*An Introduction to:*

# CARBON CAPTURE FARMING

*USGS R&D Project*

*in collaboration with CA DWR and many other state partners*

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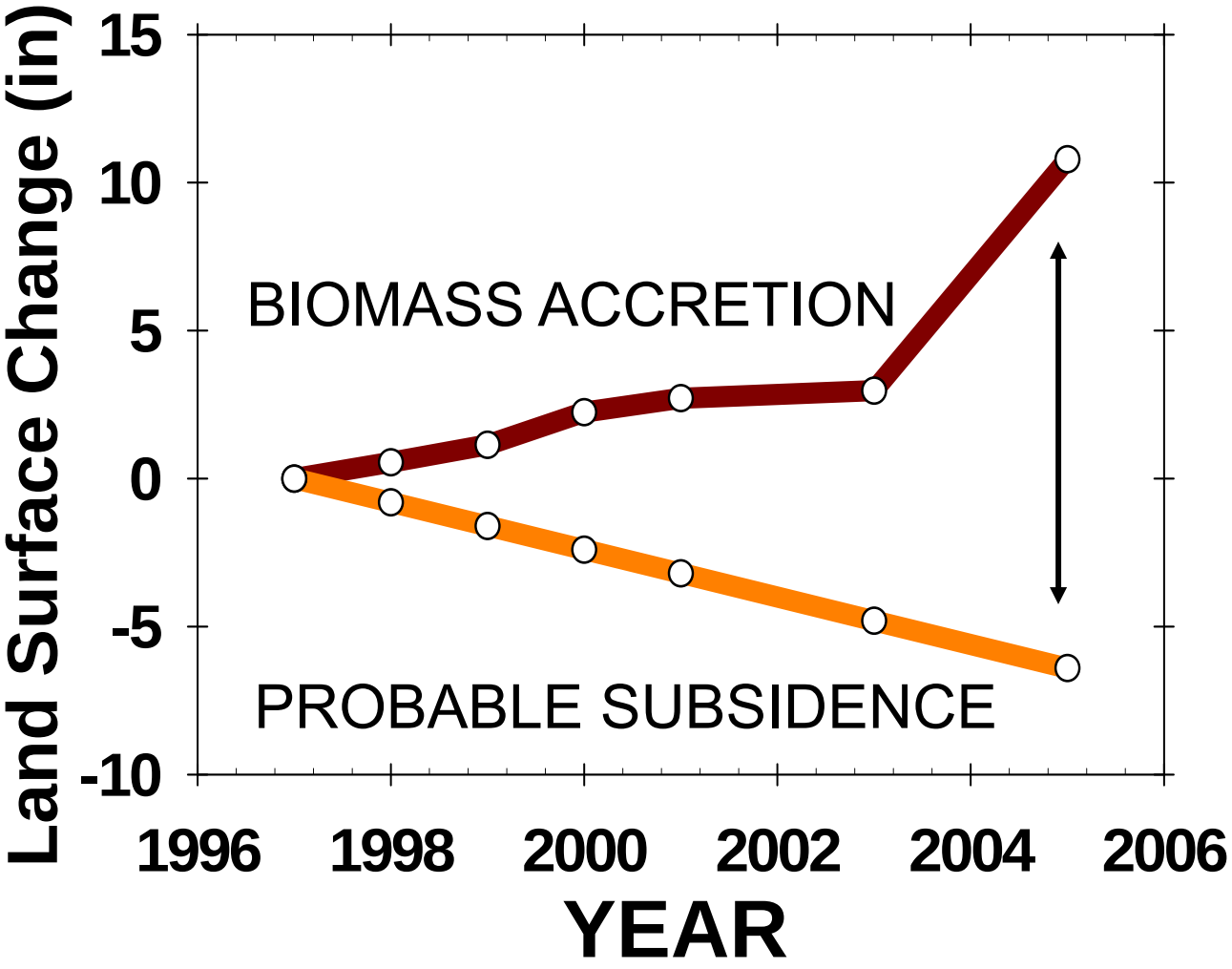
# Punch Line

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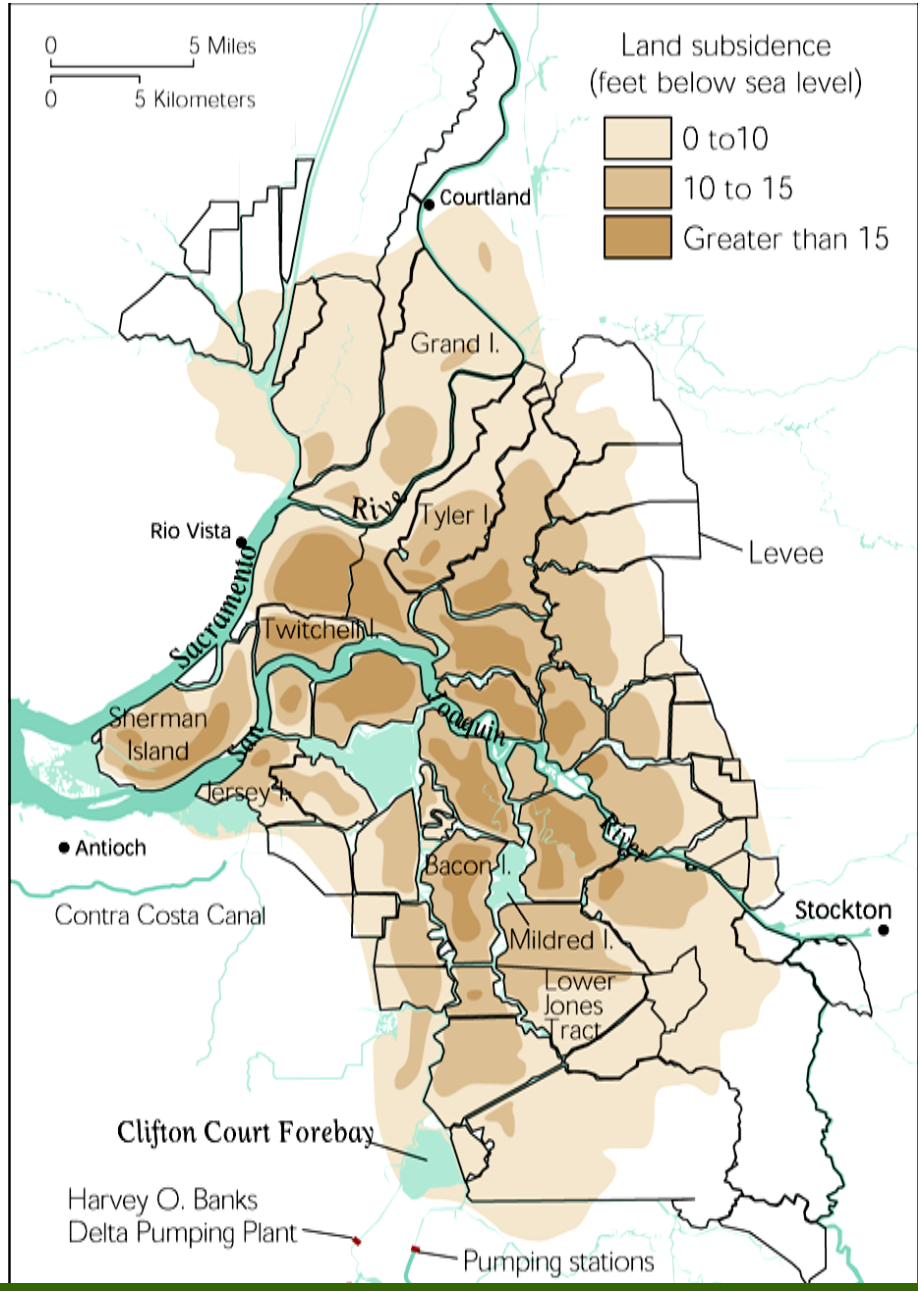
# 20+ Years of Research on Delta Subsidence

- 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


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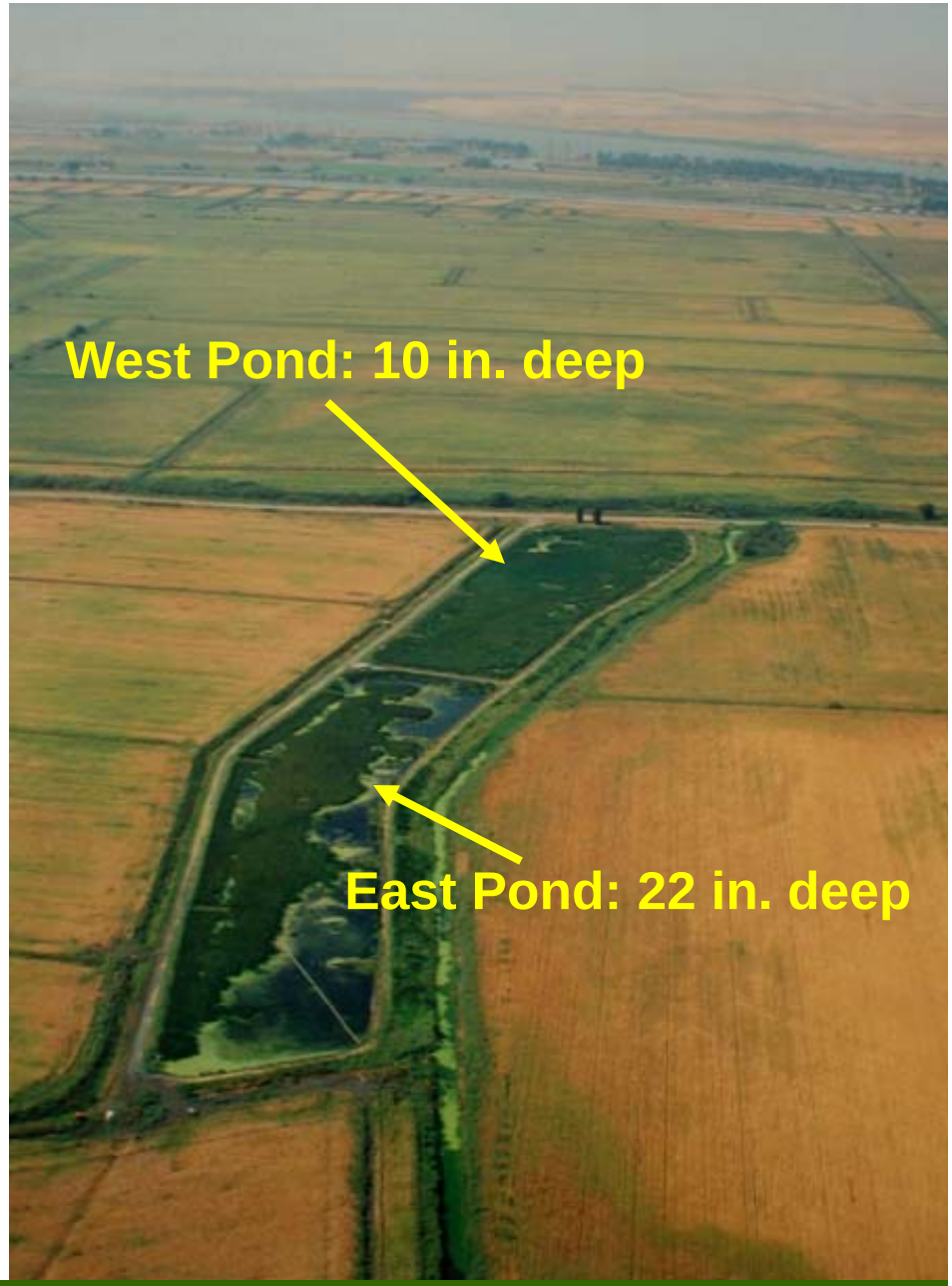
# 1997-present Demonstration Pond Experiment

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

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# Leveled Field Site

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# Flooded and Planted With Tules and Cattails


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# Site Studies…


Gas Fluxes

Biomass accretion

# Site Studies……

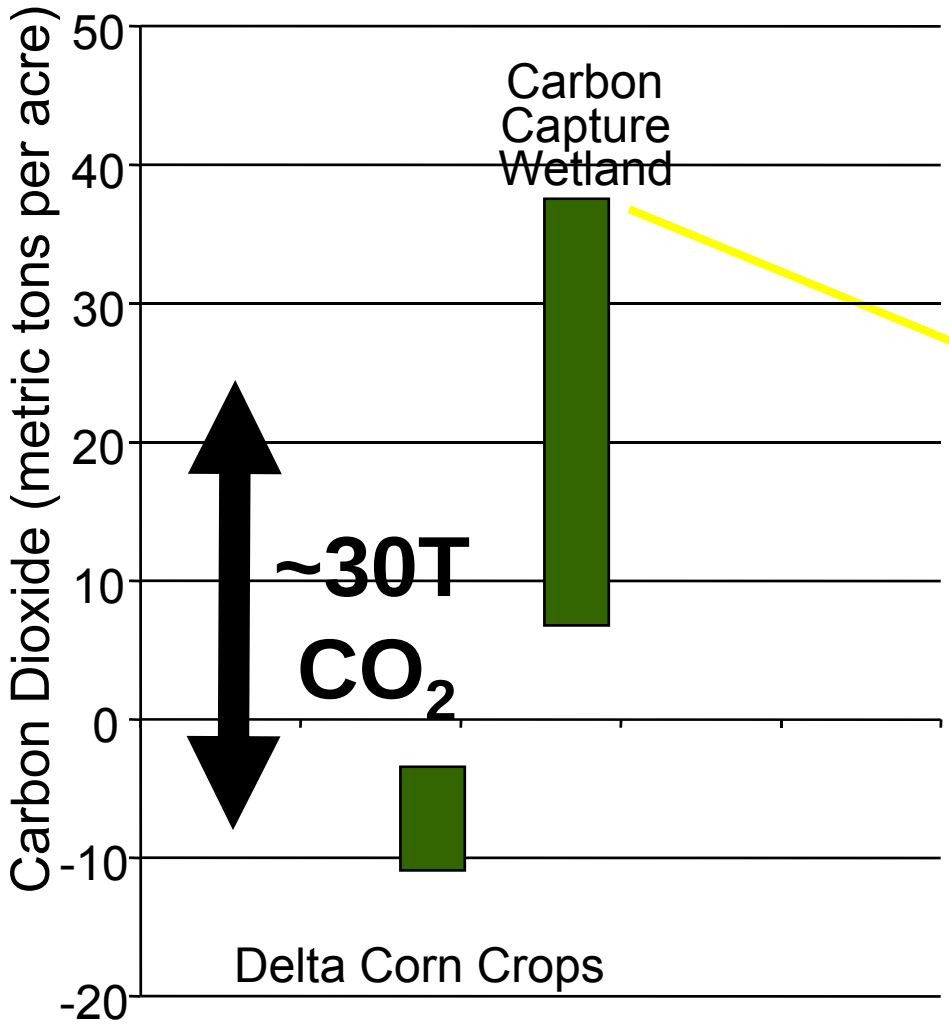
Water Budgets

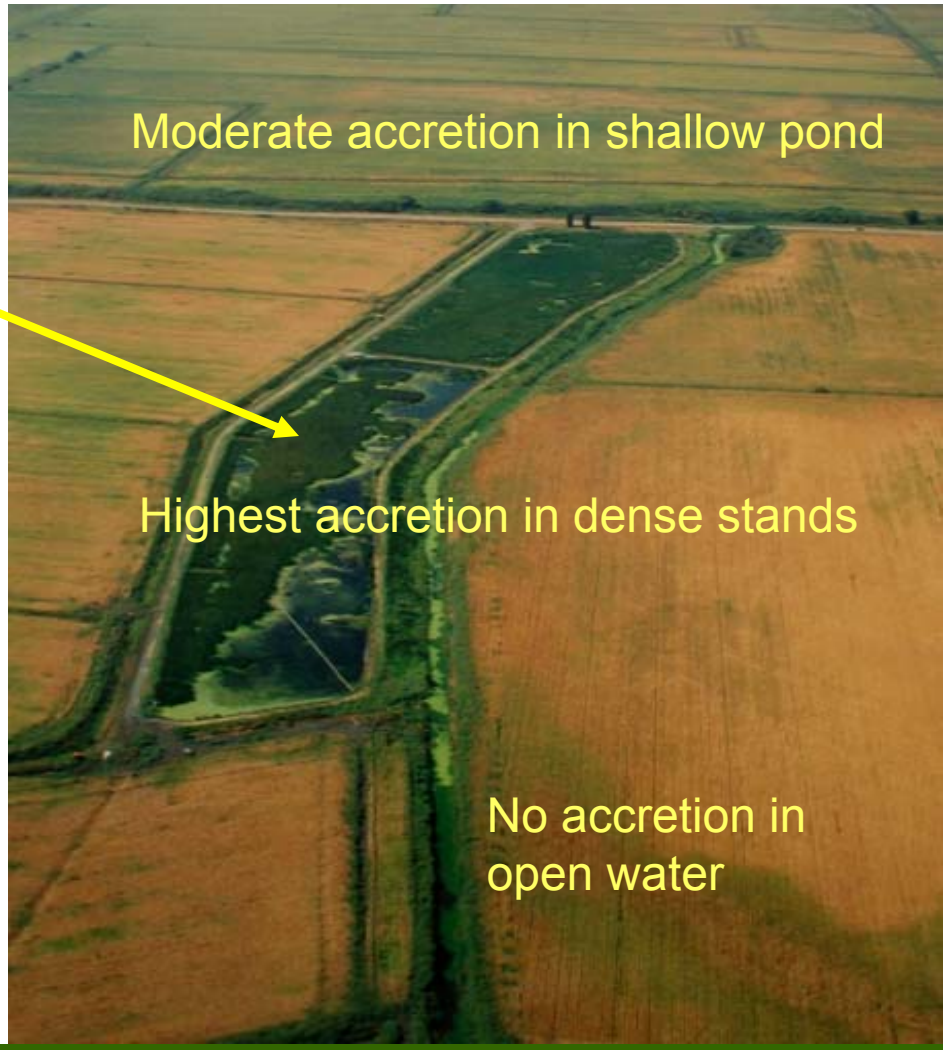
Wetland Management and Dissolved Organic Carbon Characteristics

Decomposition

ET Measurements

# Net $CO_2$ Sequestered Varied Spatially

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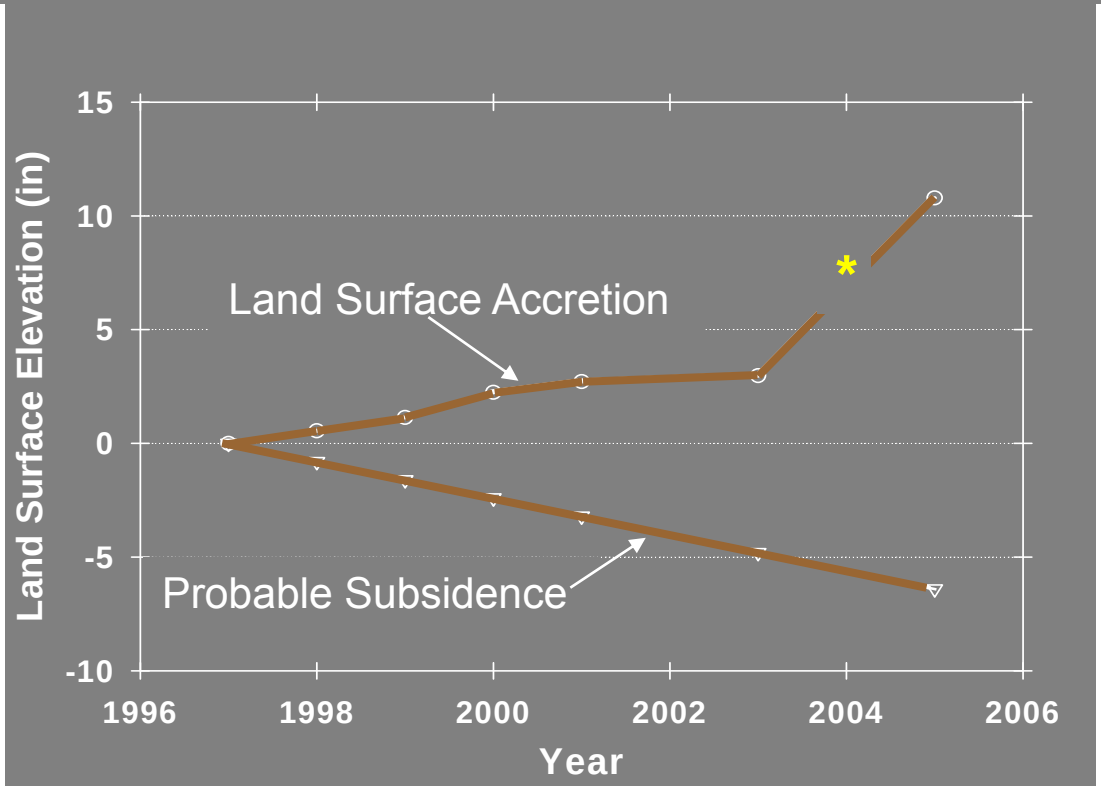
# And temporally....

## East Wetland, Land Surface Elevation




**17.2 inches / 8 years = 2.15 inches/year**

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

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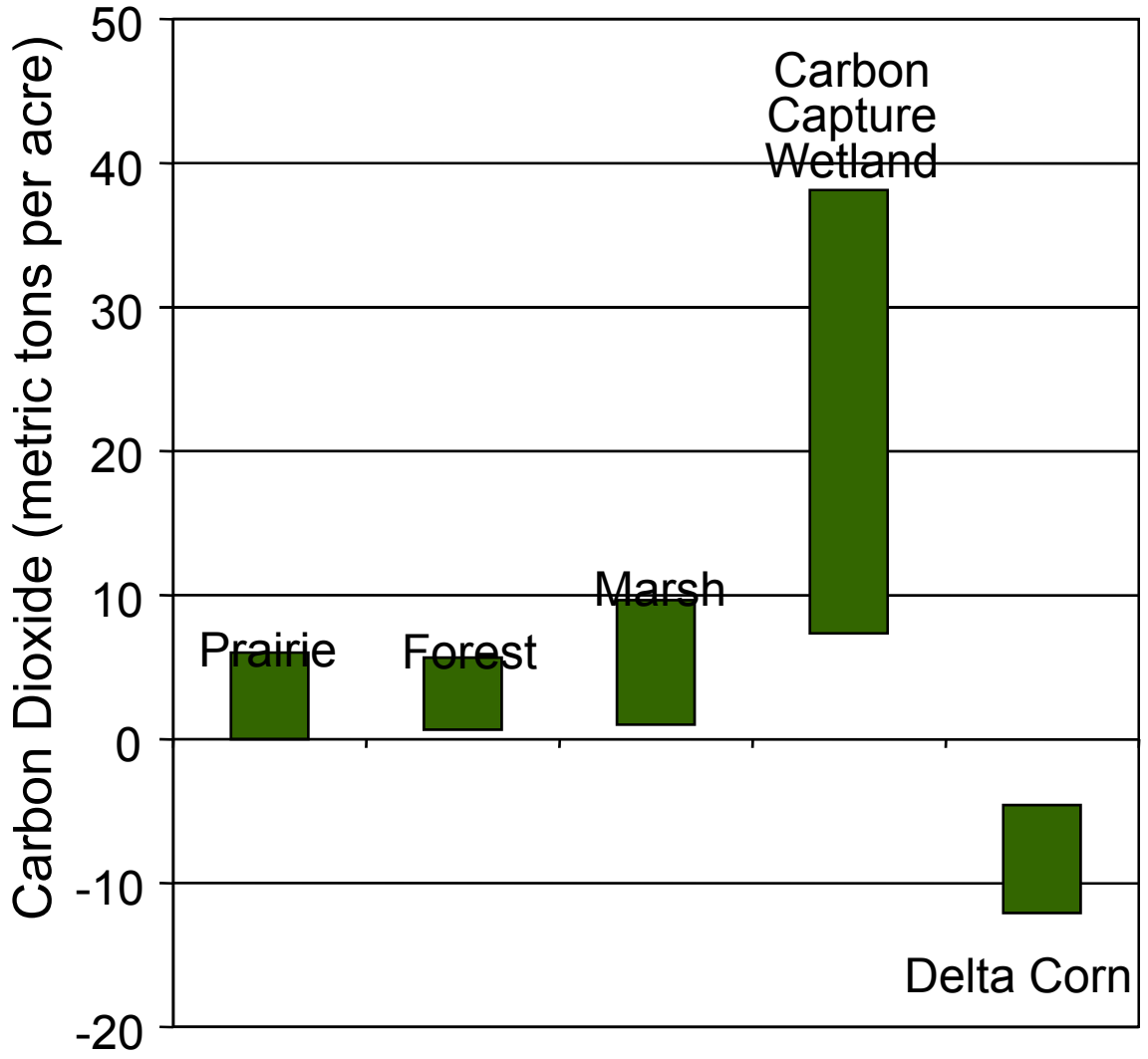
# Net $CO_2$ Sequestered by Different Land Uses

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# 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

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# 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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