Aquatic and Riparian Effectiveness Monitoring Program

Decision Support Models Part I: How They Work for Assessing Watershed Condition

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Watershed Monitoring Scope

- 250 watersheds
- Multiple species & processes
- ~10-30 habitat attributes
- 2 scales
  - Reach
  - Watershed
Watershed Assessment Methods

- Statistical analysis: not feasible
- Watershed analysis: not comparable
- Standards: not integrated
- Expert judgment: not repeatable
- Expert systems: feasible, comparable, integral, repeatable
Ecosystem Management Decision Support System (EMDS)

- **What?**
  - software
  - Arc GIS extension
  - developed by USFS
  - freely available

- **Why?**
  - watershed assessment use
  - easy to understand
  - flexible

- **Evaluation**

- **Not**
  - simulation
  - optimization
Expert Workshops
Assessment Task
Modeling Process

Watershed Condition

- Roads
  - Density
  - Crossings

- Vegetation
  - Riparian
  - Upslope

Combined Score

Aggregate

Evaluate / Normalize

Watershed Attributes (raw data)
Data Evaluation & Normalization

Watershed condition score

Riparian road density (miles of road per mile of stream)
### Types & Sources of Evaluation Curves

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Curve</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upslope Roads</td>
<td><img src="image" alt="Curve" /></td>
<td>Cederholm &amp; Reid (1987)</td>
</tr>
<tr>
<td>Water Temp.</td>
<td><img src="image" alt="Curve" /></td>
<td>OR DEQ</td>
</tr>
<tr>
<td>Riparian Veg.</td>
<td><img src="image" alt="Curve" /></td>
<td>Prof. judgment</td>
</tr>
</tbody>
</table>
Aggregating Evaluation Scores

Vegetation

Minimum?
Maximum?
Average?

Riparian 75%
Upslope 25%

Weighting?
Context Operator

Water Temperature

Bull trout present? Yes No

Water Temperature Bull trout present? Yes No

48° 55° 60° 73°
<table>
<thead>
<tr>
<th>Watershed</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerald Park Creek</td>
<td>0.52</td>
</tr>
<tr>
<td>S. Fork Lost River</td>
<td>0.56</td>
</tr>
<tr>
<td>Up. Nf. Skykomish R.</td>
<td>0.58</td>
</tr>
<tr>
<td>Chumstick Creek</td>
<td>-0.52</td>
</tr>
<tr>
<td>Chiwaukum Creek</td>
<td>0.54</td>
</tr>
<tr>
<td>Swauk Creek</td>
<td>-0.58</td>
</tr>
<tr>
<td>Fish Creek</td>
<td>0.55</td>
</tr>
<tr>
<td>Boulder Creek</td>
<td>0.51</td>
</tr>
</tbody>
</table>
Overall Assessment

Frequency of Watershed Condition Scores

Condition Scores

# Watersheds (n = 250)

-1.1 to -0.8
-0.7
-0.5
-0.3
-0.1
0.1
0.3
0.5
0.7
0.9

0
10
20
30
40
Overall Assessment

Watershed condition score

# Watersheds

1994 - - - 2004

Watershed condition score

# Watersheds

0 0.2 0.4 0.6 0.8 1

-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 1
Benefits of Using Expert Systems

- Integrate data types
- Comparable
- Repeatable
- Easy to understand
- Document process
- Updateable
Further Uses of DSMs

- Identify principle stressors
- What-if scenarios
- Prioritize restoration (types, locations)
- Consultations on listed species?