Southern California Tribal Stream Team – Working Together for Water Quality Assessment

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2019 TRIBAL LANDS AND ENVIRONMENT FORUM
Overview

- Southern California TST Background
- Benefits
- Benthic Macroinvertebrate Sampling
- Successes
- Challenges
Background
Background

- 2002 - San Diego County tribes benthic macroinvertebrate sampling and stream teams
- 2010 – Southern California tribal stream team
  - Jamul Indian Village
  - La Jolla Band of Luiseño Indians
  - Morongo Band of Mission Indians
  - Pala Band of Mission Indians
  - Pechanga Band of Luiseño Indians
  - Rincon Band of Luiseño Indians
Grown to include many more tribes

- Jamul Indian Village
- La Jolla Band of Luiseño Indians
- Morongo Band of Mission Indians
- Pala Band of Mission Indians
- Pechanga Band of Luiseño Indians
- Rincon Band of Luiseño Indians
- Augustine Band of Cahuilla Indians
- Cabazon Band of Mission Indians
- Cahuilla Band of Indians
- Campo Band of Mission Indians
- Los Coyotes Band of Cahuilla and Cupeño Indians
- Ramona Band of Cahuilla Indians
- San Manuel Band of Mission Indians
- Santa Rosa Band of Cahuilla Indians
- Twenty-Nine Palms Band of Mission Indians
Typical Meeting

- Location depends on which member is available to host
- Practice field techniques
- Answer questions in office
- Lunch
- Discuss additional water topics
- Determine next host and schedule next meeting
Benefits

- Cooperation increases resources and staff
- Pre-existing group to provide knowledge and assistance
- Training opportunities
Bioassessment

BENTHIC MACROINVERTEBRATE SAMPLING
Clean Water Act 101(a)
- Restore and Maintain:
  - Chemical Integrity
  - Physical Integrity
  - Biological Integrity

Advantages of Bioassessment
- Direct measure of aquatic ecosystem health
- Demonstrates water quality over time
- Can show water and habitat quality
“The SWAMP mission is to provide resource managers, decision makers, and the public with timely, high-quality information to evaluate the condition of all waters throughout California. SWAMP accomplishes this through carefully designed, externally reviewed monitoring programs, and by assisting other entities state-wide in the generation of comparable data that can be brought together in integrated assessments that provide answers to current management questions.”

https://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/
SWAMP Bioassessment

- Standard Operating Procedures
- Field Sheets
- Comparable Data
Equipment (as listed in SWAMP document)

- Sampling SOP
- Equipment decontamination supplies
- Hip or chest waders, or wading boots/shoes (not felt-soled)
- Full set of datasheets printed on waterproof paper
- Fine-tipped and thick-tipped waterproof/alcohol-proof pens and markers
- Pencils
- Clipboards
- Site dossier containing site maps, aerials, etc.
- Thomas Guide, regional maps, topographic maps as needed
- First aid kit
- Centigrade thermometer
- pH meter
- DO meter and spare membrane
- Conductivity meter
- Turbidimeter
- Field alkalinity meter or test kit
- Water chemistry containers as needed

- Calibration standards
- Spare batteries, user's manuals, and spare parts for meters as needed
- Digital camera & spare batteries
- GPS receiver & spare batteries
- Measuring tape: 150 m (and 250 m, optional)
- Lengths of rope (7.5 m and 12.5 m) for measuring distance between main and inter-transects in delineating the monitoring reach
- Digital watch/stopwatch & spare batteries
- 10-sided die or random number table (if no digital watch available)
- Stadia rod
- Marked ski pole (or waterproof meter stick)
- Clinometer
- Autolevel and tripod (Required for slopes <1%)
- Hand level (optional)
- Current velocity meter & top-setting rod
- Flagging tape To determine direction of stream flow for proper angling of the current velocity meter probe
- Convex spherical densiometer

- Transect flags; or large, heavy washers each tied with a strip of flagging tape
- Small/slender rod with 1, 5, and 20 mm marks For measuring microalgal thickness
- Rangefinder & spare batteries 1
- Fresh orange peel OR plastic film canister partially full of water OR ice cube
- Small metric ruler or gravelometer for substrate measurements
- D-frame kick net (fitted with 500 µm mesh bag)
- Standard #35 sieve (500 µm mesh)
- Wide mouth 500-mL or 1000-mL plastic jars several
- White sorting pan (enamel or plastic; optional)
- 95% EtOH 1 gallon
- Fine-tipped forceps or soft forceps
- Waterproof paper and tape for attaching labels as needed
- Large spill tray 1
- Preprinted waterproof labels
- Disposable gloves/elbow length insulated gloves
Equipment (as sent to TST)

- Sampling SOP
- Hip or chest waders, or wading boots/shoes (not felt-soled)
- Full set of datasheets printed on waterproof paper
- Waterproof/alcohol-proof pens and pencils
- Clipboard
- Water quality probe/meter (reference the field sheets for the parameters measured)
- Camera
- GPS receiver
- 2 different flags
- Meter tape (if you mark the transects ahead of time, this isn’t needed)
- Metric stadia rod
- Meter stick
- Clinometer or autolevel and tripod, or hand level
- Flow/current meter or neutrally buoyant object
- Convex spherical densiometer
- Small metric ruler (optional)
- D frame kick net
- Sieve
- Several wide mouth plastic jars (500 or 1000 mL)
- White sorting pan
- 95% EtOH
- Forceps
- Waterproof labels
BMI Sampling Process

- Water Quality
- BMI Collection
- Physical Habitat Assessment
Water Quality

- Standard parameters
- Each tribe is familiar with own probe

<table>
<thead>
<tr>
<th>AMBIENT WATER QUALITY MEASUREMENTS</th>
<th>* Turbidity, silica, oxygen saturation, and air temp are optional, calibration date required on page 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Temp (Deg C)</td>
<td>pH</td>
</tr>
<tr>
<td>Dissolved O² (mg/L)</td>
<td>Specific Conduct (uS/cm)</td>
</tr>
</tbody>
</table>

*Ambient water quality measurements,*
BMI Sampling

- 500 micron D frame kick net
- Sub-sample taken at each transect (11)
- Left, center, right
- Preserve the sample
  - Send to taxonomist
Physical Habitat Assessment

- In-stream substrate and habitat
- Vegetation
- Human Influence
- Slope and Bearing
## Substrate

### Transect Substrates

<table>
<thead>
<tr>
<th>Position</th>
<th>Dist from LB (m)</th>
<th>Depth (cm)</th>
<th>mm/size class</th>
<th>% Cobble Embed.</th>
<th>CPOM</th>
<th>Microalgae Thickness Code</th>
<th>Macr0algae Attached</th>
<th>Macr0algae Unattached</th>
<th>Macrophytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
</tr>
<tr>
<td>Left Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
</tr>
<tr>
<td>Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
<td>P A D</td>
</tr>
</tbody>
</table>

**Microalgae Thickness Codes**

- 0 = No microalgae present. Feels rough, not slimy.
- 1 = Present but not visible. Feels slimy.
- 2 = Present and visible but <1mm. Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
- 3 = 1-5mm;
- 4 = 5-20mm;
- 5 = >20mm;
- UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z code).
- D = Dry, not assessed.

Note: Sizes can be recorded either as direct measures of the median axis of each particle or one of the size listed on the supplemental page (direct measurements preferred).
Relatively inexpensive indicator for water quality

**Professional Identification**
- Sample identification by taxonomist ranges from $200 - $800
- Equipment costs ≈ $600
- Each year:
  - bottles and alcohol (as needed)
  - lab cost

**In-House Identification**
- Microscope $200-$1000
- Equipment costs ≈ $600
- Each year:
  - bottles and alcohol (as needed)
Staff Resources

- 2 staff members
  - 4 – 8 hours
- 6 trained staff members
  - 2 – 4 hours
BMI results

- Identify BMI to the Standard Taxonomic Effort indicated by the Southwest Association of Freshwater Invertebrate Taxonomists
  - Most insects to genus or species
  - Non-insects vary from class to family
- If doing in-house identification, many can be easily identified to family
- Look at species diversity and abundance
  - tolerance levels, functional feeding groups, habitat needs
Tolerant BMI

Tubifex Worm (*Clitellata*)

Pouch Snail (*Mollusca*)
Intolerant BMI

Hellgrammite (Megaloptera)  Stonefly (Plecoptera)
Data Analysis

- Index of Biological Integrity – Southern California Coastal Streams
- California Stream Condition Index (2013) – any location using GIS and R
- Physical Habitat Index of Physical Integrity (2018) – GIS and R
The CSCI score is a measure of how well a site’s observed condition matches its predicted, or expected, condition. Expected values of a set of ecological indicators are predicted using statistical models. Predictions are based on natural environmental variables resulting in a site-specific prediction for each site; greater deviations from this expectation indicate a greater likelihood of degradation. The CSCI score is calculated by comparing the expected condition with actual (observed) results. CSCI scores range from 0 (highly degraded) to greater than 1 (equivalent to reference).

The CSCI can be used to assess the status and trends of stream condition at multiple scales (sites, watersheds, regions, and statewide) and is also well-suited for compliance monitoring, evaluating the success of mitigation and restoration projects, and evaluating the success of stream protection policies and programs. The CSCI is useful for measuring biological integrity in wadeable perennial and non-perennial streams throughout California. The limits of the CSCI’s applicability in streams that are dry for more than 6 months each year are currently being researched by SWAMP and several regional partners.

The CSCI is responsive to human disturbance and discriminates well between reference sites and “stressed” sites, that is, sites with high levels of overall human activity in the watershed. The CSCI also responds well to individual stressor gradients such as total nitrogen, a nutrient closely associated with eutrophication in streams and rivers.

For additional information on applications of the CSCI and guidance on how to calculate it, contact Lori Webber (Lori.Webber@waterboards.ca.gov) or Calvin Yang (Calvin.Yang@waterboards.ca.gov).

More information can also be found at the SWAMP Bioassessment Program website.
TST Successes

- Regular meetings (at least quarterly)
  - Reduce learning curve for new staff
  - Refresh sampling procedures and techniques
  - Members can request assistance, ask questions, and address concerns
- La Jolla annual BMI sampling
- San Manuel BMI sampling 2019
College of Bioassessment Trainings

October 2015
- SWAMP Concepts of Bioassessment & Field Procedures

January 2017
- Aquatic Invertebrate Laboratory Procedures and Data Analysis
Additional Trainings

- Goldspotted Oak Borer and Invasive Shot Hole Borer Identification
- Proper Functioning Condition
- Equipment Calibration and Data Analysis Water Technician Training
- California Rapid Assessment Method Wetland and Riparian Area Training
More Benefits

- Water quality resources/assistance
- Information sharing on conferences, trainings, and funding opportunities
- Building mutually beneficial relationships

“Alone we can do so little; together we can do so much.”
- Helen Keller
Challenges

- Staff turnover
- Coordinating schedules/finding a host
- Group direction
- Balancing growth and catching up new members
"Coming together is a beginning. Keeping together is progress. Working together is success." - Henry Ford
Questions?

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