

Wetland Macroinvertebrate Metrics

1. Index of Biological Integrity

The Index of Biological Integrity, or IBI, is a scoring system used to measure strong responses to human disturbance, or pollution, in wetlands. In our sampling we focus on two biological communities: plants and macroinvertebrates (small organisms in the water without a backbone: insects, leeches, snails, etc.).

The Minnesota Pollution Control Agency selected a variety of metrics or measurements for us to use. The metrics focus on those organisms which best reflect wetland quality or health. Each metric is evaluated based on the identified specimens and their abundance. They reflect organism presence and relative abundance. Depending on the result of the metric, each is awarded a score of one, three, or five. The scores for each metric are then combined to calculate a total score, this is the IBI. The higher the score, the higher the likelihood of a healthy wetland.

The IBI score is then converted to an overall rating to give the wetland a qualitative description we can all understand (Poor, Moderate, Excellent). A wetland described as Poor would have a minimal variety of organisms and a large number of them would likely not be sensitive to pollution. A wetland of Excellent quality would have a higher variety of organism and contain those species that are more sensitive to human disturbance or pollution.

It should be noted that the two IBIs (macroinvertebrates and vegetation) have slightly different ratings based on the scoring range. This is due, in part, to the number of metrics evaluated in each IBI; six for the macroinvertebrate, and seven for the vegetation IBI.

2. Macroinvertebrate metrics (measures) for the Index of Biological Integrity

The metrics (measures) listed below are used to assess the health of wetlands. Each metric receives a score of one, three, or five. The six metrics are then totaled to produce an overall IBI score. The greater the score, the greater the indication of a healthy wetland. The score is then interpreted into a general health rating of Excellent, Moderate or Poor.

Metric #1 Number of kinds of leeches	The number of kinds of leeches found in dipnet and bottletrap samples is greater in healthier wetlands. There is one kind of leech that tends to increase in relative numbers in more polluted wetlands, but overall, more leech taxa indicates less disturbance. Leeches feed on a variety of different kinds of prey, both invertebrate and vertebrate. Very few kinds of leeches suck blood from mammals.
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<p>Metric #2</p> <p>Corixidae proportion metric</p>	<p>Ratio of water boatman to other true bugs and beetles in the bottle trap sample. All aquatic beetles and most true bugs are predators, mostly feeding on other invertebrates. Many of the corixid bugs feed on algae and detritus that tends to increase in polluted wetlands. The corixid bugs tend to increase in proportion to the total count of individuals of beetles and bugs found in the bottle trap samples. This is the only metric that relies only on data from bottle trap, and the only one that counts the number of individuals.</p>								
<p>Metric #3</p> <p>Number of kinds of dragonfly and damselfly larvae (Odonata)</p>	<p>The number of kinds of dragonfly and damselfly larvae found in dipnet and bottle trap samples tends to be higher in healthier wetlands. These insects are predators at all stages, and have somewhat longer life cycles than other invertebrates. Dragonflies pump water in and out of their posterior end, which could expose them to pollutants. Some odonates lay their eggs on stems of aquatic plants, so if the plants are lost, they lose their egg-laying sites.</p>								
<p>Metric #4</p> <p>Number of kinds of mayfly and caddisfly larvae plus the presence of dragonfly larvae and fingernail clams</p>	<p>Mayflies, caddisflies, and fingernail clams are sensitive to pollution. Mayflies and caddisflies are gill breathers, allowing them to take in pollutants directly from the water. Fingernail clams filter small particles from the water, allowing direct intake of pollutants, but also making them more vulnerable to siltation in the water.</p>								
<p>Metric #5</p> <p>Number of kinds of snails</p>	<p>Most snails in wetlands are lunged (pulmonate), meaning they are air breathers. Sometimes you will see snails hanging upside down under the surface film. They are breathing and may be feeding on the film. Snails are herbivores and feed on plants and the algae coating surfaces of plants, sticks and substrates. The number of taxa of snails is greater in higher quality wetlands than in disturbed wetlands. Algae and plants can accumulate contaminants, so snails could be exposed to pollutants through their feeding. Also if the vegetation is lost, there will be less food for snails.</p>								
<p>Metric #6</p> <p>Total number of macroinvertebrate taxa</p>	<p>The total number of invertebrate taxa is usually one of the strongest indicators of the health of wetlands. The total taxa metric sums the total number of leech taxa, dragonfly and damselfly taxa, snail taxa, and presence of fingernail clams. In addition, the number of macrocrustacean taxa is added to the total taxa. These are crustaceans that are visible to the eye. Smaller crustaceans like water fleas (Daphnia), ostracods and other zooplankters (copepods, rotifers) are not counted. The Dipteran or true fly taxa are also included in the total taxa metric. Mosquito larvae, Chaoborus (the phantom midge), the midges (Chironomidae), the biting midges (Ceratopogonidae) and soldier flies are some examples of some of the Dipteran taxa that might occur in wetlands.</p>								
<table border="1"> <thead> <tr> <th data-bbox="203 1633 730 1686">IBI Score</th> <th data-bbox="730 1633 1351 1686">Wetland Health Assessment</th> </tr> </thead> <tbody> <tr> <td data-bbox="203 1686 730 1738">23-30</td> <td data-bbox="730 1686 1351 1738">Excellent</td> </tr> <tr> <td data-bbox="203 1738 730 1791">15-22</td> <td data-bbox="730 1738 1351 1791">Moderate</td> </tr> <tr> <td data-bbox="203 1791 730 1822">6-14</td> <td data-bbox="730 1791 1351 1822">Poor</td> </tr> </tbody> </table>		IBI Score	Wetland Health Assessment	23-30	Excellent	15-22	Moderate	6-14	Poor
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