



Biological Assessments

Chlorophyll

Chlorophyll is an essential pigment for photosynthesis (the process of converting light energy into chemical energy) in algae, cyanobacteria and plants. It is also what makes many algae, cyanobacteria and plants green. Chlorophyll absorbs light in the blue and red portions of the visible wavelengths of the electro-magnetic spectrum and reflects green. Chlorophyll is important in water quality studies since it can be used to calculate important measures in a water body such as trophic state and primary production.

Phytoplankton

Phytoplankton are photosynthetic, free-floating microscopic organisms that live in aquatic ecosystems. They include many species of algae and cyanobacteria (blue-green algae). Lake and river ecosystems depend heavily on phytoplankton because they are the foundation of the food web. Phytoplankton are also very sensitive to water quality conditions and make excellent indicators of water quality. Because of these reasons, we monitor and assess phytoplankton communities to improve our understanding of a lake's water quality. Phytoplankton can indicate certain types of pollution (notably nutrient overloading) and can be used to track trends in pollution. When monitoring a harmful algal bloom (HAB) the water quality team collects phytoplankton to evaluate cell counts, types of species, and other community metrics.



Algal blooms are rapid increases in the phytoplankton population, typically triggered by eutrophication, a condition of nutrient over-enrichment of water systems characterized by excessive concentrations of nitrogen and phosphorus compounds. Algal blooms are a problem for water environments because they often result in conditions of low oxygen concentration after the phytoplankton die and begin decomposing. Algal blooms usually are considered nuisance events that inconvenience or constrain recreation and water supply treatment. HABs are algae blooms composed of phytoplankton known to naturally produce biotoxins. They can occur when these algae grow quickly in water, creating biochemical conditions that may harm the health of the environment, plants, or animals.

Zooplankton

Zooplankton consist of small drifting or wandering animals that occupy an intermediary niche in the food webs of reservoir and river ecosystems. Zooplankton feed on phytoplankton and smaller zooplankton and are an important food source for many fish. The Pittsburgh District collects zooplankton samples at project reservoirs in order to monitor trends in population and community composition and to understand the effects of zooplankton community dynamics on lake fisheries.



Macroinvertebrates

Macroinvertebrates make up a large portion of the benthic population in streams and lakes. Macroinvertebrates are animals without backbones that are large enough to see with the naked eye. These include organisms such as snails, mussels, worms, insects, and crustaceans. Some macroinvertebrates are sensitive to environmental conditions affecting aquatic habitats such as chemistry, flow, temperature, suspended solids, and dissolved oxygen. As a result of this, macroinvertebrates are widely used in bioassessment programs for assessing water quality. The effects of different water quality conditions on macroinvertebrate communities are well documented and widely accepted. Different indices, metrics or ratings describing insect community structure are calculated to evaluate the effects of the construction, maintenance, and operation of Corps facilities (reservoirs, navigation projects, etc.) on water quality, fish and wildlife and other project purposes in support of the District's Water Management and Natural Resource Management missions.



Mussels

Freshwater mussels inhabit many of the waters throughout the Pittsburgh District and include clams and bivalves that filter feed on plankton. Mussels typically congregate in beds and secure themselves to the substrate and other hard surfaces in the water bodies they inhabit. A number of federally listed, threatened and endangered mussels live in the Allegheny River.



These mussels are beneficial to the ecosystems they inhabit because they filter the water, which results in improved clarity, and provide a food source for aquatic organisms. Because they are sessile (stay in one place most of their life) they are good bio-indicators of disturbance. Non-native mussels, such as zebra mussels and quagga mussels, can disturb local ecosystems due to a lack of predators, prolific breeding, and disruption of trophic webs. They can also overtake recreation areas and cause maintenance issues for existing infrastructure (e.g. water treatment plant intake pipes).

Fish

Fish are a central component in aquatic ecosystems. They are indicators of ecosystem health, are often at the top of the food web, influence nutrient dynamics and zooplankton communities, and are valuable for recreation. State fishery agencies are responsible for the management of fishery resources at Pittsburgh District facilities, which requires close coordination with the Water Quality Team and project staff. Data about state sampling programs can be found on the following state websites.



Pennsylvania: <http://fishandboat.com/afm.htm> **Ohio:** <http://www.epa.state.oh.us/dsw/bioassess/ohstrat.aspx>

West Virginia: <http://www.wvdnr.gov/Fishing/research.shtm> **New York:** <http://www.dec.ny.gov/outdoor/7730.html>

Photo Captions and Credits (From Top to Bottom)

Algae Bloom Allegheny Reservoir (2013) – Rose Reilly, Biologist

Zooplankton, (*Mesocyclops edax*) under microscope – Wendell Pennington, Owner - Pennington and Associates Inc.

Stoneflies (*Acroneuria*) from Reason Run, tributary to Youghiogheny Reservoir – Ann Claire Green, Graduate Student, Chatham University

Freshwater mussels from Stonewall Jackson Reservoir – Rose Reilly, Biologist

Assortment of Paddlefish collected October 2012 during night boat electrofishing surveys targeting Walleye at the tailwaters of Kinzua Dam. From left-to-right are Brian Ensign, Fisheries Biologist with the PFBC's Area 2 office in Tionesta; Bob Hoskin, Fisheries Biologist with the U.S. Army Corps of Engineers, Pittsburgh District; and Brent Pence, Biologist with the U.S. Forest Service's Allegheny National Forest office in Warren - Photograph by Bob Ventorini, PFBC.