

FACT SHEET

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



Biological Community Assessment: Macroinvertebrates and Fish Office of Water Quality

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Introduction:

A biological community assessment is a measurement of the effect of environmental stressors (such as pollutants or habitat disturbance) on the organisms that live in the water and the resulting impact on the entire ecosystem.

The Indiana Administrative Code (IAC) provides a narrative biological criterion at 327 IAC 2-1-3(a)(2), which states that all waters (except those categorized as “limited use waters”) “will be capable of supporting... a well-balanced, warm water aquatic community” which is “diverse in species composition, contains several different trophic levels, and is not composed mainly of pollution tolerant species.” The Indiana Administrative Code provides a definition of a well-balanced aquatic community at 327 IAC 2-1-9(59). When sampled in conjunction with chemical analyses of water quality parameters and measurements of aquatic habitat quality, biological community assessments help to determine the water’s compliance with the biological criterion in 327 IAC 2-1-3(a)(2) and a waterbody’s ability to support aquatic life while providing a more complete picture of the overall ecological health of a watershed.

The Watershed Assessment and Planning Branch (WAPB) within the Indiana Department of Environmental Management’s (IDEM’s) Office of Water Quality assesses the ability of Indiana rivers and streams to support healthy biological communities by collecting aquatic organisms such as fish and macroinvertebrates (animals without a backbone that can be seen with the naked eye such as immature dragonflies and mayflies, beetles, snails, crayfish, mussels, etc.). The fish and macroinvertebrate community composition is used to complete a biological community assessment.

Environmental Indicators for Determining Health and Diversity:

Between June and October, IDEM scientists visit both randomly selected and targeted stream sites located throughout a selected watershed, where they spend one to eight hours collecting biological communities, measuring water chemistry parameters, and evaluating habitat quality.

Water chemistry parameters include water temperature, the amount of oxygen dissolved in the water, pH (the acidity of water), specific conductance (the amount of dissolved solids in the water), and turbidity (the clarity of water). Habitat quality is characterized by measuring stream width and depth, the substrates comprising the stream bed, evaluating riffle/run/pool habitat quality in the stream, the amount of shade provided by trees surrounding the stream bank (riparian vegetation), and adjacent land use. Degradation of habitat quality is determined by measuring the amount of siltation, bank erosion, and stream modification (removal of riparian vegetation or stream channelization), as well as identifying any direct point sources of chemical pollution. Chemical and habitat variables are measured to determine if ecological health impairments can be attributed to site specific habitat degradation or sources of water quality pollution.

The health and diversity of fish and macroinvertebrate communities living in Indiana’s rivers and streams reflect the ecological condition of the watershed. To determine ecological health, field crews perform aquatic life surveys. To collect and hold captured fish, crews use boat or backpack electroshocking equipment in conjunction with nets and buckets. Electroshocking temporarily stuns fish, allowing crews to identify, weigh and measure them before returning them back to the stream. While most fish will be returned to the river or stream unharmed, some will be preserved and returned to IDEM’s laboratory for identification.

Crews use nets to collect macroinvertebrates from riffles and other habitat within the stream channel and along the banks (such as rootmats, logs and woody debris). Once the stream reach has been sampled, the net contents are put into a bucket with water, rinsed through a small mesh sieve to dislodge any macroinvertebrates from leaves or rocks, and placed in a tray. For 15 minutes, the crew leader will pick and remove as many different types of macroinvertebrates from the tray as possible. Those specimens picked from the tray are preserved and returned to IDEM's laboratory for lowest taxonomic identification using microscopes and identification keys. Macroinvertebrate samples processed in the laboratory are preserved and stored for future reference.

The data obtained from these samples are then analyzed through an index of biotic integrity (IBI), which evaluates the compositional, structural, and functional integrity of the biological community and gives a site's ecological health a numerical value. This numerical value allows for the biological community to be classified as fully supporting or non-supporting for a biological community assessment.

IDEM's Role:

IDEM reports the biological community assessments to the U.S. Environmental Protection Agency in the Indiana Integrated Water Quality Monitoring and Assessment Report, which describes the condition of streams, lakes, and ground water in several Indiana watersheds. The public can review the Indiana Integrated Water Quality Monitoring and Assessment Report on the IDEM website at www.in.gov/idem/nps/2639.htm.

IDEM provides the information that is collected to affected landowners, as well as property managers, special interest groups, local governments, universities, state and federal agencies, planners, and policy makers who request it.

During various monitoring and assessment field activities, staff may find obvious biological impairment due to point or non-point source related problems. When such problems are discovered, field staff will immediately refer them to appropriate agency programs that can identify and resolve compliance issues.

Citizen's Role:

Where access to private property is needed for the agency to collect water and/or biological samples, private landowners can help by permitting IDEM staff to come onto their property.

- Between January and April, IDEM field crews will travel to potential sampling sites and determine their accessibility. Field crews often access sampling locations from public road right-of-ways at the nearest bridge. However, many sample sites are located a significant distance from bridge access, which may require field crews to contact landowners or property managers to request permission to access streams on private property. Only with the help of landowners and property managers can Indiana's rivers and streams be effectively assessed.

There are also simple actions every citizen can take at home or while recreating in waterways, to reduce their contribution to watershed pollution and the introduction of non-native fish (fish which do not naturally live in the waterway).

- Do not over fertilize. The nutrients in excess fertilizer that washes off of the land in storm water can contribute to algal growth and poor water quality. Most established lawns need few nutrients to be healthy. If applying fertilizer, look for a low phosphorus or phosphorus-free mix.
- Do not dispose of grass clippings or leaves in or near a waterway or storm sewer. As this organic matter breaks down, nutrients are released and oxygen is consumed, resulting in poor water quality.
- Do NOT dispose of motor oil or other household waste in or near a waterway or storm sewer.
- Dispose of motor oil or other household waste using an appropriate collector.
- Do NOT empty your aquarium into waterways.
- Do not modify the stream channel by dredging or straightening it.
- Do not remove trees and shrubs from the streambank.
- If you are a fisherman, do NOT empty your unused bait into waterways.

Additional Information:

- For more information about Watersheds and Nonpoint Source Water Pollution, please visit IDEM's website at www.in.gov/idem/nps/index.htm. For information about fish communities, please visit IDEM's Web page on Common Watershed Parameters at www.IN.gov/idem/nps/2577.htm.
- The Indiana Administrative Code, [327 IAC 2-1-3(a)] and [327 IAC 2-1-9(59)], is available on the Indiana General Assembly's website at www.in.gov/legislative/iac/T03270/A00020.PDF.
- For questions and concerns, please contact IDEM's Office of Water Quality at (317) 308-3173 or (800) 451-6027, ext. 308-3173 (*toll free*).