Delta Independent Science Board

Scientific Challenges with Managing Subsided Lands in the Sacramento-San Joaquin Delta

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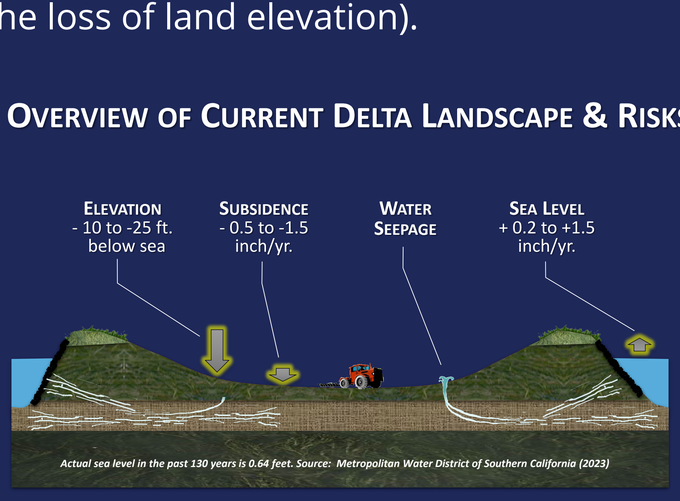
What is the problem?

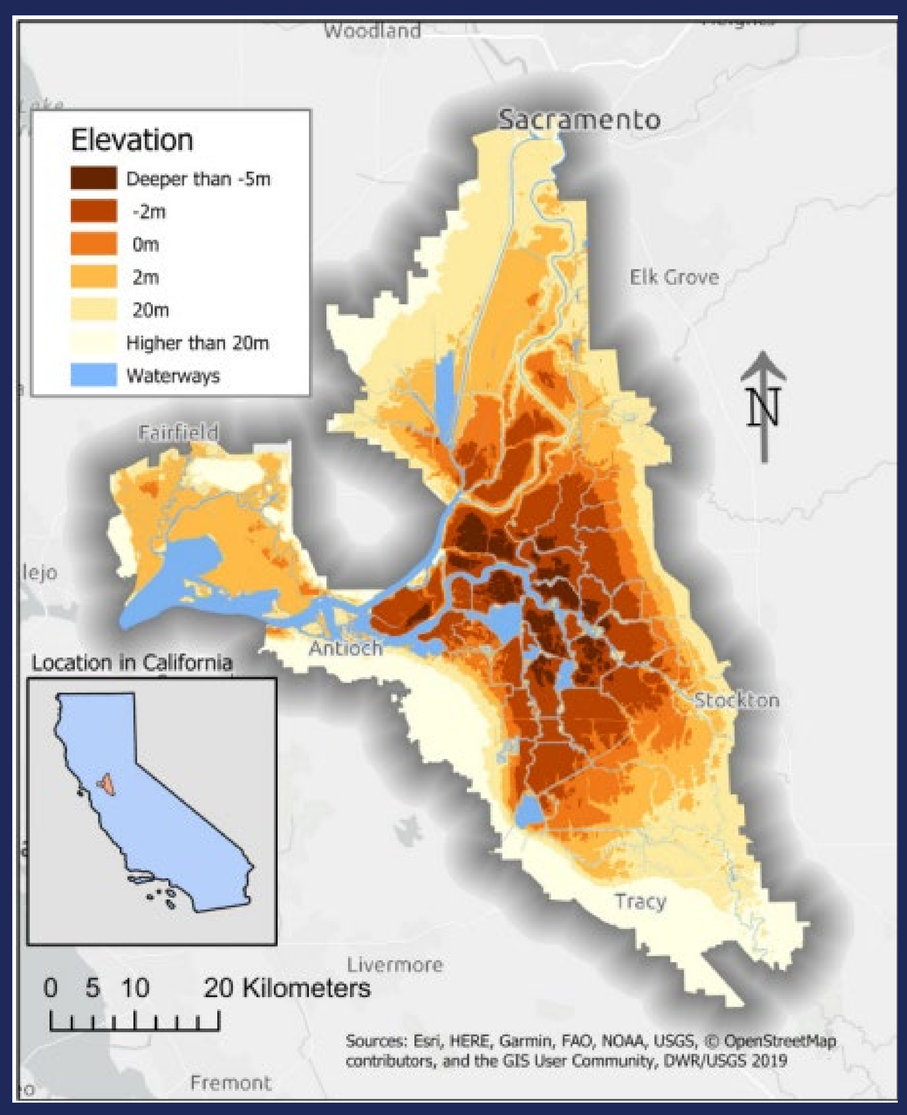
The Sacramento-San Joaquin Delta in California was once the largest freshwater estuarine wetland on the west coast of North America. Beginning in the 1880's, agricultural interests started to drain the marsh islands and protect them with levees. The reclaimed islands yielded some of the most productive farmland in California. However, the drainage of land in the Delta has caused extensive oxidation of peat soils, which causes subsidence (the loss of land elevation).

Overview of Current Delta Landscape & Risks



Subsided lands continue to cause significant challenges, such as:

- increasing costs to drain soils
- declining arability for agricultural production
- water quality degradation
- vulnerability to levee failure and flooding
- substantial emissions of greenhouse gases in areas where peat soils remain



This map of elevations in the Sacramento-San Joaquin Delta shows the areas where subsidence has occurred. An elevation of 0m indicates sea level, while negative elevations are below sea level.

What are we doing?

The Delta Independent Science Board (ISB), which is legislatively mandated to provide scientific oversight of adaptive management, is working to synthesize and evaluate the state of science related to managing subsided lands and provide recommendations to address knowledge gaps. Recently, the Delta ISB hosted a hybrid workshop where over 100 attendees participated to address science needs related to:

- Efforts to slow or reverse subsidence
- The potential to reduce GHG emissions from the Delta

This poster describes preliminary findings related to what has been learned and the scientific challenges for managing subsided lands. A draft report will be released later this year with recommendations on how to address these scientific challenges or uncertainties. If interested in receiving a copy and providing feedback, please email us!

Agriculture to wetland conversion
Restoring Delta ag land to wetlands can help reverse subsidence. Establishing a wetland can cost the farmer more than $10,000/acre because of regulation costs and taking land out of production. Establishing temporary wetlands known as "walking wetlands" that may be moved to different locations on the landscape is currently a strategy used to minimize costs.

What did we learn from the workshop?	What are the challenges?
Subsidence Management and Research	
Active experiments in the Delta to manage subsidence include: • reversing subsidence by wetland restoration and rice cultivation • developing floating tule wetlands in deeply subsided islands • designing cost beneficial land-use mosaics for agriculture While the primary objective of these experiments has been to arrest and even reverse subsidence, co-benefits include habitat restoration and carbon sequestration.	Research on managing subsided lands in the Delta is limited. Although there is interaction between participants in these experiments, there is no formal program to coordinate funding priorities nor to assess and communicate outcomes.
Agricultural Practice in the Delta	
Paludiculture remains the most attractive agricultural practice to minimize and even reverse subsidence. Rice production is currently the best suited and most economical paludiculture option.	The up-front cost of conversion to rice production is a big perceived risk to farmers. More data collection and modeling of these costs and benefits needs to be supported.
Greenhouse Gas (GHG) Emissions	
Reducing GHG production and enhancing carbon sequestration is potentially a major co-benefit of arresting and reversing subsidence	Research is needed on approaches to enhance carbon sequestration and minimize GHG production for the long term.
Carbon Credits	
Conversion of subsided land in the Delta to either wetlands or rice cultivation to reverse subsidence has demonstrated the feasibility of sequestering significant amounts of carbon, a co-benefit. Experiments in the Central Delta indicate that these land conversions have provided a net sequestration of 10 tons/acre/year of CO_2e. Sequestration can provide an economic benefit when certified by entities such as the American Carbon Registry.	Available protocols that award carbon credits in exchange for a 40-year commitment to growing rice is too small an incentive for private landowners given that a typical lease contract is 5 years.