Management Applications of SCCWRP’s Bioassessment Science
Bioassessment Management
Applications are Not New

- Dates back to the early 1970’s: “balanced indigenous populations”
  - 301h waiver decisions
  - 419 Power plant entrainment/impingement

- Sediment Quality Objectives
  - One of three lines-of-evidence

- If it were easy, we would be done by now
Benefits and Challenges for Bioassessment Management?

- Bioassessment gets closer to the Beneficial Use than chemistry or toxicity
  - Integrative measurement

- Large diversity adds complexity
  - 100s of species, 1000s of individuals per sample

- Natural variability can confound assessments
  - Differentiating anthropogenic impacts
Recent Management Focus on Stream Bioassessment

- SWRCB started developing a biointegrity policy for streams in 2010
  - Spotlight on stream invertebrates
- Started seriously considering algae in 2015
- Have now combined the Biointegrity and Biostimulatory Plans
Current Stream Bioassessment Management Applications

- NPDES Permit monitoring requirements
- 303d listing of impaired waterbodies
- Watershed Management Plans
- SWRCB Plans and Policies
7 of SCCWRP’s 8 regulated members have stream bioassessment monitoring requirements
   - Invertebrates, algae, riparian condition, but not fish

Frequently includes stressors
   - chemistry, flow, physical habitat

Management concern is building monitoring infrastructure
   - standardized, representative, high quality data
2015 Results From Southern California Regional Stream Monitoring

Watersheds
- Southern San Diego
- Mission Bay San Diego
- Central San Diego
- Northern San Diego
- San Juan
- San Jacinto
- Upper Santa Ana
- Middle Santa Ana
- Lower Santa Ana
- San Gabriel
- Los Angeles
- Santa Monica
- Calleguas
- Santa Clara
- Ventura
- Urban
- Open
- Ag
- South Coast

Land Use
- Combined
- Inverts
- Diatoms
- Soft Algae
- Riparian

% stream-miles in good condition
- 75
- 50
- 25
- 0
Stream Monitoring Infrastructure Is Largely Complete

- Field protocols
- Quality Assurance Plans
- Training and auditing
- Data standards
  - Perhaps lacking a good system for storing and sharing data, producing information
Assessment Tools Are Key

- Translates complex biodiversity data into easy-to-understand information
  - Robust, quantitative, repeatable
- Based on biological expectations at reference sites
  - Landscape scale ecological models
- Statewide applicability for equity and site-specificity to account for natural differences
  - California Stream Condition Index (CSCI)
  - Algal Stream Condition Index (ASCI)
Example Biological metric (Percent predators)

30%: Meets expectation

30% Below expectation
Current 303d Listing Policy for Bioassessment

- Uses a chemistry paradigm
  - Cannot list on biology alone

- Causal assessment becomes the fulcrum
  - Causal assessment before or after listing?

- Management concerns revolve around two topics
  - Challenge of delisting
  - Ability to achieve TMDL compliance
## 303d listed Waterbodies for Bioassessment in Streams

<table>
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<tr>
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<tr>
<td>Los Angeles</td>
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<td>Santa Ana</td>
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<td>4</td>
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<tr>
<td>San Diego</td>
<td>0</td>
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Causal Assessment

- What is causing the biology scores to be so low?

- We’ve evaluated the EPA toolkit (CADDIS)
  - It’s not perfect

- So Cal has the regional data to build an improved toolkit
  - Screening tools to make it faster, more quantitative
Traditional EPA Comparators (N=4)

Southern California Regional Comparators (N=200)
Screening Causal Assessment

- Specific conductivity (μS/cm)
  - Regional Comparator Sites

- Total N (mg/L)
  - Regional Comparator Sites

Your Site Score
### Site: SMCXXYY

#### Condition Assessment
- **CSCI** – 0.4
  - Expected range (0.39 – 0.63)
- **H2O** – 32
  - Expected range (28 – 50)

#### Rapid Screening Bioassessment Dashboard

#### Causal Assessment

<table>
<thead>
<tr>
<th>Stressor Class</th>
<th>Overall</th>
<th>BMI</th>
<th>Algae</th>
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<tbody>
<tr>
<td>Habitat</td>
<td>🟢 4/1/0</td>
<td>0/3/2</td>
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<tr>
<td>Eutrophication</td>
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<td>4/1/0</td>
<td>4/1/0</td>
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<tr>
<td>Flow</td>
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<td>0/2/3</td>
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<tr>
<td>Water Chemistry</td>
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<td>4/1/1</td>
<td>0/1/3</td>
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<tr>
<td>Sediment Chemistry</td>
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<td>0/1/5</td>
<td>0/1/5</td>
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<tr>
<td>Invasives</td>
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<td>NA</td>
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<tr>
<td>Organic Matter</td>
<td>⬜ 0/0/0</td>
<td>0/0/0</td>
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**LOE summary:** # of likely/# of indeterminate/# of unlikely
What is an appropriate biological expectation [CSCI score] for modified systems?

Current [non-regulatory] thresholds are based on undeveloped reference streams

It is clear that modified systems may never reach reference like levels
  - Restoration investments
  - Use attainability analysis
Choosing a Threshold is Not Entirely Technical

![Box plot diagram showing CSCI values for Reference, Intermediate, and Stressed categories.]

- 30th percentile
- 10th percentile
- 1st percentile
Index Scores in Modified Systems
Index Scores in Modified Systems
Management Challenges
Outnumber Technical in Modified Systems

- Choose a regulatory approach
  - Tiered Aquatic Life Use (TALU) and tiered objectives
  - Antidegradation

- Prioritizing future restoration efforts
  - Focus on really poor sites
  - Fair sites that are just below the threshold
Current Stream Bioassessment Management Applications

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Watershed Management Plans

- Watershed Plans beginning to use biology as success metrics
  - Malibu Creek for nutrients and suspended sediment
  - Rainbow Creek and Santa Margarita River for nutrient concentrations
  - San Juan Creek for flow alteration

- San Diego RWQCB has made stream restoration a key element of their long-term vision

- Management concerns focus on ability to succeed
  - Independent applicability
  - Uncertain how local vs watershed activities influence stream biology
There’s Limited Empirical Data for Restoration Effectiveness

Forester Creek Restoration

IBI score

O = Downstream
X = Upstream

Very Good
Good
Fair
Poor
Very Poor

2005 - Pre  2006 - During  2008 - Post
Predicting Response to Management Actions
Mapping Vulnerability to Future Growth

Flow ecology in the San Diego River
Established three goals for updating the Inland Surface Water Plan for bioassessment:

- Protect high quality streams
- Restore degraded streams
- Utilize numeric guidance
<table>
<thead>
<tr>
<th>Task</th>
<th>Example Product</th>
<th>Target Dates</th>
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<tr>
<td>Project Initiation</td>
<td>Focus groups, Regulatory and Stakeholder Advisory Groups, CEQA</td>
<td>Nov 2017</td>
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<td>Staff Report</td>
<td>Draft Biostimulatory Substances/Biological Integrity Amendment language</td>
<td>Winter 2018</td>
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<tr>
<td>Public Hearing</td>
<td>Public Hearing to receive oral comments</td>
<td>Summer 2019</td>
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<tr>
<td>Board Adoption</td>
<td>Board meeting to consider adoption</td>
<td>Winter 2019</td>
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