

# Reducing Methylmercury Accumulation in the Food Webs of San Francisco Bay and Its Local Watershed

**Jay Davis, Letitia Grenier, Don Yee, Lester McKee, Ben Greenfield**  
***San Francisco Estuary Institute***

**Richard Looker, Carrie Austin**  
***San Francisco Bay Regional Water Quality Control Board***

**Mark Marvin-DiPasquale**  
***U.S. Geological Survey***

**Robert Brodberg**  
***California Office of Environmental Health Hazard Assessment***

**Joel Blum**  
***University of Michigan***

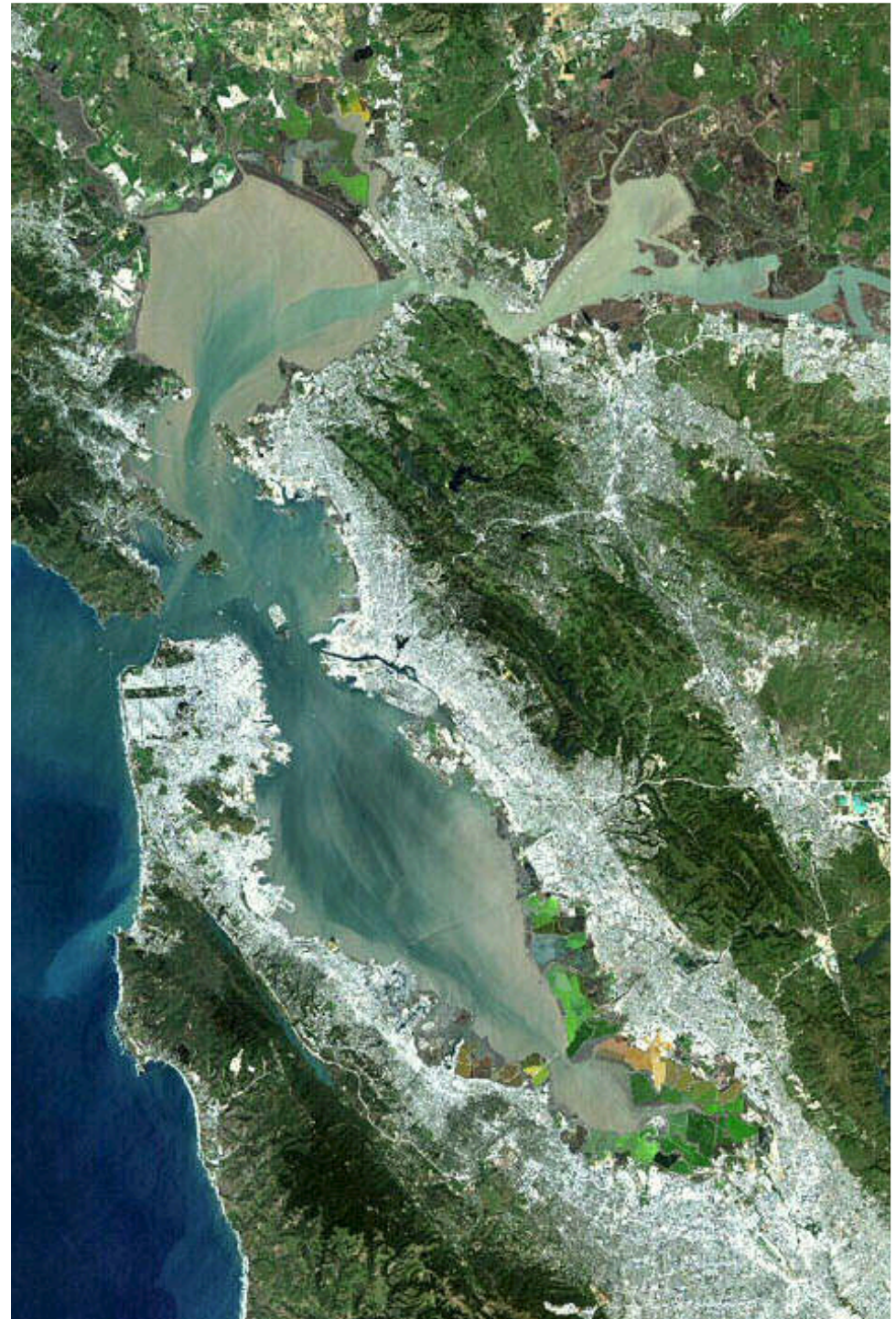
**ICMGP July 2011**





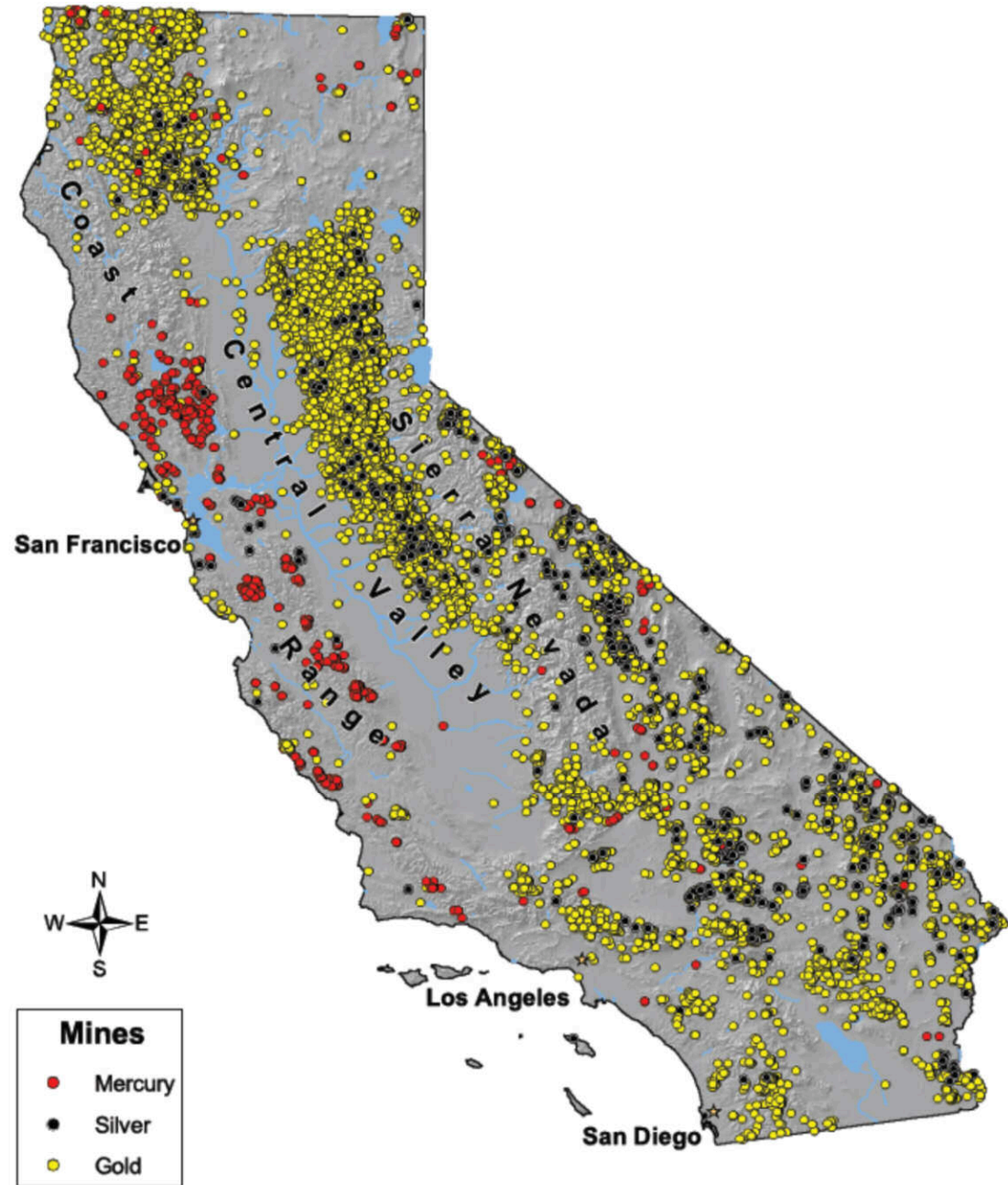
# Interesting Case Study: Features Typical of Estuaries

- Sediment retention
- Dense population
- Urban and industrial
- High productivity
- Food web contamination



# Interesting Case Study: Atypical Features

- Mining legacy
- Lack of local atmospheric sources
- Unusual speciation
- Erosional sediment regime
- Extensive wetland restoration
- Not eutrophic
- Thorough monitoring

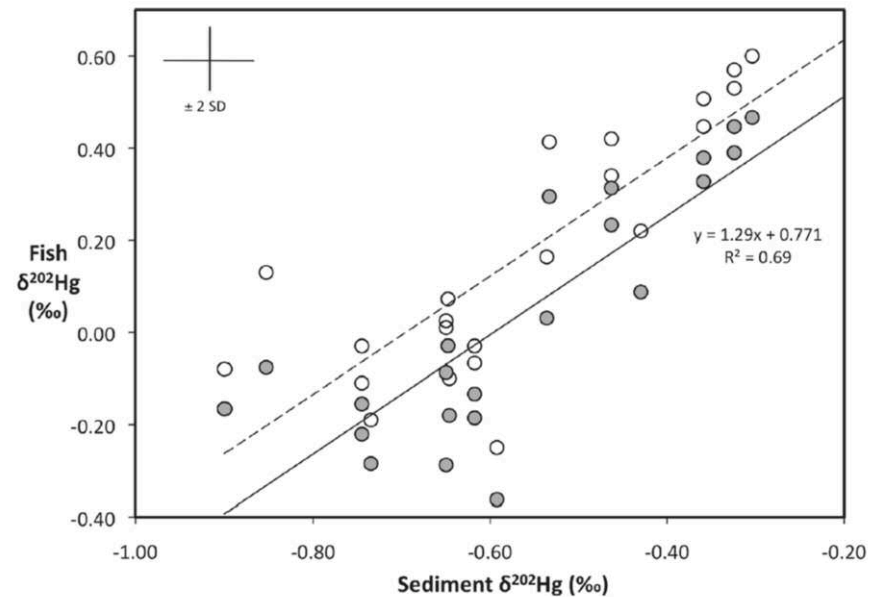


From Wiener and Suchanek (2009). Ecological Applications 18(8) Supplement: A3-A11.



# Mining legacy Hg matters

- Isotopes
- Spatial patterns
- Even Hg in cinnabar and related forms makes it into the food web
- Sediment from historic mining regions is clearly a concern
- Elemental Hg from gold mining, urban/industrial, and atmosphere is also important



Gehrke et al. 2011. ES&T 45 (4), pp 1264–1270

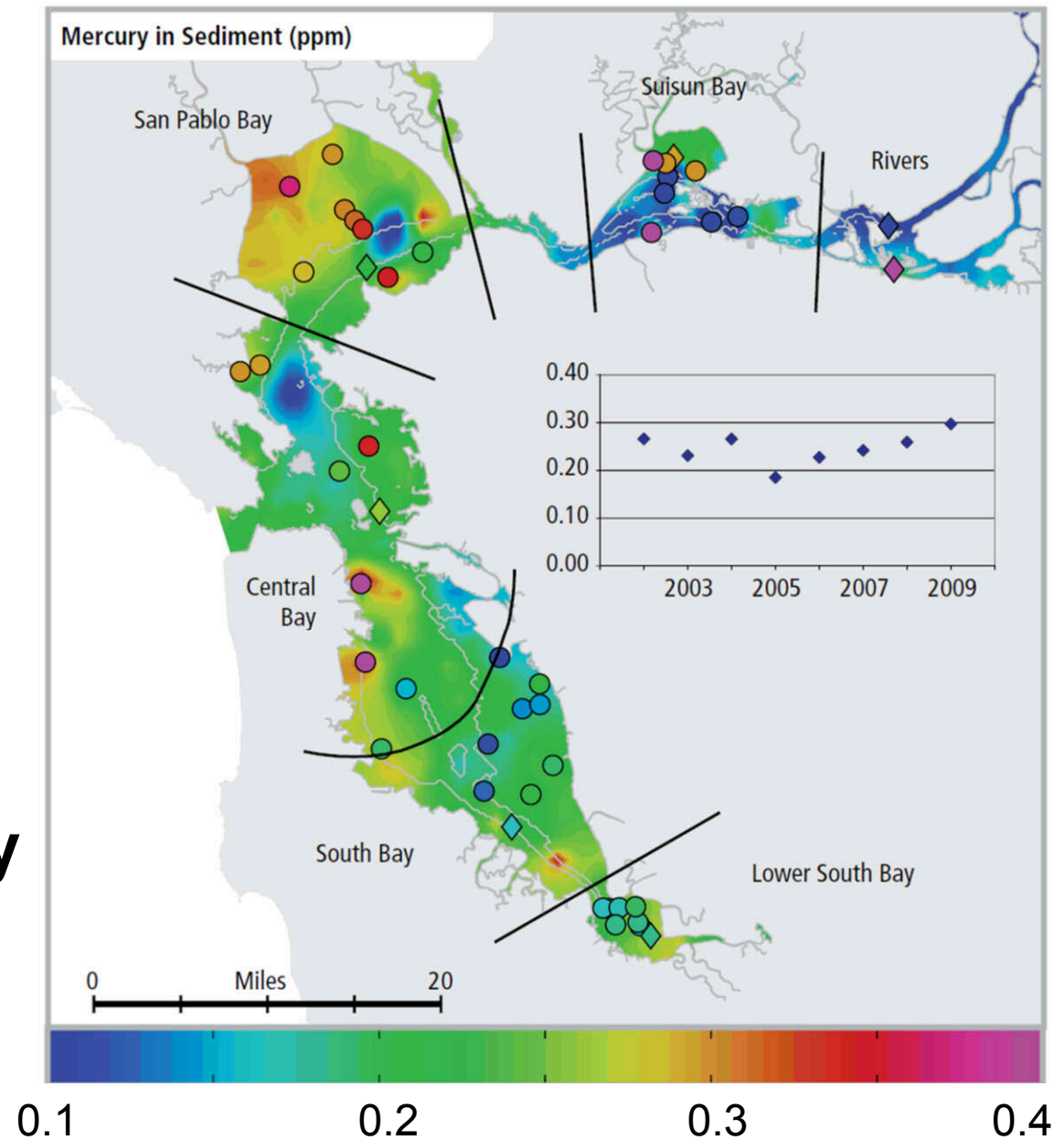
***Fluvial inputs of THg  
should be controlled***

***Atmospheric deposition  
is a secondary concern***

# THg in Sediment

- 2002-2009
- 378 data points
- Average 0.25 ppm
- Regional variation

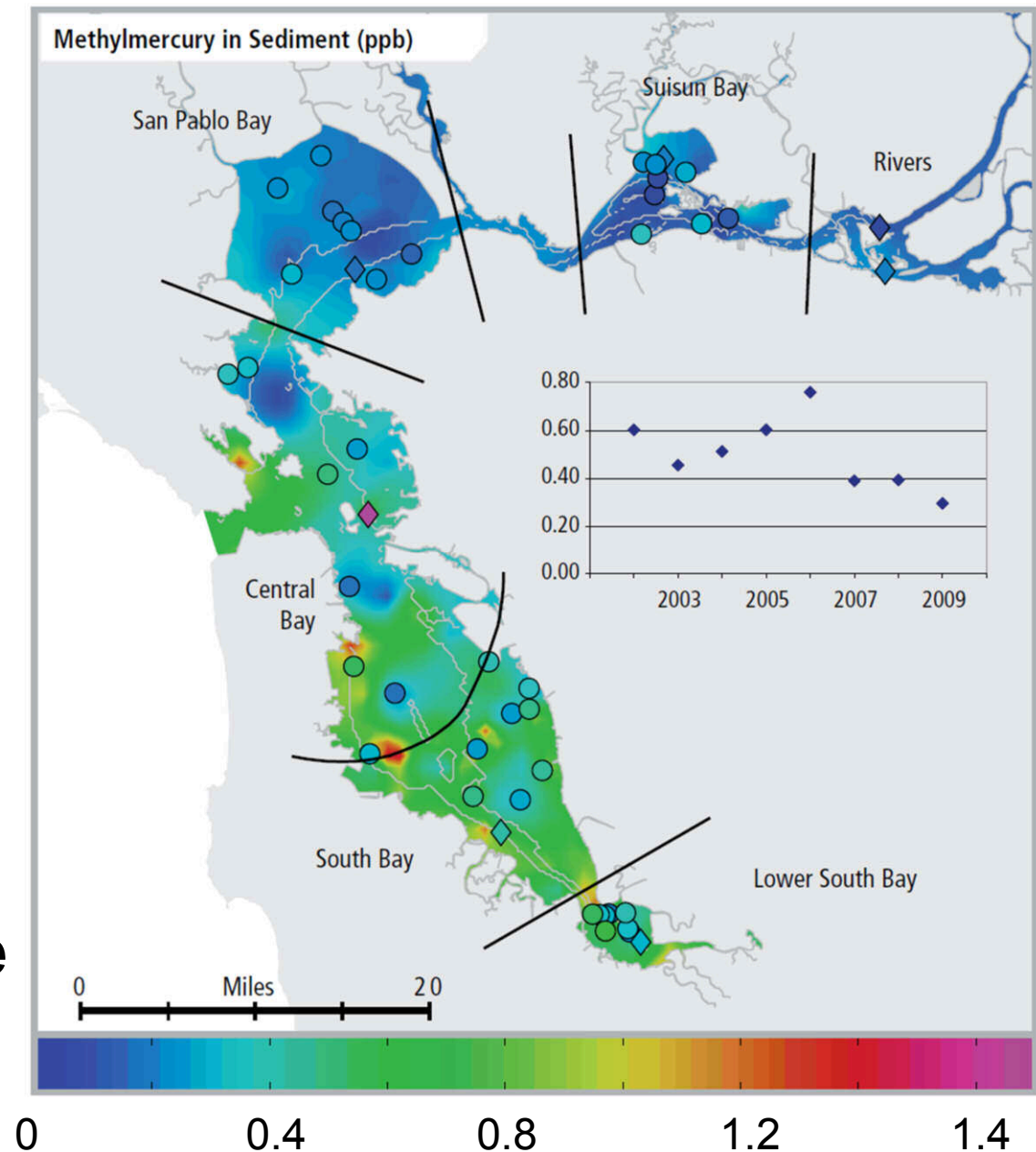
**There is a lot of THg in circulation and it is thoroughly mixed**



# MeHg in Sediment

- 2002-2009
- Average 0.5 ppb
- Contrasting regional pattern to THg

**Internal net MeHg production dominates the mass budget and is another possible intervention point**



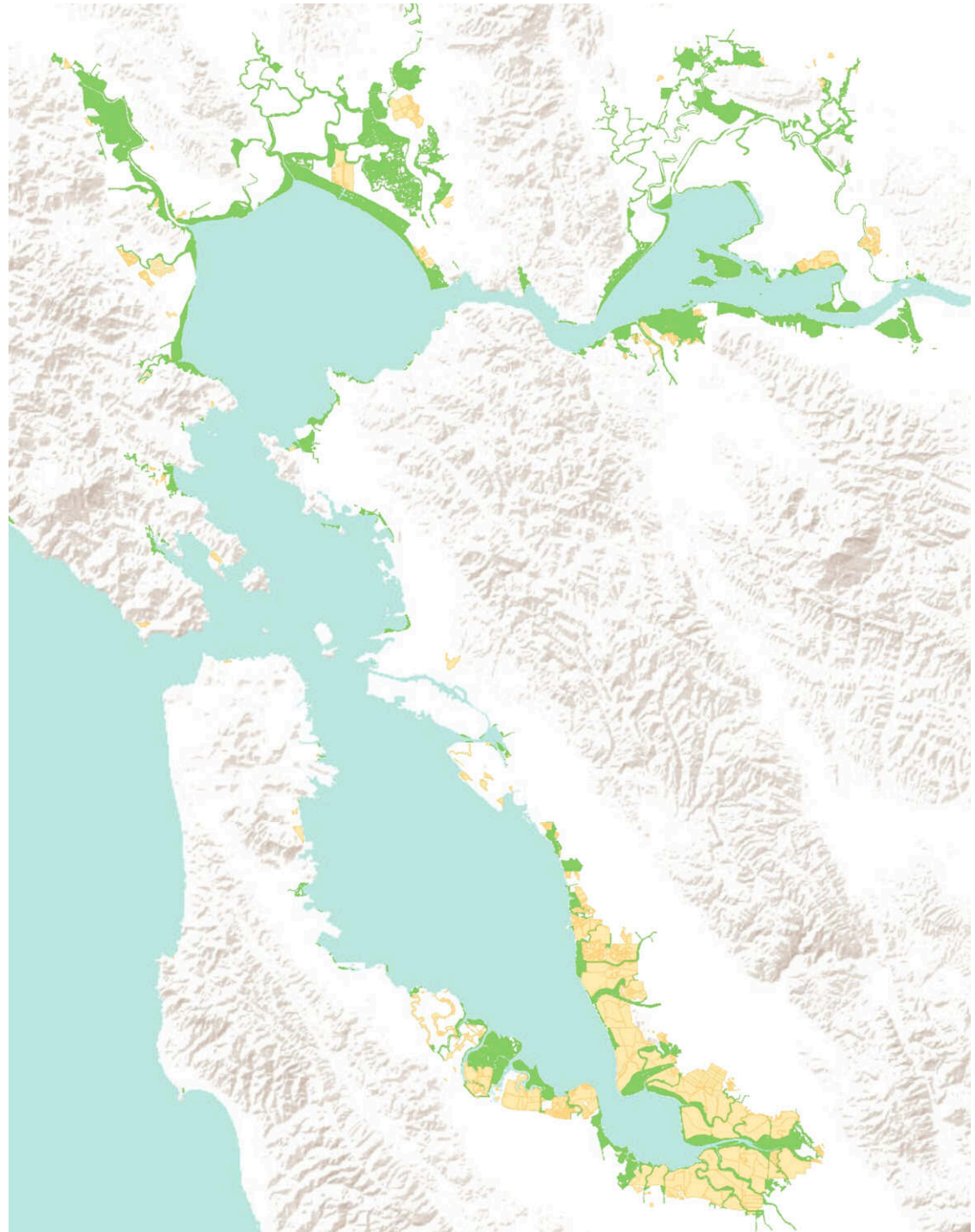
# Habitats

**Open Bay**

**Tidal Marsh**

**Managed Pond**

**Reservoir**



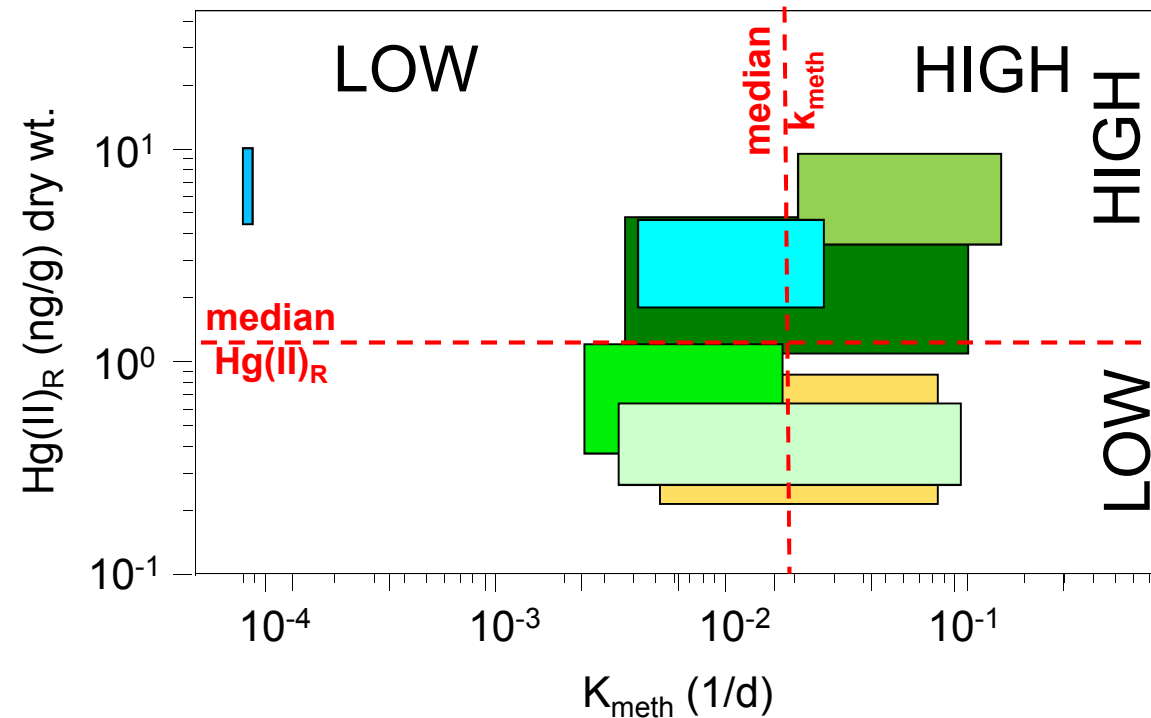
# MeHg production varies by habitat

## North & Central SFB

- Bay subtidal
- marsh plain
- marsh slough

## South SFB

- Bay subtidal
- marsh plain
- marsh slough
- salt pond

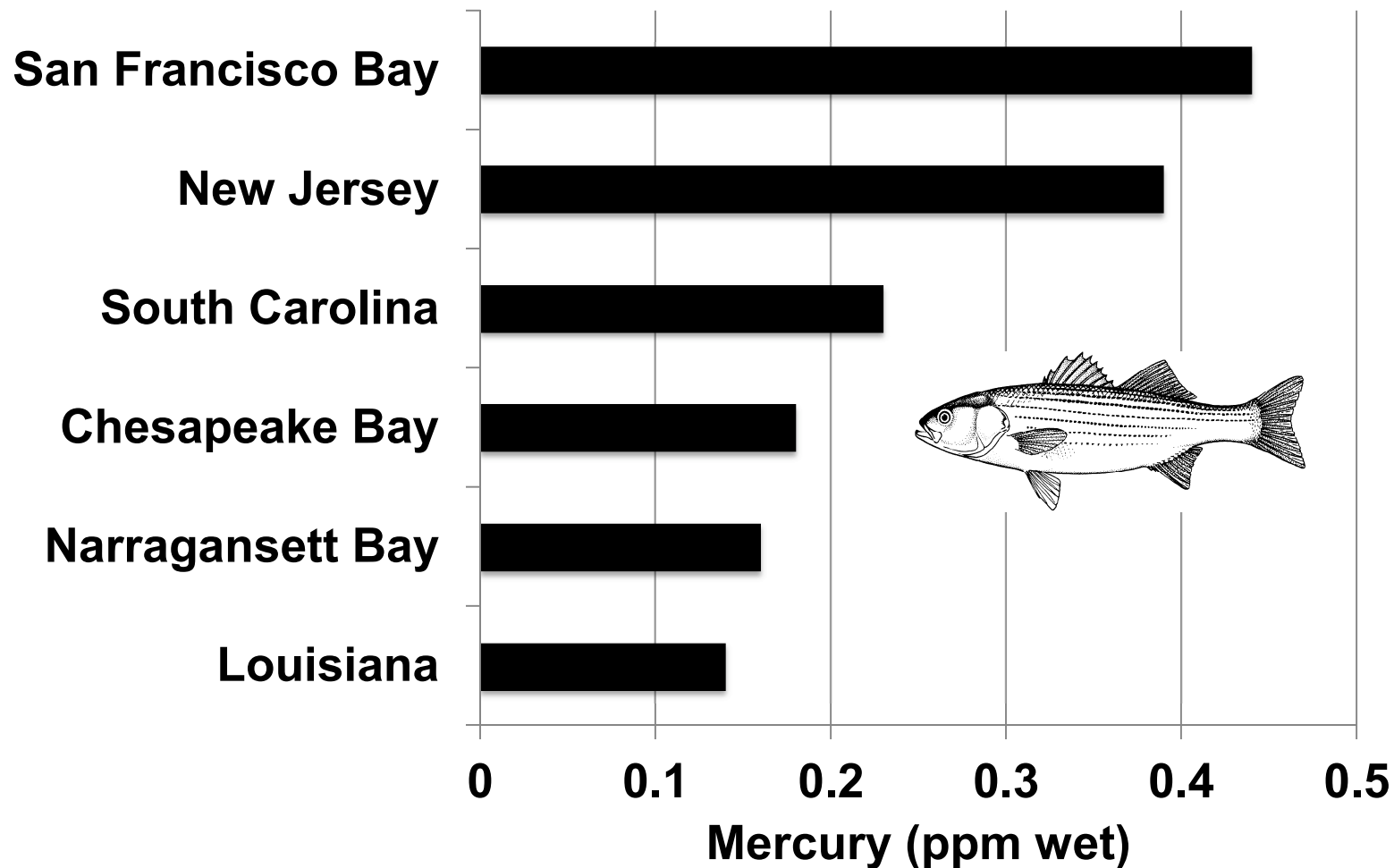


And so does degradation



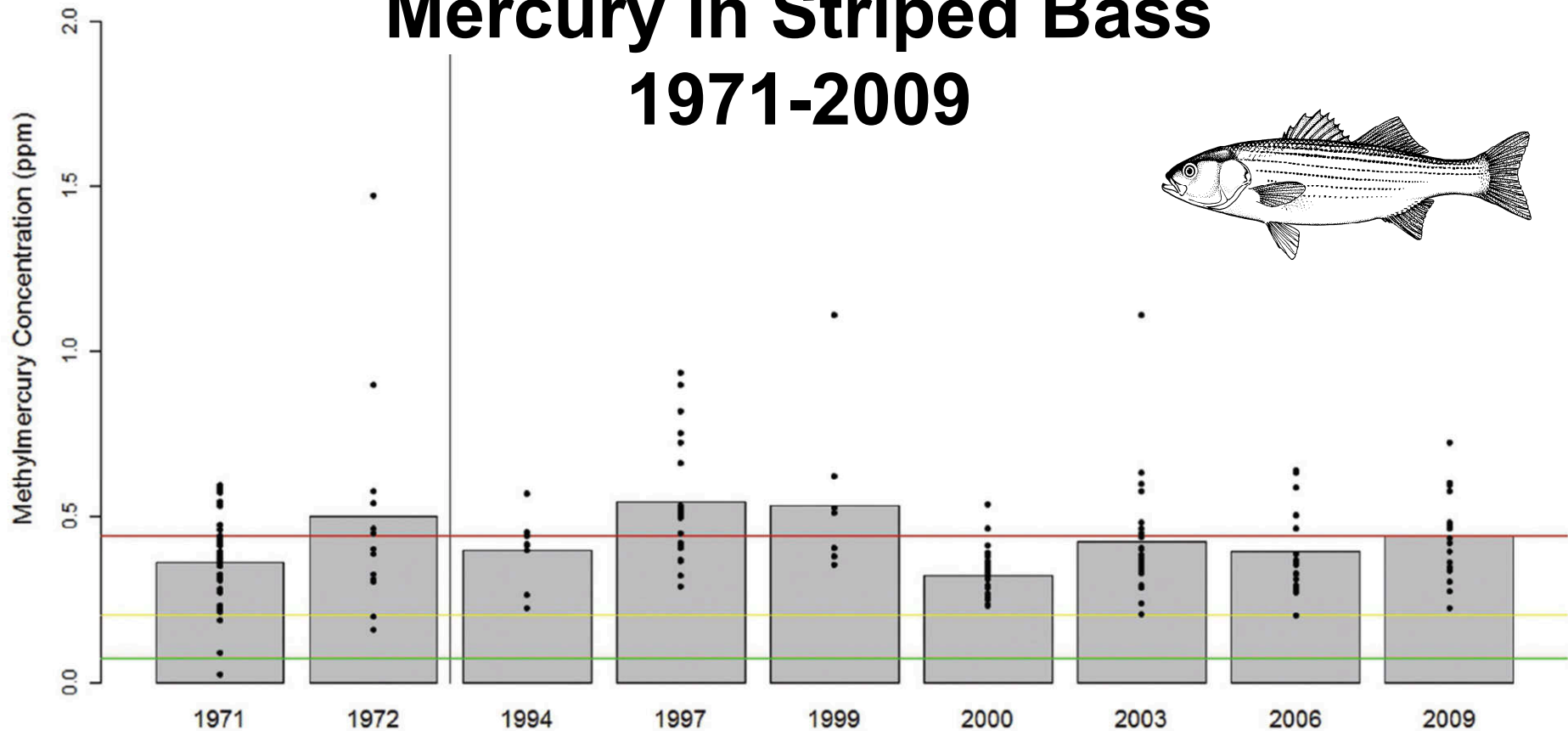
# Open Bay: Risk Indicator

## Mercury in Striped Bass



# Open Bay: Risk Indicator

## Mercury in Striped Bass 1971-2009



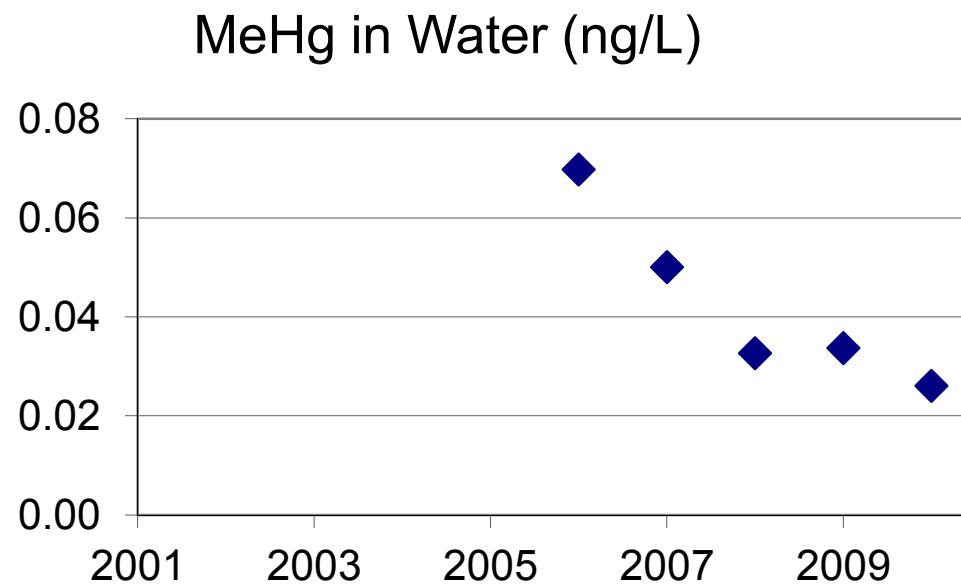
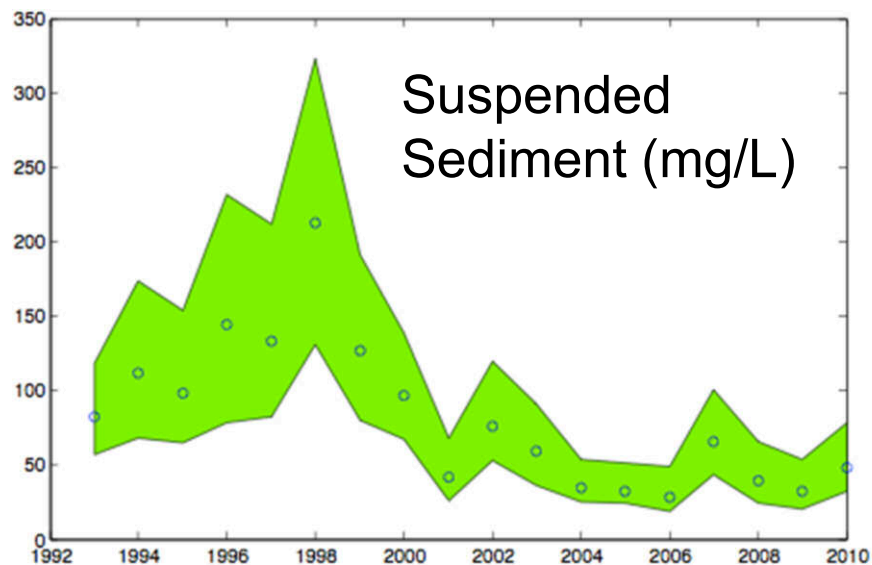
# Open Bay: Possible Knobs

- Elective strategies
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Nutrient control?
- Non-elective changes
  - Suspended sediment regime
  - Temperature change
  - Sea level rise
  - Food web shifts





# Open Bay: Non-elective Change



# Tidal Marsh

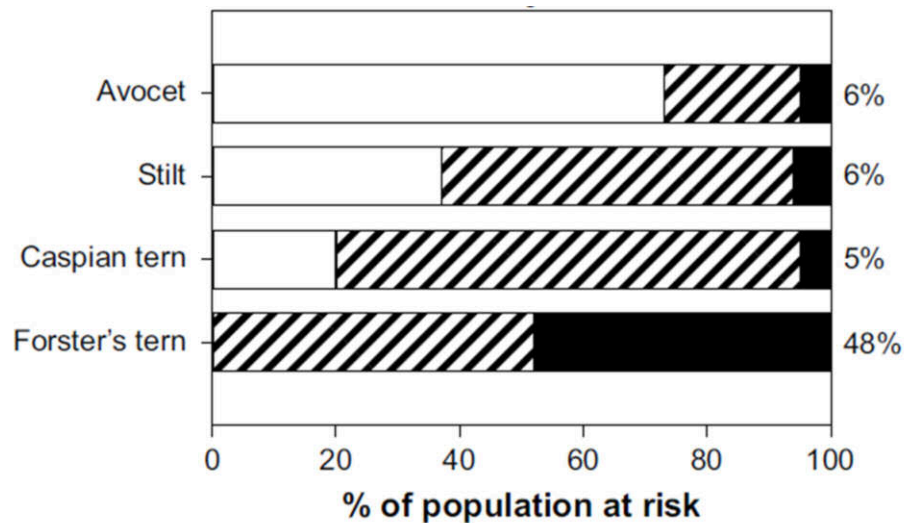
## Risk Indicators



## Knobs

- Elective strategies
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Design of restored marshes
- Non-elective changes
  - Temperature change
  - Food web shifts

# Managed Pond

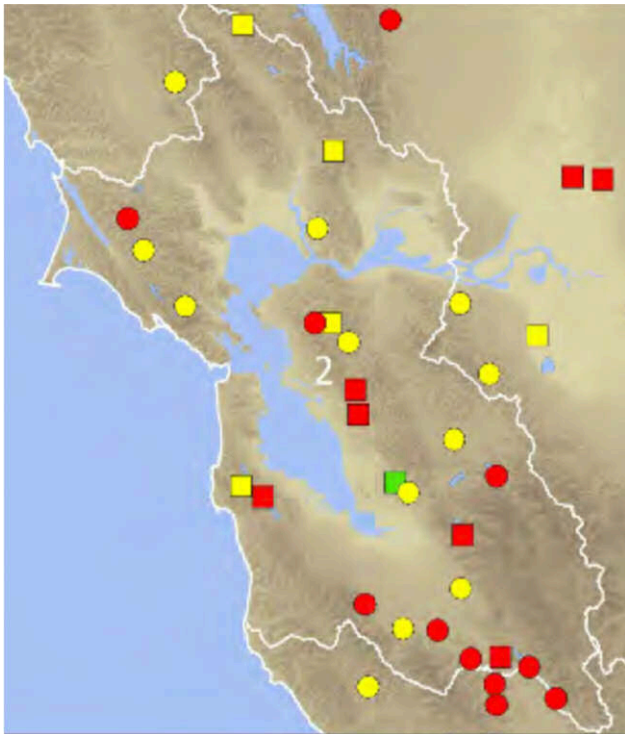
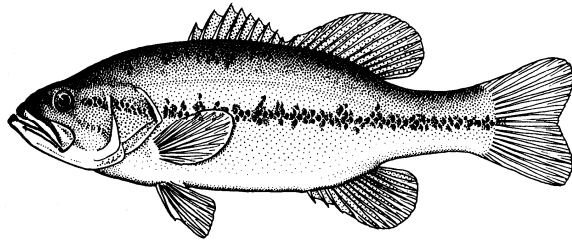


## Knobs

- Elective strategies
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Pond management
    - Pond placement
- Non-elective changes
  - Temperature change
  - Food web shifts



# Reservoir



## Knobs

- Elective strategies
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Water management
    - Water chemistry
    - Fishery management
- Non-elective changes
  - Temperature change
  - Food web shifts

**To be submitted to**  
***Environmental Research***

**jay@sfei.org**

**www.sfei.org**



# Plans for 2012

## Mercury

- Revise report/manuscript in response to comments
- Resubmit for publication
- Mercury Strategy Team meeting
  - Workshop?
  - Recommendations for next steps

## PCBs

- Draft synthesis in April
- PCB Strategy Team meeting
  - Recommendations for next steps

