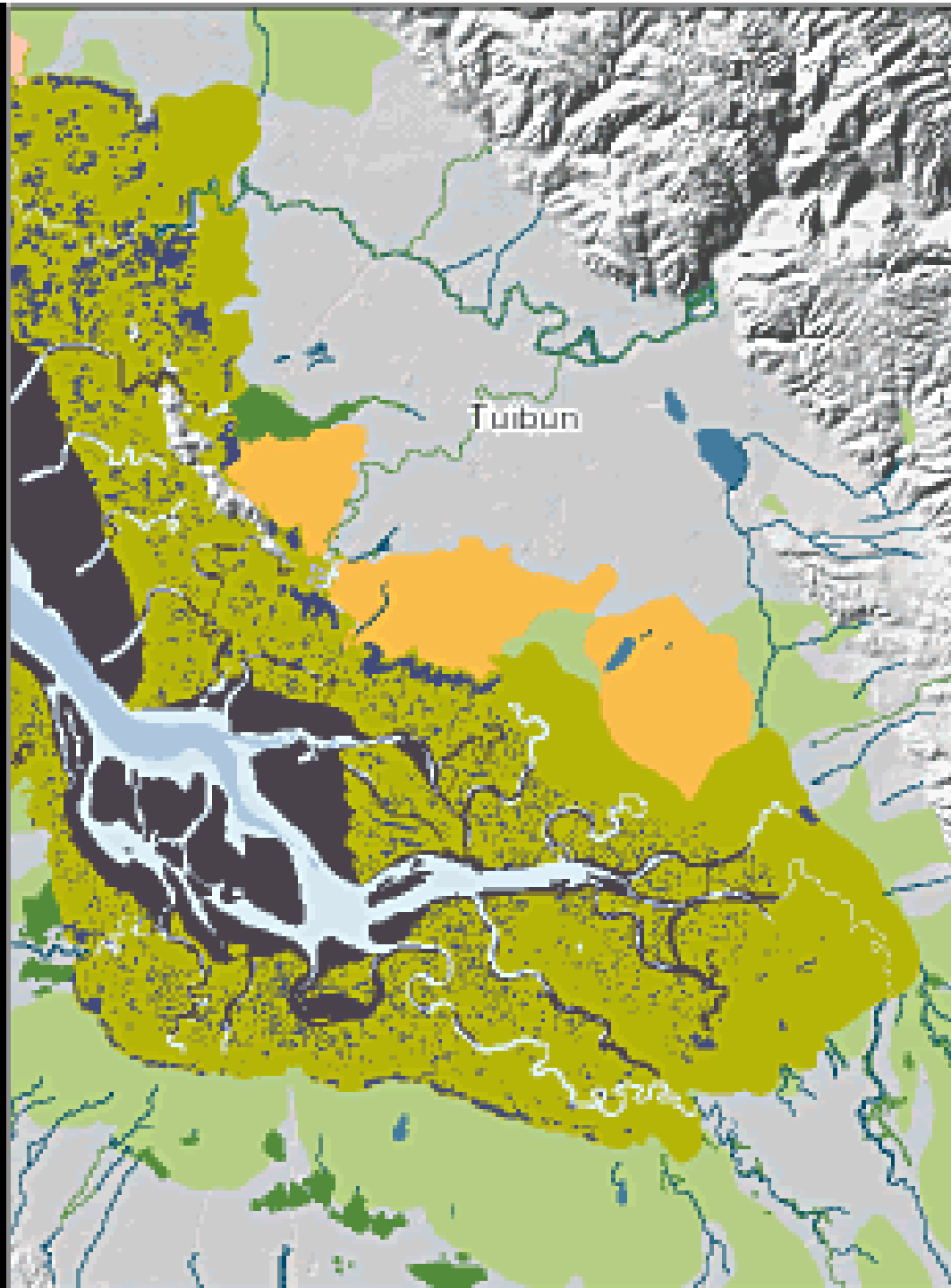


# Answering Management Questions about Tidal Marsh Restoration

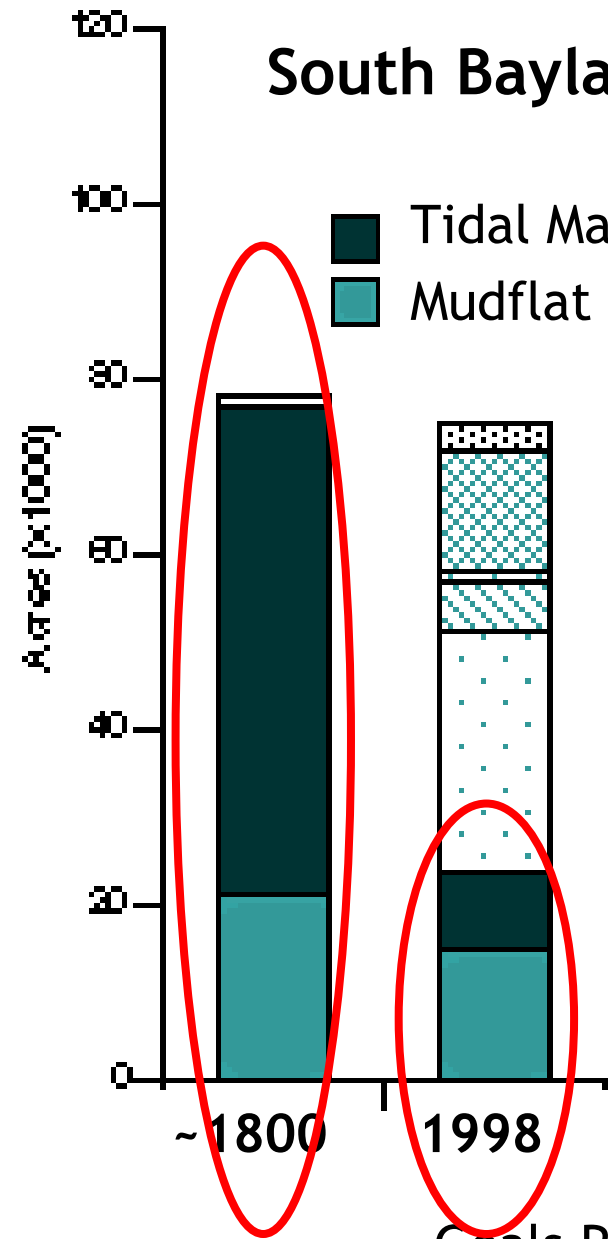
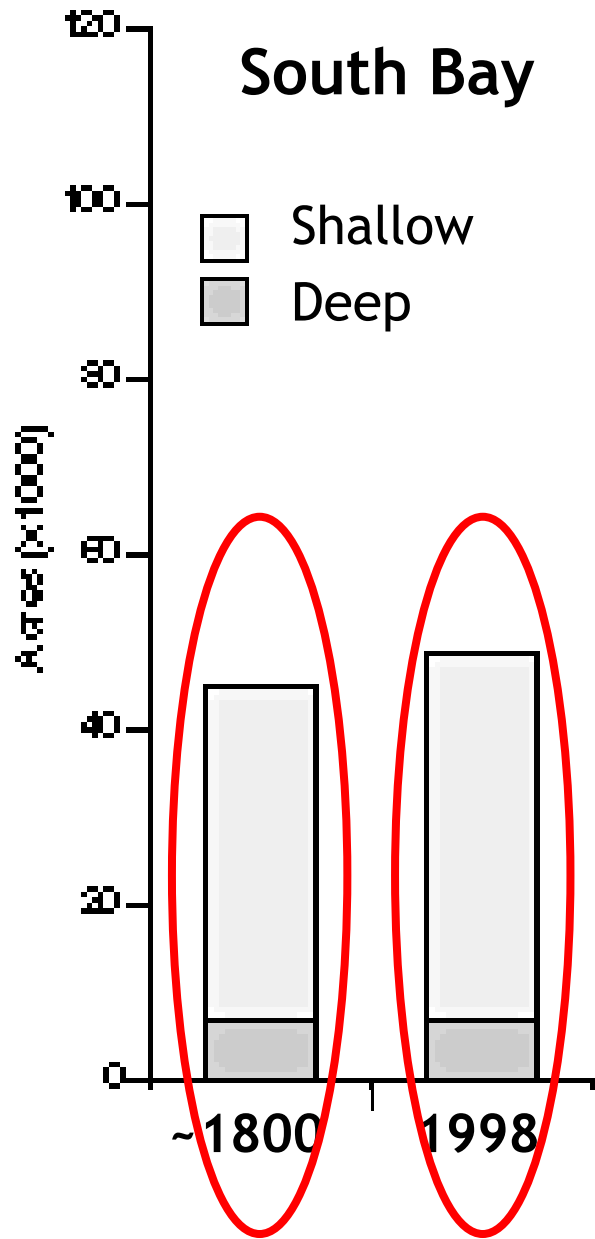
Using  
Tidal Marsh Biosentinels  
for Mercury



Ca. 1800



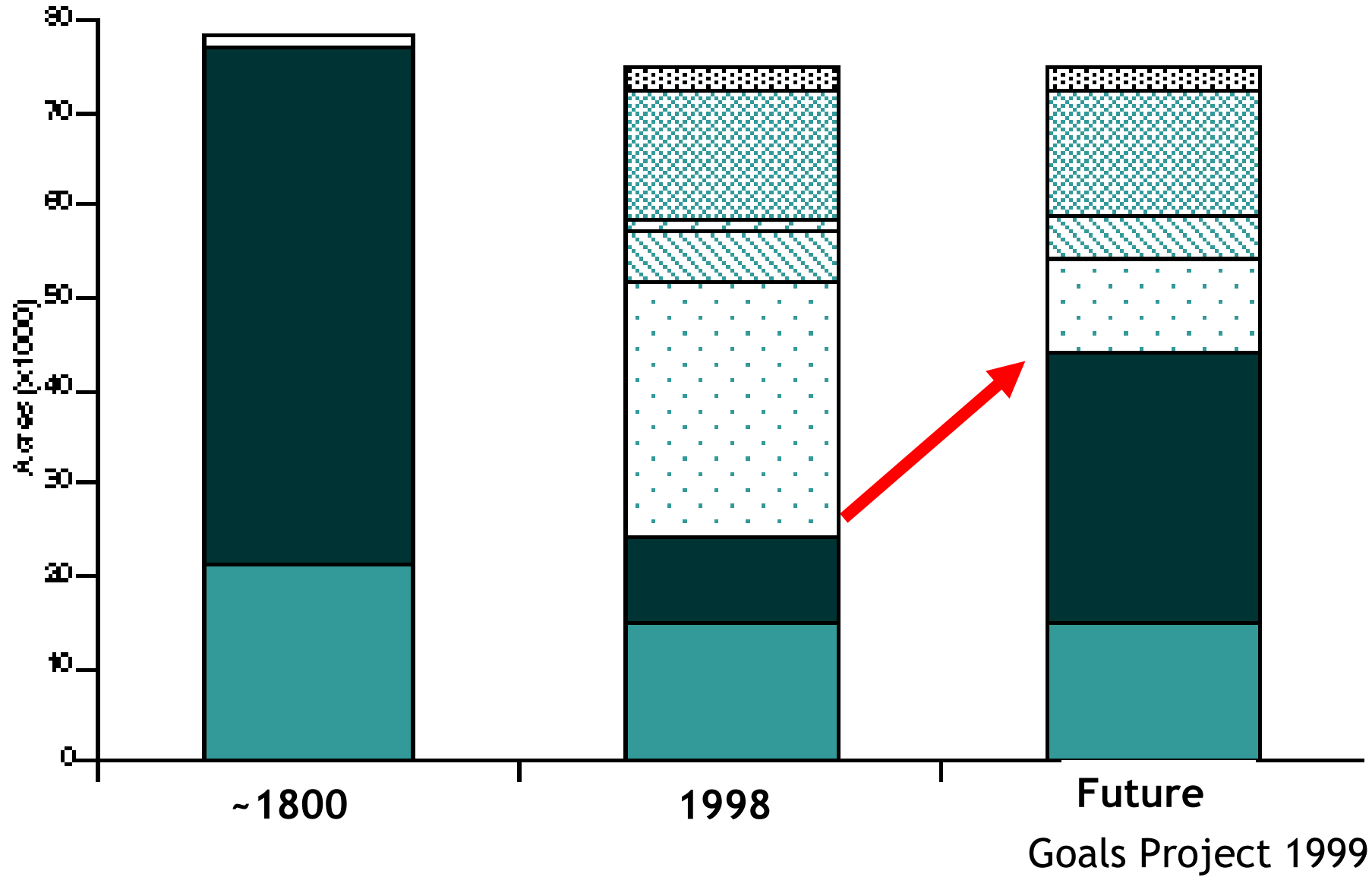
Goals Project  
1999



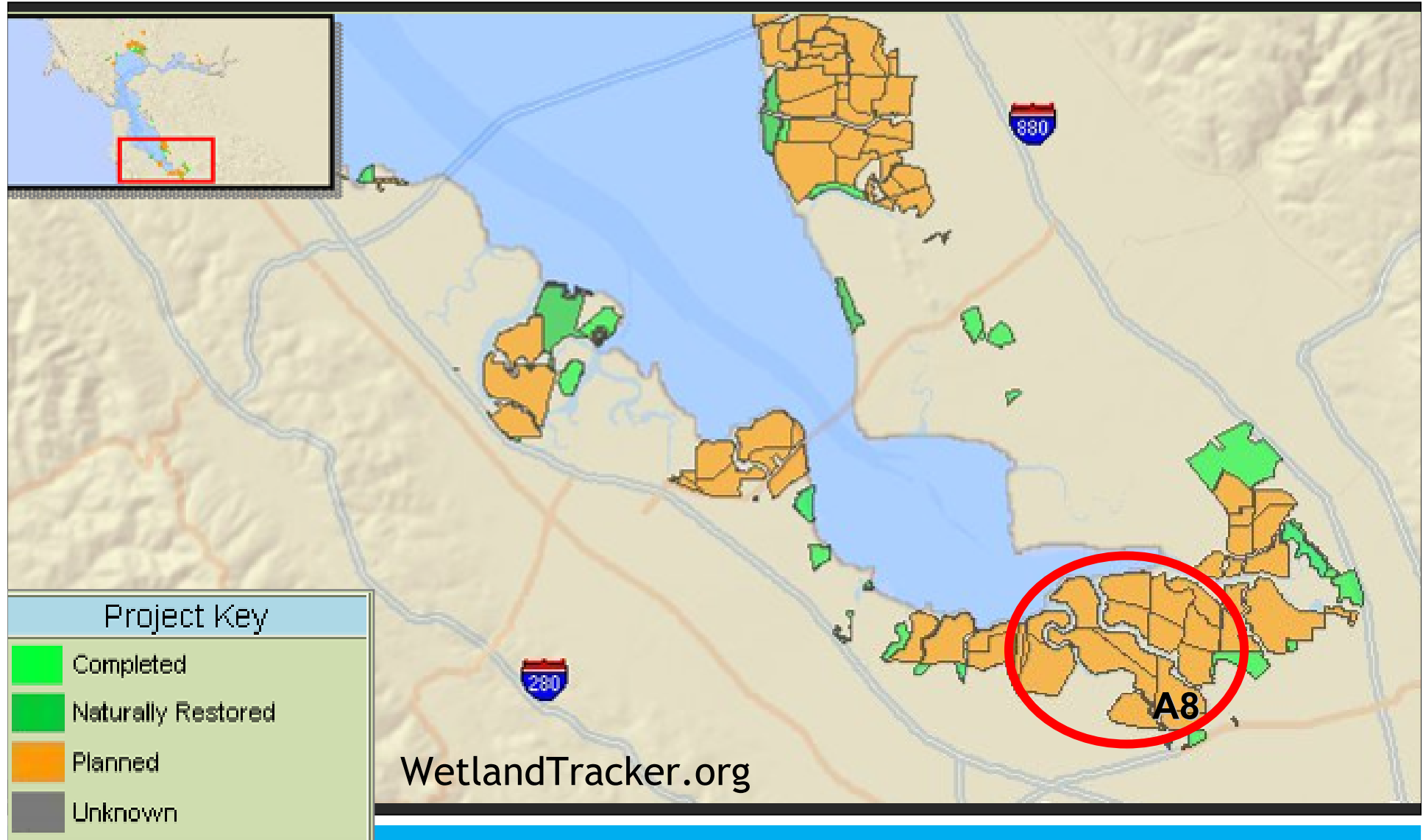
Goals Project 1999

# South Baylands

- Tidal Marsh
- Mudflat



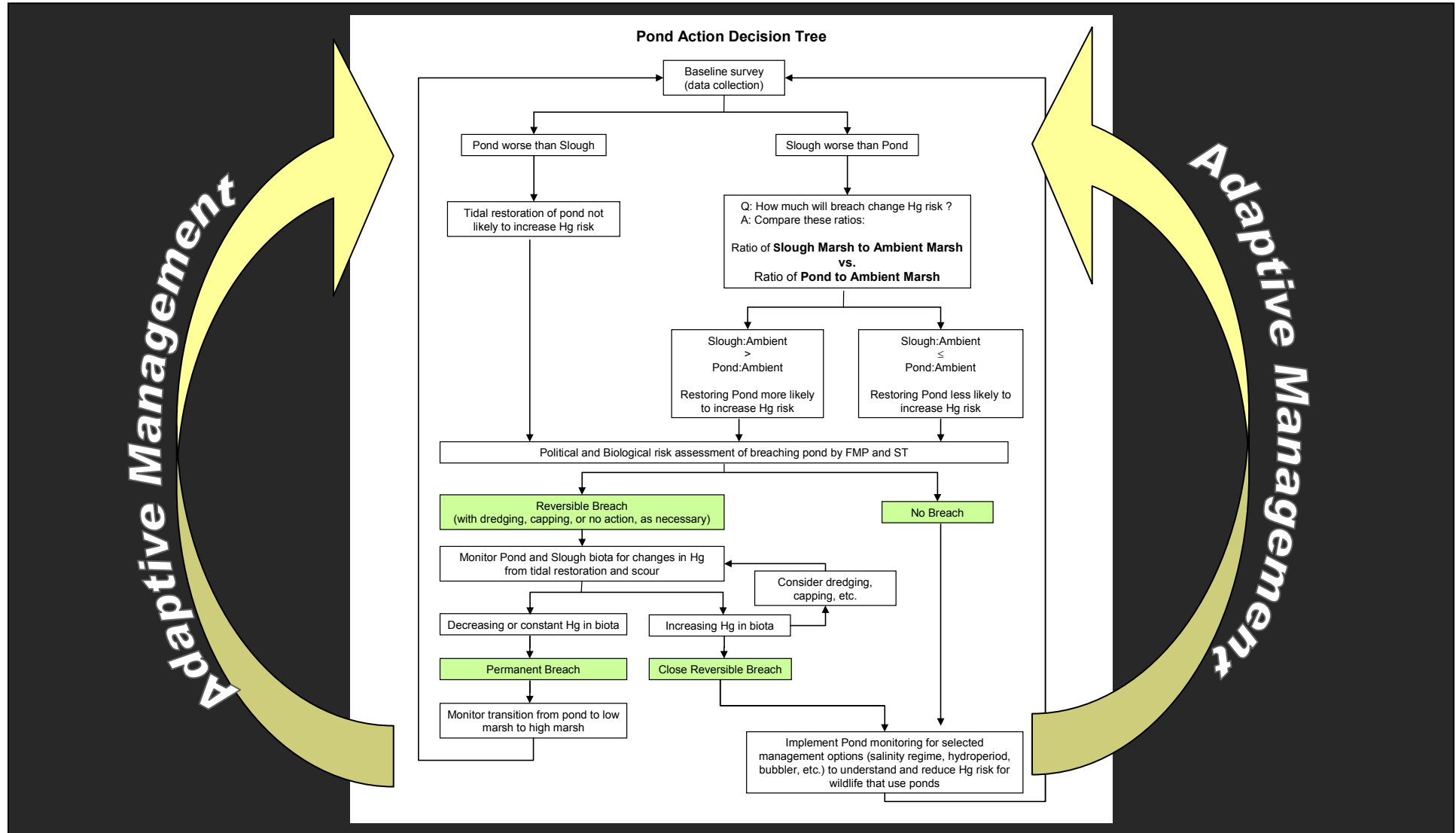
# South Bay Salt Pond Restoration Project



# Q1: How should the mercury problem be assessed?

- **Measure mercury concentrations in wildlife species indicative of restoration habitat endpoints (biosentinels)**
  - Endpoints: tidal marsh and managed pond
  - Habitat-specific
  - Highly localized

# Results feed directly into management decisions



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

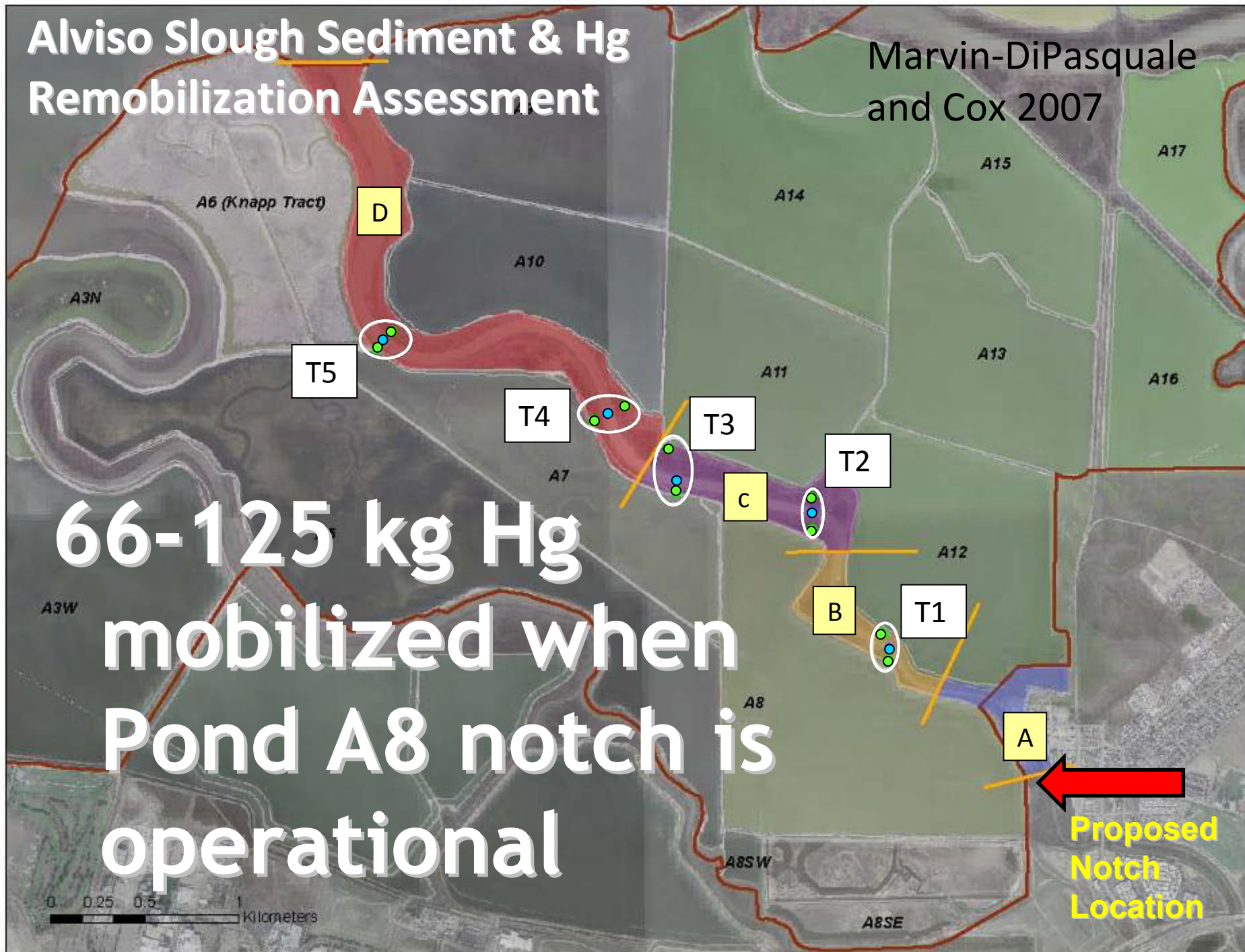
- Increase in tidal prism when Pond A8 is opened will cause Alviso Slough to erode



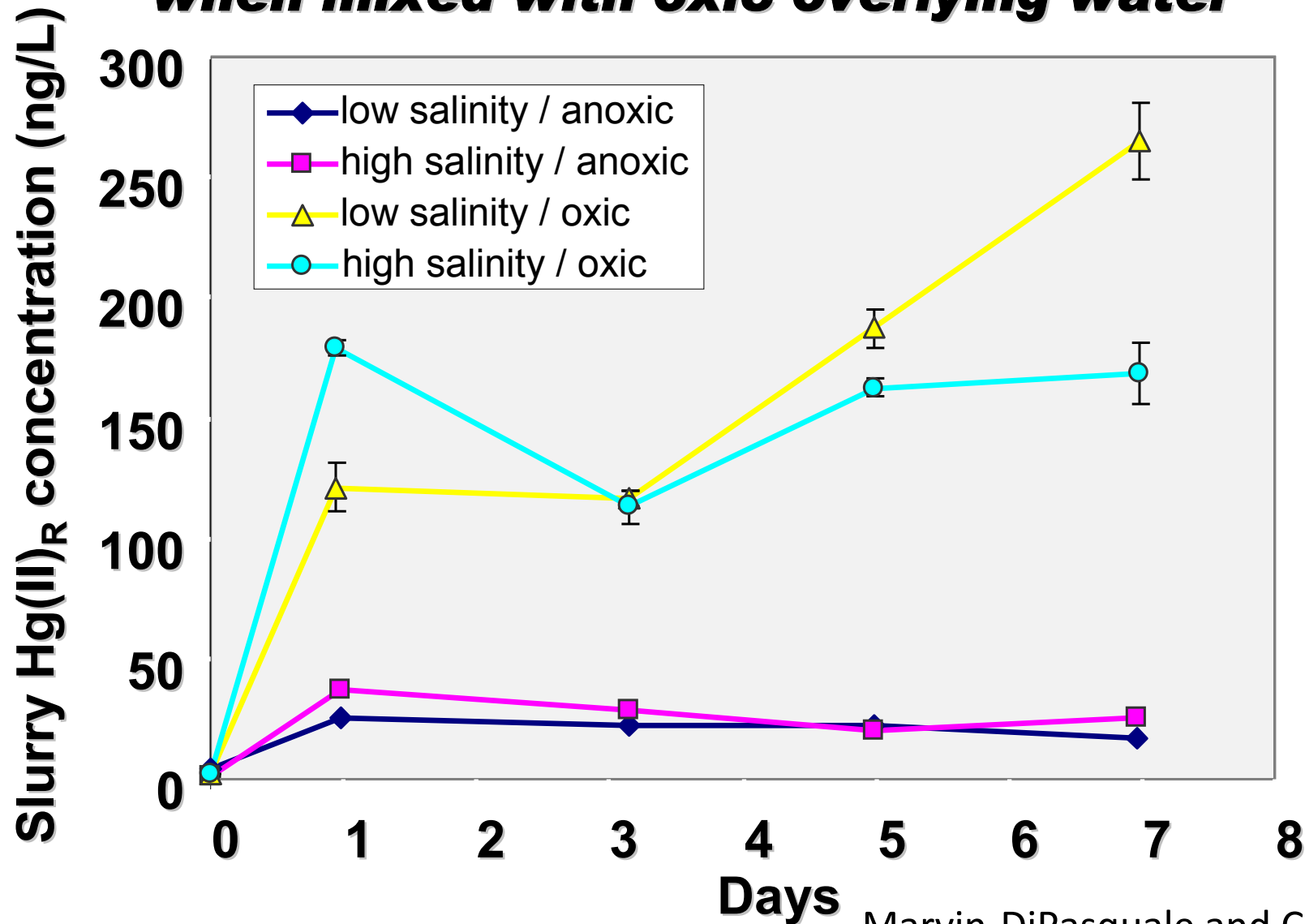
# Alviso Slough Sediment & Hg Remobilization Assessment

Marvin-DiPasquale and Cox 2007

66-125 kg Hg mobilized when Pond A8 notch is operational



# ***Slough Scour Simulation Experiment: Buried sediment $\text{Hg(II)}_R$ increases significantly when mixed with oxic overlying water***



Marvin-DiPasquale and Cox 2007

## 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?

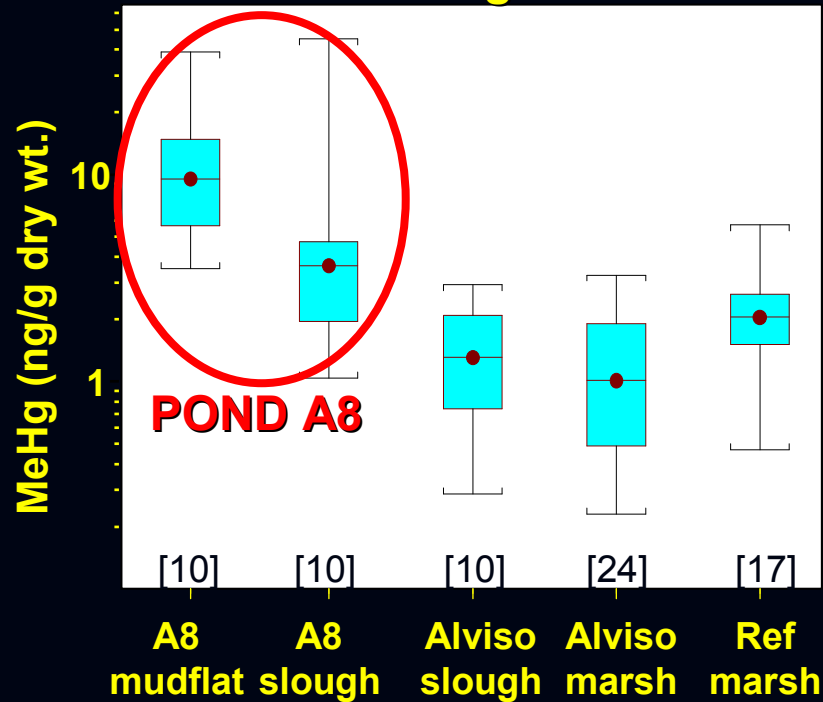
- **Pond A8 -- non-tidal habitats**
  - Shoreline, water-column, benthic
- **Alviso Slough -- tidal habitats**
  - marsh plain, marsh channel, marsh panne, mudflat
- **Multiple comparisons of sediment, water and biosentinel mercury concentrations among these habitats**



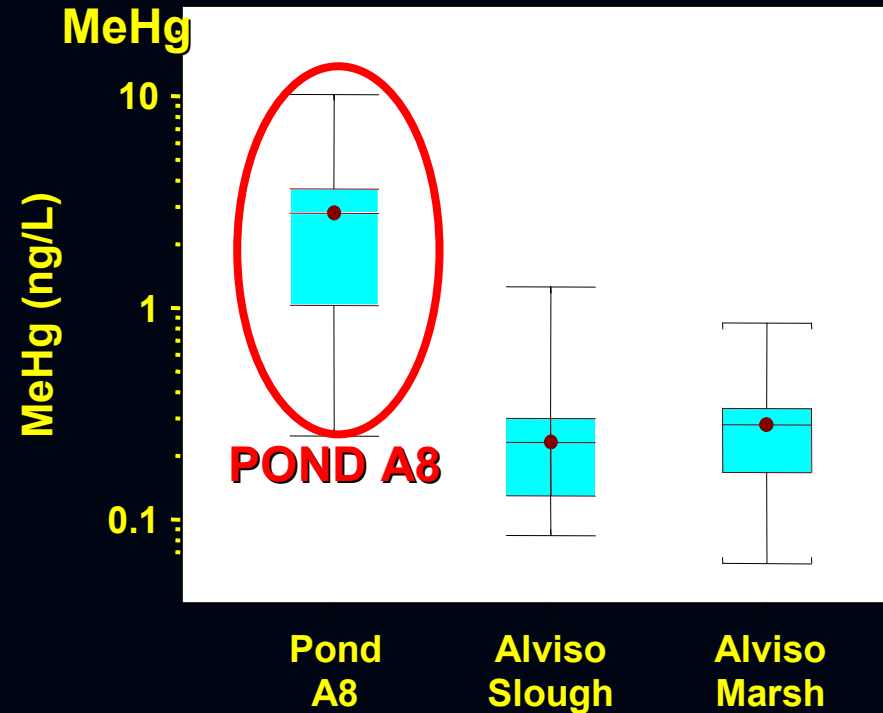
- Note that only compared endpoints, not transitional period

# Sediment and water methylmercury is highest in Pond A8...

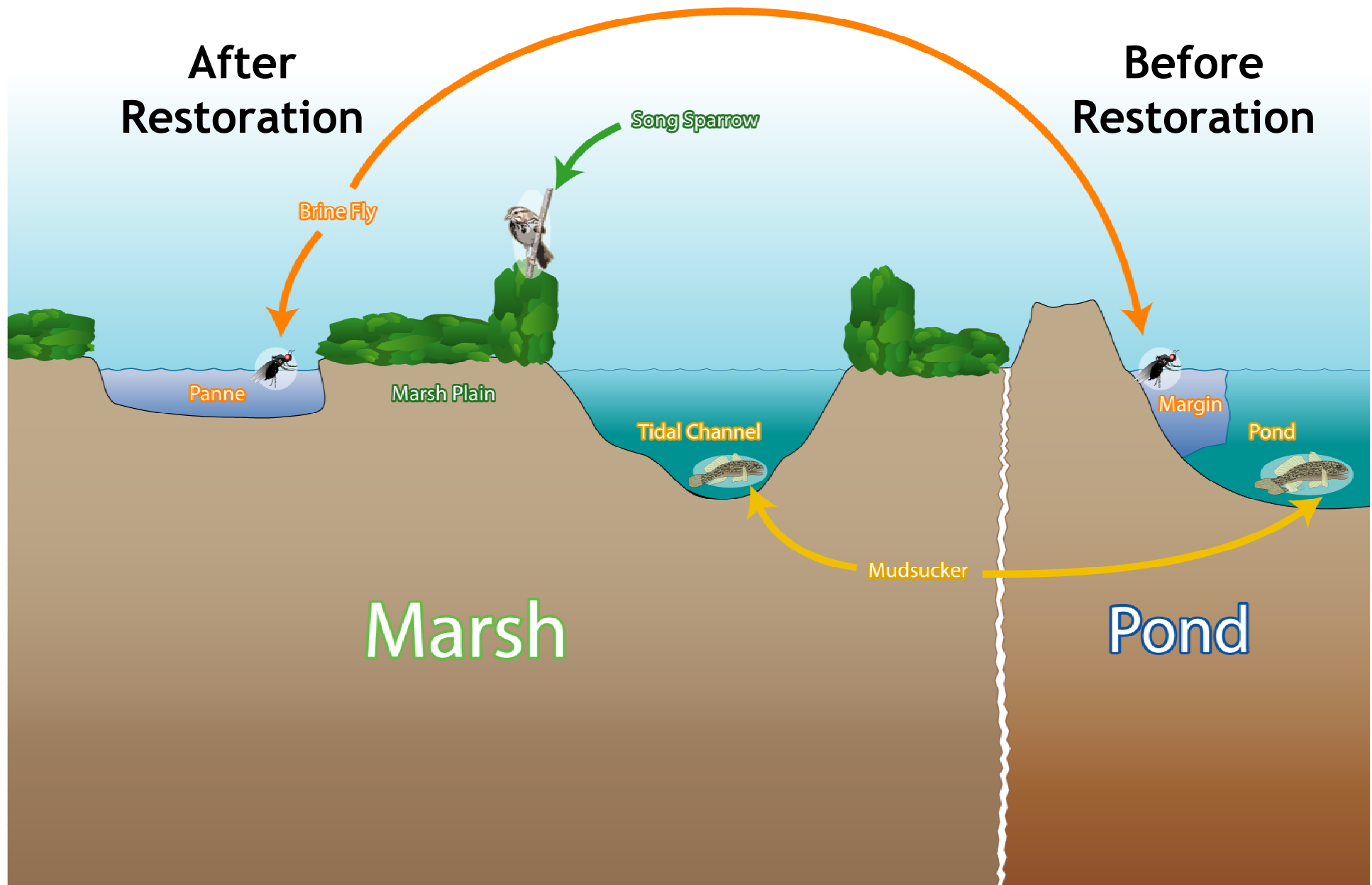
## SEDIMENT MeHg



## UNFILTERED SURFACE WATER MeHg

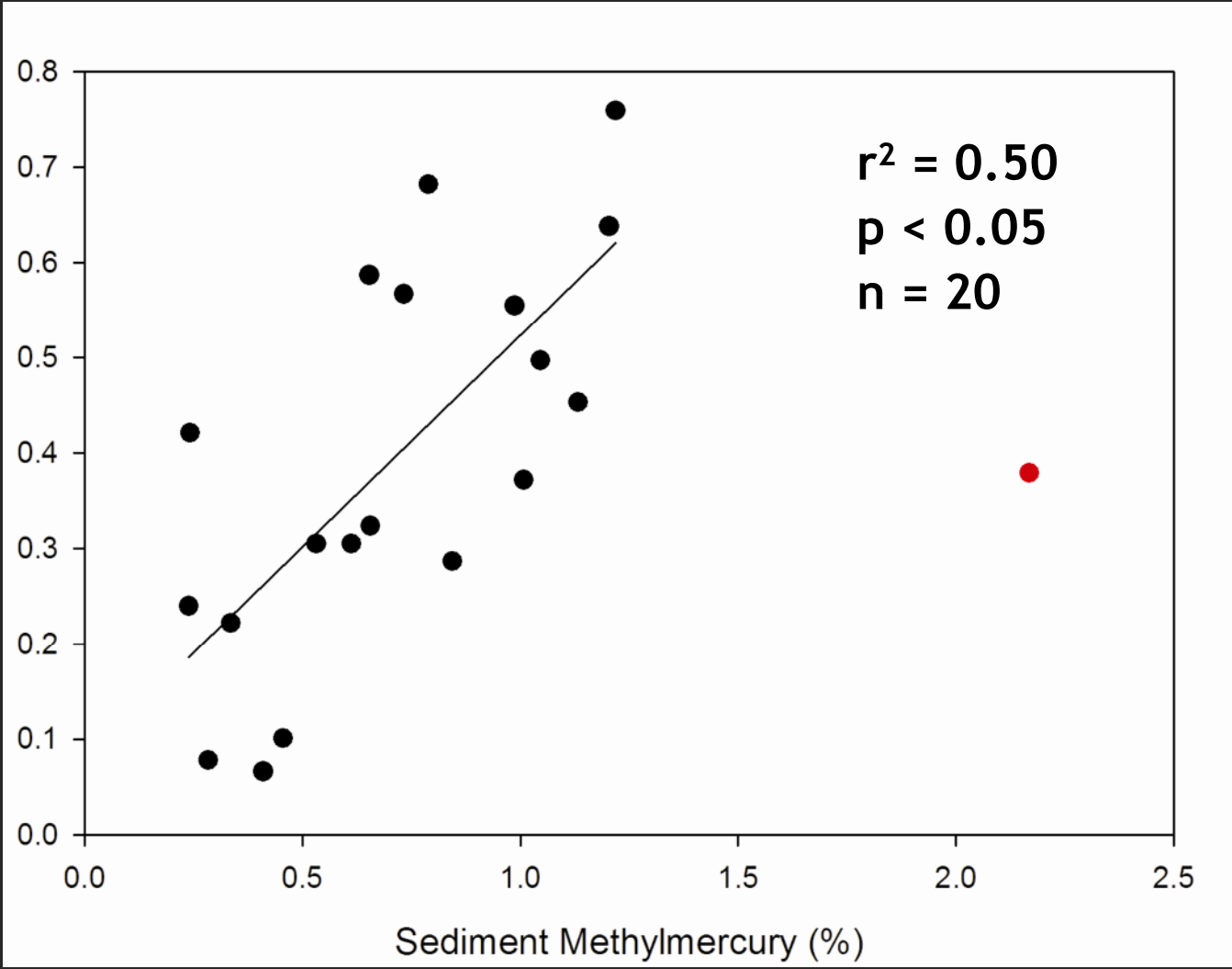


# Use wetland biosentinels to compare restoration options



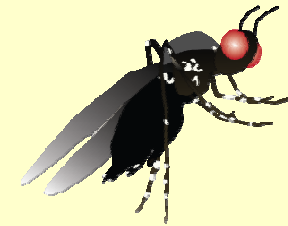
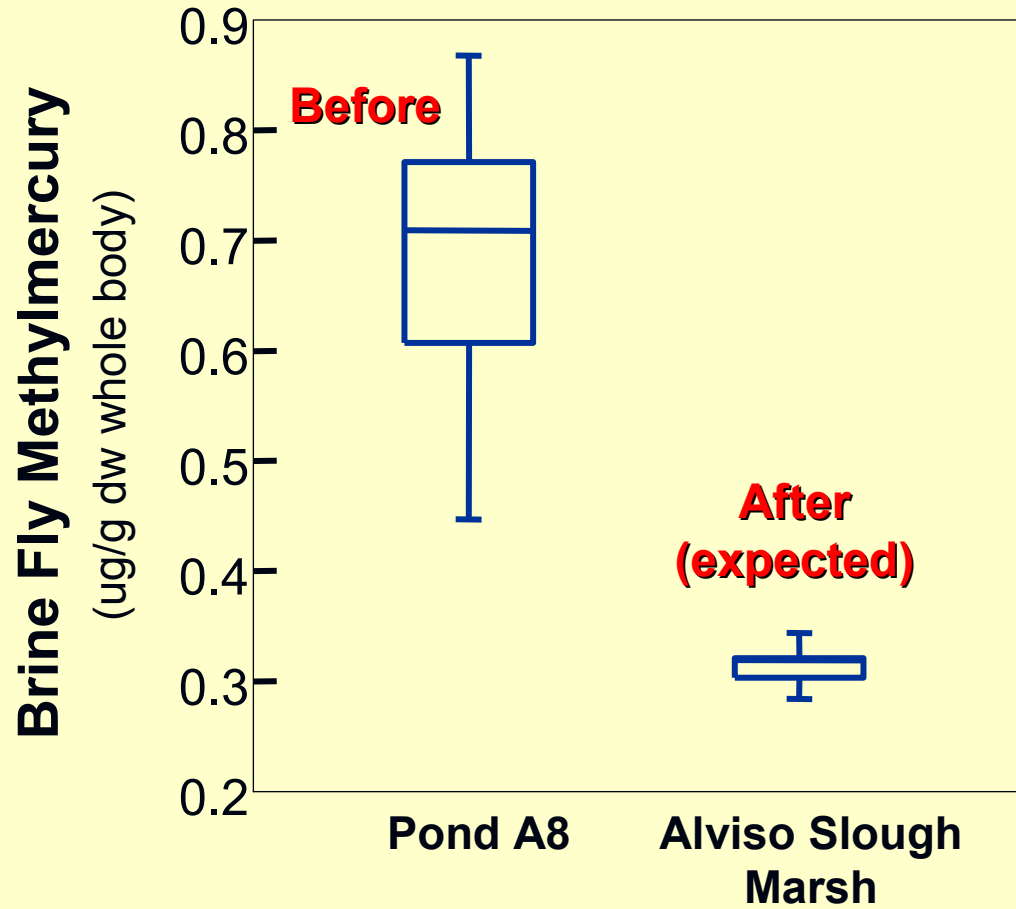
# Strong relationship between biosentinels and methylmercury in their habitat

Song Sparrow THg  
(Marsh plain biosentinel)  
ug/g ww in whole blood





# 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 > MeHg than tidal marsh

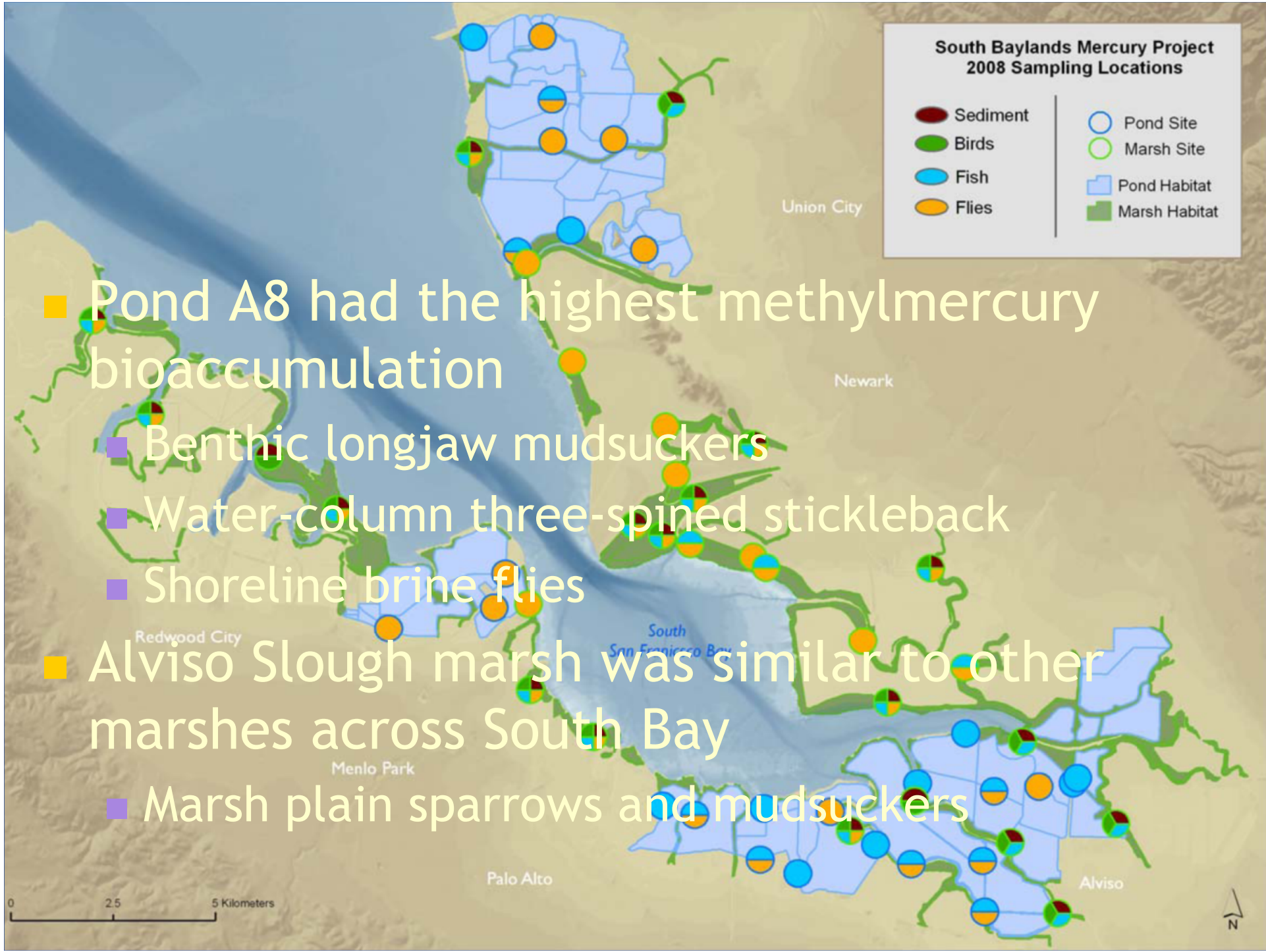
## **Q4: Would converting Pond A8 to tidal marsh worsen the mercury problem?**

- Conversion of Pond A8 to fully tidal marsh likely would lessen the mercury problem within the A8 footprint**
- How do Pond A8 and Alviso Slough marsh compare to the rest of South Bay?**

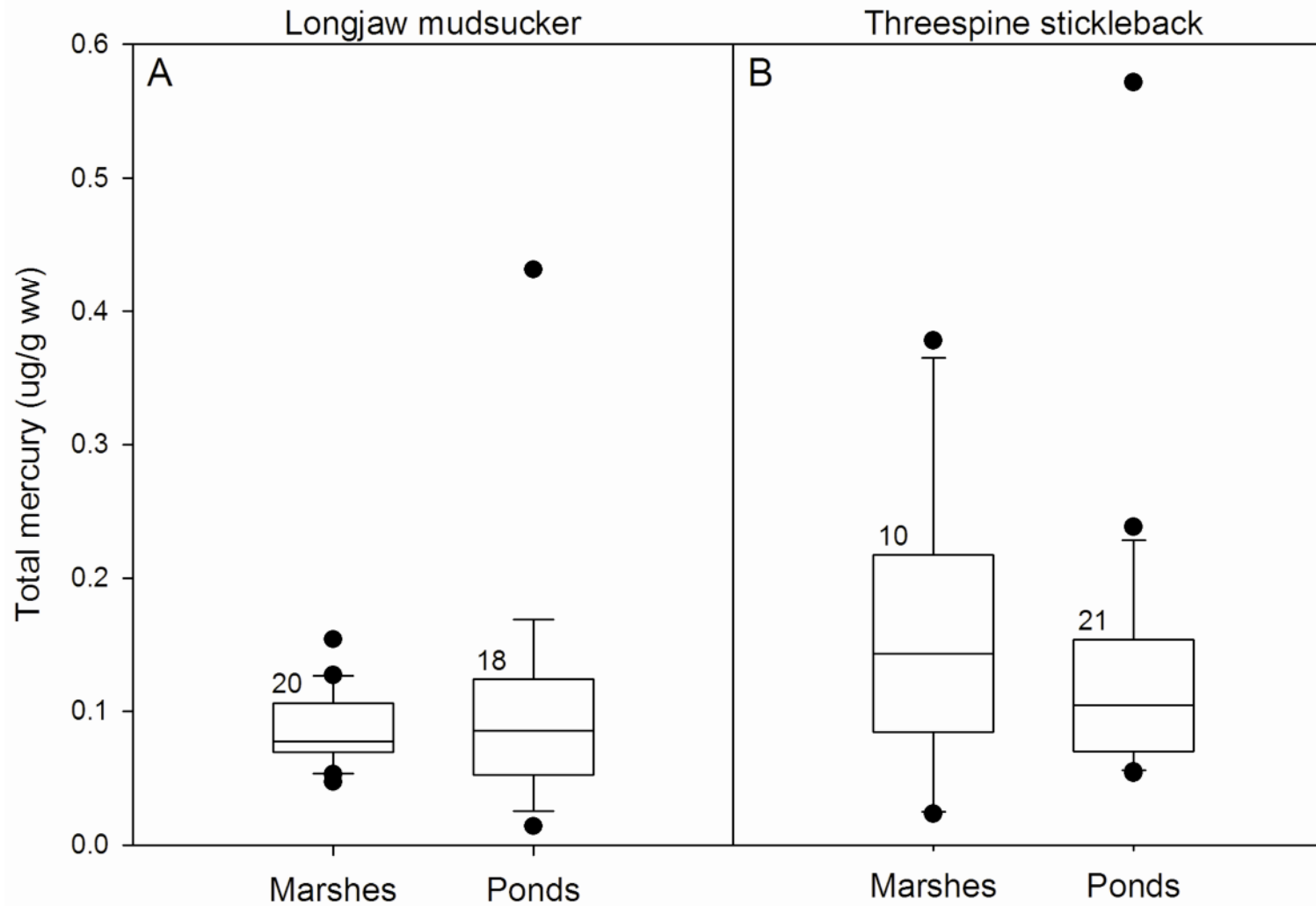
South Baylands Mercury Project  
2008 Sampling Locations



- Pond A8 had the highest methylmercury bioaccumulation
  - Benthic longjaw mudsuckers
  - Water-column three-spined 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 has particularly high methylmercury
- Alviso Slough marsh has typical methylmercury

# Take Home Messages

- The future Bay has a lot more tidal marsh
- Tidal marsh biosentinels can help us understand what that change means for Hg in the food web
- Breaching managed ponds -> sediment scour -> MeHg spike?
- Restoration projects should be monitored with biosentinels tailored to meet management questions

# 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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