Euclid Creek Volunteer Water Quality Monitoring Program:
Research Update

Why should we care about water quality monitoring

We live on Lake Erie one of the Great Lakes which form the largest group of freshwater lakes on Earth. Euclid Creek flows directly into Lake Erie, our source of drinking water. Caring about the quality of our water is important to human and ecological health—and we depend upon water to live.

Program Overview

Volunteers collect water quality data at five sites within the Euclid Creek Watershed to record changes in the waterways over time and to identify contaminants and problems in the watershed. Both chemical and physical monitoring were made at each site monthly between May 2006 and December 2012 by over 24 volunteers, resulting in over 2000 observations about the creek. Nutrient levels, turbidity, dissolved oxygen concentration, conductivity, temperature and pH were examined. The methods used for monitoring were selected based on guidelines provided by the Ohio Environmental Protection Agency. An analytical review of these data follows in the subsequent sections of this report.

Where do we monitor?

The monitoring sites are distributed throughout the watershed and were chosen to represent the entire watershed, with two sites on the west branch, two sites on the east branch, and one near the mouth of Euclid Creek just before it reaches Lake Erie. The location of the monitoring sites is shown on the map below.
What is being tested for and why?

Not unlike a living thing, there is no single measure of stream health at a particular monitoring location. Therefore the Euclid Creek Watershed Volunteer Monitoring Program monitors nutrients, temperature, pH, conductivity, turbidity, and dissolved oxygen on a monthly basis at each of the five monitoring sites.

**Nutrients:** Both phosphates and ammonia are measured and documented at each site to give an indication of the phosphorus and nitrogen levels in the stream. In excess, nitrogen and phosphorus can negatively affect aquatic life. High nutrient levels can lead to harmful algal blooms and low oxygen conditions. Lawn fertilizers, soil erosion, pet waste runoff, illegal wastewater discharges, and combined sewer overflows are all sources of nutrient pollution.

**Turbidity:** Turbidity refers to the clarity of the water, as water that is cloudy or murky is said to be turbid. Excessive turbidity can lower dissolved oxygen concentration, increase available phosphorus, and significantly alter available habitat and harm fish and other aquatic wildlife. Bed and bank erosion during storm events, runoff from land-based activities, failing septic systems, and illegal discharges all contribute to higher than normal turbidity levels.

**Dissolved Oxygen:** Dissolved oxygen content of streams can dictate what types of animals can live there. Like humans, many animals simply do not tolerate low oxygen (dissolved) conditions. Tolerant animals replace less-tolerant, often desirable, species under prolonged low oxygen conditions. Increased stream temperature and excessive turbidity can both lead to low dissolved oxygen levels.

**Temperature:** Much like dissolved oxygen, temperature can determine what animals are found in a stream. Cool water can hold more dissolved oxygen than warm water. Impervious surfaces such as roads, parking lots, and sidewalks in urban watersheds increase stream temperature when storm water runoff travels across hot pavement and then enters the stream. Small urbanized streams often lack the cover of shade trees too. Few aquatic organisms can tolerate super-heated water.

**pH:** pH is a scale used to measure how acidic or basic a solution is. The scale is from 0-14, with 7 being a neutral pH, 0 being highly acidic, and 14 being highly basic. A stream’s pH can be affected by surrounding urban land use. Acid rain can often lower stream pH in areas that use coal to generate electricity, as coal power plant emissions are the leading cause of acid rain in the United States. The pH can also determine wildlife conditions, as most critters cannot survive if the water is either too acidic or too basic.

**Conductivity:** The concentration of certain dissolved solids in water can be determined using a conductivity meter. Polluted storm water run off containing road salts and particular types of fertilizers as well as illegal discharges can increase the amount of dissolved solids that are detected by the meter and subsequently reported as the water’s conductivity. Given the seasonal nature of road salting, stream conductivity can increase greatly in the winter months to levels that challenge the health of aquatic life.

**Physical Stream Observations:** Volunteers monitor rainfall, debris, vegetation present, and other general factors that affect water quality.
Results

The results presented here are depicted in reference to the target goals for each metric measured. The targets for nitrogen and phosphorus are from the Euclid Creek Total Maximum Daily Load (TMDL) Report. Conducted by the Ohio EPA, a TMDL Report is “the calculation of the maximum amount of pollutant that a water body can receive and still meet water quality standards”. Targets for dissolved oxygen and pH are taken from the Ohio EPA report on Water Quality Standards, specifically the section on water use designations and statewide criteria for the protection of aquatic life.

The entire Euclid Creek TMDL Report is available online at:
http://www.epa.ohio.gov/portals/35/tmdl/Euclid%20Creek%20Final%20Report%20080505.pdf

The Ohio EPA document setting forth the State of Ohio Water Quality Standards is available online at:
http://www.epa.state.oh.us/portals/35/rules/01_all.pdf

Nitrogen & Phosphorus:

Nitrogen and phosphorus levels were evaluated at each site using a Hach-brand meter. Ammonia (NH₃) and phosphate (PO₄) were chosen to represent nitrogen and phosphorus, respectively. Ammonia was routinely well below Ohio’s standards. Phosphorus, on the other hand, continues to be well above the standard set forth by the US EPA approved Euclid Creek TMDL and continues to rise. The reasons for excessive phosphorus are due in large part to human activities. Ways to reduce phosphorus levels are to limit erosion by managing storm water on-site using a rain garden, native plantings or a rain barrel, cut back on lawn fertilizer applications, and picking up after your pet. The graphs to the left to show phosphorus and nitrogen levels at each volunteer monitoring site in relation to TMDLs.

Dissolved Oxygen, Temperature, and pH:

Dissolved oxygen concentration, temperature, and pH were all measured with a YSI meter. While pH was slightly higher (more basic) than usual, it routinely fell within accepted limits. Dissolved oxygen was also at acceptable levels at each site every month they were surveyed. Dissolved oxygen is generally less of an issue in flowing streams because air is regularly incorporated through turbulent flow. Temperature did fluctuate a bit, as would be expected in a relatively shallow stream such as Euclid Creek due to seasonal change, but was also generally within acceptable values.

Water Quality Data and Graphs Now Online

To download an excel spreadsheet of data collected through June of 2014: Go to www.EuclidCreekWatershed.org and click on the ‘Euclid Creek Volunteer Monitoring Program’ icon, then click on ‘Outcomes’ to pick the file. , then scroll down to ‘Monitoring Program Raw Data’ and click on link.*

To see graphs of dissolved oxygen, temperature and pH, download this update report on the Monitoring Program website (instructions above) - or if you’d like a copy, email cposius@cuyahogaswcd.org or call 216-524-6580 x16 with your email or street address.

*Disclaimer: The analytical data posted online was generated to satisfy specific data quality objectives for the Euclid Creek Volunteer Monitoring Program. All of the samples were analyzed and collected by trained volunteer water quality monitors. Users of the data must understand potential limitations of the information and its suitability for their intended use.
Conductivity:

Conductivity throughout the watershed varies seasonally. The graph to the right highlights the seasonality trend seen at the Wildwood Park location, but similar trends can be seen at all sites. These variations are directly attributable to road salt applications throughout the winter months.

Many municipalities throughout the Euclid Creek watershed have adopted sensible salting practices to save money and reduce salt loading in the creek. Hopefully, with reduced salt use over time, these seasonal fluctuations will become less drastic and conductivity will become less of an issue.

Turbidity:

Turbidity throughout the watershed is usually under the maximum levels set by the Euclid Creek TMDL report. Like conductivity, however, turbidity fluctuates quite a bit. The fluctuations in turbidity are due to storm events as opposed to road salting.

Below are two graphs that demonstrate how turbidity fluctuates with storm events. On the right is a USGS hydrograph showing the discharge of a nearby site on the Chagrin River during a February 2009 storm. The graph on the left shows the turbidity levels on Euclid Creek at the Highland Picnic Shelter site. The outlying point on the graph to the left represents the turbidity of the stream on February 12, 2009—the date that corresponds with the same winter storm.