FACT SHEET

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Algae in Aquatic Ecosystems
Office of Water Quality

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Introduction:

Algae are simple nonflowering plantlike organisms ranging in size from single-celled diatoms (microalgae) to giant multicellular forms such as kelp or seaweed (macroalgae). All algae contain chlorophyll but most lack leaves, roots, vascular tissue, and stems. They play a vital role in aquatic ecosystems by forming the energy base of the food web for all aquatic organisms. As autotrophic organisms, algae convert water and carbon dioxide to sugar through the process of photosynthesis. Photosynthesis also generates oxygen as a byproduct, contributing to the survival of fish and other aquatic organisms.

The Watershed Assessment and Planning Branch (WAPB) within the Indiana Department of Environmental Management's (IDEM's) Office of Water Quality focuses on sampling microalgae. Microalgae are often microscopic unicellular plants. The microalgae can be broken down into two general groups, periphyton and phytoplankton (seston).

Periphyton live attached to substrate and other organisms. Periphyton samples can be collected from epilithic (rock), epidendric (stick), epipsammic (sand), epipelic (silt), or epiphytic (aquatic plant) substrates. Epilithic substrate is preferred since it is the most stable and can be found at a majority of sites for comparison of samples from different waterbodies. Small rivers and streams (less than 1000 mi^2 drainage area) tend to have a periphyton driven food web.

Phytoplankton are free floating or suspended algae in the water column. Large rivers (greater than 1000 mi^2 drainage area) tend to have a phytoplankton driven food web.

Environmental Impacts:

Community structure and abundance levels of algae are greatly impacted by chemical and physical shifts in the environment. The susceptibility of algae to environmental change make them excellent indicators of water quality and a major component of many sampling programs.

Elevated algal and aquatic plant growth can clog water intake pipes and filters as well as interfere with recreational uses such as fishing, swimming, and boating. Excessive algal growth (blooms) coupled with the prevalence of nuisance species indicate excessive nutrients. Substantial nutrient concentrations in the Midwest from localized sources become greater as they merge with downstream sources and contribute to water quality problems. Once algal blooms die off, a substantial amount of dissolved oxygen is used by bacteria to breakdown the organic matter, depleting oxygen levels in the waterbody; this condition is known as hypoxia. Hypoxia zones are most notably found in the Gulf of Mexico and the Central Basin of Lake Erie.

IDEM's Role:

IDEM collects and analyzes algae samples at both randomly selected and targeted stream sites located throughout selected watersheds. Samples are collected for both algal biomass (quantification) and identification/enumeration (qualification).

IDEM determines the algal biomass, identification, and the diversity of algal stream communities associated with differing nutrient conditions, watershed characteristics and habitat. Data are used to continue developing numeric criteria for total phosphorous and total nitrogen in streams for the protection of aquatic and human health.

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 all citizens can take at home, to reduce their contribution to watershed pollution.

- IDEM promotes the use of Best Management Practices (BMPs) that reduce excess nutrient runoff and increase nutrient retention.
- 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.

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 Common Watershed Parameters, please visit IDEM's website at www.in.gov/idem/nps/2577.htm.
- 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).