Watershed-wide Macroinvertebrate monitoring in Johnson Creek

Inter-jurisdictional Committee of Johnson Creek
Roy Iwai - Multnomah County

April 2012
NWQMC
5 Cities and 2 County jurisdictions
Watershed Council
OR DEQ & Agriculture
Metro
East Multnomah & Clackamas SWCD
Friends groups

25 miles of mainstem
Area: 54 square acres
Population: 175,000
Elevation: 26 ft - 745 ft
Discharge: 10 - 2,200 cfs

79% Urban/Developed
13 % Forest/Open
8% Ag/Rural
Survey design

Spatially balanced random sample using a GRTS design (Larsen et al)

- “Oregon Master Sample”
- Ordered list of sample points in which each successive point maintains spatial balance
- Probabilistic vs. targeted approach

Four year rotation – preliminary results
27 sites, ~100 OTUs
Progress: First Two Years

Preliminary analysis of accumulated macroinvertebrate data and land-use data

- Does the macroinvertebrate community respond to changes in land-use in Johnson Creek?
- Does the response reflect an increase or decrease in biological integrity?
- Can we use these results to improve monitoring efforts and address management concerns?
Methods

Variables used in the analysis:

<table>
<thead>
<tr>
<th>Macroinvertebrate Metrics</th>
<th>Land-cover Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBI</td>
<td>PREDATOR O/E</td>
</tr>
<tr>
<td>Total Richness</td>
<td>EPT</td>
</tr>
<tr>
<td>Mayfly Rich.</td>
<td>% Shredders</td>
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<tr>
<td>Stonefly Rich.</td>
<td>% Scrapers</td>
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<tr>
<td>Caddisfly Rich.</td>
<td>% Coll-Gath.</td>
</tr>
<tr>
<td># Sensitive</td>
<td>% Coll-Filt.</td>
</tr>
<tr>
<td># Sediment Sens.</td>
<td>% Predators</td>
</tr>
<tr>
<td>Modified HBI</td>
<td></td>
</tr>
<tr>
<td>% Tolerant</td>
<td></td>
</tr>
<tr>
<td>% Sediment Tol.</td>
<td></td>
</tr>
<tr>
<td>% Dominance</td>
<td></td>
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</tbody>
</table>
Methods

4 scales of analysis for land use variables:

1. 10m buffer, 1km
2. 30m buffer
3. 100m buffer
4. Subbasin area
Index of Biotic Integrity

IBI

Downstream ==>
Classification And Regression Tree model (CART)

- Canopy < 37%
  - Vegetation < 66%
  - Impervious > 8%
  \[ r^2 = 0.39 \]

- 10m-Vegetation < 88%
  - 100m-Impervious > 6%
  - 30m-Vegetation < 89%
  \[ r^2 = 0.61 \]

- 12.2 (n = 13)
  - 15.6 (n = 9)
  - 24.4 (n = 5)

Graph showing IBI distribution.
Cluster Analysis
Cluster groups
Classification And Regression Tree model (CART)

Vegetation > 70%
  Canopy > 44%
  Impervious < 8%

100m-Canopy > 57%
30m-Canopy > 64%
10m-Canopy > 68%

Impervious > 13%
  Road Dens. > 8.28/mi
  Area > 31.6mi²
Conclusions

What do we learn from our preliminary analysis?

• Macroinvertebrate samples indicate severe disturbance in all but a few sites; differences between habitats and communities can be discerned

• Relationships with land-use may be confounded by correlations with a down-stream gradient

• Need for continued coordination for watershed-wide monitoring and assessments

• Further study can inform prioritization of strategies for watershed restoration
Thank you

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Jeff Meacham, PSU
Chris Prescott, City of Portland
Johnson Creek IJC members