California’s Surface Water Ambient Monitoring Program

Assessing Extent of Stream Impairment with Targeted and Probabilistic Monitoring

John Hunt, UCD
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<table>
<thead>
<tr>
<th>Water Body Type</th>
<th>Aquatic Life</th>
<th>Beneficial Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Streams</strong></td>
<td>SWAMP</td>
<td>Fishable</td>
</tr>
<tr>
<td></td>
<td>PSA</td>
<td>No Statewide Program</td>
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<tr>
<td></td>
<td>RCMP</td>
<td>No Statewide Program</td>
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<tr>
<td></td>
<td>SPoT</td>
<td>No Statewide Program</td>
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<tr>
<td></td>
<td><strong>SWAMP</strong></td>
<td>Swimmable</td>
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<tr>
<td></td>
<td></td>
<td>No Statewide Program</td>
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<tr>
<td></td>
<td></td>
<td>Drinkable</td>
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<tr>
<td></td>
<td></td>
<td>No Statewide Program</td>
</tr>
<tr>
<td><strong>Large Rivers</strong></td>
<td><strong>SWAMP</strong> SPoT</td>
<td>Fishable</td>
</tr>
<tr>
<td></td>
<td>Sacramento Toxics Program</td>
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<tr>
<td></td>
<td>San Joaquin River Program</td>
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<tr>
<td></td>
<td>Klamath River Program</td>
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<tr>
<td><strong>Lakes</strong></td>
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<td>Fishable</td>
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<tr>
<td><strong>Coastal Waters</strong></td>
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</tr>
<tr>
<td></td>
<td>EPA Coastal Survey (2010)</td>
<td>(funding recently cut)</td>
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<tr>
<td></td>
<td>SF Bay RMP</td>
<td></td>
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<td>So Cal Bight</td>
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<tr>
<td></td>
<td>C-Clean MLPAs</td>
<td></td>
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<tr>
<td></td>
<td>ASBS Mussel Watch</td>
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<tr>
<td><strong>Bays/Estuaries</strong></td>
<td>No Statewide Program</td>
<td>Fishable</td>
</tr>
<tr>
<td></td>
<td>Estuarine (2008)</td>
<td></td>
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<tr>
<td></td>
<td>Riverine (2009)</td>
<td></td>
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<tr>
<td></td>
<td>EPA Wetland Survey (2011)</td>
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<tr>
<td><strong>Wetlands</strong></td>
<td>No Statewide Program</td>
<td>Fishable</td>
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<tr>
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<td>Estuarine (2008)</td>
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<tr>
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<td>Riverine (2009)</td>
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<td>EPA Wetland Survey (2011)</td>
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<td>CWMW</td>
<td>NA</td>
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</tbody>
</table>
California Water Quality Monitoring Council

- 2008 State Legislation (SB 1070)
- Coordination and Comparability
- Theme-based web portals
- Theme-based workgroups

  SWAMP fish consumption safety
  SWAMP stream ecosystem health
Clean Water Act Objectives

- Establishing water quality standards (Section 303(c)).
- Determining standards attainment (Section 305(b)).
- Identifying impaired waters (Section 303(d)).
- Identifying causes and sources of impairments (Sections 303(d), 305(b)).
- Supporting management programs (Sections 303, 314, 319, 402, etc.).
- Supporting the evaluation of program effectiveness (Sections 303, 305, 402, 314, 319, etc.).
Perennial Streams Assessment (PSA)

- Establishing water quality standards (Section 303(c)).
- Determining standards attainment (Section 305(b)).
- Identifying impaired waters (Section 303(d)).

Stream Pollution Trends (SPoT)

- Identifying causes and sources of impairments (Sections 303(d), 305(b)).
- Supporting management programs (Sections 303, 314, 319, 402, etc.).
- Supporting the evaluation of program effectiveness (Sections 303, 305, 402, 314, 319, etc.).
Perennial Streams Assessment (PSA)

- Statewide status (of populations of waterbodies)
- Probabilistic design (EPA EMAP)
- Ecological indicators

Stream Pollution Trends (SPoT)

- Statewide trends (of specific watersheds)
- Targeted design (USGS NAWQA)
- Diagnostic indicators
- Sites linked to monitoring program networks
- Trends with land use and management implementation
Samples drawn to characterize 6 populations of streams

- **A** = North Coast
- **B** = Oak Chaparral (1= coastal, 2= interior)
- **C** = Sierra (1= West Sierra, 2= East Sierra)
- **D** = Central Valley
- **E** = SMC
- Other = Mojave/Sonora + Modoc Plateau

Invertebrate bioassessment
Physical habitat
EMAP + CMAP = ~430 sites
Long-term rolling averages for population trends
Physical Habitat and Bioassessment Metrics and bio-objectives development, CWA 303(c).
Stream Pollution Trends (SPoT)
• Fine sediment from depositional areas
• Pesticides, PCBs, PAHs, PBDEs
• Trace metals, TOC, grain size, total P
• Sediment toxicity
NLCD land cover in area draining to urban site
Information at the intersection of PSA and SPoT
Determining the extent of impairment with limited sites:
Which upstream reaches?
Impairment identified in lower watersheds
Ecological indicators developed for higher gradient streams
In the absence of upstream sites, assume impairment ends at “boundaries” to less intensive land cover.

Identify impairment with targeted monitoring by SPoT and local partner programs.

Test assumption of “clean” upstream areas through PSA probabilistic monitoring.
Elevation contour as approximate boundary for land use intensity.

750 ft contour
Statewide Monitoring Framework:

SPoT integrator sites anchor local impairment characterization

PSA random sites test hypotheses of condition upstream of boundary

- Diagnostics in lowlands
- Inference in the uplands
Perennial Streams Assessment (PSA) and Reference Condition Monitoring Program
Peter Ode, CDFG
Tom Suk, CRWQCB
Terry Fleming, US EPA and US EPA EMAP

Stream Pollution Trends (SPoT) Assessment
John Hunt, UCD
Terry Fleming, US EPA

SWAMP
Val Connor, Karen Larsen, SWRCB
Rusty Fairey, Marco Sigala, Cassandra Lamerdin, Bev van Buuren, SJSURF
Terry Fleming, US EPA