HABITAT MEASUREMENT AND ITS USE IN BIOASSESSMENT IN WISCONSIN

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Needs for Developing Wisconsin Habitat Assessment Procedures

- Determine if management practices are working
  - Evaluate watershed best management practices (BMP).
  - Assess instream habitat improvement projects.
  - Examine success of stream restoration.

- Assess resource status:
  - Provide procedures for stream baseline monitoring.
  - Evaluate the realization of designated aquatic life uses.
  - Identify localized versus watershed conditions.
Criteria for Wisconsin Habitat Procedures

• Minimum effort that is necessary for adequately sampling habitat parameters.

• Known accuracy and precision for certain parameters.

• Summarize habitat parameters into an index value that is meaningful for biological conditions.
Determining Stream Length that is Necessary for Habitat and Fish Sampling

- Evaluated (catch 95% fish species):
  \[ \text{SWE} = 30-104 \times \text{MSW} \ (n=10); \]
  \[ \text{RPS} = 0-6 \ (n=10); \]

- Conclusion:
  
  Approximately: 35 \times \text{MSW} with a minimum of 100 m is sufficient.

  (Lyons, J. 1992. JNFM)
Compare Transect and Reach Scale Sampling

• Evaluated:
  ✽ 51 stations;
  ✽ 12-13 transects/station;
  ✽ One MSW zone vs. four 0.3-m quadrates on transect line for substrate and riparian variables.
Compare Transect and Reach Scale Sampling

• Evaluated:
  51 stations; 12-13 transects/station; MSW zone vs 5 0.3-m quadrates on substrate and riparian variables.

• Conclusion:
  Accuracy: transect = reach
  Precision: transect > reach
  (Simonson, T. 1993. JFE)
Determine number and spacing of transects

- Evaluated:
  86 stations with length of 35 x MSW. Transect spacing ≤ 1 MSW (35-48 tran.)

- Conclusion:
  12-13 transects spaced at 2-3 MSW is sufficient

(Simonson, et al. 1994. NJFM)
Examine Accuracy and Precision

• **Accuracy:**
  Compare photo-digitized and visual estimated substrates.

• **Precision:**
  Compare estimates from 6 individuals on 27 habitat variables.
Examine Accuracy and Precision

Conclusion:

- **Accuracy:**
  Difference: \(< 12\% \) substrate composition.

- **Precision:**
  70\% variables with CI \(< 10\) 
  4\% variables with CI \(> 20\) 

(Wang et al. 1996, NJFM)
Habitat Variables Sampled

• Variables measured on map: (5 variables).
• Morphology from entire station length: (9 variables)
• Instream cover from 13 transects: 8 variables
• Riparian vegetation, land-use, bank condition on 13 transects: 15 variables
• Substrate on 13 transects: 11 variables
## Low-Gradient Habitat Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan Score</td>
<td>61-100</td>
<td>11-60</td>
<td>1-10</td>
<td>10</td>
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<tr>
<td>Chan Age</td>
<td>&lt;10</td>
<td>10-20</td>
<td>&gt;20</td>
<td>natural</td>
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<tr>
<td>Cover Score</td>
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<td>5-10</td>
<td>11-15</td>
<td>&gt;5</td>
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<tr>
<td>Erosion Score</td>
<td>&gt;90</td>
<td>51-90</td>
<td>6-50</td>
<td>&lt;5</td>
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<tr>
<td>Sinuosity Score</td>
<td>&lt;1.1</td>
<td>1.1-1.2</td>
<td>1.2-1.4</td>
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<tr>
<td>Depth std Score</td>
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<td>0.1-0.3</td>
<td>0.3-0.4</td>
<td>&gt;0.4</td>
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<tr>
<td>Buffer Score</td>
<td>&lt;20</td>
<td>20-50</td>
<td>51-90</td>
<td>&gt;90</td>
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</tbody>
</table>

(Wang et al. 1998, NJFM)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Excel.</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer width (m)</td>
<td>&gt;10</td>
<td>5-10</td>
<td>1-5</td>
<td>&lt;1</td>
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<tr>
<td>(score)</td>
<td>(15)</td>
<td>(10)</td>
<td>(5)</td>
<td>(0)</td>
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<tr>
<td>Bank erosion (%)</td>
<td>&lt;10</td>
<td>10-50</td>
<td>50-90</td>
<td>&gt;90</td>
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<tr>
<td>(score)</td>
<td>(15)</td>
<td>(10)</td>
<td>(5)</td>
<td>(0)</td>
</tr>
<tr>
<td>Pool area (%)</td>
<td>40-60</td>
<td>30-40</td>
<td>10-30</td>
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<tr>
<td>(score)</td>
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<td>(7)</td>
<td>(3)</td>
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<td>Width:depth ratio</td>
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<tr>
<td>(score)</td>
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<td>Riffle:width ratio</td>
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<td>&gt;25</td>
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<tr>
<td>(score)</td>
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<td>(0)</td>
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<td>Fine sediment (%)</td>
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<td>20-60</td>
<td>&gt;60</td>
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<tr>
<td>(score)</td>
<td>(15)</td>
<td>(10)</td>
<td>(5)</td>
<td>(0)</td>
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<tr>
<td>Fish cover (%)</td>
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<td>10-15</td>
<td>5-10</td>
<td>&lt;5</td>
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<tr>
<td>(score)</td>
<td>(15)</td>
<td>(10)</td>
<td>(5)</td>
<td>(0)</td>
</tr>
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Simonson et al. 1994, US Forest Services
Habitat Score from LGHM and IBI for Testing Streams

\[ R^2 = 0.64 \]
Examine relation between watershed land-use and stream conditions
Evaluate Effectiveness of BMPs

- Habitat score
- Bank erosion (%)

Sites: Site 1, Site 2, Site 3

Before and After comparisons.
Work in Progress to Refine Stream Classification and Biocriteria

- Resource management team: sample 200 sites/year for habitat, fish, and bugs for assessing stream current conditions.
- Research team: develop models using weather and landscape parameters as natural condition determinator and land use as modifier to predict expected conditions.
- Classify streams based on expectation.
- Compare current with expected conditions to determine impairment and management action.
QUESTIONS