San Gabriel River Regional Monitoring Program

Assessing the Condition of Streams in the San Gabriel River Watershed (California): Integrating Multiple Indicators

Authors:
Scott C. Johnson, Aquatic Bioassay & Consulting, Inc
Kristy Morris, LASGRWC
Edward Belden, LASGRWC

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Watershed Description

- Watershed description
  - 1,900 Km²
  - ~2 million people
  - 54% undeveloped; all in the upper watershed
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Watershed Description

- Hydrology of upper and lower watershed are disconnected
- San Gabriel river discharges to ocean after passing through soft bottom estuary
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Monitoring Questions

1. What is the health of streams in the watershed?
2. Are the conditions at areas of unique importance getting better or worse?
3. Are receiving waters near discharges meeting water quality objectives?
4. Are local fish safe to eat?
5. Is body-contact recreation safe?
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Monitoring Design

- Probability-based design
- Random allocation of sites
- 3 sub-regions
  - Upper watershed
  - Lower watershed
  - Mainstem
- Incorporated into State-wide SWAMP program (2009)
- Multiple indicators
- Annual surveys (May – July)
  - 2005 to 2009
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- Bioassessment
  - BMI
  - So CA Index of Biological Integrity (IBI)
- Water Chemistry
- Toxicity
  - 7 day Ceriodaphnia
- Physical habitat condition
  - SWAMP
  - CRAM
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Indicators

- CA Rapid Assessment Method (CRAM)

CRAM Scoring:
Average of Attribute Scores = Overall Score

Wetland Condition: 52%

- Landscape Context: 57%
- Hydrology: 30%
- Physical Structure: 47%
- Biotic Structure: 75%

Interspersion and Zonation = 12 of 12
Plant Comm. Composition = 6 of 12
Vertical Biotic Structure = 9 of 12

27 of 36 Possible = 75%
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Integration of Indicators

- Assess indicators one at a time
  - Map using regulatory or derived thresholds
  - Graph results across sub-regions
  - Use ambient watershed condition to determine the % of sites affected
  - Compare against water quality objectives

- Compare indicators against biological condition
  - Correlate analytes against IBI scores

- Use multivariate techniques to look for patterns in the biological and environmental datasets
  - Cluster analysis (Bray Curtis Similarity Index)
  - PCA
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Bioassessment

- Multimetric So CA IBI
  - EPT taxa
  - Predator taxa
  - Coleoptera taxa
  - % intolerant individuals
  - % tolerant taxa
  - % collectors
  - % non-insects
- Scores < 39 = degraded
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Bioassessment

F = 40, p < 0.0001

IBI Scores

Degraded

Watershed Sub-Region

Cumulative Frequency (%)

Degraded
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Water Quality Objectives

- CA Toxics Rule: hardness adjusted dissolved metals
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Toxicity

Tests = 61
Results = 122
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Physical Condition (CRAM)
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Stressor Identification

<table>
<thead>
<tr>
<th>Stressor</th>
<th>Correlation Coefficient</th>
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<tbody>
<tr>
<td>CRAM Score</td>
<td>R = 0.53</td>
</tr>
<tr>
<td>Channel Alteration</td>
<td>R = 0.37</td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td>R = 0.31</td>
</tr>
<tr>
<td>Epifaunal Substrate Cover</td>
<td>R = 0.31</td>
</tr>
<tr>
<td>Temperature (ºC)</td>
<td>R = 0.26</td>
</tr>
<tr>
<td>Dissolved Zinc (µg/L)</td>
<td>R = 0.1727</td>
</tr>
</tbody>
</table>
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Stressor Identification

1. Lower Tribs/ Mainstem: All Years (n = 27)
2. Lower Tribs/ Mainstem: 2005 & 2006 (n = 20)
3. Upper Watershed 2006 to 2009 (n = 10)
4. Upper Watershed 2005 (n = 10)

Lower watershed
Tolerant sp

Upper watershed
Sensitive sp
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Stressor Identification
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Stressor Identification

- PCA Axes

45% Physical Attributes

15% Sediment

10% Dissolved Ions
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Stressor Identification

- Upper Watershed
  - CRAM
  - epifaunal substrate
  - % cobble
  - % canopy
  - channel alteration
- Lower Watershed
  - temperature
  - nickel
  - DOC
- Mainstem
  - concrete
  - nitrate
  - zinc
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Summary & Conclusions

- Condition of streams
  - Biological communities (BMIs) degraded; mostly in lower watershed
  - Very few exceedances of water quality standards
  - Few toxic endpoints
  - The biological condition is strongly associated with physical habitat conditions
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What’s Next?

- State of the Watershed Report
- Addition of attached algae as biological indicator
- Comparison of SGR Watershed with other regions
- State of CA biological objectives
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Stakeholders

- AES (generating station)
- City of Downey
- Friends of the San Gabriel River
- LA & SG Rivers Watershed Council
- Los Angeles County Sanitation Districts
- Los Angeles County Department of Public Works
- Los Angeles Department of Water and Power
- Los Angeles Regional Water Quality Control Board
- Orange County Stormwater Program
- Rivers and Mountains Conservancy
- San Gabriel Mountains Regional Conservancy
- Santa Ana Regional Water Quality Control Board
- Southern CA Coastal Water Research Project
- US Army Corps of Engineers
- US EPA
- US Forest Service
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Questions?