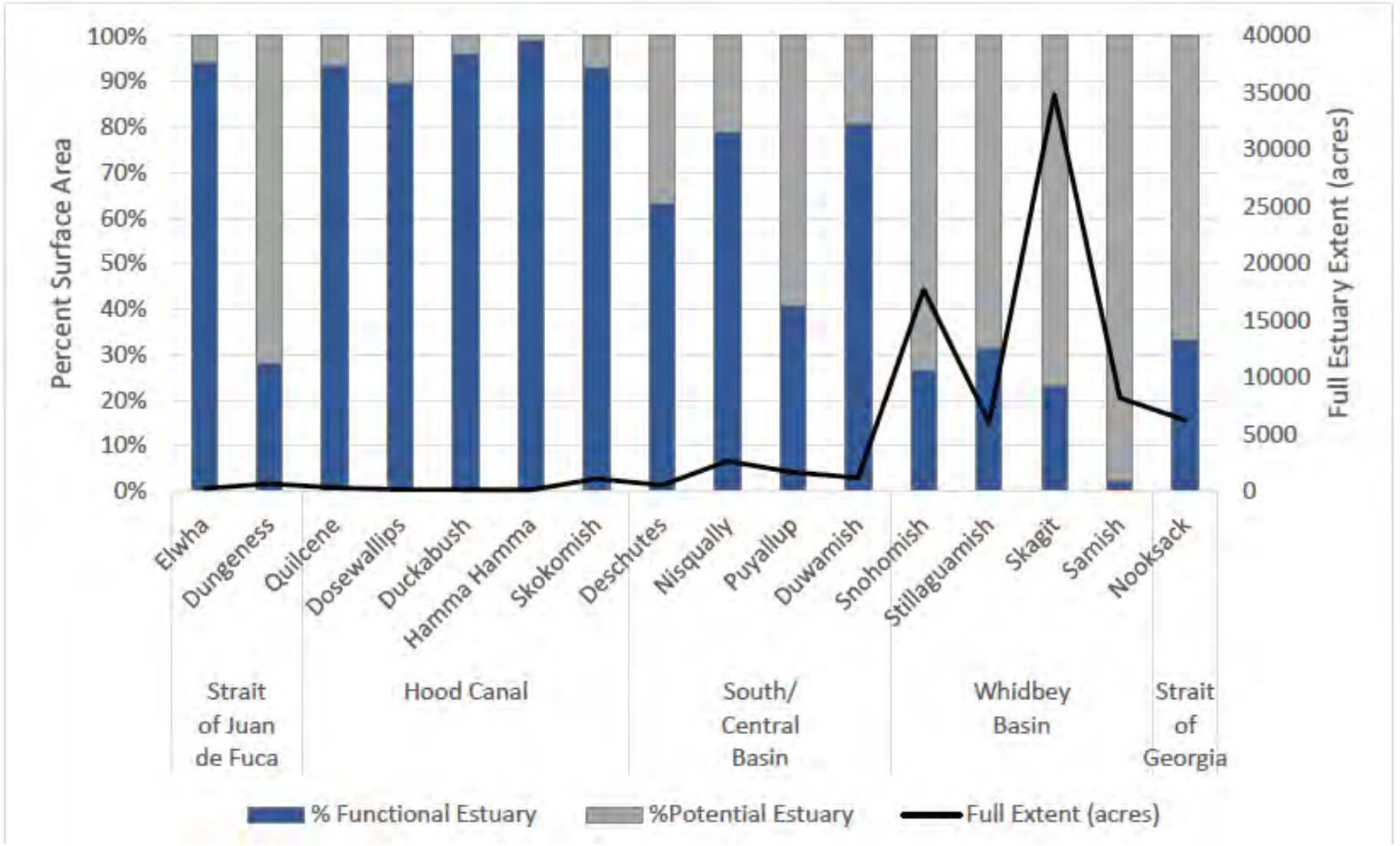


# Puget Sound Valuation



- Up to 61.7 billion dollars/year.
- Shorelines, eelgrass beds and freshwater marshes were most valuable on a per acre basis.
- Scored highest for habitat, recreation and storm surge protection





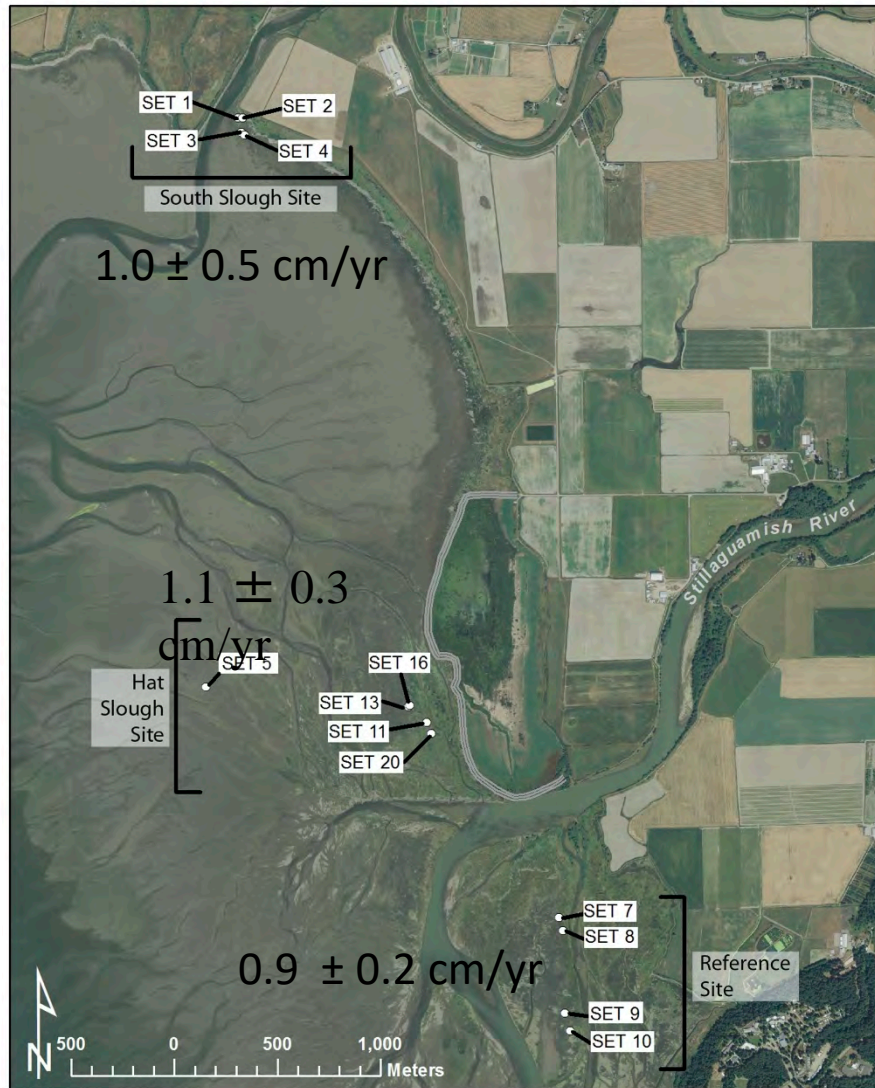
Ramirez, M. 2019. Tracking Estuarine Wetland Restoration in Puget Sound; Reporting on the Puget Sound Estuaries Vital Sign Indicator. Report prepared for the Puget Sound Partnership at the University of Washington, Seattle, WA.









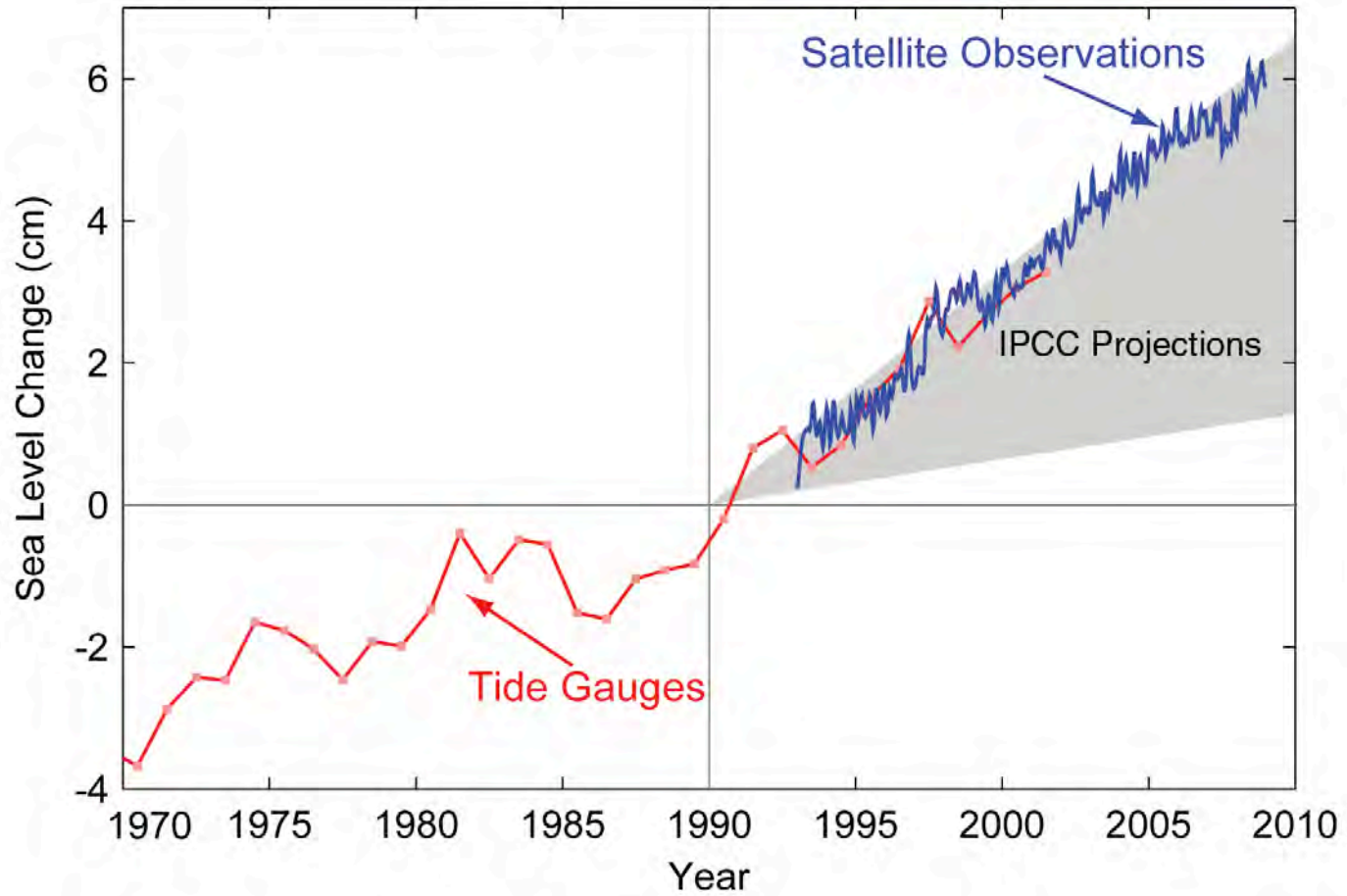




-  Levee (to be removed)
-  SET Locations



Current Rates = 3.1 mm/year



# Running Twice as Fast



- Maximize opportunities for sediment delivery and trapping.
  - Restoration of natural hydrology.
  - Re-introduction of river water.
  - Allow for upslope migration.
  - Bigger is better.







