Using a stream bug index to prioritize areas for stormwater retrofits in an urban watershed

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Use of a Stream Bug Index to Prioritize Areas for Stormwater Retrofits in an Urban Watershed

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Southwest Suburban Sewer District: Tim Berge
WSDOT: George Ritchotte
CSI: Highline volunteers
For (permeably) paving the way in Kitsap County: Chris May

Miller/Walker Creek Basin Stewardship

[Logos of various organizations]
Miller Creek Basin

Walker Creek Basin

Unincorporated King County

SeaTac

Normandy Park

Working Draft
For Planning Purposes Only
Removing invasive weeds and planting native trees and shrubs at Walker Preserve
Volunteers, Fall 2012
Coho Prespawn Mortality (PSM)
Coho Prespawn Mortality (PSM)

Coho female, full of eggs
October 25, 2012
Photo courtesy of Pam Silimperi
Most developed areas have no stormwater controls (pre-1992)
Add stormwater facilities in areas that are already developed
Conventional and/or low impact development/green stormwater infrastructure:
- Detention ponds or vaults
- Rain gardens/bioretention
- Pervious pavement

Rain garden, pervious asphalt road and pervious concrete sidewalk in Puyallup
Stormwater Retrofit Project Identification and Prioritization

Identify Opportunity Areas
- Review relevant data, evaluate constraints
- Identify areas with biggest hydrologic impact

Identify Feasible Sites
- GIS evaluation
- Select feasible sites
- 80 sites

Assess & Rank Feasible Sites
- Evaluate feasibility and benefit criteria
- Rank projects
- Select top projects for further analysis
- 30 sites

Develop Concepts & Prioritize Projects
- Field evaluation
- Prepare planning-level designs and estimates
- Prioritize projects
- Select highest priority projects

Preliminary Engineering
- Refine conceptual designs and estimates
- Prepare preliminary engineering reports
- 3-5 projects

We are here

3-5 projects
Miller-Walker Sub-basins for HSPF Hydrologic Model
<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>BIBI Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Comparable to least disturbed reference condition; overall high taxa diversity, particularly of mayflies, stoneflies, caddis flies, long-lived, clinger, and intolerant taxa. Relative abundance of predators high.</td>
<td>46-50</td>
</tr>
<tr>
<td>Good</td>
<td>Slightly divergent from least disturbed condition; absence of some long-lived and intolerant taxa; slight decline in richness of mayflies, stoneflies, and caddis flies; proportion of tolerant taxa increases.</td>
<td>38-45</td>
</tr>
<tr>
<td>Fair</td>
<td>Total taxa richness reduced – particularly intolerant, long-lived, stonefly, and clinger taxa; relative abundance of predators declines; proportion of tolerant taxa continues to increase.</td>
<td>28-37</td>
</tr>
<tr>
<td>Poor</td>
<td>Overall taxa diversity depressed; proportion of predators greatly reduced as is long-lived taxa richness; few stoneflies or intolerant taxa</td>
<td>18-27</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Overall taxa diversity very low, dominated by few species tolerant of poor stream conditions.</td>
<td>10-17</td>
</tr>
</tbody>
</table>
# Hydrologic Metrics Used to Estimate BIBI Scores

<table>
<thead>
<tr>
<th>Metric</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC</td>
<td>Low Pulse Count</td>
<td>Number of times each calendar year that discrete low flow pulses occurred</td>
</tr>
<tr>
<td>LPD</td>
<td>Low Pulse Duration</td>
<td>Annual average duration of low flow pulses during a calendar year</td>
</tr>
<tr>
<td>HPC</td>
<td>High Pulse Count</td>
<td>Number of days each water year that discrete high flow pulses occur</td>
</tr>
<tr>
<td>HPD</td>
<td>High Pulse Duration</td>
<td>Annual average duration of high flow pulses during a water year</td>
</tr>
<tr>
<td>HPR</td>
<td>High Pulse Range</td>
<td>Range in days between the start of the first high flow pulse and the end of the last high flow pulse during a water year</td>
</tr>
<tr>
<td>FR</td>
<td>Flow Reversals</td>
<td>The number of times that the flow rate changed from an increase to a decrease or vice versa during a water year. Flow changes of less than 2% are not considered</td>
</tr>
<tr>
<td>TQmean</td>
<td>TQmean</td>
<td>The fraction of time during a water year that the daily average flow rate is greater than the annual average flow rate of that year</td>
</tr>
</tbody>
</table>
Simulated BIBI Scores

Mitigated Conditions Includes Bioretention and Detention per WA State Department of Ecology Standards
Ranking Basin Catchments

- Modeled 2-year peak discharge rate
- Subbasin-scale
- Existing land use
Stormwater mitigation and retrofit need

- Detention storage (ac-ft)
- Infiltration footprint area
Identifying Feasible Sites

- Hydrology
- Infiltration potential
- Impervious surface
- Slope
- Risk to surrounding environment
- Available area
- Utility, Transportation, Capital project coordination
Next Steps

- Select top 80 potential sites based on multiple criteria
- Gather feedback at public meetings
- Narrow to top 30 potential sites
- Preliminary field testing, conceptual design, and cost estimating
- Gather feedback at public meetings
- Develop criteria for further site refinement
- Select top 3-5 sites for refined concept design and cost estimating
- Present results of study to public
Example Conceptual Design

Potential LID Strategies:
1. Bioretention swale
2. Underdrain
3. Curb cut
4. Cross slope pavement to drain to bioretention swale
5. Permeable pavement walkway/sidewalk
6. Asphalt curb/hump

Courtesy of Chris May
Contact Information

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