The South Baylands Mercury Project

Answering questions to guide the restoration of Pond A8

SFEI

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Santa Clara Valley Water District

South Baylands Mercury Project Goal

- Answer four questions to guide the restoration of Pond A8
  - How should the mercury problem be assessed?
  - Would erosion of Alviso Slough after breaching the Pond A8 levee increase the mercury problem?
  - Does the mercury problem differ between the habitats in Pond A8 and Alviso Slough?
  - Would conversion of Pond A8 to tidal marsh unacceptably worsen the mercury problem?

Q1: How should the mercury problem be assessed?

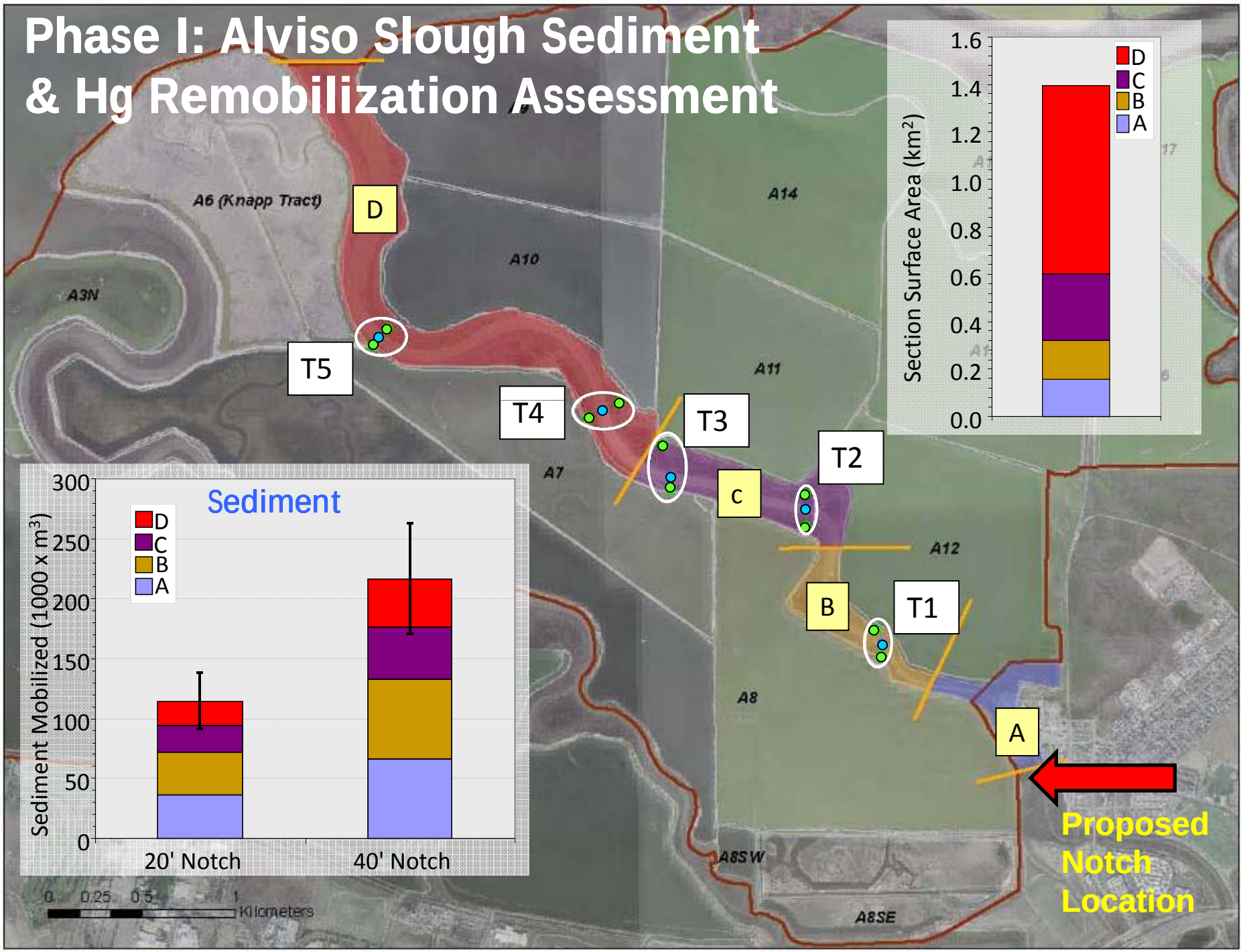
1. Measure mercury concentrations in wildlife species indicative of restoration habitat endpoints (biosentinels)

2. Compare these concentrations to
   - known thresholds of deleterious effects
   - ambient concentrations in biosentinels of the South Bay

Q2: Would erosion of Alviso Slough increase the mercury problem?

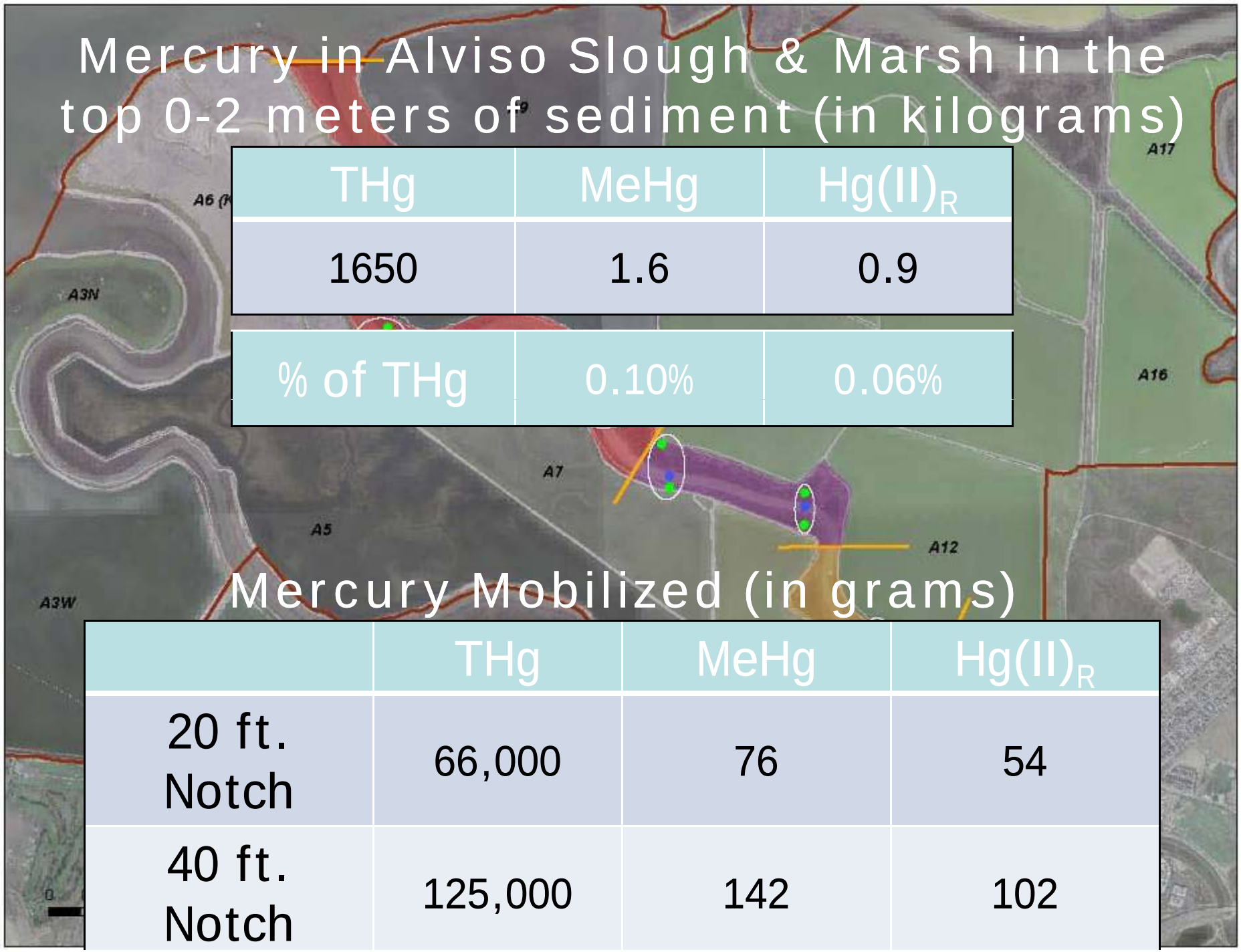
- Increase in tidal prism when Pond A8 is opened will cause Alviso Slough to erode

Phase I: Alviso Slough Sediment & Hg Remobilization Assessment



Mercury in Alviso Slough & Marsh in the top 0-2 meters of sediment (in kilograms)

THg	MeHg	$Hg(II)_R$
1650	1.6	0.9
% of THg	0.10%	0.06%

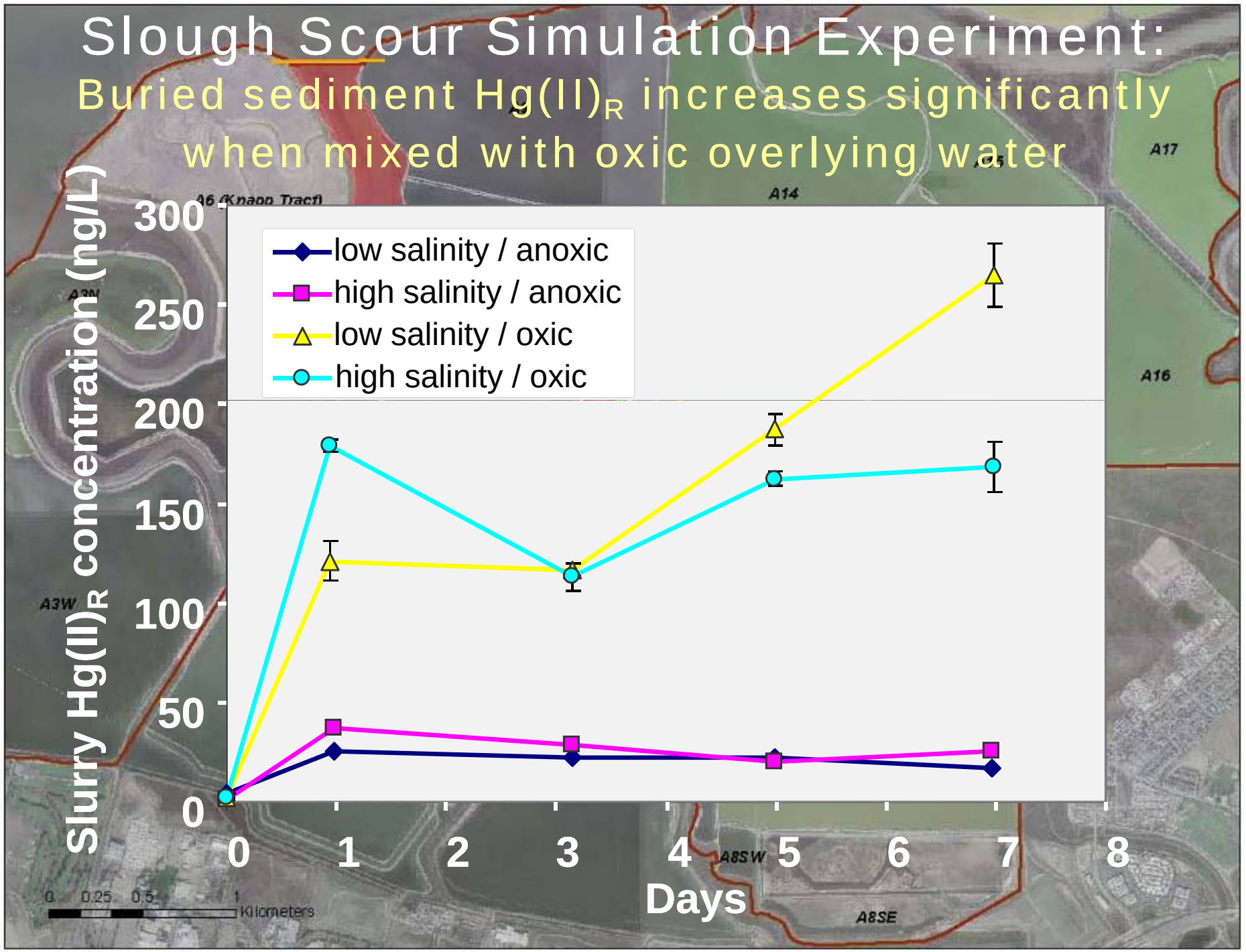


Mercury Mobilized (in grams)

	THg	MeHg	$Hg(II)_R$
20 ft. Notch	66,000	76	54
40 ft. Notch	125,000	142	102

Slough Scour Simulation Experiment:

Buried sediment $Hg(II)_R$ increases significantly when mixed with oxic overlying water



Q2: Would erosion of Alviso Slough increase the mercury problem?

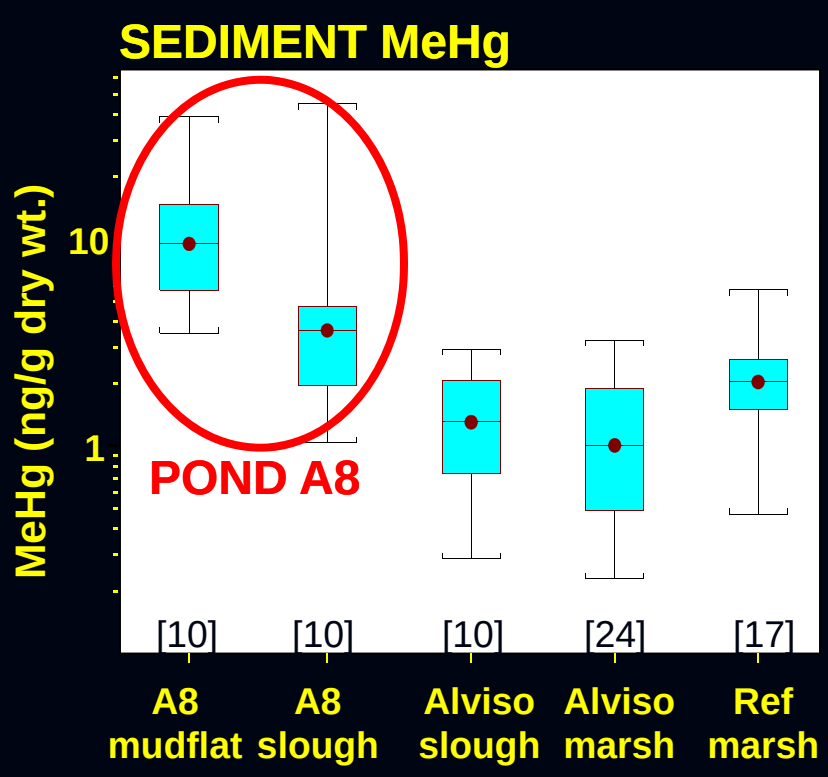
- **Maybe**
- Need to monitor what happens after notch is opened

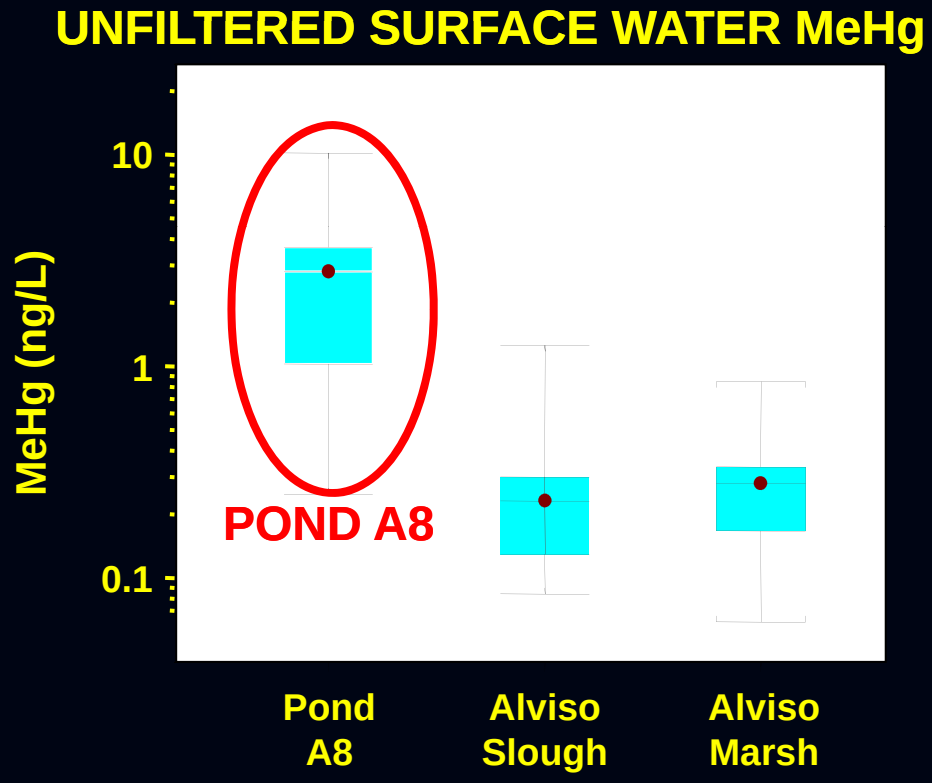
Q3: Does the mercury problem differ among habitats of Pond A8 and Alviso Slough?

- Pond A8 ecosystem has non-tidal habitats
  - Shoreline, water-column, benthic
- Alviso Slough has tidal habitats
  - marsh plain, marsh channel, marsh panne, mudflat
- Multiple comparisons of sediment, water and biosentinel mercury concentrations among these habitats

- Note that only compared endpoints, not transitional period

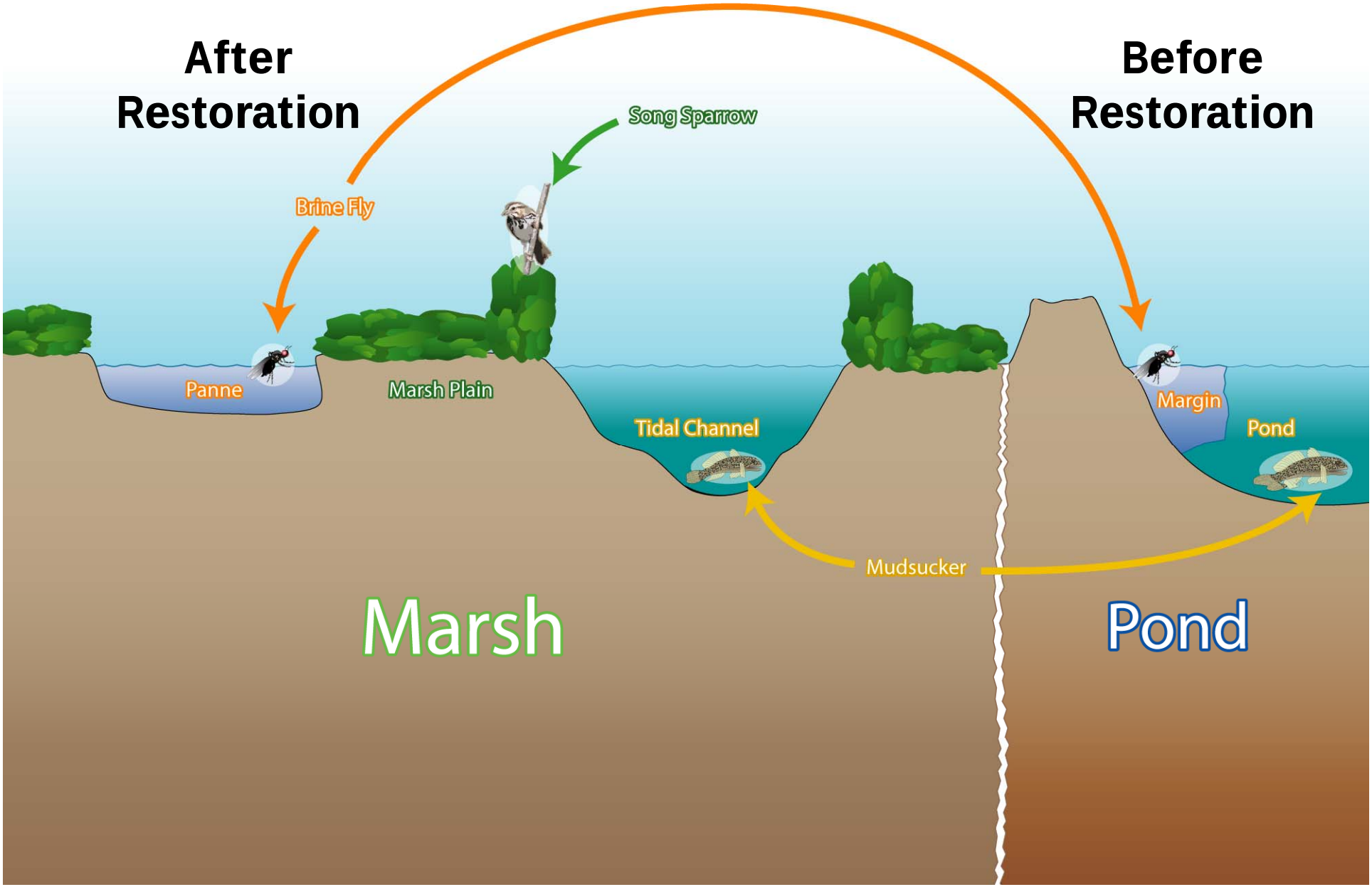
Sediment and Water Methylmercury is highest in Pond A8…



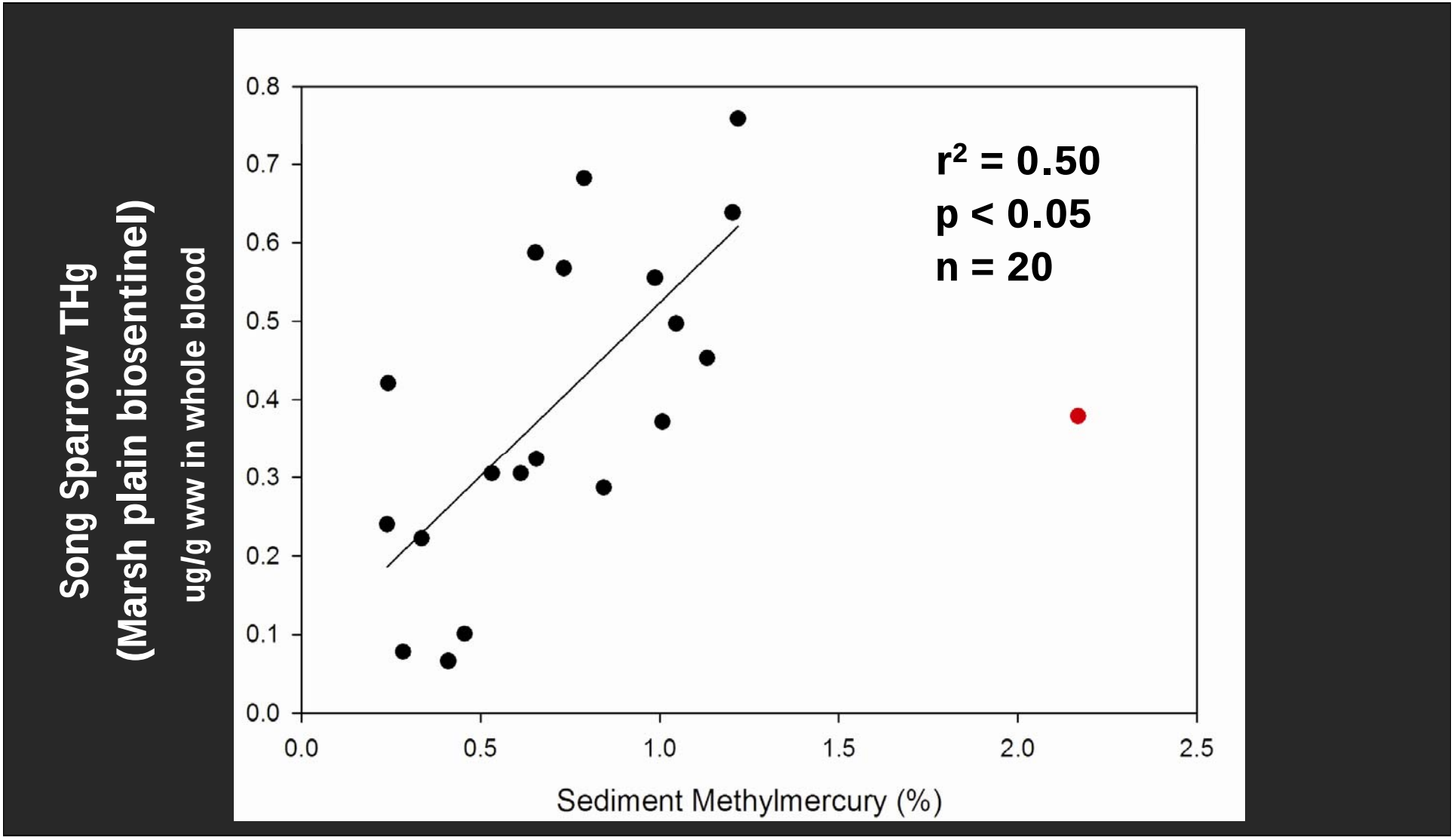


… but WHY?

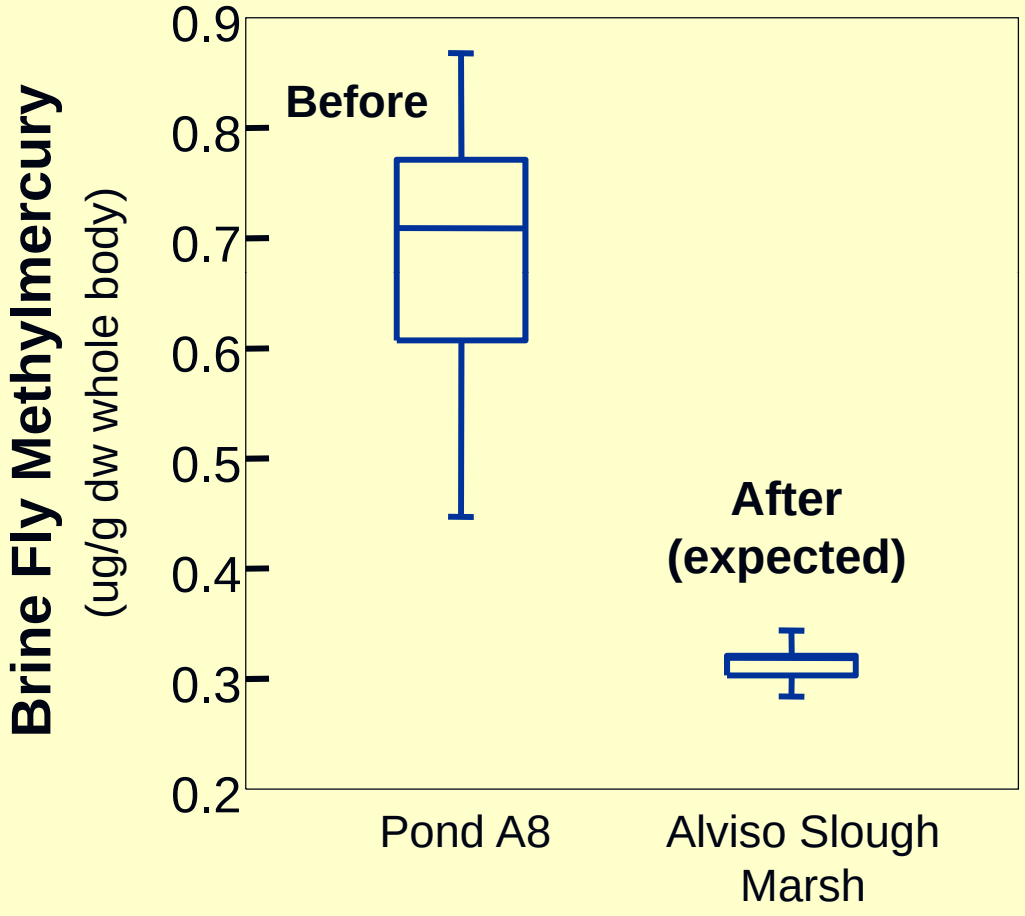
Use Wetland Biosentinels to Compare Restoration Options



Strong relationship between biosentinels and methylmercury in their habitat



Higher mercury in Pond A8 than Marsh

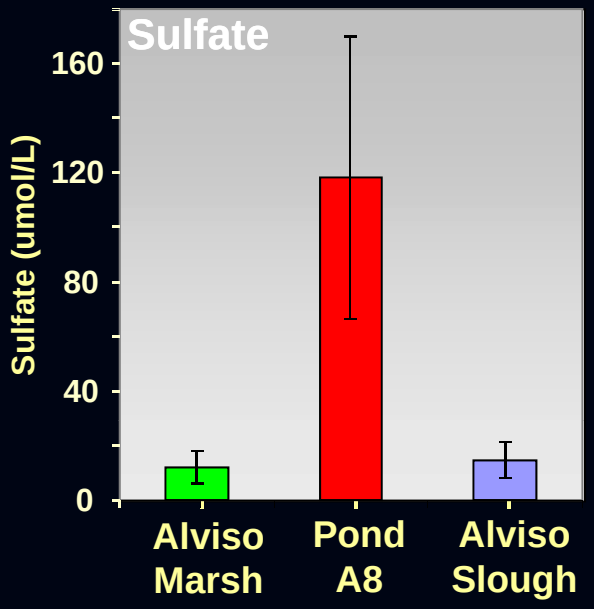


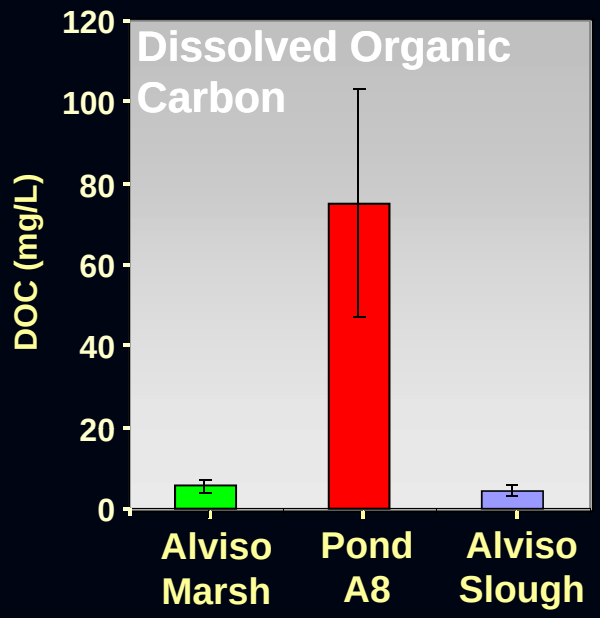
p < 0.05
Summer 2007
Composites

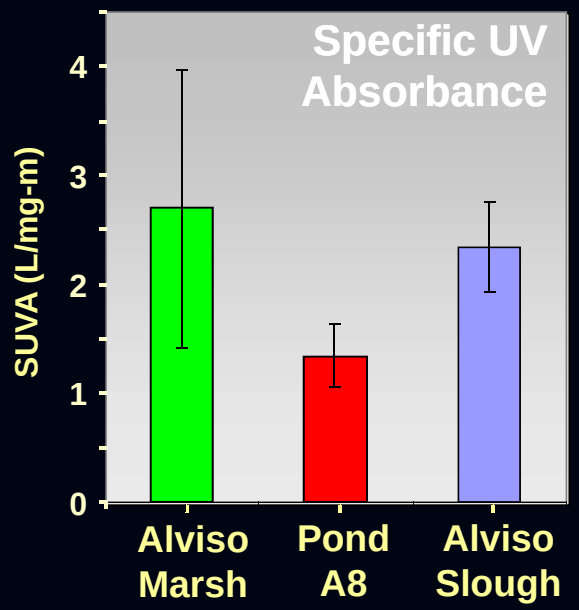
Q3: Does the mercury problem differ among habitats of Pond A8 and Alviso Slough?

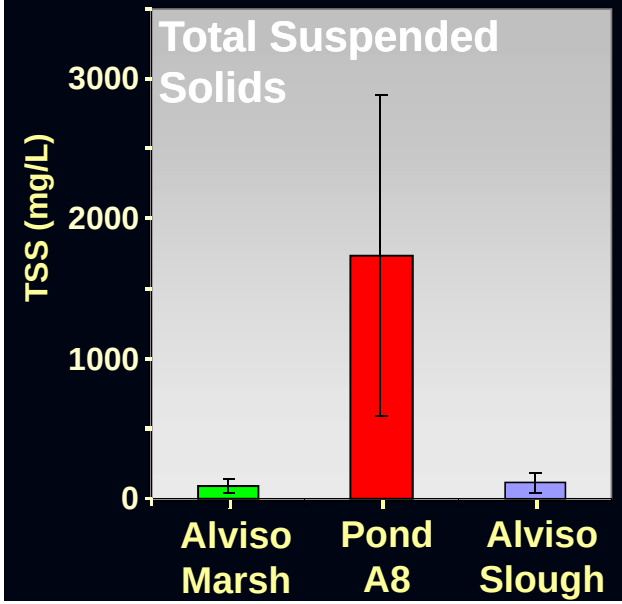
- Yes
- Pond A8 habitats (as measured in sediment and water) and their biosentinels had higher MeHg concentrations than the tidal habitats and their biosentinels

PHASE II: Overlying WATER Chemistry
(Average of six dates: Nov'06 → Aug. '07)



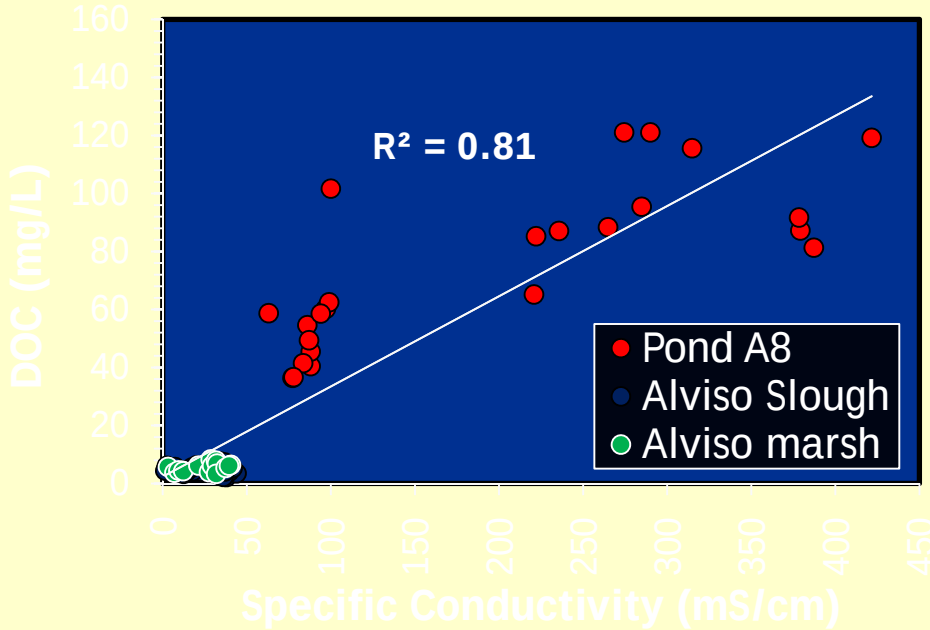


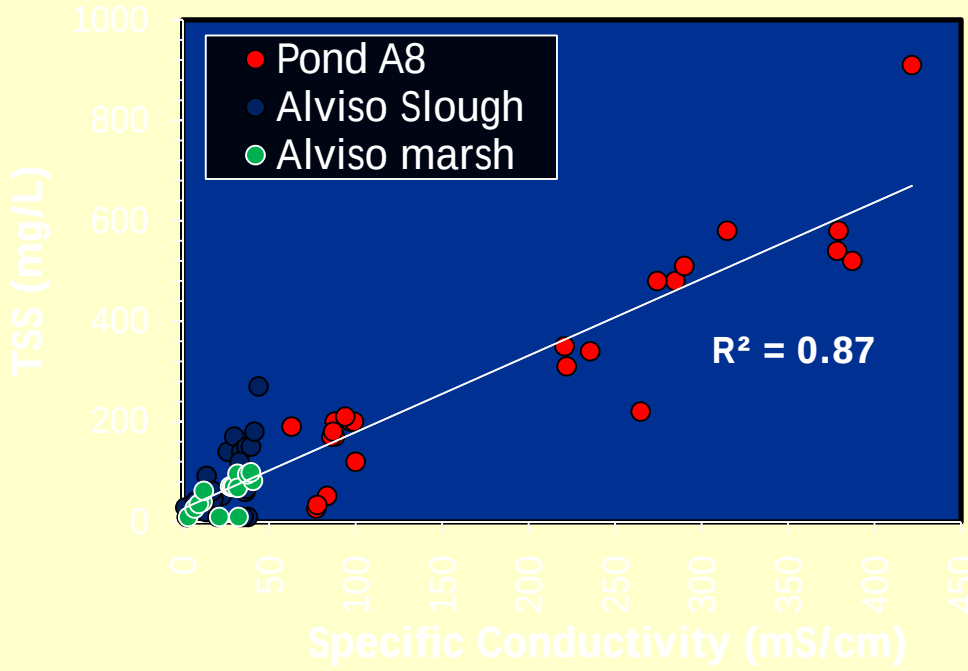




- Pond A8: high sulfate (salinity), DOC and TSS
- Pond A8:
  low SUVA = DOC low in lignin = phytoplankton
- Alviso Marsh & Slough:
  high SUVA = DOC high in lignin = wetland plants
- CONCLUSION: Pond A8 is phytoplankton rich → better fuel for microbes → MeHg production

TSS and DOC increase with salinity across all habitats and seasons





Phase II Conclusion:

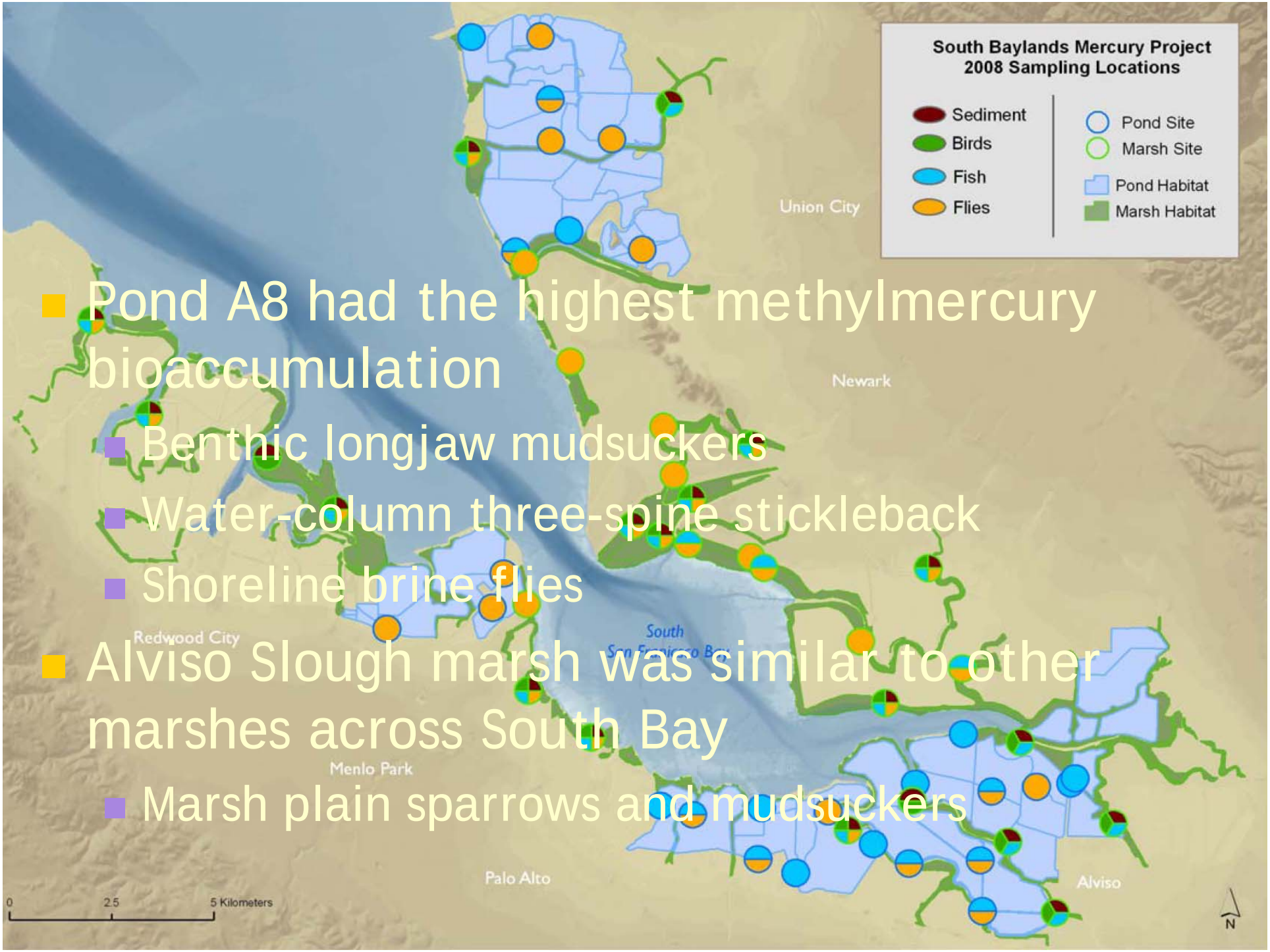
Salinity → control on phytoplankton production → control on MeHg Production

*Especially in Pond A8

Q4: Would converting Pond A8 to tidal marsh worsen the mercury problem?

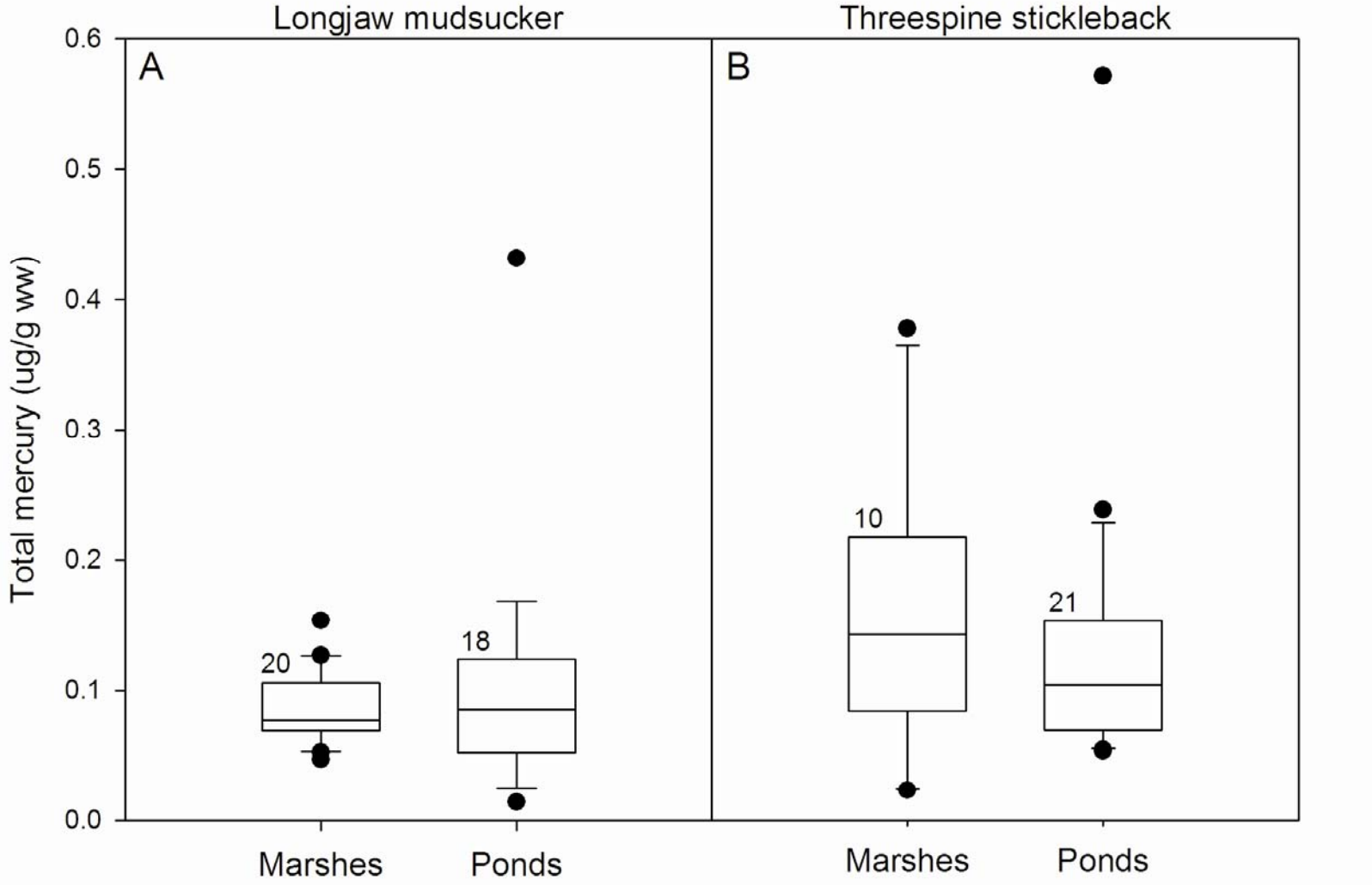
- Conversion of Pond A8 to fully tidal marsh likely would lessen the mercury problem within the A8 footprint

- What about how Pond A8 and Alviso Slough marsh compare to the rest of South Bay?



- Pond A8 had the highest methylmercury bioaccumulation
  - Benthic longjaw mudsuckers
  - Water-column three-spine stickleback
  - Shoreline brine flies
- Alviso Slough marsh was similar to other marshes across South Bay
  - Marsh plain sparrows and mudsuckers

Bioaccumulation of mercury similar in ponds and marshes



Q4: Would converting Pond A8 to tidal marsh worsen the mercury problem?

- **Probably not**
- Pond A8 seems to be a pond with particularly high methylmercury
- Alviso Slough marsh seems to be a typical tidal marsh in terms of methylmercury

Take Home Messages

- Erosion of Alviso Slough might lead to a spike in methylmercury; will depend on sediment dynamics
- Different habitat types have different bioaccumulation of methylmercury; this is good (e.g., manage for less phytoplankton in ponds)
- Pond A8 as tidal marsh should be a better mercury situation than in its current state
- Keep monitoring with biosentinels; add sediment and water studies to understand processes

Thank you

- Funding sources
  - Santa Clara Valley Water District
  - State Coastal Conservancy
  - San Francisco Foundation Bay Fund
  - Regional Monitoring Program for Water Quality
- Don Edwards SF Bay National Wildlife Refuge
- Field work by SCVWD partners
- Texas A&M Trace Elements Laboratory

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