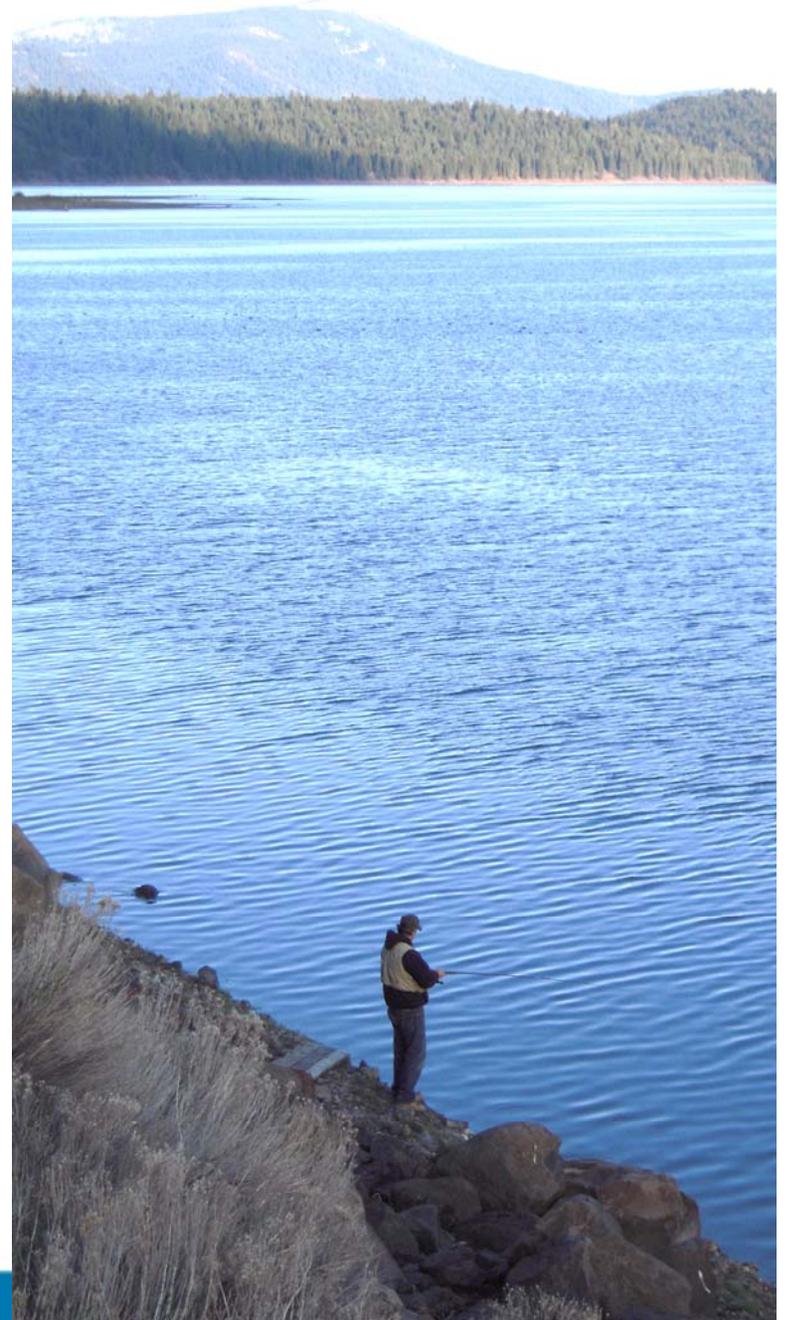


# California's Surface Water Ambient Monitoring Program Contaminants in Fish from California Lakes and Reservoirs



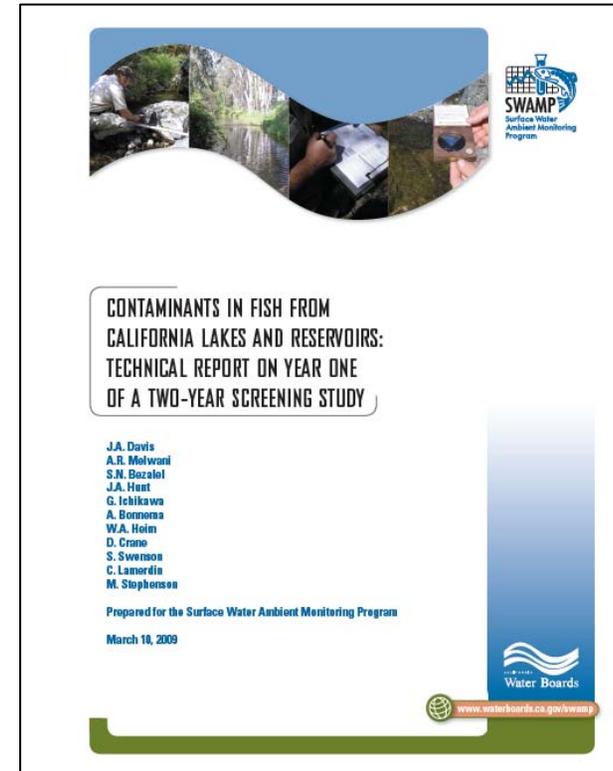
# Background

- Problem
  - lack of statewide information on contaminant impacts on the fishing beneficial use
  - lack of safe eating guidelines
  - especially for lakes
- New SWAMP monitoring began in 2007
- \$750,000 to \$1 million per year
- Five-year cycle to cover all water body types, beginning with lakes
- Initial focus on sport fish



# Lakes Survey

- Questions
  1. Condition of California lakes?
  2. Candidates for 303(d) listing?
  3. Candidates for additional sampling?
- Focus on screening of indicator species
- 2007 – 2008



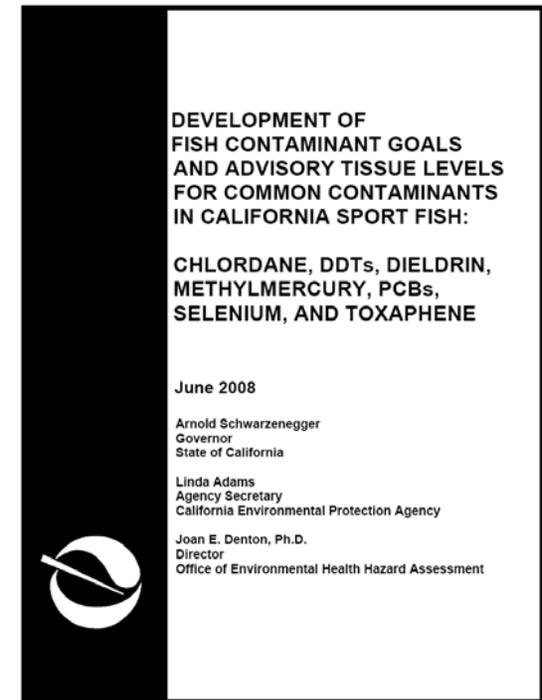
# Summary of Results (Year 1)

- California now has one of the best datasets and is making substantial progress in defining the problem
- As in many other states, the problem is widespread
- Mercury poses the greatest concern
- There is significant variation among lakes and among species
- Data from this screening will be valuable in setting priorities for developing TMDLs and for OEHHA in developing safe eating guidelines



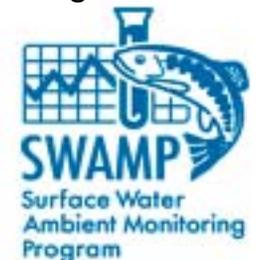
# Assessment Thresholds

- New OEHHA thresholds
- Fish Contaminant Goals (FCGs)
  - Purely risk-based
  - 1 serving/wk
  - 1 in 1,000,000 additional cancer risks
  - Useful goals for risk minimization or elimination
- Advisory Tissue Levels (ATLs)
  - Take benefits into account
  - 1 in 10,000 additional cancer risks
  - 0, 1, 2, 3 servings per week categories
  - For OEHHA use in advisories/safe eating guidelines



**Klasing and  
Brodberg, 2008**

[http://www.oehha.ca.gov/fish/  
gt1sv/index.html](http://www.oehha.ca.gov/fish/gt1sv/index.html)



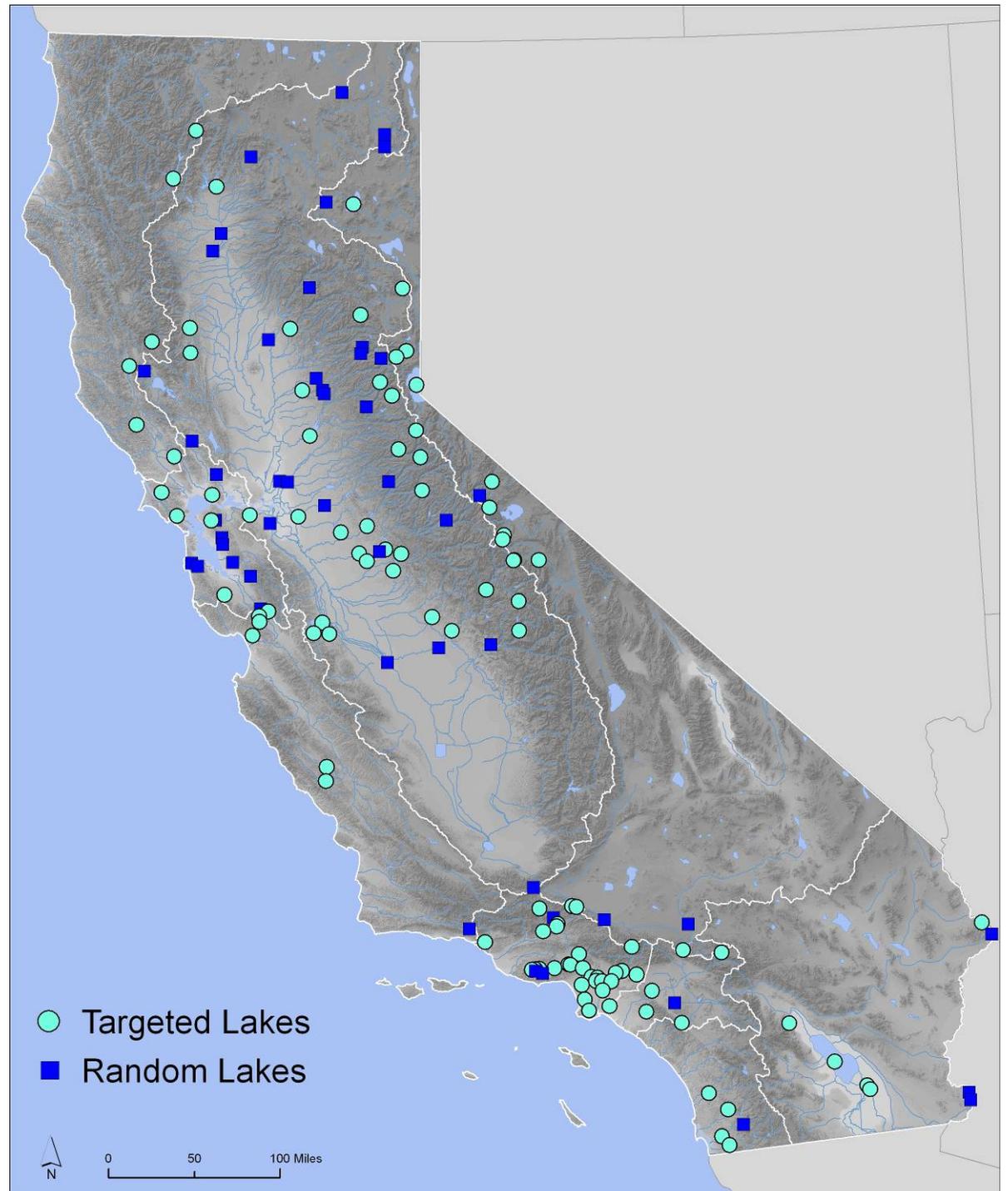
# Assessment Thresholds (ppb)

| <b>Pollutant</b> | <b>Fish Contaminant Goal</b> | <b>Advisory Tissue Level (3 servings/ week)</b> | <b>Advisory Tissue Level (2 servings/ week)</b> | <b>Advisory Tissue Level (No Consumption)</b> |
|------------------|------------------------------|---|---|---|
| Chlordanes       | <b>5.6</b>                   | 190   | 280   | 560   |
| DDTs             | <b>21</b>                    | 520   | 1000  | 2100  |
| Dieldrin         | <b>0.46</b>                  | 15  | 23  | 46  |
| Mercury          | 220                          | <b>70</b>                                       | 150   | 440   |
| PCBs             | <b>3.6</b>                   | 21  | 42  | 120   |
| Selenium         | 7400                         | <b>2500</b>                                     | 4900  | 15000   |

**Klasing and Brodberg, 2008** <http://www.oehha.ca.gov/fish/gtllsv/index.html>

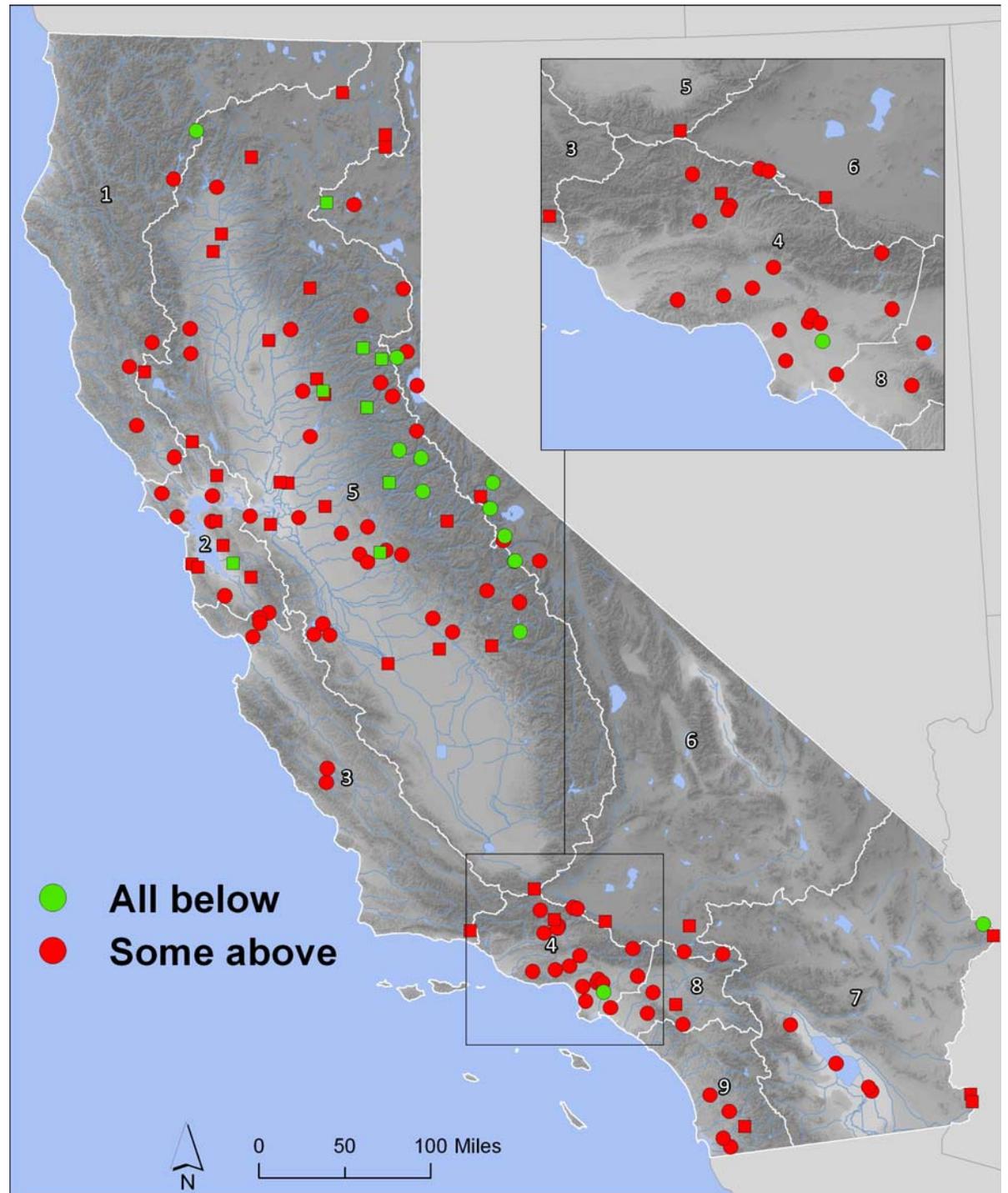
# Sampling Locations, 2007

- 152 lakes sampled
- 50 random
- 102 popular
  - 22 extra in Region 4

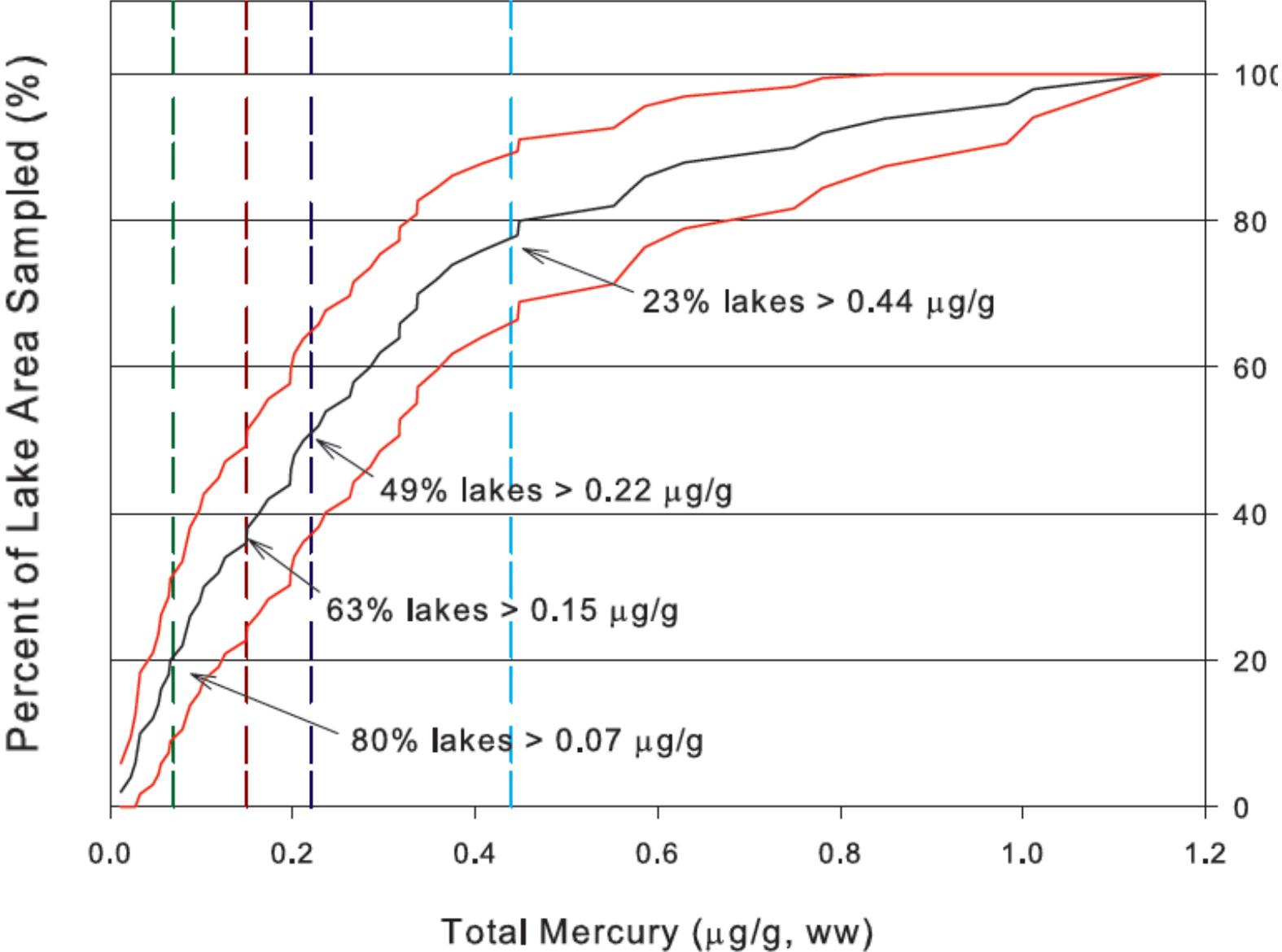


## “Clean” Lakes (Based on This Survey)

- 15% of the lakes tested “clean” - all samples below all thresholds
- These lakes are low priorities for further sampling
- 85% were “red”
- Mercury is the main problem at most of these lakes

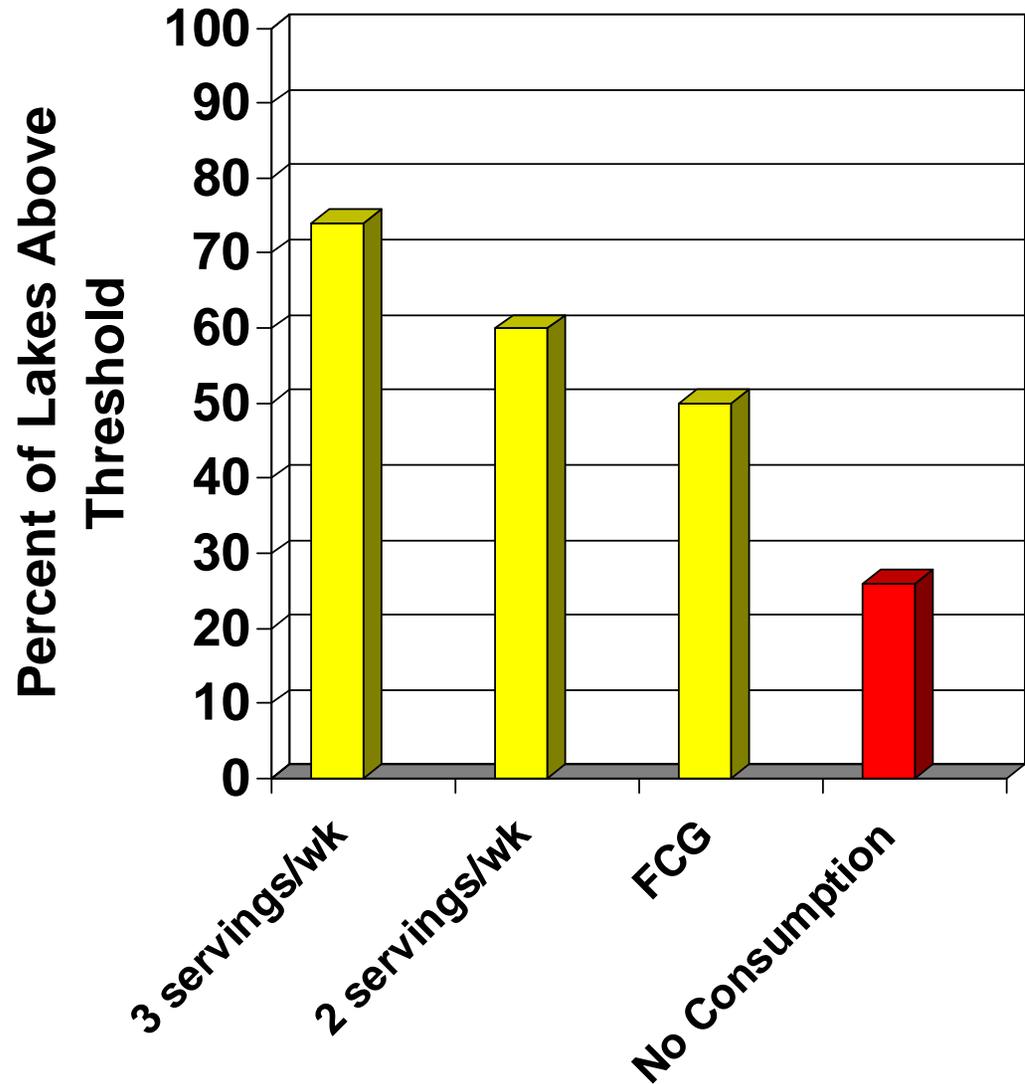


# Mercury: Severity of the Problem



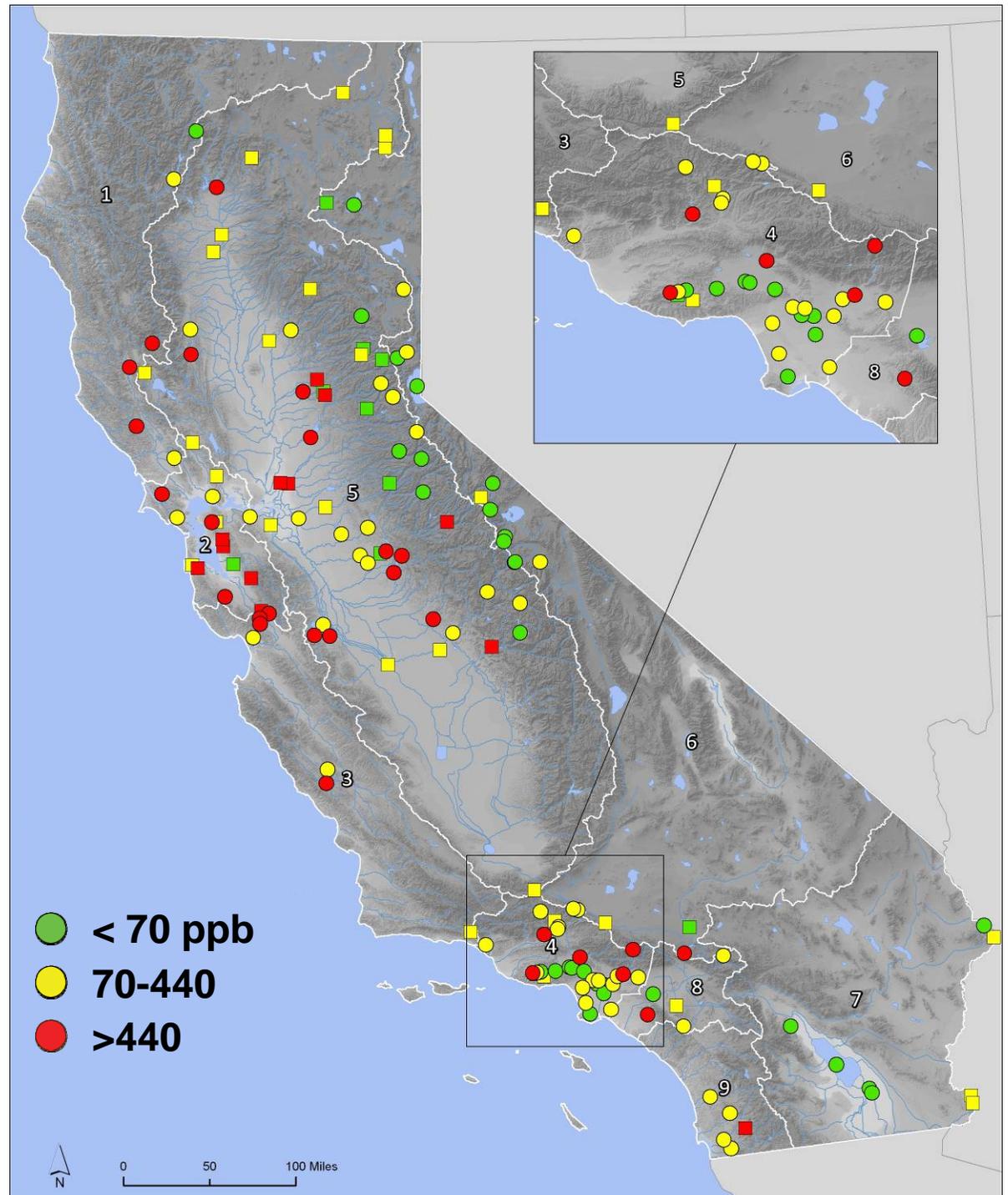
# Mercury: Severity of the Problem

- Based on highest species average at each lake
- 26% in no consumption range (> 440 ppb)
- 50% above Fish Contaminant Goal (220 ppb)
- 61% above 2 serving/wk ATL (150 ppb)
- 74% above 3 serving/wk ATL (70 ppb)



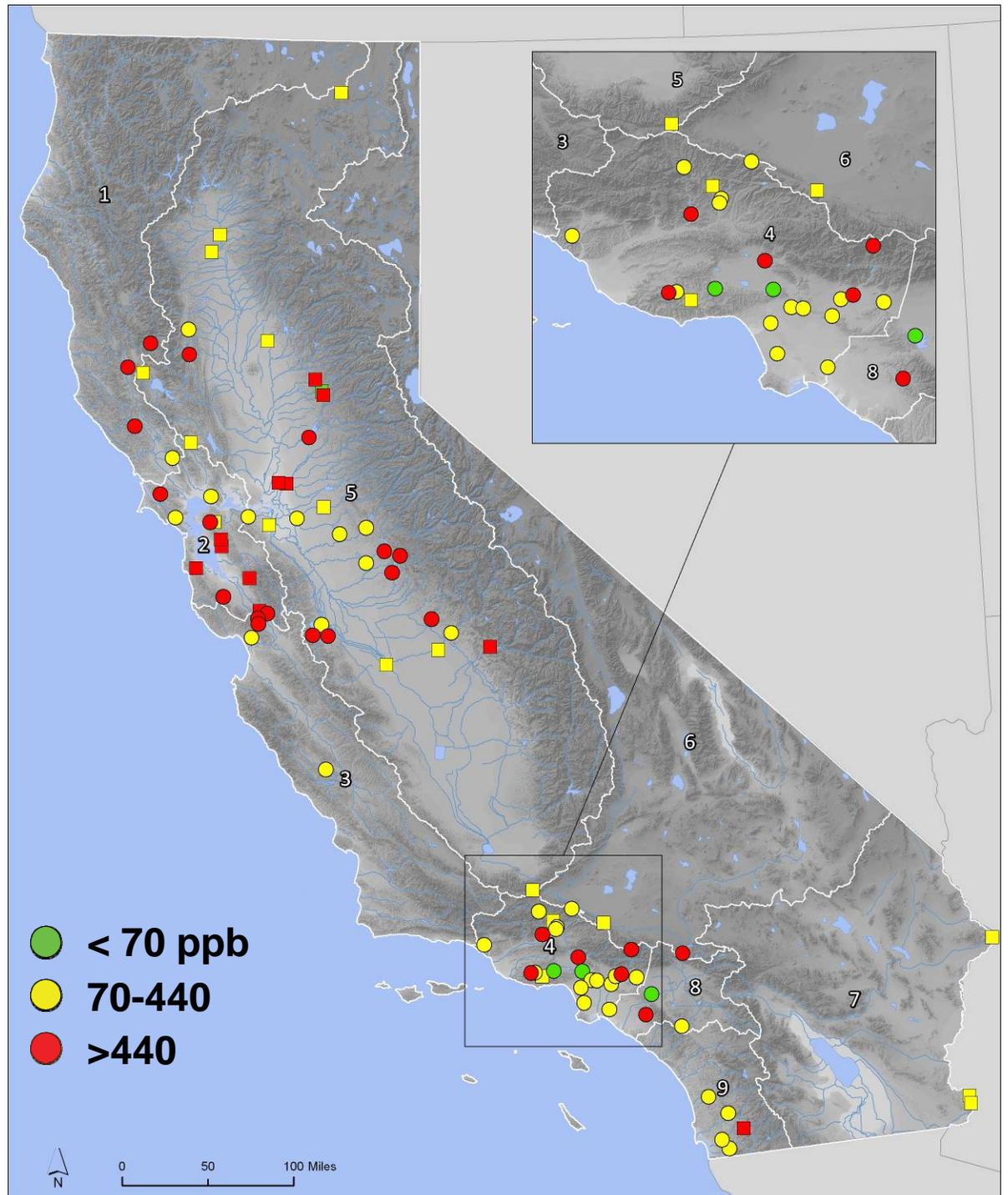
# Mercury: Spatial Distribution

- Based on highest species average at each lake
- Low concentrations in some Sierra Nevada and southern CA lakes
- Not just a northern CA problem
- Species distribution has a big influence
- Red lakes a high priority for followup



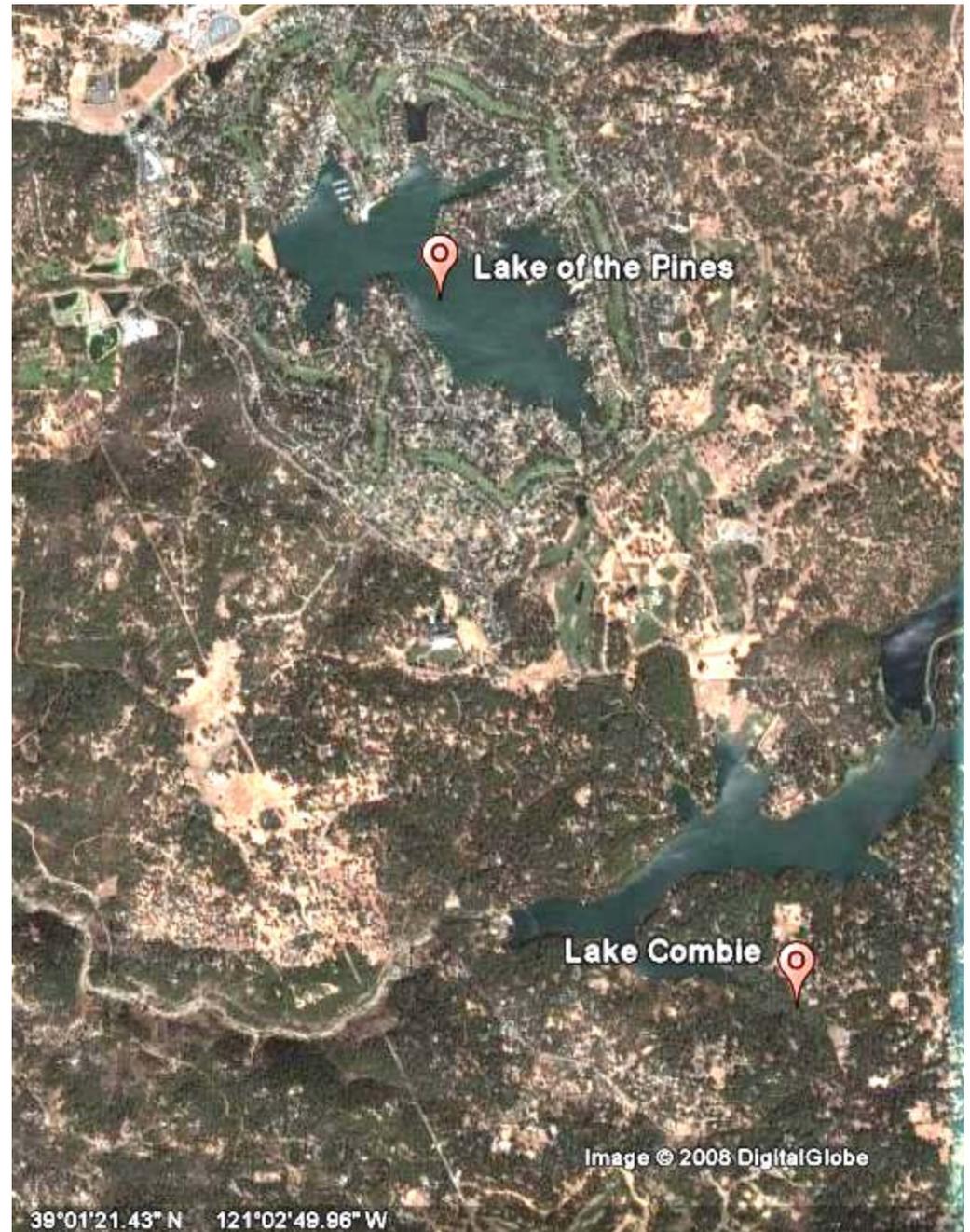
# Mercury: Spatial Distribution

- Standard size largemouth bass: apples vs. apples
- One “clean” lake in northern California
- Three clean lakes in southern California
- Sources: mining may not be the only driver

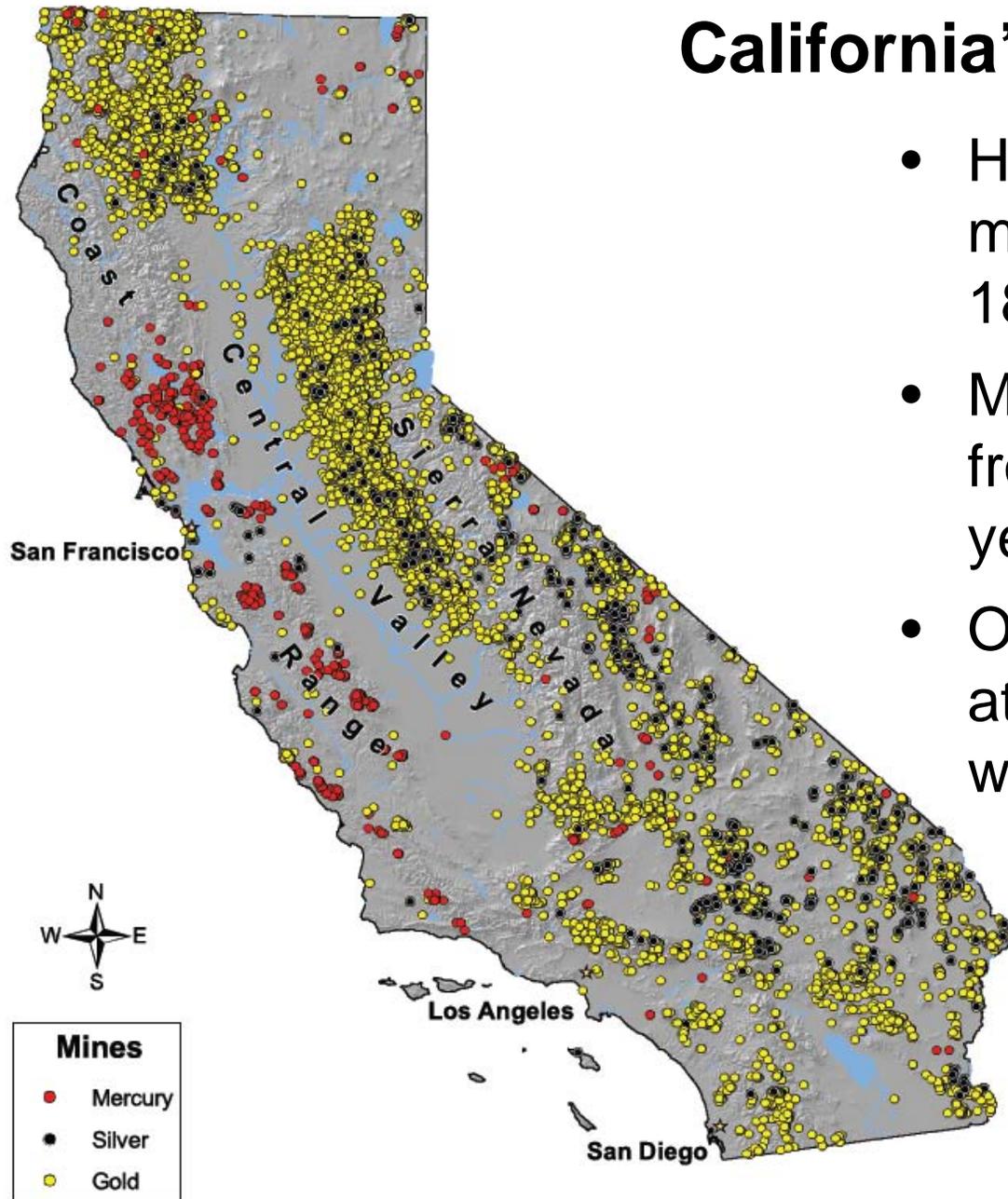


## Mercury: Spatial Distribution

- A tale of two NorCal lakes
- 2 miles apart
- Lake of the Pines: 0.07 ppm
- Lake Combie: 0.98 ppm

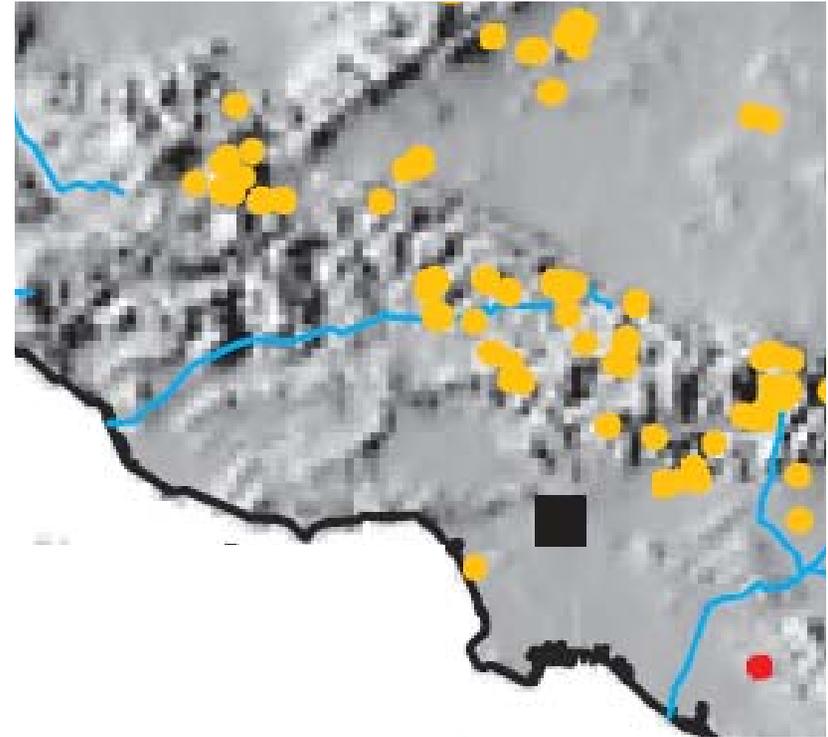
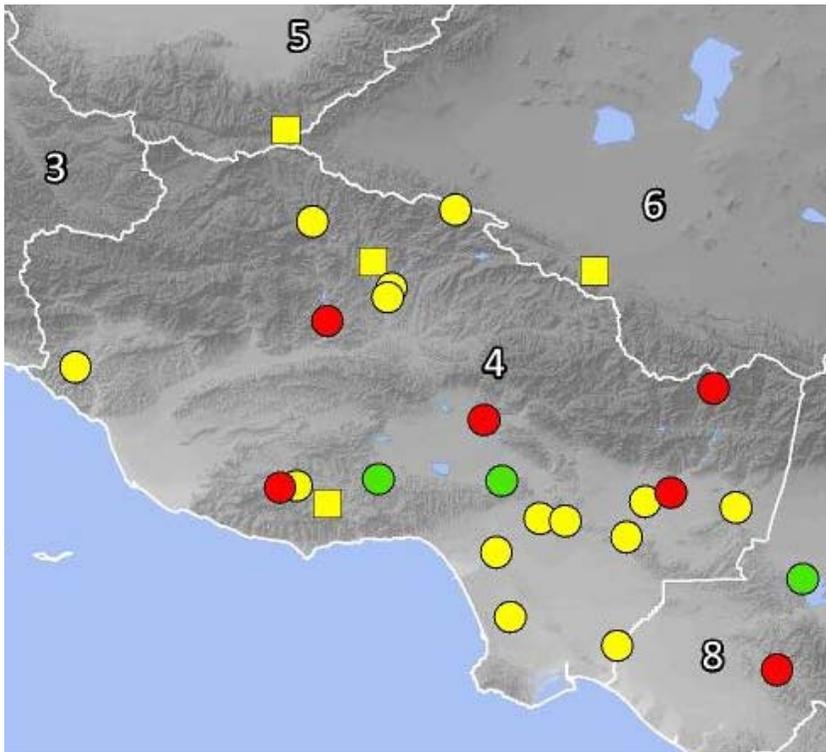


# California's Mining Legacy



- Hundreds of gold and mercury mines from mid-1800s
- Mercury contamination from mining persists 150 years later
- Other sources: atmospheric deposition, wastewater, urban runoff

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



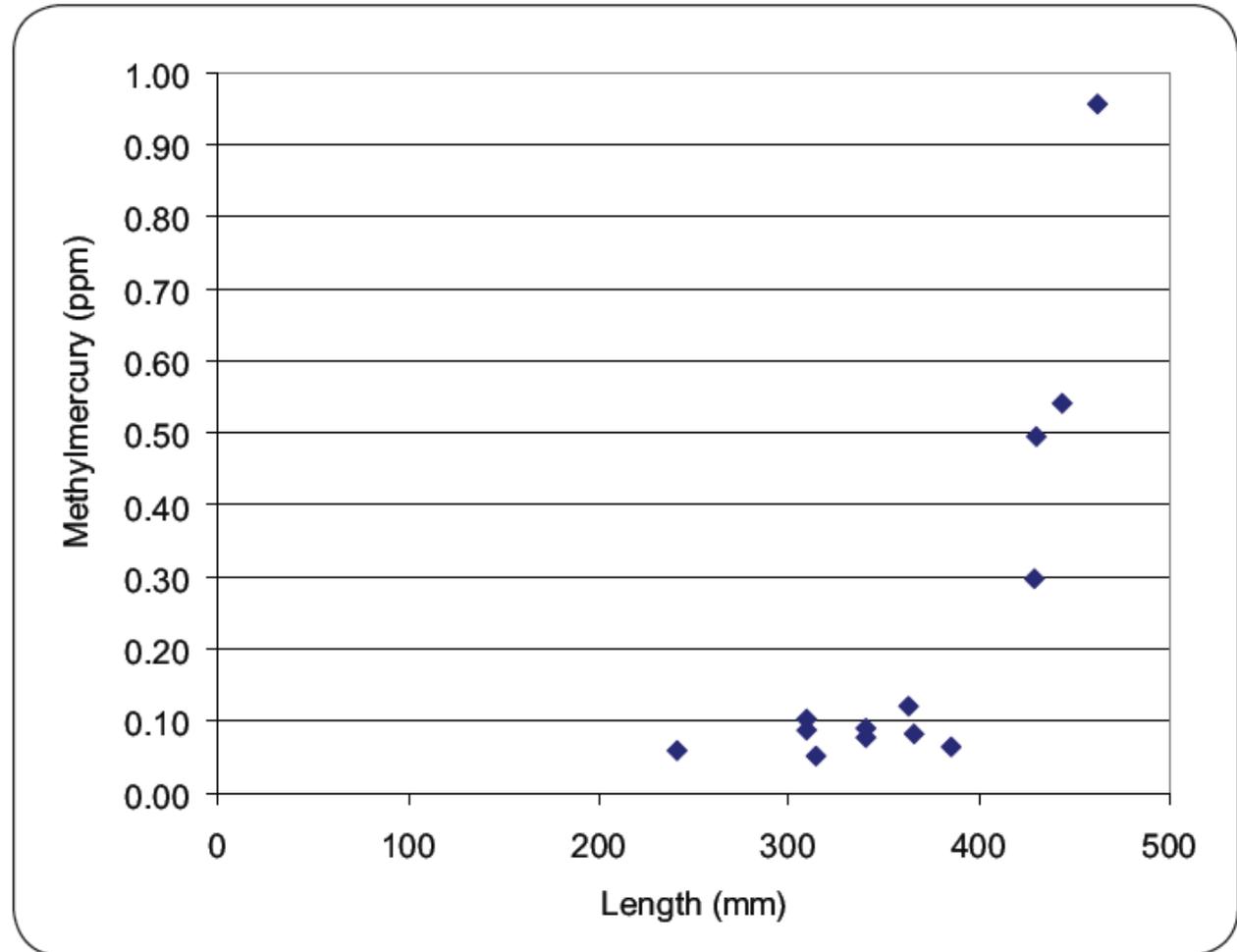
## Mercury: Spatial Distribution

- Southern CA has mercury too
- Southern CA had mines too
- Toluca Lake: 0.01 ppm
- Crystal Lake: 0.95 ppm

From Alpers et al. (2005) – Fact Sheet  
2005-3014 Version 1.1, Revised October  
2005

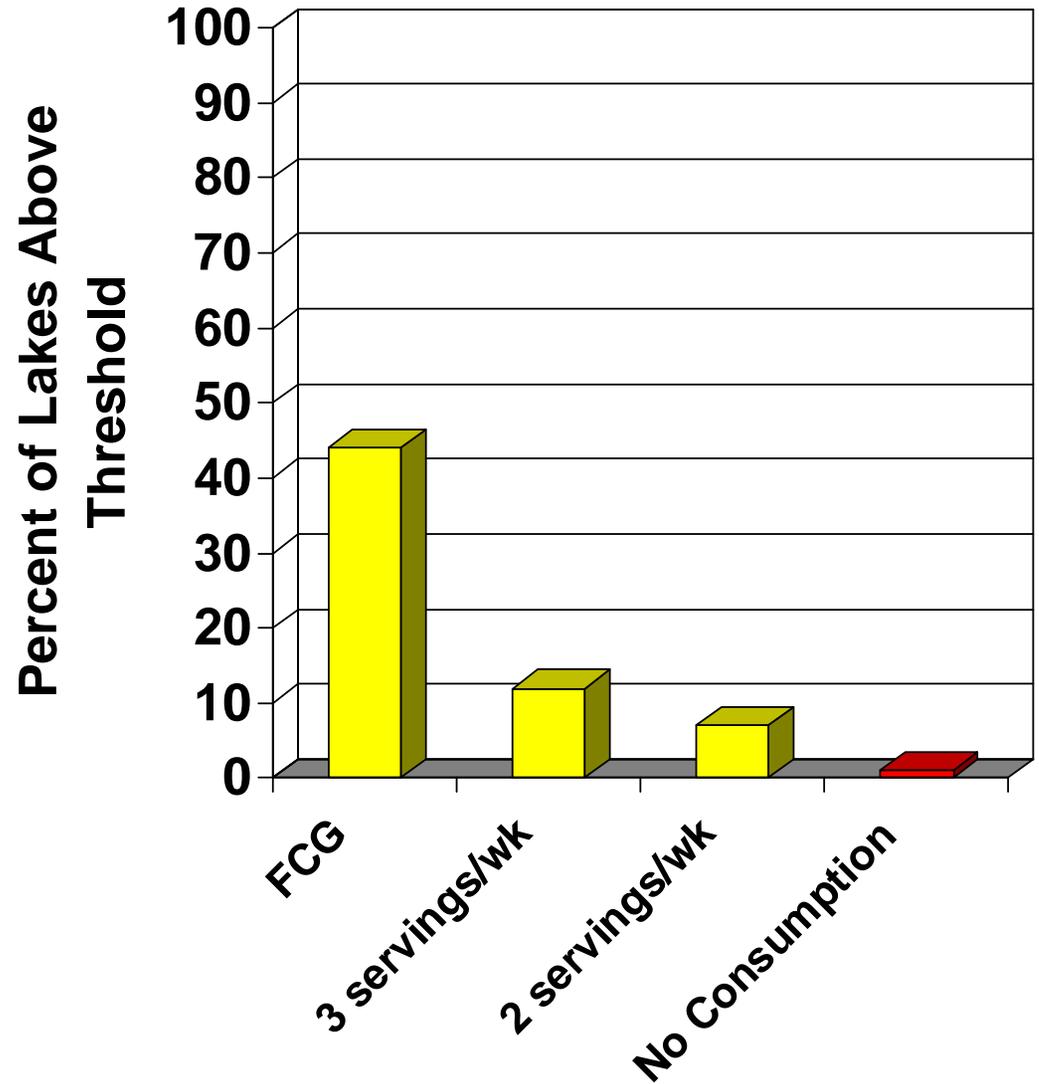
# Mercury: High Elevation Lakes

- Brown trout
- Hetch  
Hetchy stood out
- Larger (piscivorous) fish from resident trout populations can be high



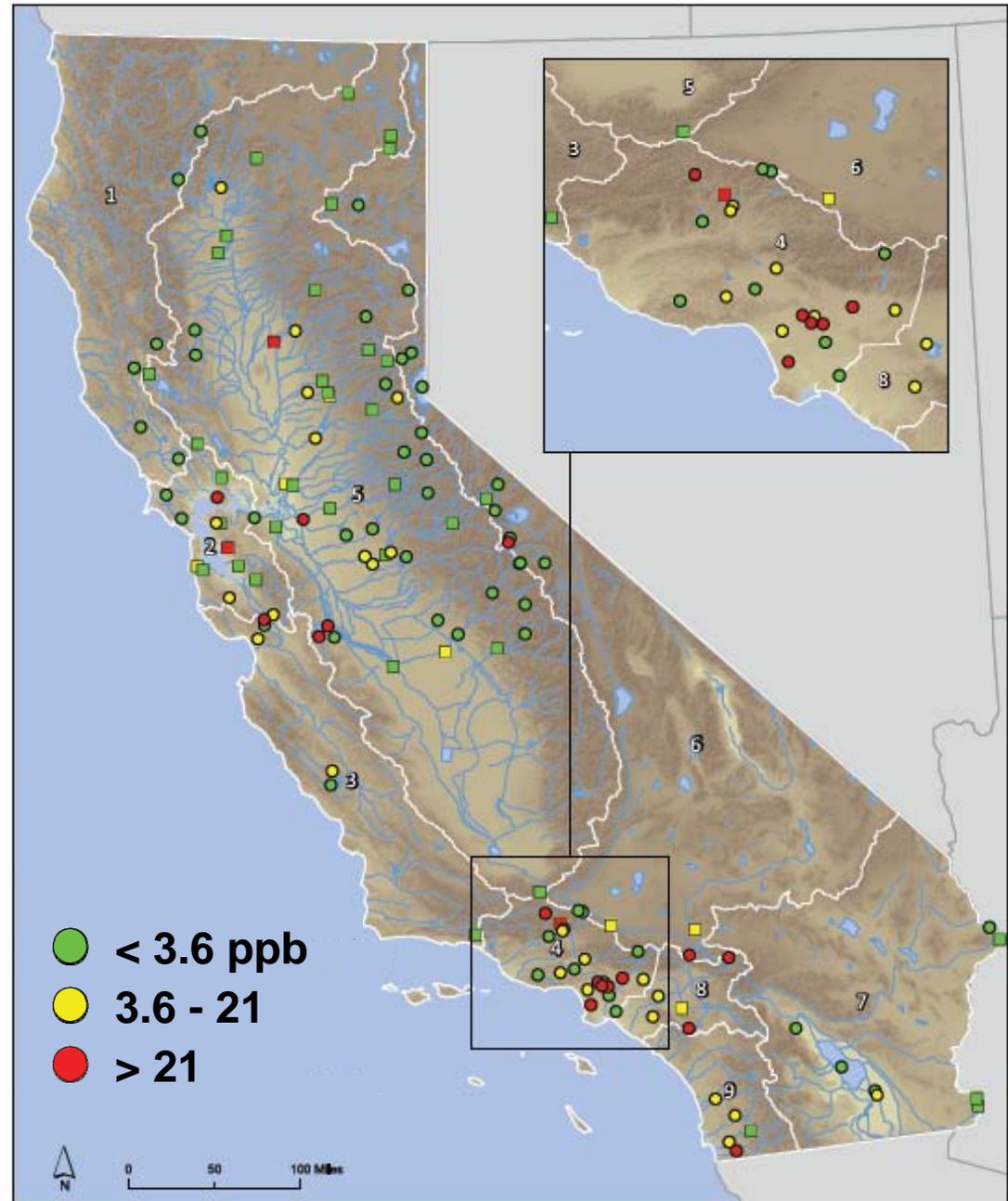
# PCBs: Severity of the Problem

- Based on highest species at each lake
- 1% of lakes in no consumption range (>120 ppb)
- 8% above 2 serving/wk ATL (42 ppb)
- 13% above 3 serving/wk ATL (21 ppb)
- 37% above Fish Contaminant Goal (3.6 ppb)



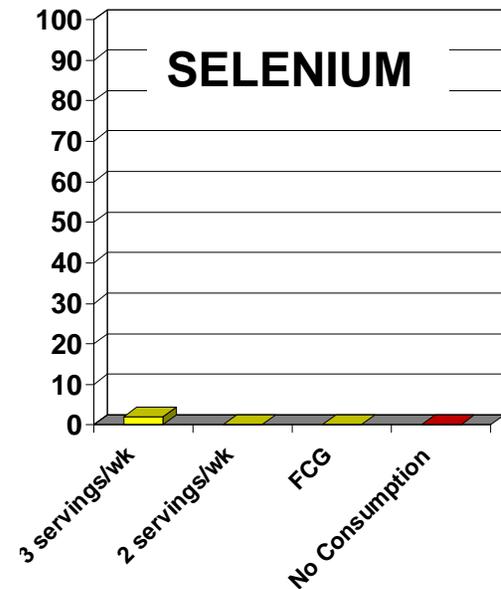
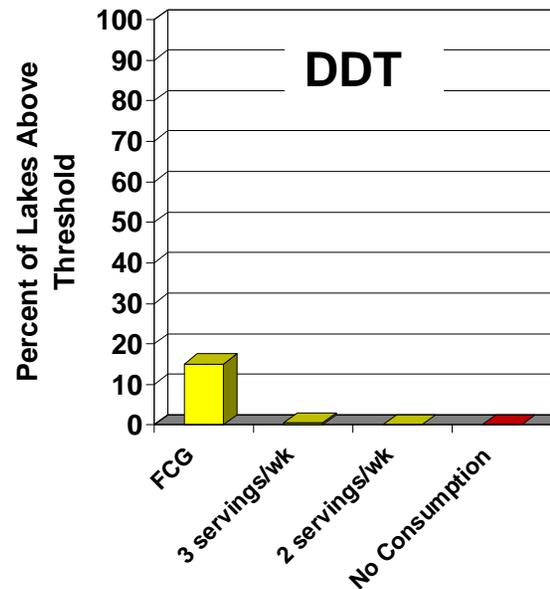
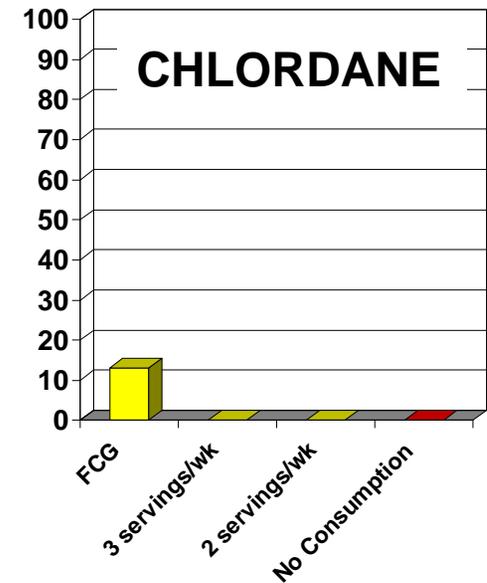
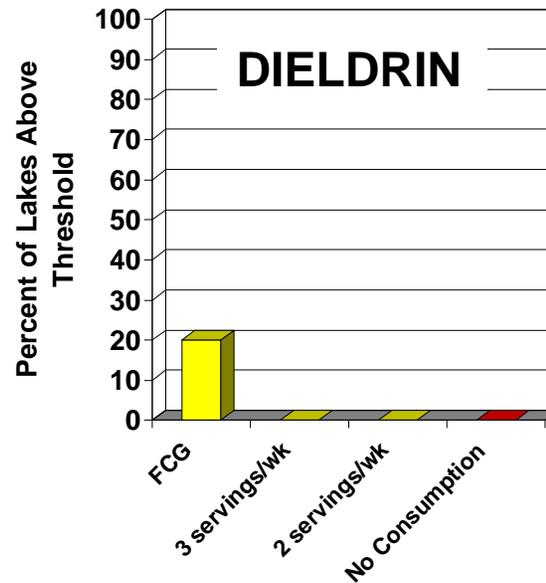
# PCBs: Spatial Distribution

- Based on highest species average at each lake
- Note different scale from mercury
- Elevated concentrations across the south
- Some elevated lakes in north



# Other Contaminants: Severity of the Problem

- Dieldrin: 21% above Fish Contaminant Goal (0.46 ppb)
- DDT: <1% above 3 serving/wk ATL, 17% above FCG (21 ppb)
- Chlordane: 10% above FCG (5.6 ppb)
- Selenium: 2% above 3 serving/wk ATL (2500 ppb)



# Timeline

## ■ 2009

- Report on Lakes Year 1
- Sampling for Coast Year 1
- Safe to Eat Portal

## ■ 2010

- Report on Lakes Years 1 and 2
- Sampling for Coast Year 2
- Planning for Rivers and Streams

## ■ 2011

- Report on Coast Year 1 (SoCal Bight and Region 2/RMP)
- Sampling for Rivers Year 1



# Acknowledgements

## The BOG

- Terry Fleming
- Bob Brodberg
- Michael Lyons
- Chris Foe
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- Cassandra Lamerdin
- Marco Sigala
- Billy Jakl
- Jennifer Doherty
- Autumn Bonnema
- Jennifer Hunt

## Peer Review Panel

- Jim Wiener
- Ross Norstrom
- Chris Schmitt





Joseph A. Garcia / Ventura County Star

Servando Arredondo of Fontana and others wait for a bite along the shore at Lake Piru.

