Quantifying the Effects of Climate Change & Sea Level Rise on Carbon Accretion of Wetlands in the San Francisco Bay & Delta

Study Period
2021-2025

Funded by:

Delta Science Program
DELTA STEWARDSHIP COUNCIL

BUREAU OF RECLAMATION

About this Project

Wetlands provide many ecological services and climate benefits, for example, carbon capture and sequestration. Tidal and non-tidal wetlands in California estuaries are prime candidates for effective natural carbon solutions due to their high primary productivity and wetland soils that can bury carbon for thousands of years.

Over 95% of the original tidal wetlands in the Sacramento-San Joaquin Delta (Delta) have been lost due to development. Many of the remaining wetlands have been drained and are sinking due to oxidation, compaction, and erosion. These losses of soil reduce the capacity for wetlands to store carbon and combat climate change.

Under a changing environment, it is important to understand how different restored wetlands respond to weather changes, tidal inundation, and salinity today and tomorrow to better predict their resiliency and climate benefits in a future Delta. This project explores current and projected wetland carbon storage capacity in wetland restoration projects throughout the Bay-Delta.

Lead Investigator

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Project Objectives

1. Produce new, continuous carbon dioxide and methane transport measurements at hourly to yearly time scales over a set of brackish/freshwater and tidal/non-tidal wetlands in the Delta
2. Benchmark those greenhouse gas flux measurements with evaluation of soil carbon cores and measurements of lateral carbon fluxes
3. Compare carbon storage and movement between restored tidal wetlands and a set of highly productive, non-tidal wetlands in the Delta
4. Develop simpler and cheaper methods of evaluating the performance of wetlands to sequester carbon
5. Develop models to assess rates of carbon sequestration on larger scales over a range of tidal and non-tidal wetlands
6. Inform managers about the capacity of Bay-Delta restored wetlands to provide climate benefits in the future, including best-management guidance on different types of wetlands to mitigate climate change and adapt to sea level rise

Why This Research Matters

To better understand the ability of wetlands to sequester carbon along the complex Delta, it is important to span the full range of salinity, vegetation type, and age of the studied wetlands. By coupling various measurements with remote sensing of wetland structure, climatology, and greenhouse gas modeling to evaluate the impacts, rates, and efficacy of wetland restoration, this research will help establish workable wetland restoration protocols.

Management Application

Outputs from this project, such as projected greenhouse gas budgets and soil carbon accretion rates of restored wetlands, will be useful for wetland restoration managers to understand the resilience of restored wetlands in the Delta and their capacity to provide climate benefits in the future.

Connections to the 2017-2021 Science Action Agenda

1: Invest in Assessing the Human Dimensions of Natural Resource Management

2: Capitalize on Existing Data Through Increasing Science Synthesis

3: Develop Tools and Methods to Support and Evaluate Habitat Restoration