Washington State Department of Ecology: Biological Assessment Model Development and Use in State Regulatory Programs

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Biological Assessment Model Development and Use in State Regulatory Programs
Brief discussion of:

- Biological Index – how does it fit into the water quality standards regulation?
- How does Ecology use macroinvertebrate indices to designate impaired rivers and streams?
- Ecology’s current biomonitoring program for freshwaters
Clean Water Act Objectives

- Restore and Maintain the chemical, physical, and biological integrity of our waters
Clean Water Act Objectives

- Restore and Maintain the **chemical**, **physical**, and **biological** integrity of our waters

**Fishable and Swimmable Goals - CWA Section 101(a)**

**Aquatic Life Use**
- Protection and propagation of fish, shellfish and wildlife

**Recreational Use**
- Safe recreation in and on the water

**Human Health**
- Safe consumption of fish, shellfish and water
Clean Water Act Objectives

- Restore and Maintain the chemical, physical, and biological integrity of our waters

**Fishable and Swimmable Goals - CWA Section 101(a)**

- Aquatic Life Use
  - Protection and propagation of fish, shellfish and wildlife
- Recreational Use
  - Safe recreation in and on the water
- Human Health
  - Safe consumption of fish, shellfish and water

- State and Tribal WQ Standards establish:
  - Designated Uses
  - Criteria to protect those uses (Numeric and Narrative)
  - Antidegradation rules
Clean Water Act Objectives

- Restore and Maintain the **chemical**, **physical**, and **biological** integrity of our waters

### Fishable and Swimmable Goals - CWA Section 101(a)

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- State and Tribal WQ Standards establish:
  - Designated Uses
  - Criteria to protect those uses (Numeric and Narrative)
  - Antidegradation rules
Criteria development

- **Numeric criteria** –
  - States and tribes use EPA recommended criteria
  - Modified criteria for site/region specific conditions
  - Other scientifically defensible methods
Criteria development

• Numeric criteria –
  • States and tribes use EPA recommended criteria
  • Modified criteria for site/region specific conditions
  • Other scientifically defensible methods

Useful for measuring the **chemical** integrity of our waters necessary to protect designated uses

- Direct concentration limits for pollutants – metals, organic chemicals, temperature, nutrients, etc.
- Surrogates that indicate other pollution problems – dissolved oxygen, chlorophyll-a, bacteria indicators
Criteria development

- Narrative criteria –
  - Used where numeric criteria cannot be established or to supplement numeric criteria
  - Must be scientifically defensible
Criteria development

• Narrative criteria –
  - Developed where numeric criteria cannot be established or to supplement numeric criteria
  - Must be scientifically defensible

Examples

- Adequate substrate for salmon spawning
- Natural flow regimes
- Aesthetics
- Aquatic species richness and abundance

Most useful for measuring the Physical and Biological integrity necessary to protect designated uses
Biological Indices

Can account for confounding chemical and physical stressors to provide an index score of the overall health
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Can account for confounding chemical and physical stressors to provide an index score of the overall health

How do we incorporate these into our water quality standards, and cleanup programs?

We currently use our Narrative Criteria provisions to develop thresholds which distinguish impaired waters from waters that are meeting designated uses.
Index thresholds are different than numeric criteria

- Index thresholds are tools to indicate impaired waterbodies -- but are not numeric limits in state rule

**Developing WQS rules has a very high bar – often requires site-specific or regional precision.**

- Thresholds are developed in policy.
- Thresholds are used by many states -- and a few have index models that are robust enough to set biological index values as criteria in water quality standards.

This is the goal -- numeric biological index criteria
How does Washington use a biological index such as B-IBI for regulatory decisions?
**Washington’s Water Quality Assessment**

**Category 1** – aquatic life uses are protected

**Category 2** – possible impairment of aquatic life uses – prioritize for further study

**Category 5** – aquatic life uses are impaired (303d list)
Water cleanup study is required.
Total Maximum daily Load (TMDL)
Biomonitoring Programs at Ecology

1) **Ambient Biological** – reference sites from eight Washington ecoregions – rotating (8-10 sites in each ecoregion)

1) **Sentinel** – reference sites sampled annually from 16 sites statewide

2) **Watershed Health and Salmon Recovery** – randomly selected sites sampled throughout seven Status and Trends Monitoring Regions (50 sites per region, with 25 new random sites & 25 revisits on repeat cycle)
Ambient Biological – 94 site visits
Sentinel – 54 site visits
WHSR – 443 site visits

2009-2013
Ecology contacts

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- WQ Standards – conventional pollutants
- WQ Assessment/ 303(d) listing policy

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Directed Studies, Environmental Assessment Program
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- Status and Trends – biological monitoring
- Biological index development
### Ambient Biological - Ecoregions

<table>
<thead>
<tr>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coast Range</td>
<td>Cascades</td>
</tr>
<tr>
<td>Eastern Slopes</td>
<td>North Cascades</td>
</tr>
<tr>
<td>Northern Rockies</td>
<td>Blue Mountains</td>
</tr>
</tbody>
</table>

Starting in 2014, annual sampling of 3 sites from each Ecoregion not sampled during a particular year.

### WHSR – Status and Trends Monitoring Regions

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Coastal</td>
<td>Mid Columbia</td>
</tr>
<tr>
<td>Lower Columbia River</td>
<td>Snake River</td>
</tr>
</tbody>
</table>
B-IBI scores

10th = 22
25th = 28
Mean = 35.21

N = 472

Density

N = 472
Reference sites only (Ambient Biological, Sentinel)

B-IBI scores

$10^{th} = 34$

$25^{th} = 38$

Mean = 41.17

N = 94
$10^{th} = 25.02$

$25^{th} = 45.18$

Mean = 62.30

B-IBI scores

N = 472