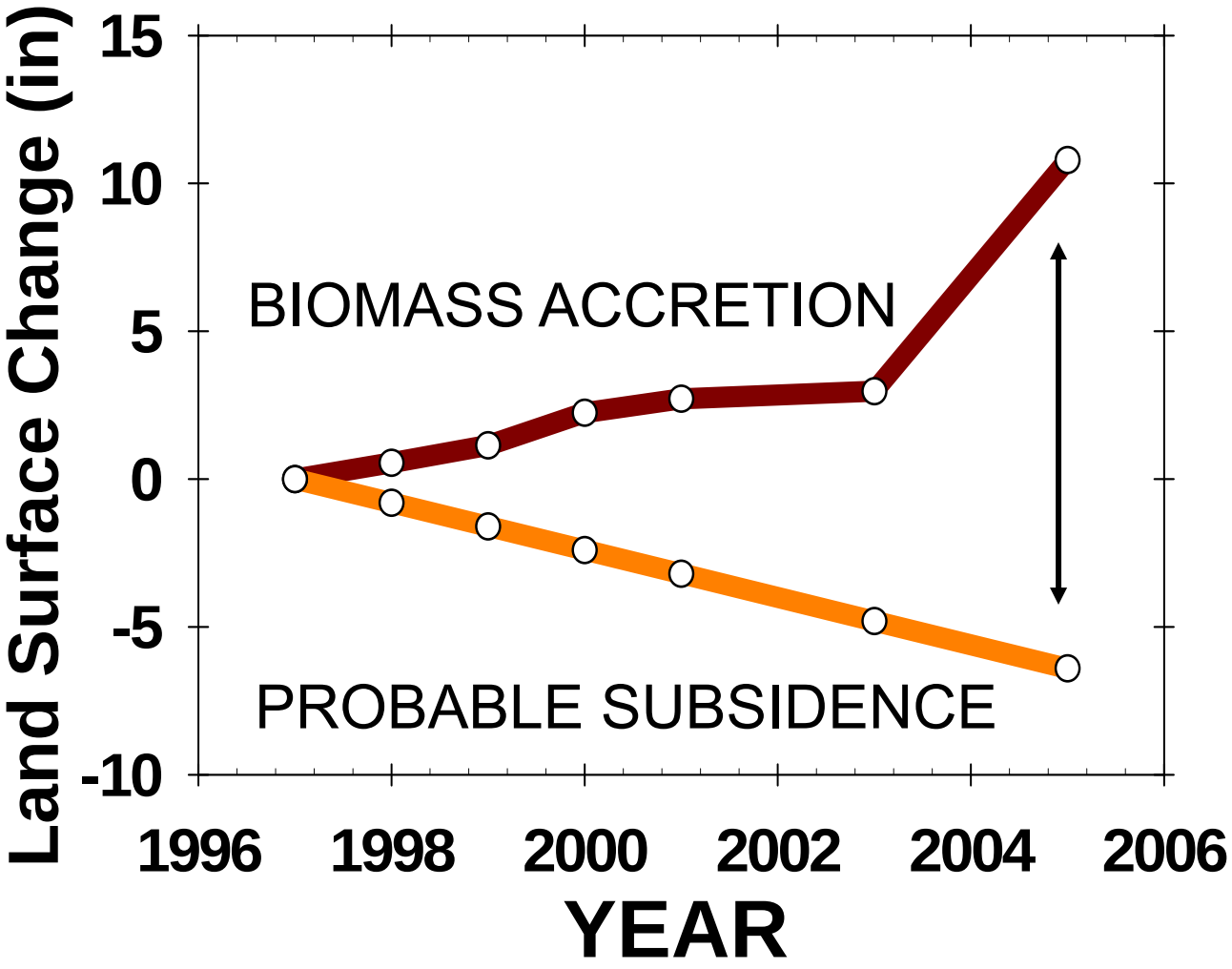
An Introduction to:

CARBON CAPTURE FARMING

USGS R&D Project

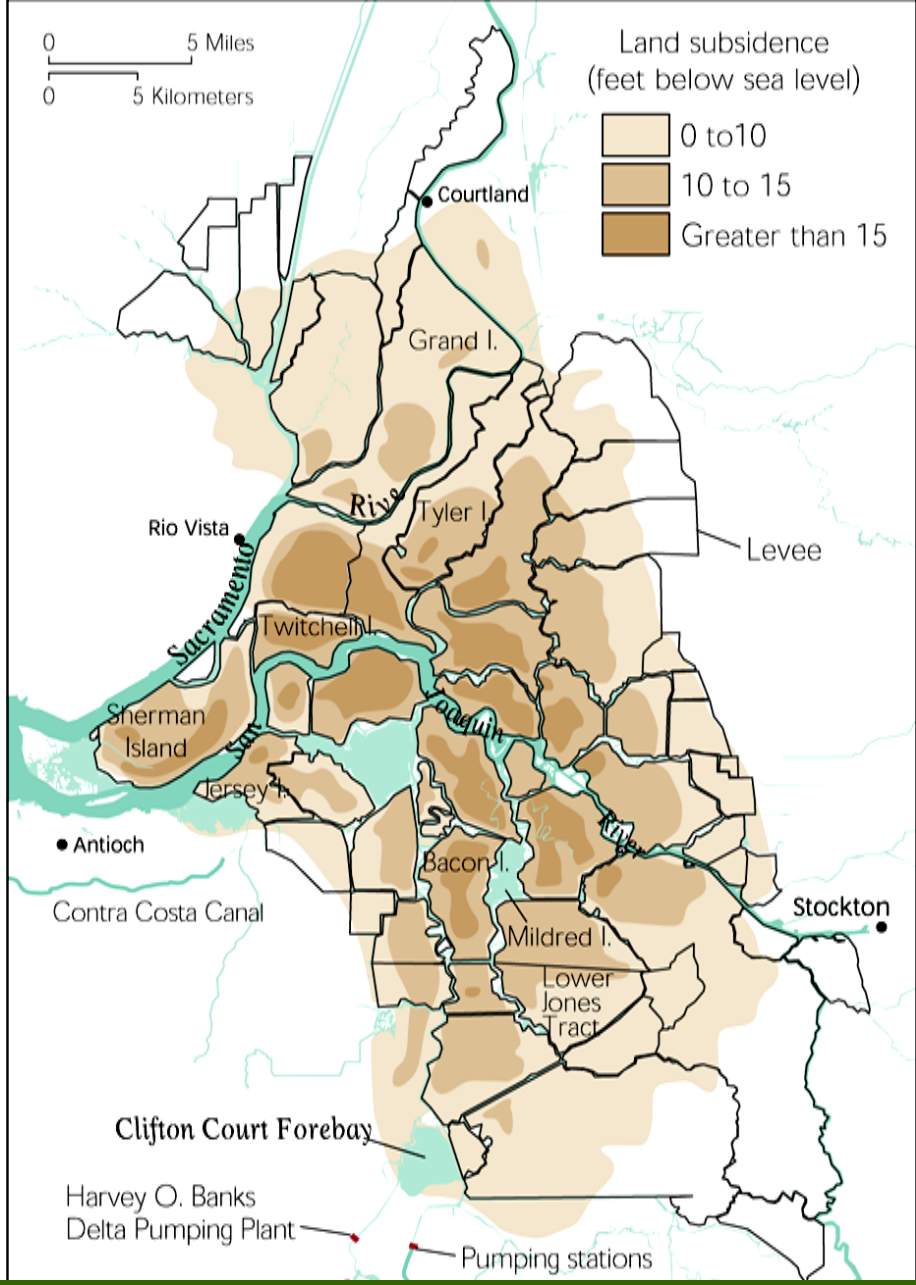
in collaboration with CA DWR and many other state partners

Punch Line


Land Surface Change (in)
15
10
5
0
-5
-10
BIOMASS ACCRETION
PROBABLE SUBSIDENCE
1996
1998
2000
2002
2004
2006
YEAR

20+ Years of Research on Delta Subsidence

- Historic compaction
- Microbial oxidation of peat soils dominant cause
- Peat islands subsided up to 25 feet below sea level
- Ongoing subsidence of a few inches per year



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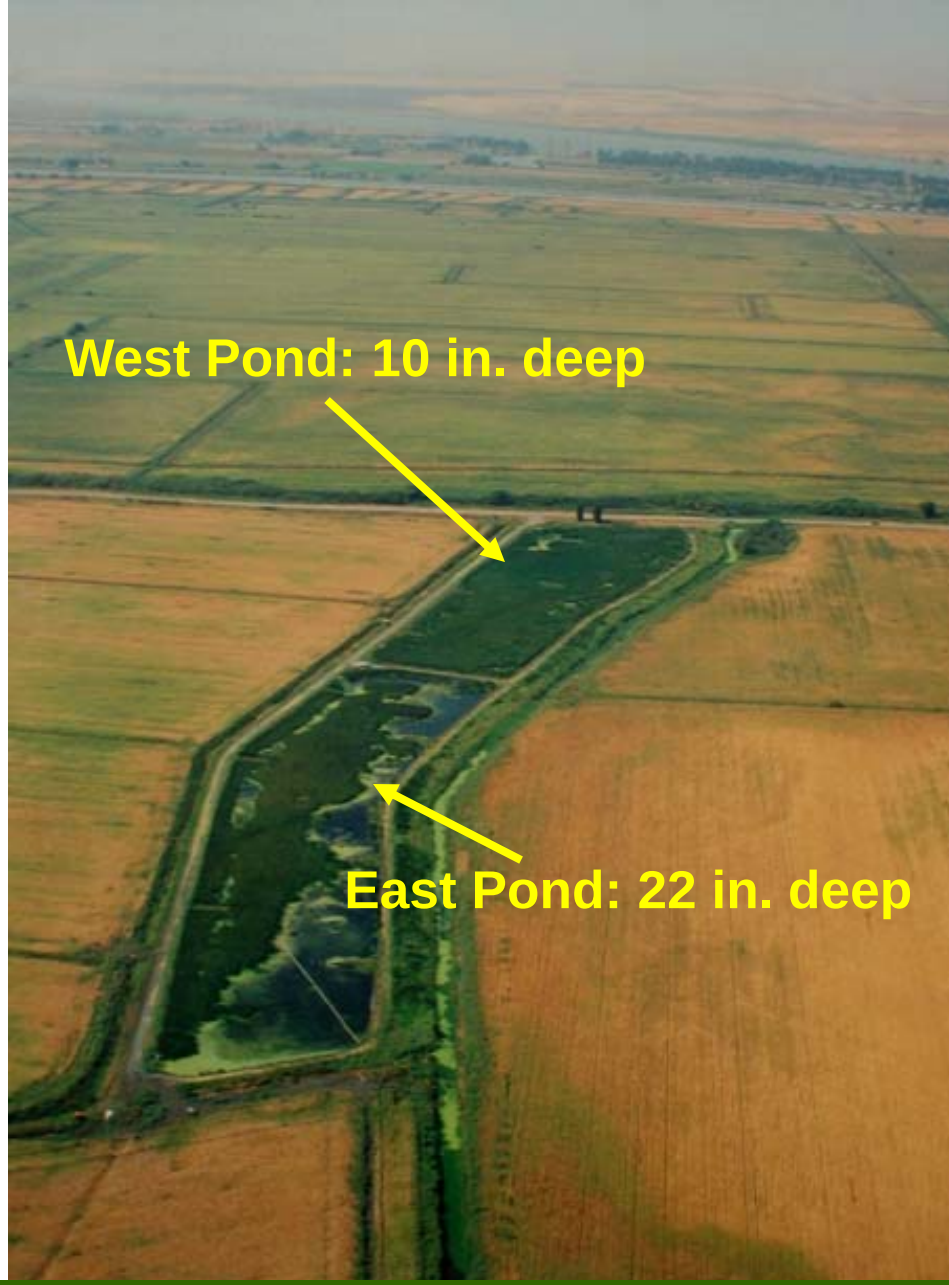
Continuous Flooding Found to Stop Microbial Oxidation

1997-present Demonstration Pond Experiment

- Used existing water management infrastructure—siphons and island drains
- Created two 7½ acre wetlands
- Maintained constant water levels



Leveled Field Site

Flooded and Planted With Tules and Cattails

Site Studies...

Gas Fluxes

Biomass accretion

Site Studies……

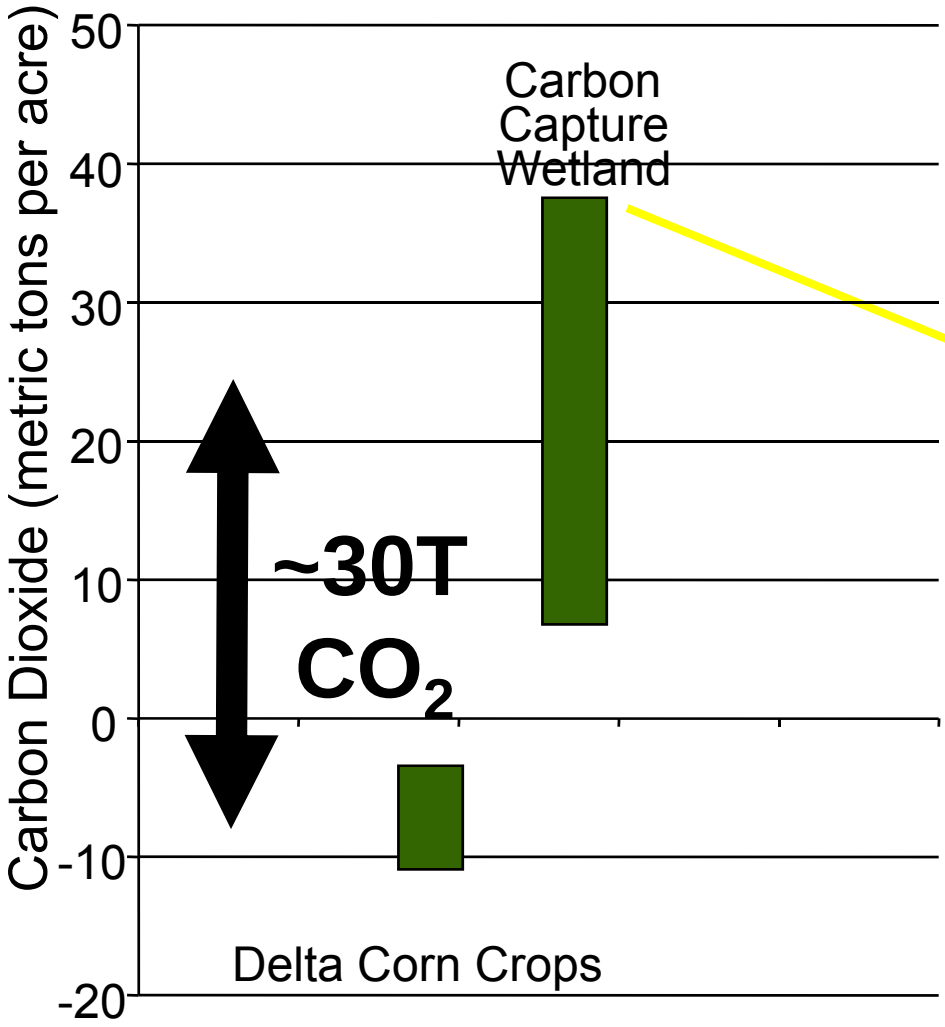
Water Budgets

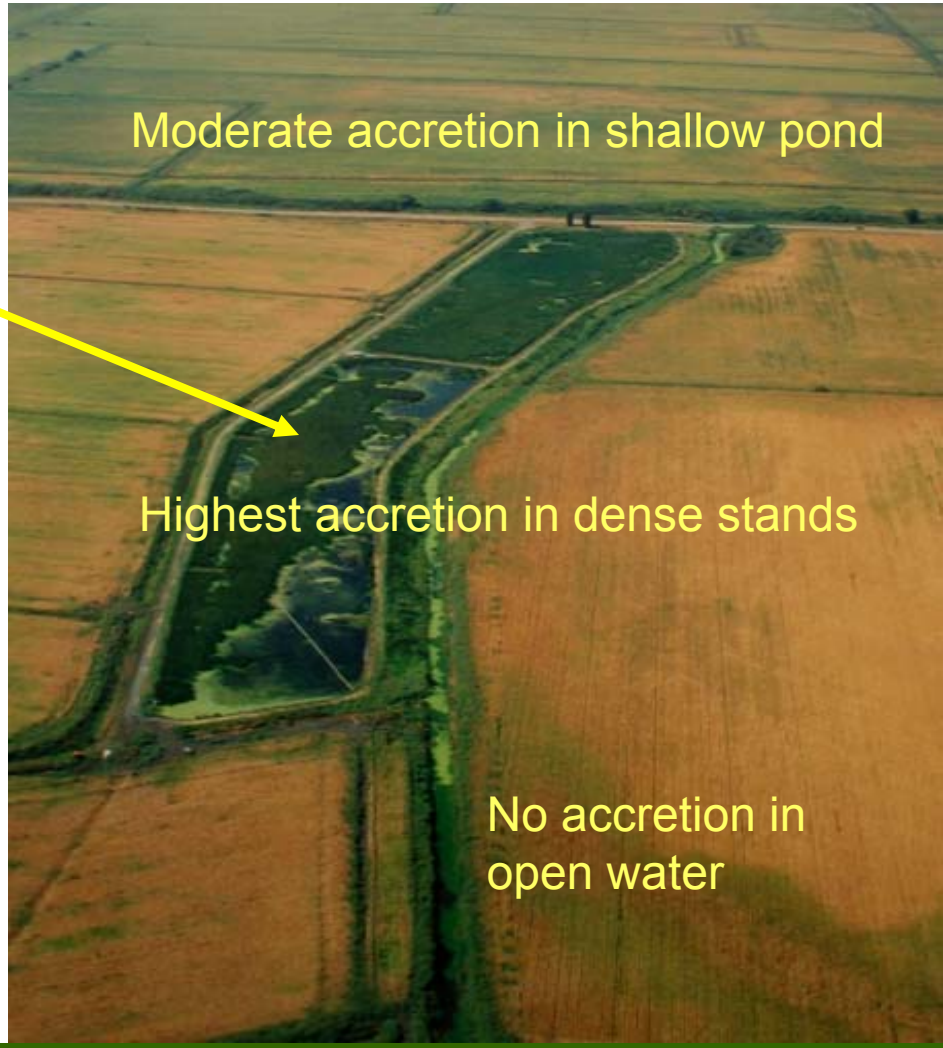
Wetland Management and Dissolved Organic Carbon Characteristics

Decomposition

ET Measurements

Net CO_2 Sequestered Varied Spatially





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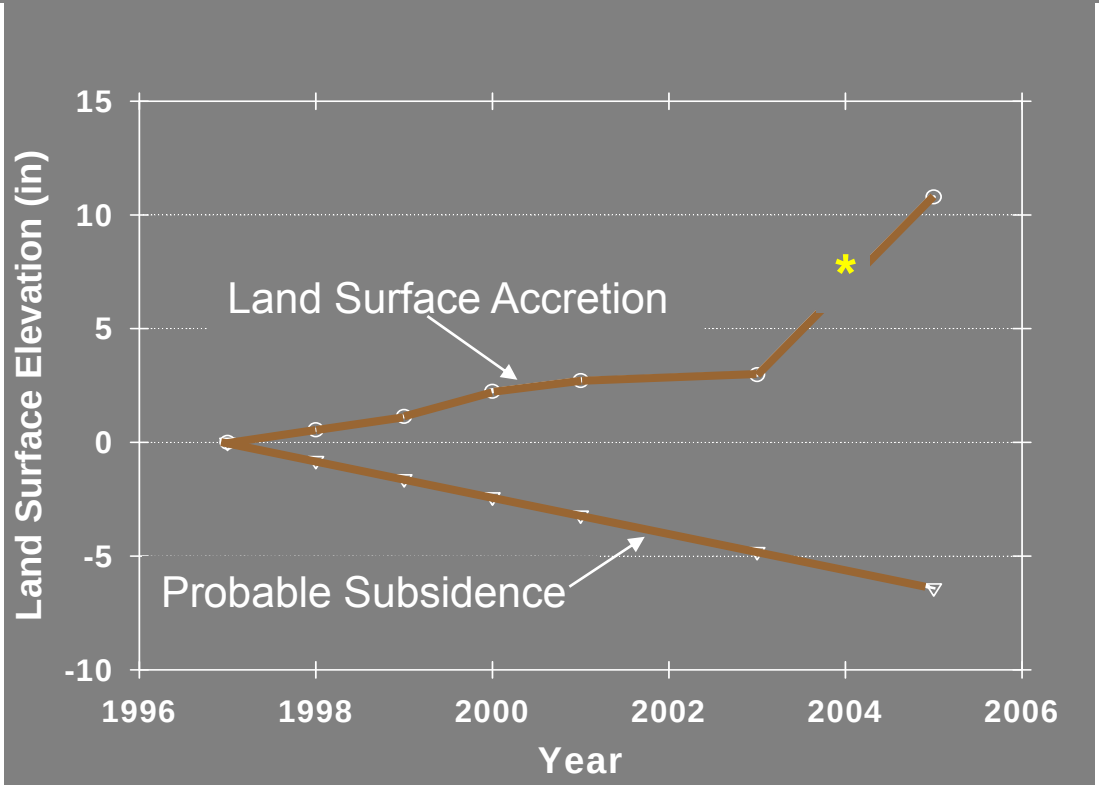
And temporally....

East Wetland, Land Surface Elevation



17.2 inches / 8 years = 2.15 inches/year

*** 2003 - 2005: 3.9 inches/year**

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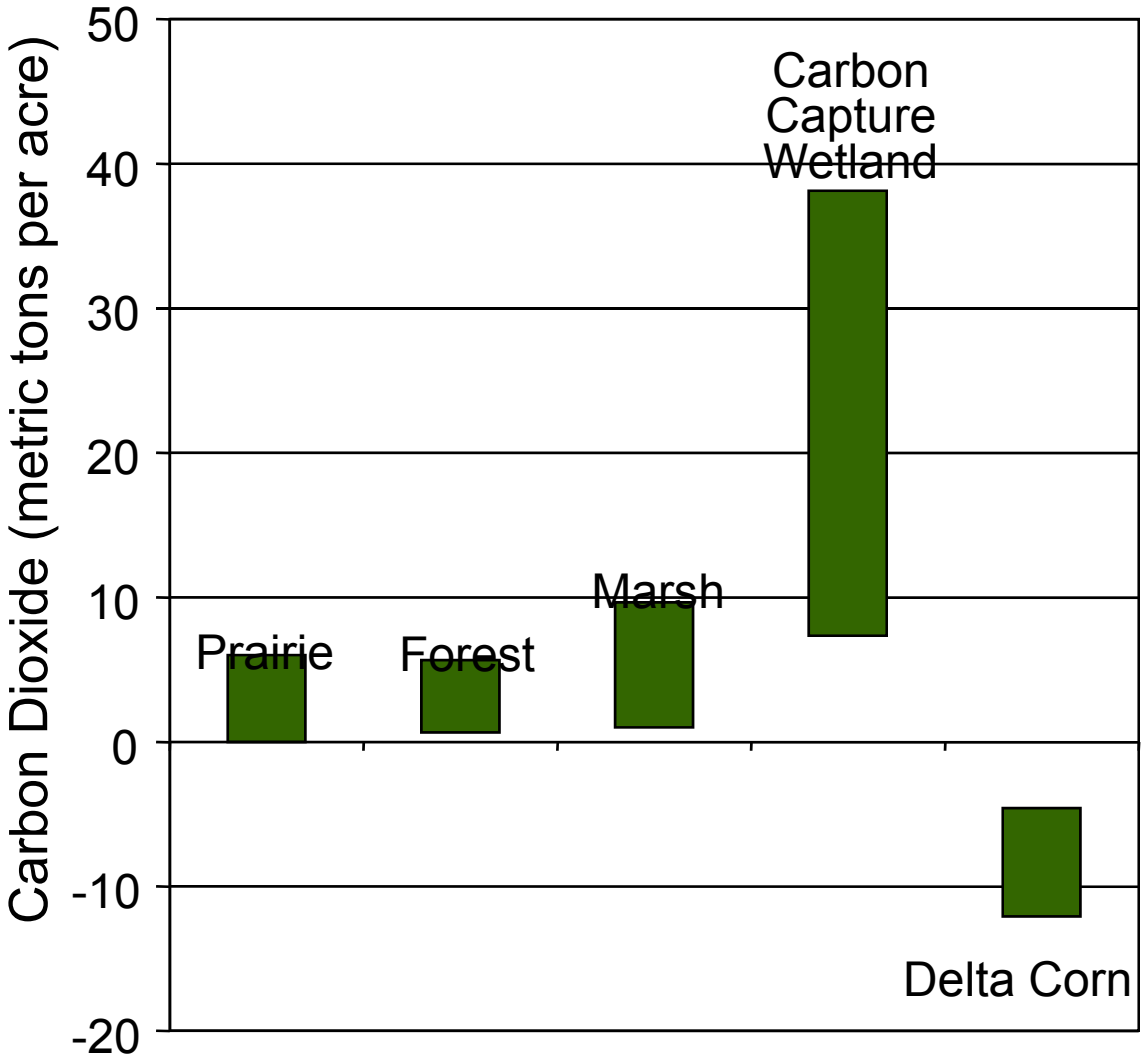
Net CO_2 Sequestered by Different Land Uses



Observations from Demonstration Ponds

- Emergent plants shaded water, lowered temp., algal activity, & DO
- Maximum accretion where water circulation low
- River water nitrate rich, nitrate and methane emissions decreased along flow paths

→ "Sweet spot" where conditions:

  - retard decomposition
  - minimal nitrate and methane emissions
  - high sequestration rates


The Research Plan

Research Elements

- Characterize specifics of biogeochemical processes
- Test responses to flow rates, plant communities, sediment amendments
- Test responses across range of estuarine environmental conditions
- Calibrate DNDC model to plot conditions

Research Elements cont'd

- Identify conditions which minimize methyl mercury production and export
- Characterize methyl mercury levels in wetland food chain
- Quantify formation of dissolved organic matter and offsite transport
- Assess linkages between manageable wetland conditions and GHG fluxes

Research Elements, cont'd

- Quantify variability of GHG gas fluxes over time over wetland plots and adjacent lands
- Calibrate DNDC model to range of Delta conditions

Science Designed in Support Of

- Carbon credit protocols
- Farm-scale economic decisions
- Delta levee failure risk mitigation
- Regional-scale economic assessments
- State and federal hazard and recovery programs

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