STANDARDIZING AND ENHANCING BIOASSESSMENT PROTOCOLS: DEVELOPING A SCIENCE-BASED PERFORMANCE MEASURE OF STREAM CONDITION

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Overview

- Regional benthic macroinvertebrate monitoring issues that initiated this project
- Key project goals
- Preliminary results
- Next steps
Regional Benthic Monitoring Issues

- Inconsistent sampling and data analysis methods
- Puget Lowland BIBI – developed in early 1990’s using limited data
- Taxa attributes inconsistent and not empirically derived
- Need to enhance data management tools
- Need for a regional freshwater biological indicator
- Need for regional coordination
Developed a proposal for funding under EPA’s Scientific Studies and Technical Investigation Assistance Program to address these issues

Awarded the grant in late 2010!
Key Goals of Project

- Strengthen taxa attribute sensitivity
- Recalibrate BIBI metric scoring
- Reconcile differences in sampling methods
- Expand the Puget Sound Stream Benthos data management system
- Refine B-IBI as a freshwater indicator
- Enhance regional coordination
Strengthen Sensitivity of Taxa Attributes

### PL-BIBI Metrics

<table>
<thead>
<tr>
<th>Metric</th>
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<tbody>
<tr>
<td>Total Taxa</td>
</tr>
<tr>
<td>Mayfly Taxa</td>
</tr>
<tr>
<td>Stonefly Taxa</td>
</tr>
<tr>
<td>Caddisfly Taxa</td>
</tr>
<tr>
<td>Long-lived Taxa</td>
</tr>
<tr>
<td>Intolerant Taxa</td>
</tr>
<tr>
<td>% Tolerant individuals</td>
</tr>
<tr>
<td>% Predator individuals</td>
</tr>
<tr>
<td>Clinger Taxa</td>
</tr>
<tr>
<td>% Dominance</td>
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</tbody>
</table>

Update Using Peer-Reviewed Literature

Update with Existing Data
Strengthen Sensitivity of Tolerant/Intolerant Attributes

![Graph showing the relationship between B-IBI and % Urban area (watershed). The graph indicates a decrease in B-IBI as the % Urban area increases.](image)
Select Most Tolerant & Intolerant Taxa

- N = 784 sites (most recent)
- Genus level or higher
- >= 25 occurrences
- 155 taxa tested

![Graph showing frequency of Epeorus across % Urban (watershed).]
Example of Intolerant Taxon

Epeorus (genus)

95% of occurrences at < 40% urban
Example of a Tolerant Family

Erpobdellidae

- Prefers sites with greater %urban
Early Findings - Next Steps

- Changes to predator taxa list less significant than long lived and clinger taxa
- Significant change to tolerant and intolerant taxa list, many rare taxa dropped
- Test metrics against % urban using a separate validation data set
- Additional testing and validation as needed
Recalibrate BIBI

- Current BIBI protocol scores metrics from 1, 3, 5
- Updated BIBI will score metrics from 0-10 improving precision
- Updated metrics will be tested for correlation with natural features and scoring adjusted as needed
- Evaluate differing levels of taxa resolution on BIBI
- Incorporate updates to taxa attributes
Reconcile Differences in Sample Collection Methods

- Sample collection area varies from 3, 8 or 9 ft$^2$
- Ecology collects 8 ft$^2$; EPA recommends 8 ft$^2$
- Some reluctance to shift to 8 ft$^2$
  - Loss of long term trend data due to mixed methods
  - Increased level of effort
- Need for “cross walk” to allow comparison of data collected from different surface areas
Data Collection: Summer 2011

STREAM REACH SAMPLE COLLECTION

- Sample each riffle twice, 1 ft² per sample
- Move from downstream to upstream
- 3 ft²: collect one sample from three riffles
- 5 ft²: collect one sample from three riffles and two from a fourth riffle

55 Paired Sample Locations
Preliminary Results – Sample Area Comparison

R² = 0.7273
Database Enhancements - pugetsoundstreambenthos.org
Next Steps

- Complete initial data analysis presented here
- Determine need for additional sampling
- Initiate work on freshwater indicator
- Continue to enhance regional collaboration associated with benthic monitoring
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Strengthen Sensitivity of Taxa Attributes

- Clinger and predator taxa attributes revised based primarily on Merritt, Cummins and Berg (2008)
- Tolerant/Intolerant – used available data to empirically derive attributes