Fish Biocriteria For Western Corn Belt Plains Ecoregion

Prepared for Prairie Band Potawatomi Indian Nation by Kansas Biological Survey
Data Collection

- Sixteen selected streams from the Western Corn Belt Plains ecoregion were sampled each season for 2 1/2 years for a total of ten collection events.
- Five sites on each stream were sampled during each event.
- Habitat, periphyton, macroinvertebrates and fish were sampled.
- Fish sampling involved electroshocking and exhaustive seining.
The data from the fish samples were compiled and 46 candidate metrics were calculated for reference and impacted sites.

- 24 Richness Metrics
- 3 Abundance Metrics
- 12 Composition Metrics
- 7 Diversity Metrics

Box plots were created for each metric to compare reference and impacted metric values.
Seasonal comparison of native fish species richness values from reference & impacted sites from the WCBP ecoregion
Metric Selection (Continued)

• Metrics were selected on the basis of two criteria:
  – Good separation between reference and impacted box plots.
  – Low variability.

• Based on this criteria, 26 metrics were potentially useful, but many of these metrics were redundant.

• In order to identify and eliminate some redundancies, a correlation matrix was used and the list of metrics was reduced to 11.
Selected fish biocriteria richness metrics used in the WCBP ecoregion IBI

- **RICHNESS**
  - Native Species Richness
  - Family Richness
  - Sunfish Richness
  - Darter and Madtom Richness
  - Simple Lithophil Richness
  - Pioneer Richness

- **ABUNDANCE**
  - Abundance per 100m

- **COMPOSITION**
  - Proportion of Omivores and Generalists

- **DIVERSITY**
  - Shannon’s (Numbers)
  - Index of Well Being
  - Gleason’s
Once the metrics were selected, an Index of Biotic Integrity was calculated.

A scoring system similar to EPA’s RBP was used. This involved assigning a score of 1, 3 or 5 to lower, middle and upper metric values, respectively.

The upper, middle and lower divisions were determined using natural breaks when present, but when data was scattered, the chart was divided into thirds.
## Scoring for WCBP IBI metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>1</th>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Species Richness</td>
<td>&lt;5</td>
<td>5-8</td>
<td>&gt;8</td>
</tr>
<tr>
<td>Family Richness</td>
<td>&lt;2</td>
<td>2-3</td>
<td>&gt;3</td>
</tr>
<tr>
<td>Sunfish Richness</td>
<td>&lt;1</td>
<td>1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Darter &amp; Madtom Richness</td>
<td>&lt;1</td>
<td>1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Simple Lithophil Richness</td>
<td>&lt;1</td>
<td>1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Pioneer Richness</td>
<td>&lt;2</td>
<td>2-3</td>
<td>&gt;3</td>
</tr>
<tr>
<td>Abundance per 100m</td>
<td>&lt;300</td>
<td>300-750</td>
<td>&gt;750</td>
</tr>
<tr>
<td>Proportion of Omnivores &amp; Generalists</td>
<td>&gt;40%</td>
<td>40-20</td>
<td>&lt;20%</td>
</tr>
<tr>
<td>Shannon’s (Numbers)</td>
<td>&lt;1</td>
<td>1-1.4</td>
<td>&gt;1.4</td>
</tr>
<tr>
<td>Index of Well Being</td>
<td>&lt;6</td>
<td>6-8</td>
<td>&gt;8</td>
</tr>
<tr>
<td>Gleason’s</td>
<td>&lt;1.3</td>
<td>1.3-1.7</td>
<td>&gt;1.7</td>
</tr>
</tbody>
</table>
Index of Biotic Integrity (Continued)

• The score from each metric was summed to produce a raw value between 11 and 55 (11=Impacted & 55 = Reference)
• The raw score was multiplied by 10/11 to obtain an even integer.
• This value was then multiplied by 2 to increase the spread.
Soldier Creek

• The IBI was then applied to Soldier Creek as part of the ecological assessment of this WCBP stream.
• Individual metrics and the IBI were compared with box plots to determine how Soldier Creek ranked among other streams in the WCBP ecoregion.
Box plots comparing native species richness values from WCBP reference & impacted sites to Soldier Creek site values.
Box plots comparing WCBP reference & impacted site IBI scores to Soldier Creek site scores.
Conclusions

- Comparisons of Soldier Creek to WCBP reference & impacted sites imply that Soldier Creek is at least a reference site in this ecoregion.
- In reality the Soldier Creek sites may be more impacted than the IBI score indicates due to the increased size of Soldier Creek compared to the other streams in this study.
Conclusions (Continued)

- Further studies of fish communities from larger streams of the WCBP ecoregion will allow modifications of the WCBP IBI and improve accuracy in the future.
- However, the limited, tolerant fauna of this region may prevent the development of successful biocriteria for this region, particularly in small headwater streams.