



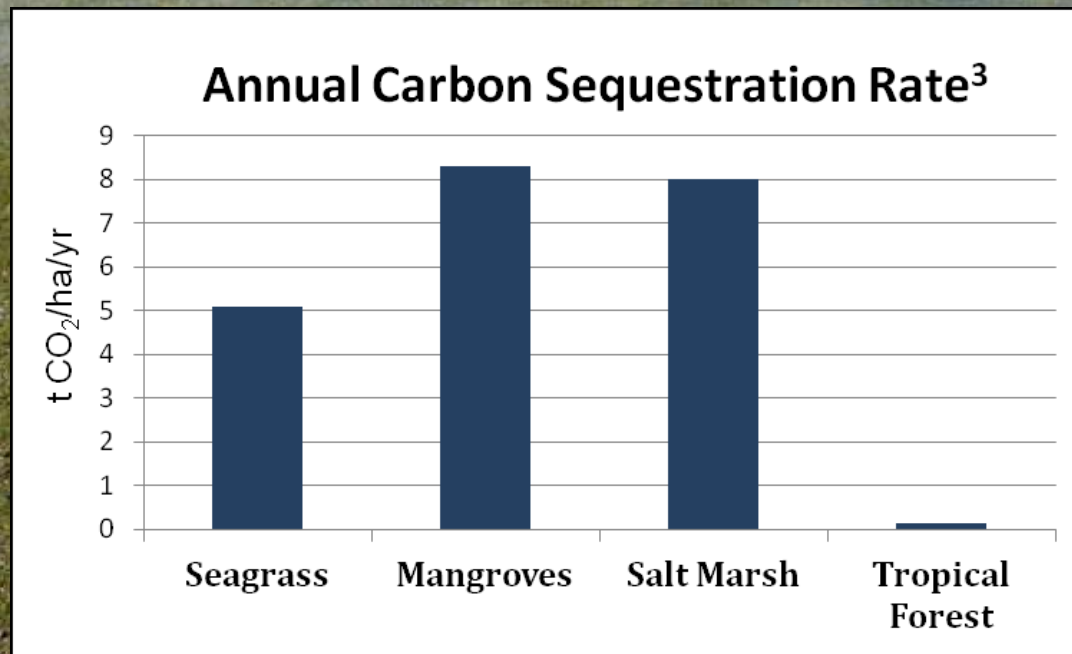
Enhancing blue carbon sequestration and resilience to sea level rise with tidal marsh restoration

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Analissa Merrill, Sage Pollack



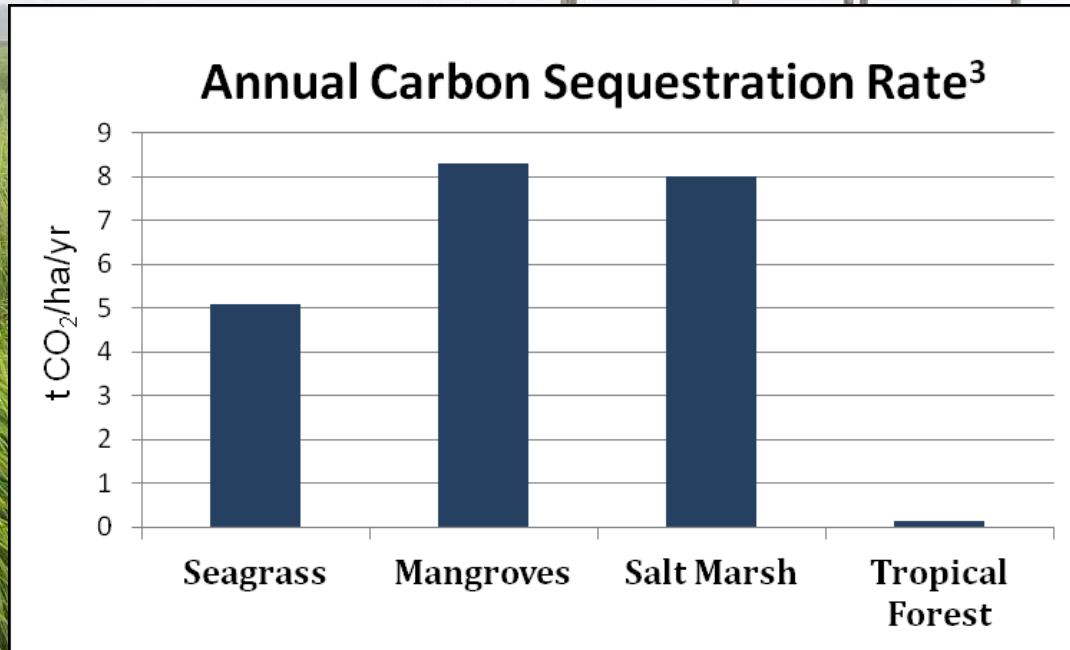
What is Blue Carbon?

“Blue carbon” = Carbon stored, sequestered, or released from tidal wetlands



McLeod et al. 2011

What makes tidal wetlands so good at sequestering carbon?



1. Anaerobic soil
2. Tidal and riverine flooding delivers sediment that buries organic material

Why is Blue Carbon important?

Drained and degraded wetlands release stored carbon

Tidal wetland losses continue to outpace gains in the U.S.

Restoration efforts limited by lack of funding and resources

Blue carbon could help by adding climate mitigation as additional incentive to prioritize wetland restoration/conservation

Voluntary Carbon Market

1 carbon offset = 1 tonne CO₂eq = Average \$4 - 5 in the U.S.

Methodologies

- Provide detailed guidance for particular types of projects
- Methodology for Tidal Wetland and Seagrass Restoration (2015)

Standards

- Projects must be approved by a standard
- Provide requirements for GHG accounting



Stillaguamish estuary

The Nature Conservancy owns 4,122-acre Port Susan Bay Preserve

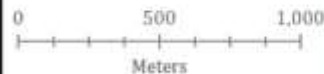
Contains a 150-acre marsh restoration site

We have been monitoring elevation change with SETs since 2011



Marsh Type Location

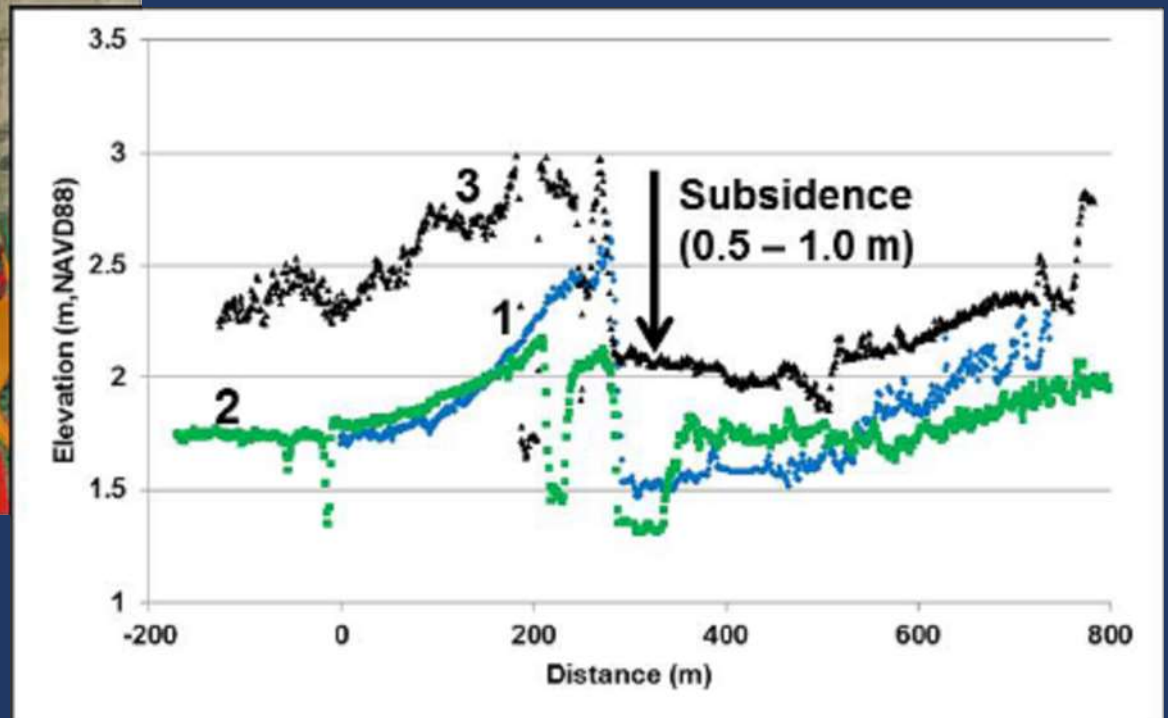
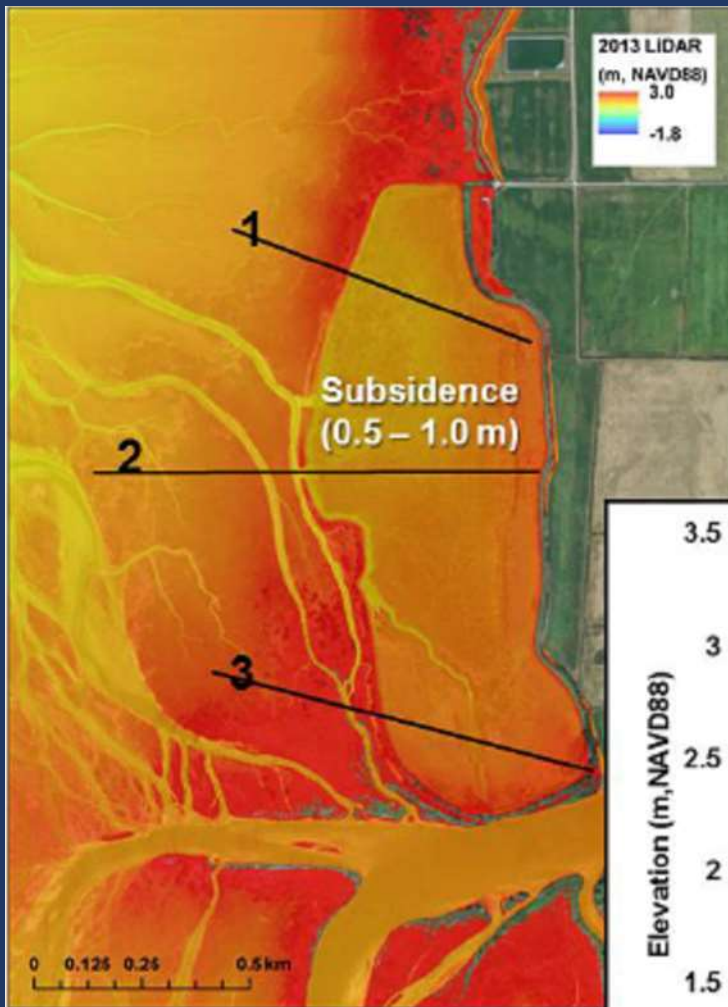
- High Marsh
- Low Marsh
- Tidal Flat



Data Source: John Rybczyk,
Western Washington University



Subsidence prior to restoration



Grossman and Curran (2015)



Approach

1. Obtain carbon stocks partitioned into three pools:
 - Aboveground biomass
 - Belowground biomass
 - Sediment carbon
2. Determine carbon sequestration rates
 - Long-term accretion rate using Pb-210
3. Continue monitoring elevation change at 21 SETs
4. Site characteristics:
 - Elevation, salinity, sediment grain size

Sediment coring



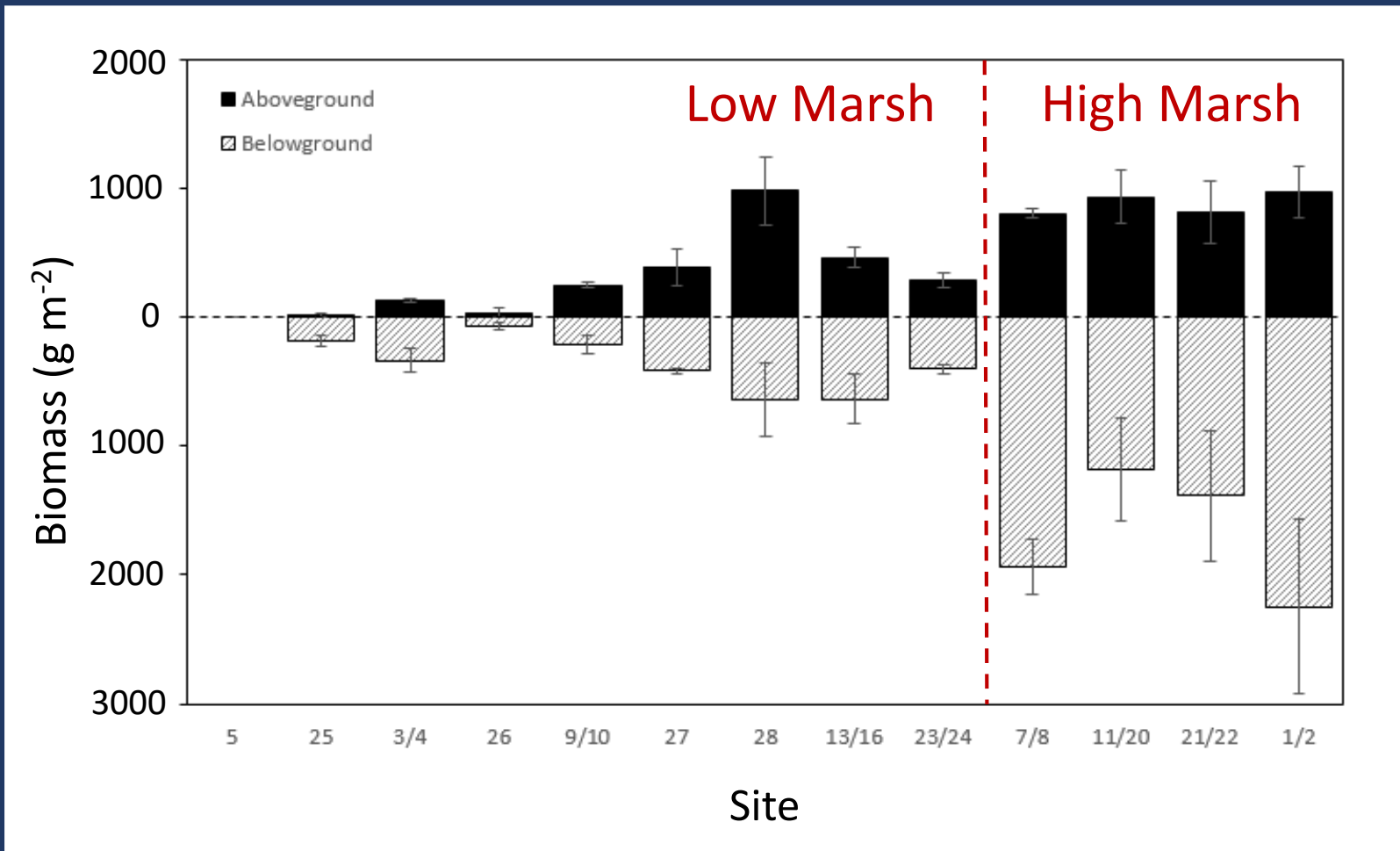
- 13 sites, 2 cores per site
- 75-100 cm depth

Biomass sampling



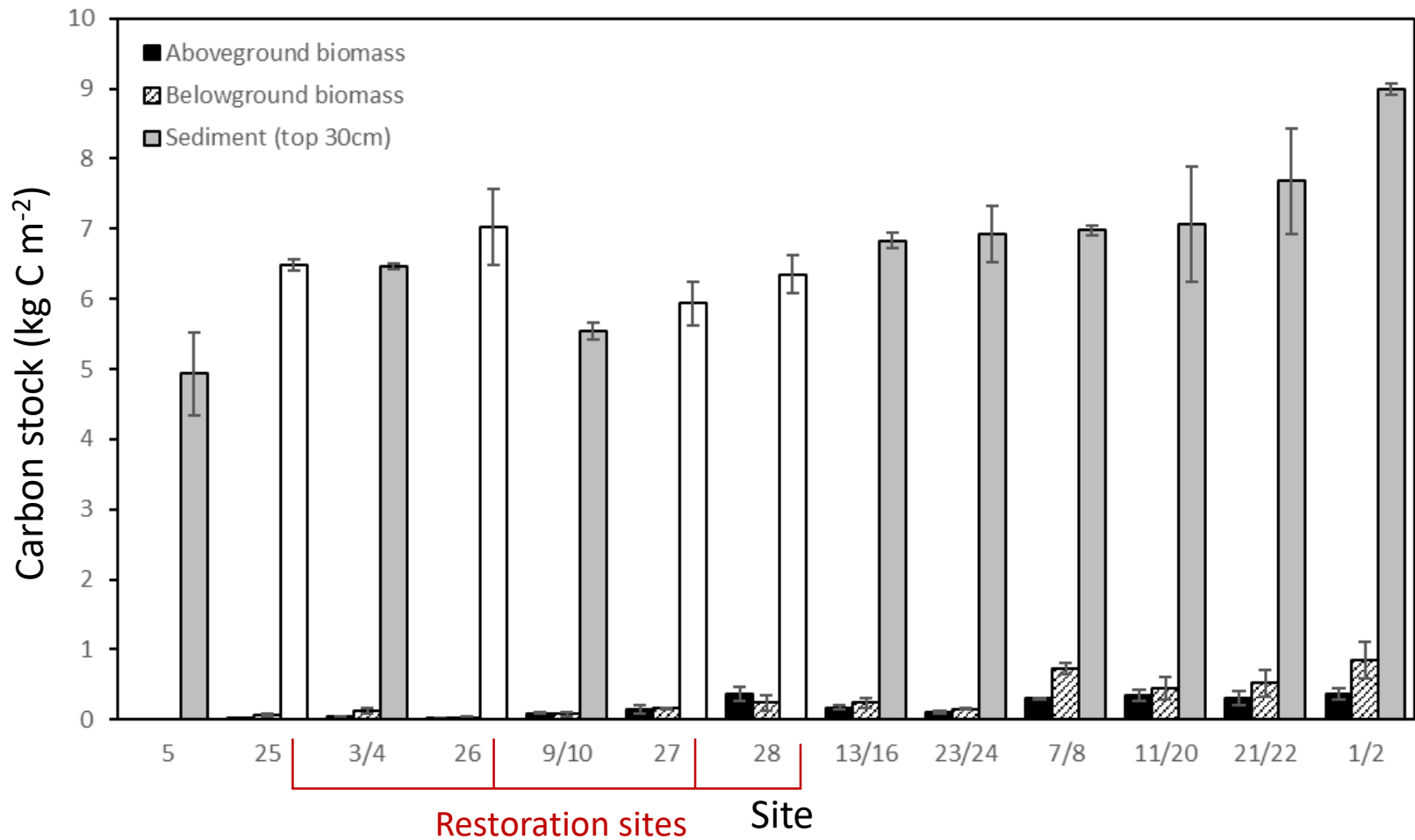
- Above- and belowground
- Separate shoots by species
- Separate roots by live and dead

Biomass Results

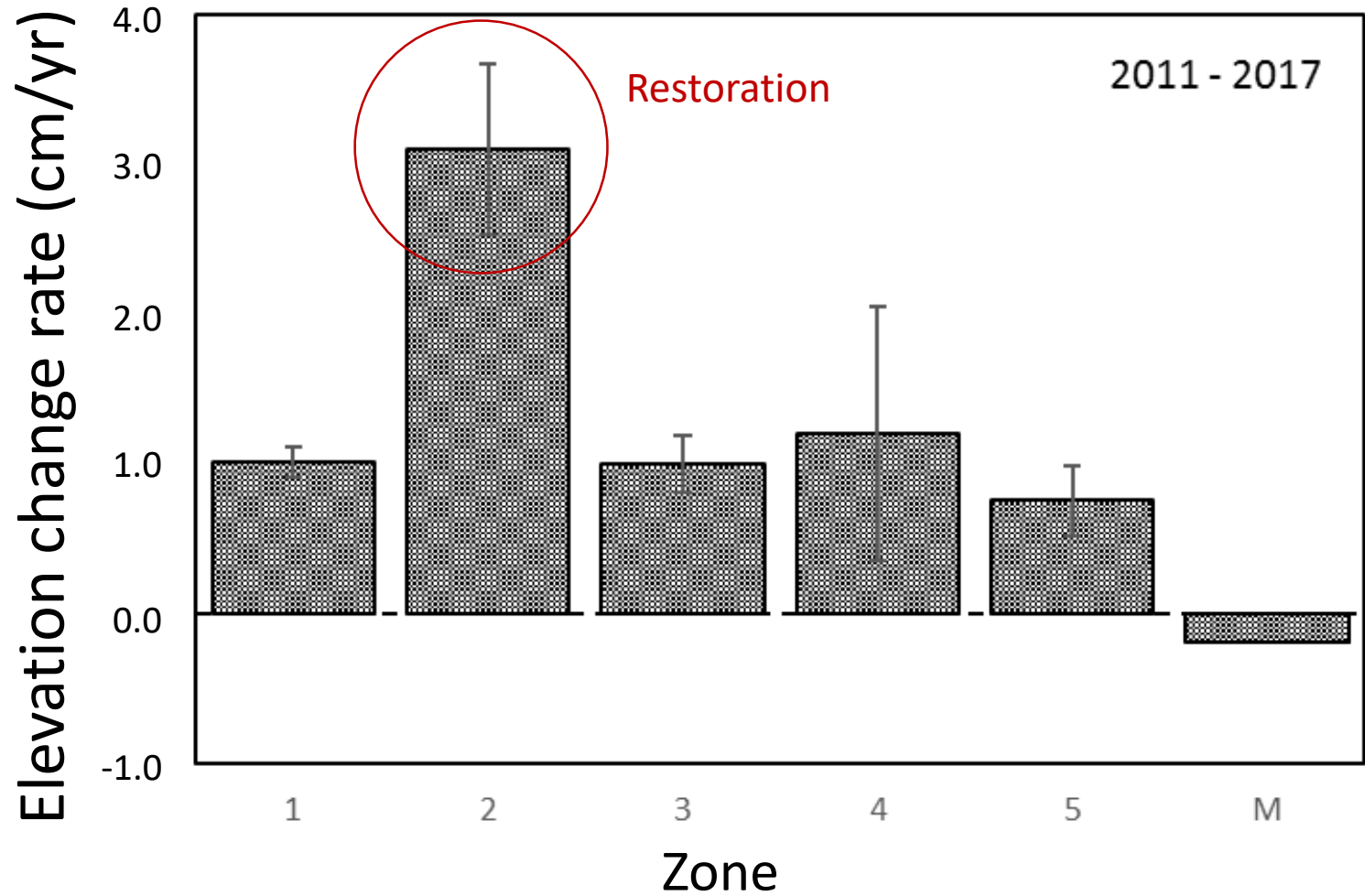


Elevation →

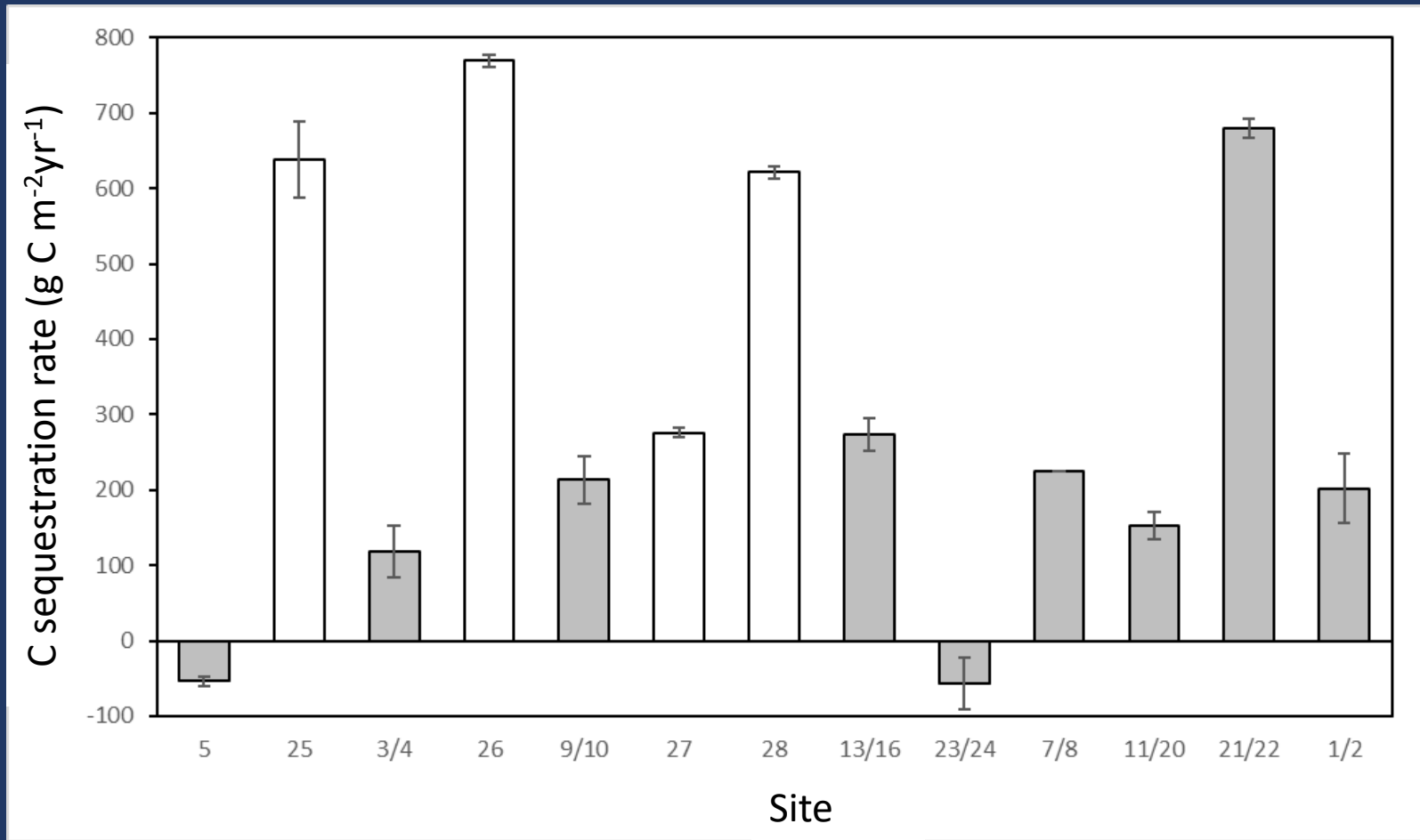
Carbon Stocks



Elevation Change Rates



Carbon Sequestration Rates



Preliminary

Climate Benefit of Marsh Restoration

150-acre site will sequester
5,660 – 13,200 tonnes C.

- Equivalent to taking 4,440 – 8,880 cars off road for one year.

Restoration site worth **\$83,000 – \$207,500** in carbon offsets using national average of \$4-5/Tonne CO₂.

5,000 – 9,000
cars off road

Climate Benefit of Marsh Restoration

150-acre site will sequester

5,660 – 13,200 tonnes CO₂e

• Equivalent to taking **1,100 – 2,600** cars off road

• Equivalent to **100 – 250** acres of forest
• Site worth **\$83,000 – \$207,500** in
carbon offsets using national average of
\$4-5/Tonne CO₂e.

METHANE WARNING

9,000
off road

Insights

1. Sediment carbon stocks much higher than biomass stocks
2. Sediment carbon stocks relatively low in the Pacific Northwest
3. Restoration soil profile resembles reference marshes in just a few years
4. Healthy accretion rates, much higher than current rate of SLR, offering both climate change resilience and mitigation

Acknowledgments

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