

Measuring Stream Health

What is stream health?

A healthy stream performs a variety of ecological functions and contains its full complement of native species. The “health” or condition of a stream can be determined using physical, chemical and biological measurements. The Clean Water Act requires that states maintain the “physical, chemical, and biological integrity” of their waters. Increasingly, indicators of biological integrity are being developed to assess the health of stream biota. Biotic indices are useful because fishes and other organisms are considered good integrators of human-induced stressors and are thus good indicators of stream health.

Generally, state agencies such as the Department of Environmental Quality conduct surveys of stream condition, and report this information to the U.S. Environmental Protection Agency, which publishes biennial reports. Nonpoint source pollution (or diffuse pollution) is currently the major cause of impaired river miles in the United States.

Biologically diverse headwaters



Agricultural ditch



Riverfront property







What are some of the variables affecting stream health?

Streams vary widely in their condition, due to natural circumstances as well as human impairment. Measuring human impairment, and diagnosing the causes, are challenging endeavors. Human-induced impairments include a wide variety of contaminants, some of which we are just beginning to detect. These impairments include both in-stream and out of stream habitat degradation, invasive species, altered river flows, and more.

Why are stream indicators important?

Streams have many important functions. They absorb wastes, harbor a rich diversity of species, and provide drinking water and recreational enjoyment. Thus, stream indicators are critical because they allow us to determine when conditions are degrading, target areas for protection and restoration, and measure the success of investments in ecological stewardship.

| | |
|--|---|
| Poor | Good |
|  |  |
| Channel Form | |
|  |  |
| Bank Stability | |
| Habitat Variables: | Total Score: |
| <ol style="list-style-type: none"> 1. Bottom substrate and available cover 2. Embeddedness and siltation 3. Velocity/depth variability 4. Flow stability 5. Bottom deposition/sedimentation 6. Pools, riffles, runs, bends 7. Bank stability 8. Bank vegetative stability 9. Streamside cover | <ol style="list-style-type: none"> Poor Fair Good Excellent |

How can we assess the condition of stream habitat?

Visual habitat surveys assign a score to a variety of habitat variables. The scores for each variable are summed to determine a composite habitat score. This method is rapid and provides independent information on in-stream and near-stream habitat both of which are important to stream health. Although subjective, trained observers obtain very similar results,

Contact Information:

David Allan, School of Natural Resources & Environment,
The University of Michigan, Ann Arbor MI 48109-1115
734-764-6553 dallan@umich.edu

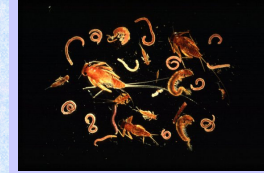
The Good



Invertebrate Variables:

1. Total number of taxa
2. Total number of mayfly taxa
3. Total number of stonefly taxa
4. Total number of caddisfly taxa
5. Total number of clinger taxa
6. Total number of predator taxa
7. % Mayfly taxa
8. % Tolerant taxa

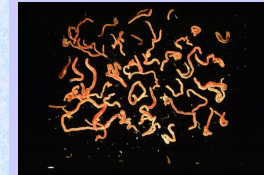
The Bad



Total Score:

- Poor
- Fair
- Good
- Excellent

The Ugly



How can we assess biotic integrity?

A stream with good biotic integrity is one which supports biota that are a product of natural phenomenon and not human influence. One may assess the biotic integrity of a stream by assigning a score to a variety of biological variables and summing these scores to determine a value for the overall index of biotic integrity (IBI). Many scientists recognize that biota are excellent indicators of stream health because they are influenced by land use, habitat and water chemistry.

While most scientists agree that biotic indices are critical to assessing stream health, they continue to debate whether fish or aquatic invertebrates make better indicators. Because fish are long-lived and mobile, they may be more indicative of regional conditions over a longer period of time. In contrast, invertebrates are relatively short-lived and stationary and may be indicative of more local conditions over a shorter period of time.