Inclusion of Coastal Wetlands into the U.S. Inventory of GHG Emissions & Sinks

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Restore America's Estuaries

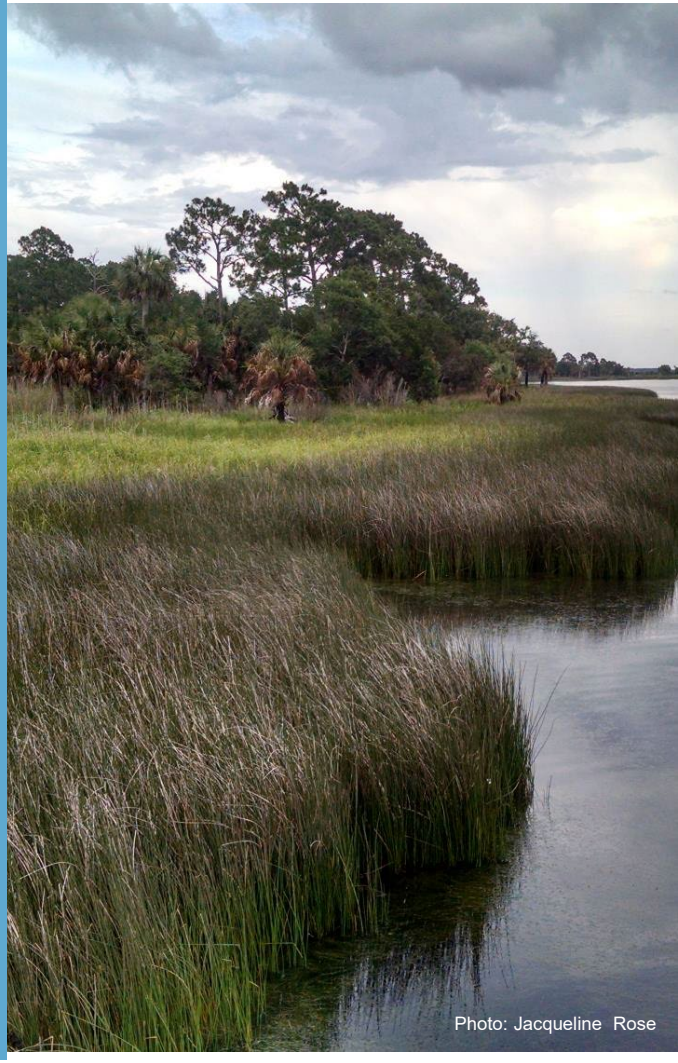
Photo: Jacqueline Rose

Building a Roadmap to Integrating Inland Wetlands into the US GHG Inventory

Dept, Interior, Washington DC, July 16th 2024

silvestrum CLIMATE ASSOCIATES

U.S. Coastal Wetland Carbon Working Group

U.S. National Oceanic and Atmospheric Administration (Coastal Management, Habitat Conservation, International), U.S. Environmental Protection Agency (Climate Change, Wetlands), U.S. Geological Survey, U.S Forestry Service, Environmental Science Associates, Florida International University, Smithsonian Environmental Research Center, Restore America's Estuaries, Colorado State University, Pennsylvania State University, Texas A & M.

"Blue" Carbon Monitoring System

Linking soil and satellite data to reduce uncertainty in coastal wetland carbon burial: a policy-relevant, cross-disciplinary, national-scale approach

Lisamarie Windham-Myers (18 Science PIs; October 2014-17)

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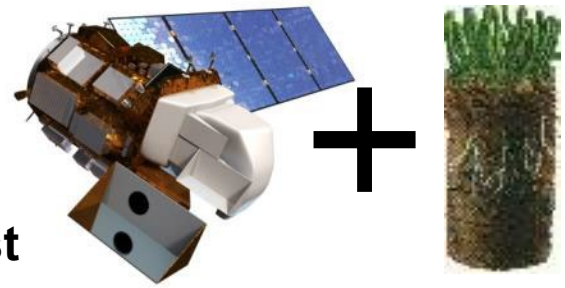
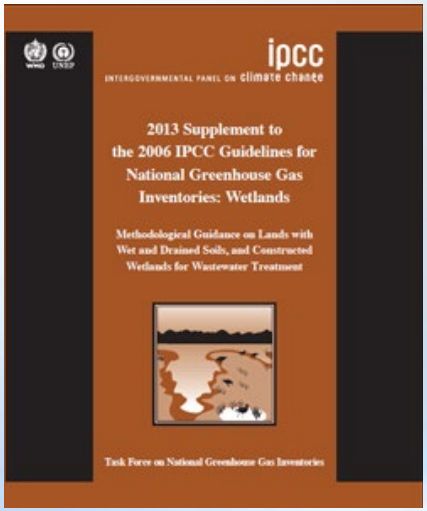




Coastal Wetland Chapters

- 6.8 Coastal Wetlands Remaining Coastal Wetlands
  - Vegetated Coastal Wetlands Remaining Vegetated Coastal Wetlands
  - Vegetated Coastal Wetlands Converted to Unvegetated Open Water Coastal Wetlands
  - Unvegetated Open Water Coastal Wetlands Converted to Vegetated Coastal Wetlands
  - Nitrous Oxide Emissions from Aquaculture in Coastal Wetlands

- 6.9 Lands Converted to Vegetated Coastal Wetlands

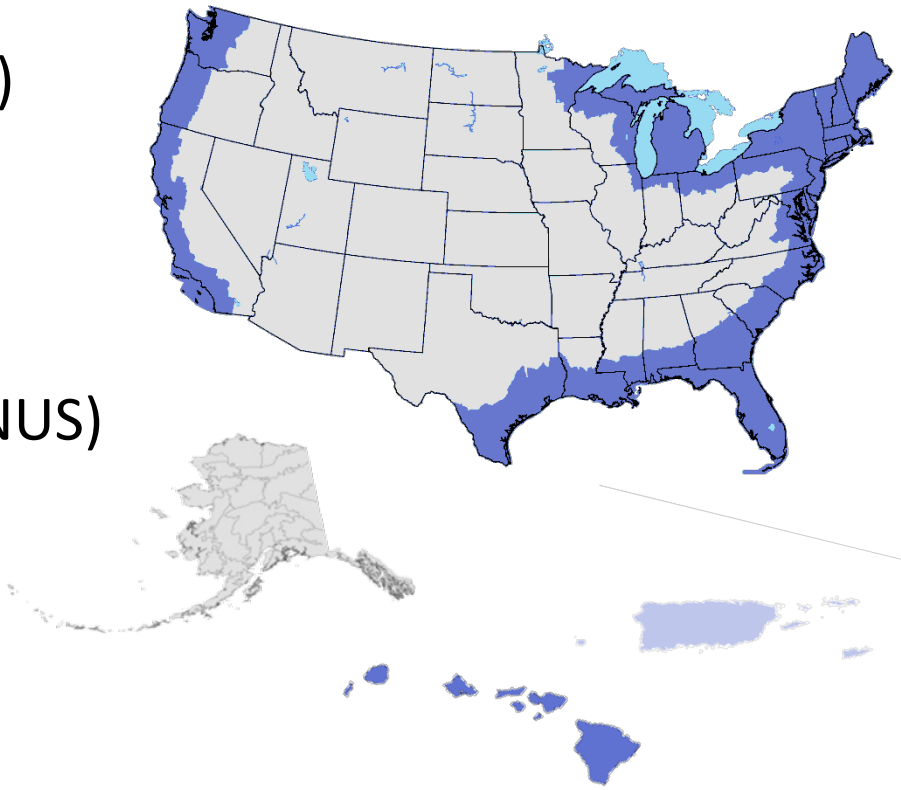
United States: Emissions of Interest

- **Emissions and removals of CO_2 and CH_4 on intact (Ch 6.8) and restoring (Ch 6.9) wetlands.**
- **Drainage**
  - calculated, but not reported beyond other chapters
- **Excavation activities**
  - included in VCM converted to Open Water CW
- **Conversion of wetlands to open water**
  - VCM to Open Water CW
- **Forestry activities on wetland soils**
  - to fall under Forest Lands
- **CH_4 emissions from impounded waters**
  - Insufficient data, not calculated
- **Aquaculture**
  - Chapter 6.8

C-CAP Regional Land Cover and Change

coast.noaa.gov/digitalcoast/data/ccapregional

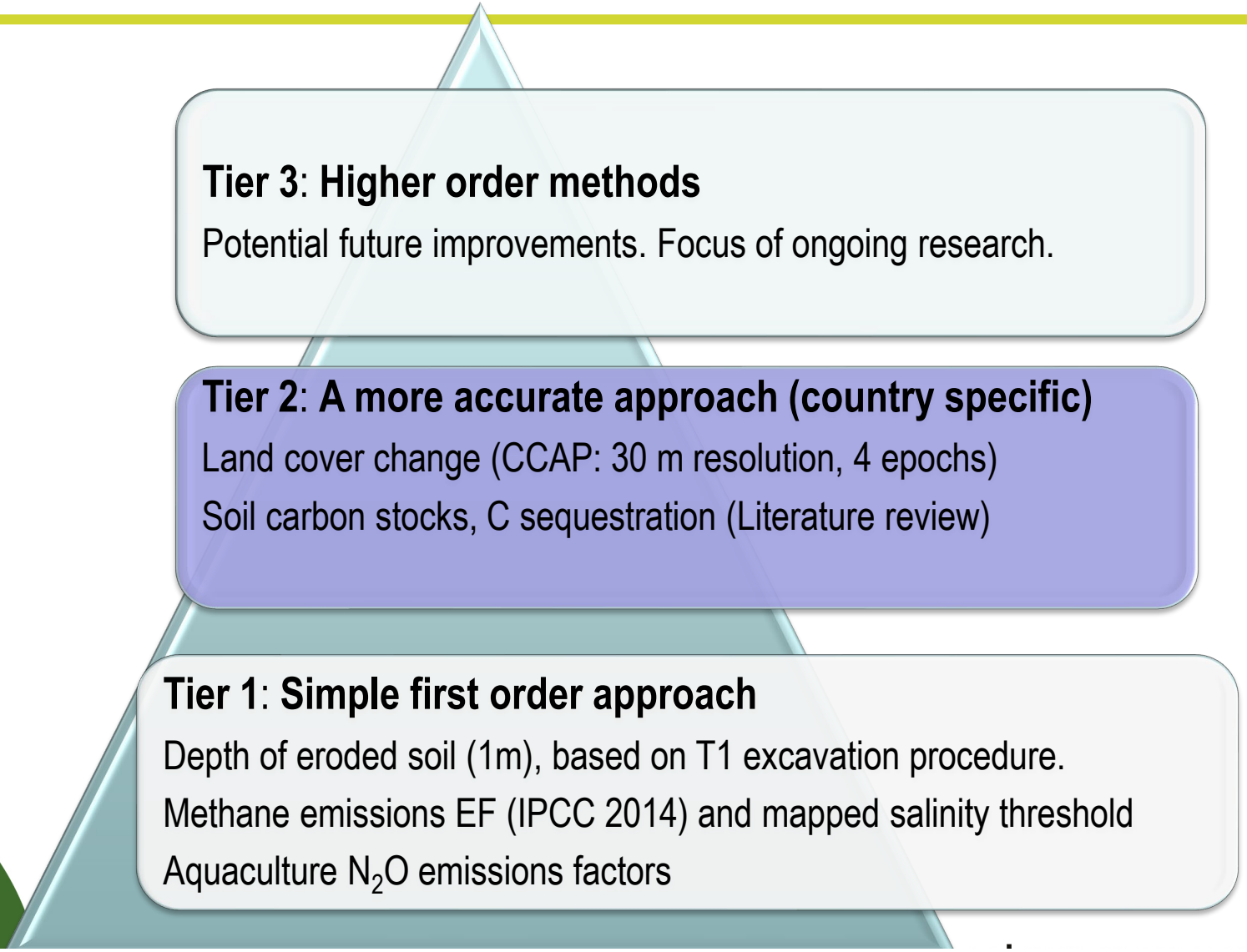
- National Coastal Land Cover Monitoring Program
  - Updated every five years since 1996
- Based on Landsat imagery (30m)
  - Regional to county scale in scope
- Consistent, Accurate Products
  - FGDC National Geospatial Data Asset
- 25% of the contiguous U.S. (CONUS)
  - Coastal expression of the NLCD
- Additional Coastal Detail
  - Focus on wetland categories
  - More dates / longer time series



Methodology

- Evaluation application of Managed Land Proxy.
- Define Coastal Land Area based upon extent of tides and US Land Representation.
- Quantify land use within Coastal Land Area (based upon CCAP)
- Quantify land use change 1990-2022.
- Ascribe a CO_2 and CH_4 emissions factor for land use change based upon lit review of C stocks, stock change and CH_4 flux.
- Estimate N_2O emissions from aquaculture based upon T1 emissions factor and annual survey of aqua. production.
- Calculate annual emissions and removals:
  - Vegetated Coastal Wetlands Remaining Vegetated Coastal Wetlands
  - Vegetated Coastal Wetlands converted to Unvegetated Open Water Coastal Wetlands
  - Unvegetated Open Water Coastal Wetlands Converted to Vegetated Coastal Wetlands
  - Lands Converted to Coastal Wetlands.

U.S. Analysis: Methodological Tiers*

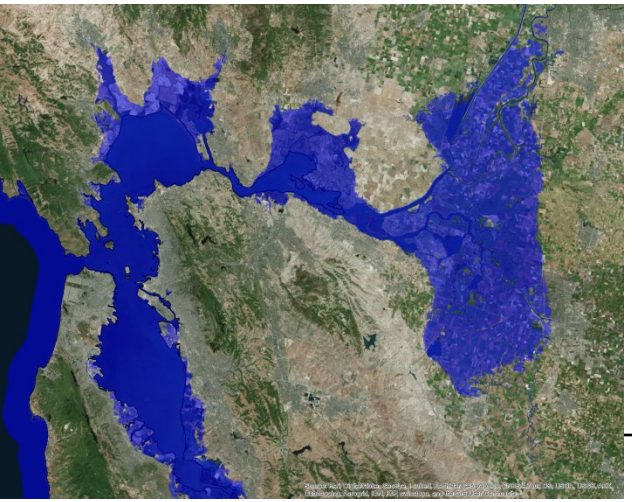


* Different tiers can be applied to different C pools, if all data do not support the highest tier approach

Extent of Coastal Land Area

OFFICE FOR COASTAL MANAGEMENT
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tide data
Lidar surface
C-CAP land cover

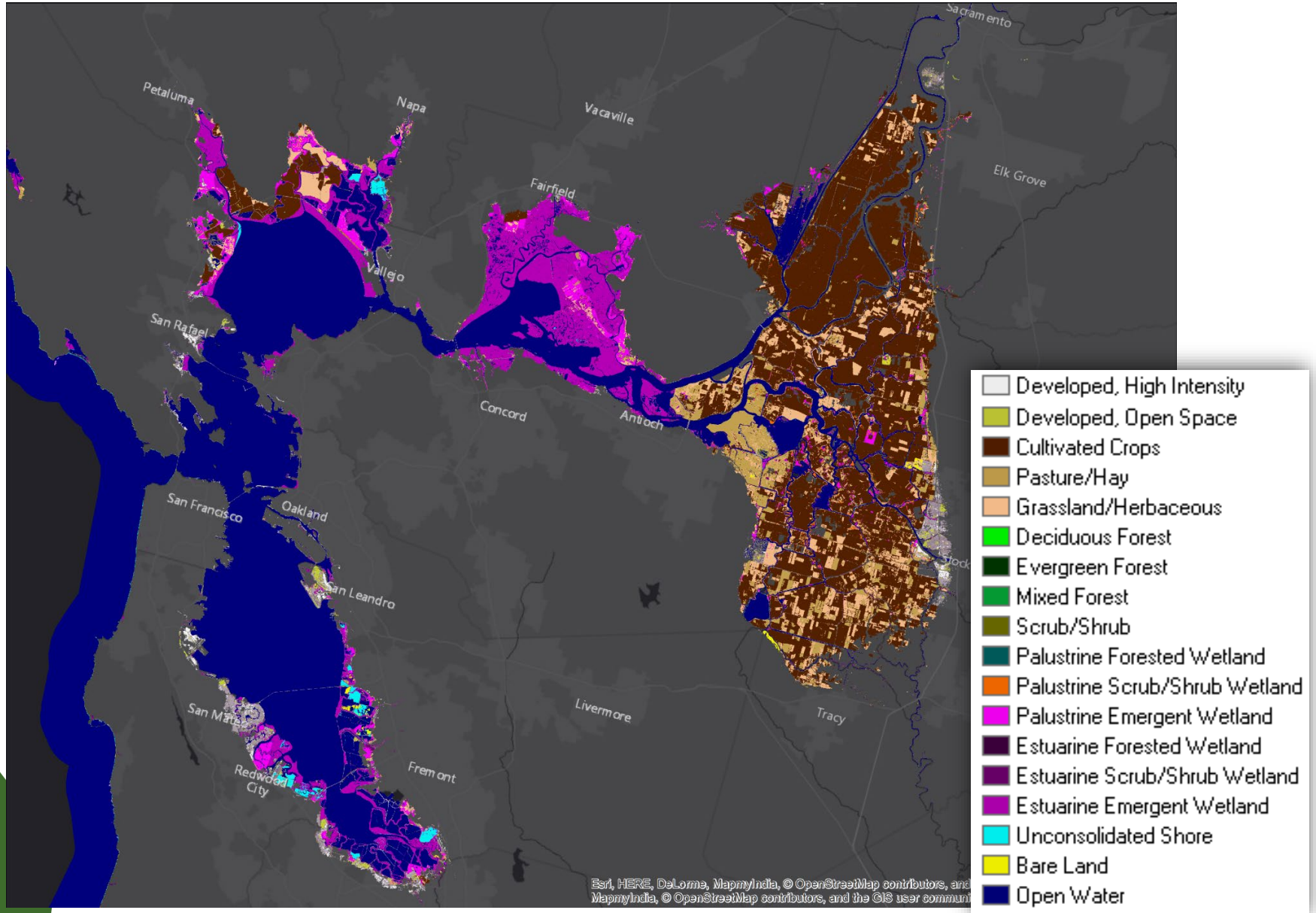


San Francisco Bay – San Joaquin River, CA

New Orleans – Mississippi River, LA

Chesapeake Bay – Blackwater National Wildlife Refuge, MD

San Francisco Estuary, CA



Main Sources of Error

- Small data set for Palustrine wetlands (C stocks, stock change and CH_4).
- Trend changes: extrapolation from 4 CCAP data points 1996, 2001, 2006, 2010. (2003, 2008, 2013, 2015 to be released this year)
- Methane: estuarine / palustrine delineated by 5 ppt salinity. Emissions factors by 18 ppt.
- Soil C erosion losses: based upon Tier 1 assumption of 1 m depth of soil erosion.
- Fate of C: 100% of eroded C returns to atmosphere. (Standard across inventory.)

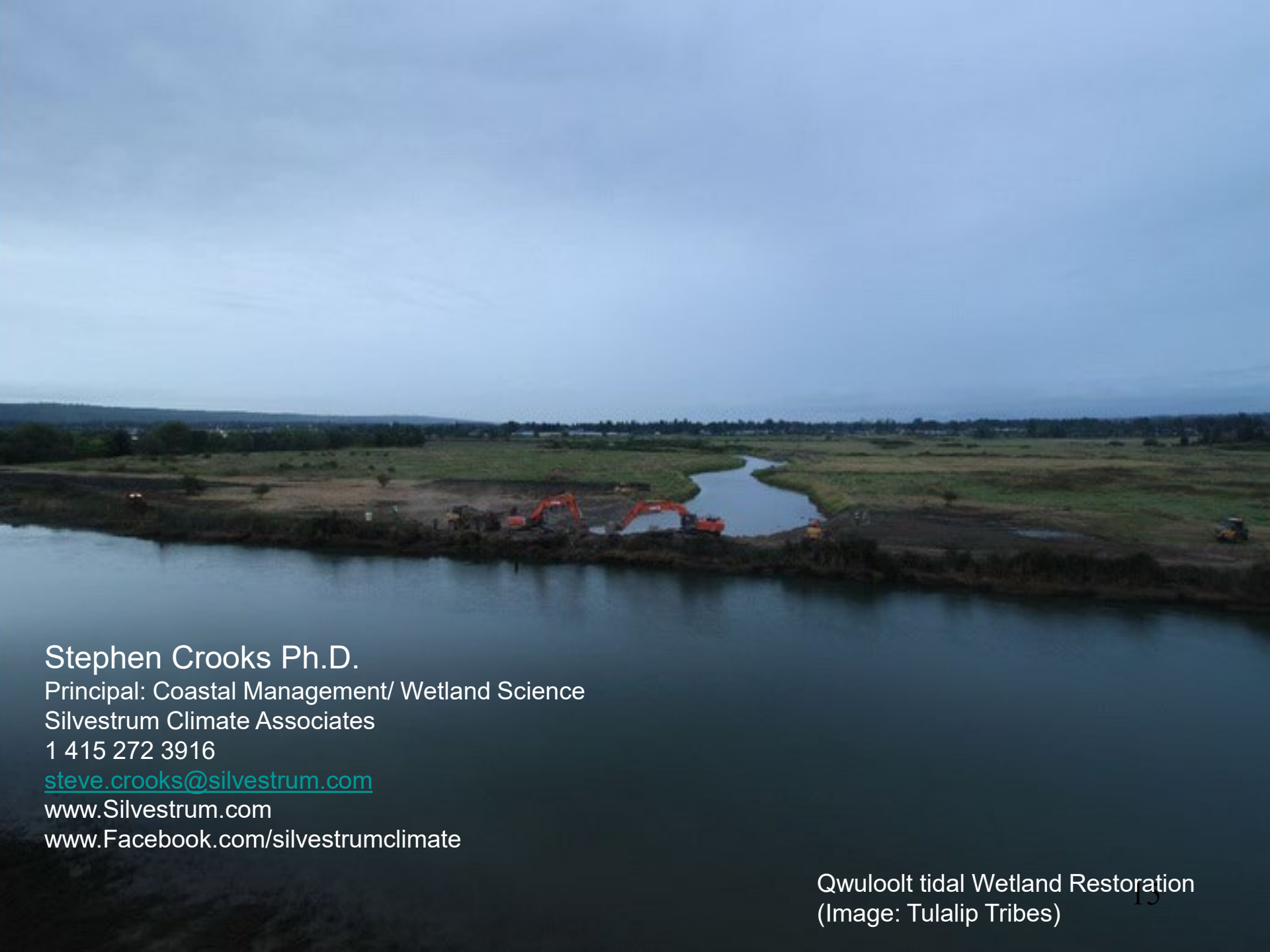
Planned and Potential Improvements

Recent Improvements

- Inclusion of emergent marsh biomass (2019)
- Refined dataset and database on soil carbon stocks, T2 (2019-2020)
- Refined uncertainty analysis (2020)
- Inclusion of CCAP 2015 in trend analysis (2020)
- Refined tidal boundary (2020)

Planned Improvements

- Further integration with NRI and FIA datasets
- Quantification of emissions with wetland loss
- Inclusion of seagrass meadows
- Improved C and CH_4 fluxes from palustrine wetlands
- Improved quantification of fluxes from impounded water
- Impacts of forestry activities on wetland soils



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Qwuloolt tidal Wetland Restoration
(Image: Tulalip Tribes)