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/gtlsv/index.html
### Assessment Thresholds (ppb)

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

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

- 23% lakes > 0.44 μg/g
- 49% lakes > 0.22 μg/g
- 63% lakes > 0.15 μg/g
- 80% lakes > 0.07 μg/g
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

Mercury: Spatial Distribution

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

Mercury: High Elevation Lakes

- Brown trout
- Hetch
  Hetchy stood out
- Larger (piscivorous) fish from resident trout populations can be high
• 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
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- Jim Wiener
- Ross Norstrom
- Chris Schmitt

SWAMP
Surface Water Ambient Monitoring Program
Servando Arredondo of Fontana and others wait for a bite along the shore at Lake Piru.