DAY IN THE LIFE OF THE NIAGARA RIVER LAKE ERIE WATERSHED

STUDY • ANALYZE • SHARE • ACT

2021 Annual Report

October 7, 2021

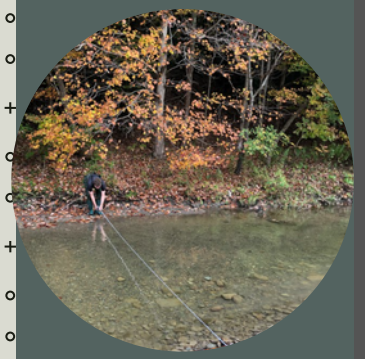
Thank you.

The ninth annual "Day in the Life" event was one step closer to normal this year. While many schools were unable to travel to sampling sites due to COVID restrictions and uncertainty, more than 275 students and teachers from eight schools collected water quality data within the Niagara River/Lake Erie (NRLE) Watershed.

We also had a dedicated team of community partners from Buffalo Niagara Waterkeeper and the NYSDEC Great Lakes Program as well as Reinstein Woods staff and volunteers assisting at the sites.

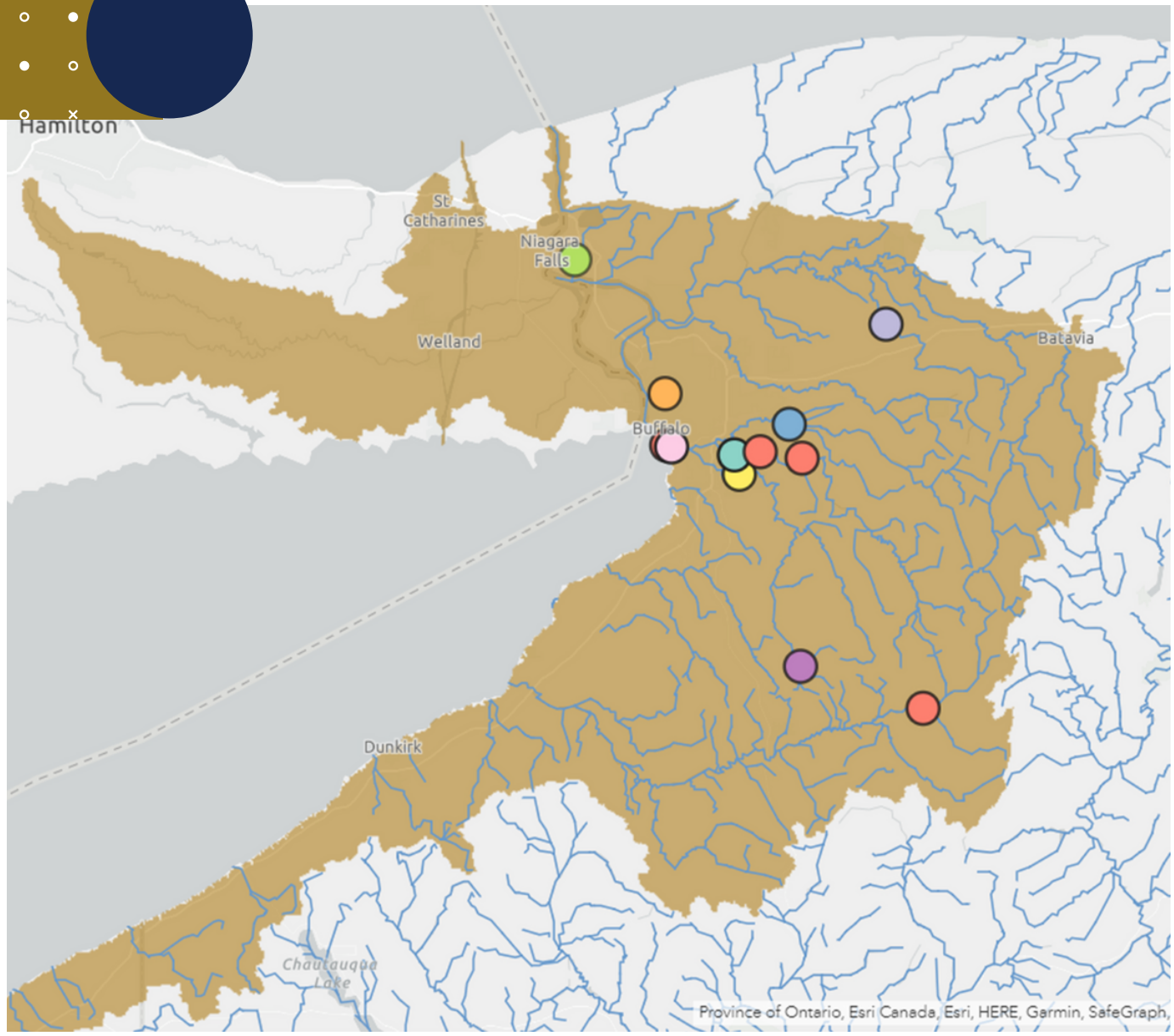
It was a beautiful day to be at the water, with the sun shining and air temperatures reaching 80 degrees. Water levels were close to normal, creating a safe environment to enter the water to collect data...except for Gaskill Preparatory School! Check out their story on page 10.

The "Day in the Life" event provides a snapshot of our watershed at a particular point in time. This report shows the compiled results from the event and highlights notable trends and observations. This data was also uploaded to the Global Learning and Observations to Benefit the Environment (GLOBE) database, joining countless other observations by community scientists from around the world.

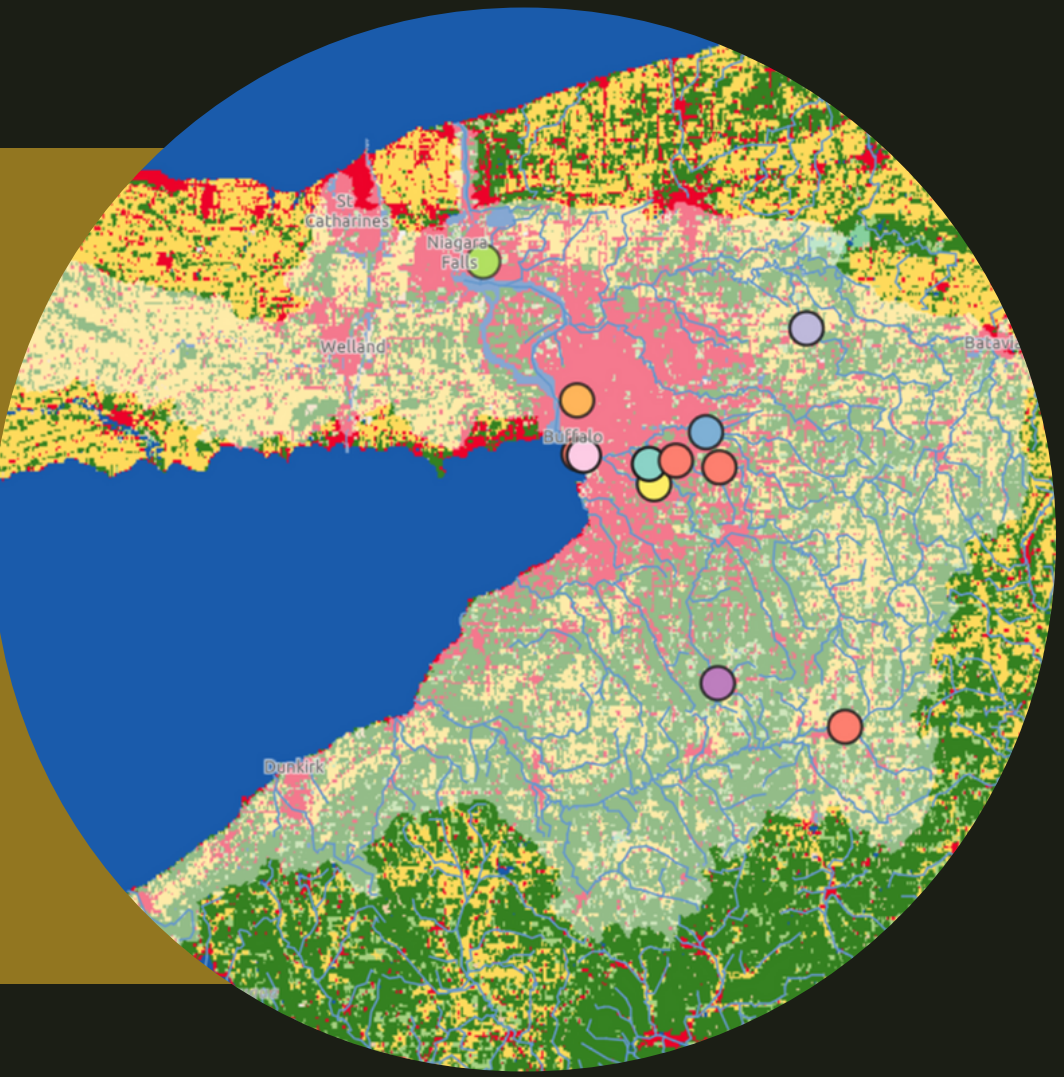


Sampling Sites & Schools

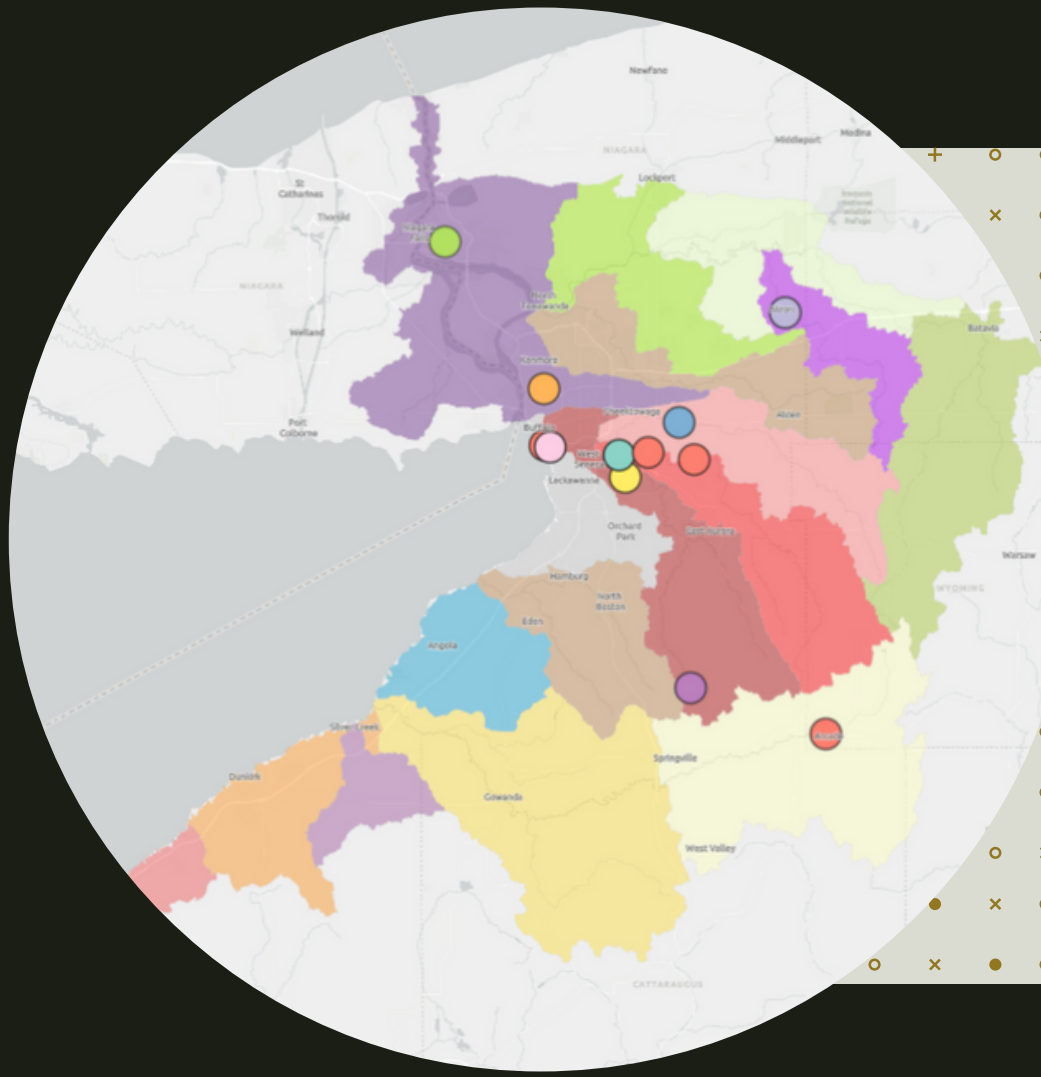
- Reinstein Woods Staff
- Depew High School
- Gaskill Preparatory School
- Holland High School
- Nichols School
- Randolph Academy Hamburg Campus
- Riverside Academy
- Stella Niagara Education Park
- West Seneca Christian School



Landcover



Sub-Watersheds



- Water
- Trees
- Grass
- Flooded Vegetation
- Crops
- Scrub/Shrub
- Built Area

- Reinstein Woods Staff
- Depew High School
- Gaskill Preparatory School
- Holland High School
- Nichols School

- Randolph Academy Hamburg Campus
- Riverside Academy
- Stella Niagara Education Park
- West Seneca Christian School

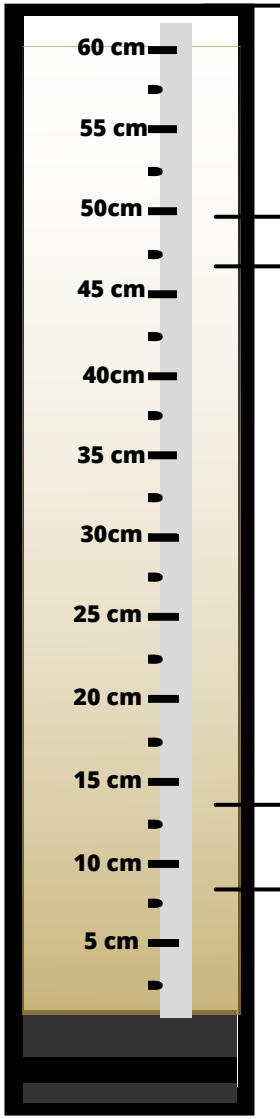
Watershed Boundaries

10-digit HU (Watershed)

- Niagara River
- Lower Tonawanda Creek
- Middle Tonawanda Creel
- Upper Tonawanda Creek
- Murder Creek
- Buffalo River
- Buffalo Creek
- Cayuga Creek
- Ellicott Creek
- Big Sister Creek-Frontal Lake
- Eighteenmile Creek
- Cattaraugus Creek
- Headwaters Cattaraugus Creek
- Smoke Creek-Frontal Lake Erie
- Walnut Creek
- Canadaway Creek-Frontal Lake Erie
- Chautauqua Creek-Frontal Lake Erie
- Sixmile Creek-Frontal Lake Erie

WATER TRANSPARENCY

Water transparency– or turbidity- is the cloudiness of the water due to suspended particles. Turbidity in centimeters (cm) is the total distance through which light can penetrate water. For example, if the water turbidity is 24 cm, an object would not be visible in depths greater than 24 cm. Turbidity affects plant photosynthesis and animal navigation. It can also be an indicator of other water quality problems such as sediment pollution and algal blooms.



< 7 NTU

- **Scajaquada Creek, Delaware Park**
- **Cazenovia Creek, Mill Road Park**
- **Buffalo Creek, Burchfield Nature & Art Center**
- **Buffalo Creek, Borden Raod**
- **Buffalo Creek, Elma Village Green**
- **Cazenovia Creek Tributary, Sprague Book Park**

12 NTU

- **Murder Creek, Akron Falls Park**

13 NTU

- **Cayuga Creek, Como Lake Park**

Healthy turbidity values: HIGH centimeters LOW NTU

90 NTU

- **Buffalo River, Ohio Street Fishing Access**

185 NTU

- **Buffalo River, Mutual Riverfront Park**

NTUs

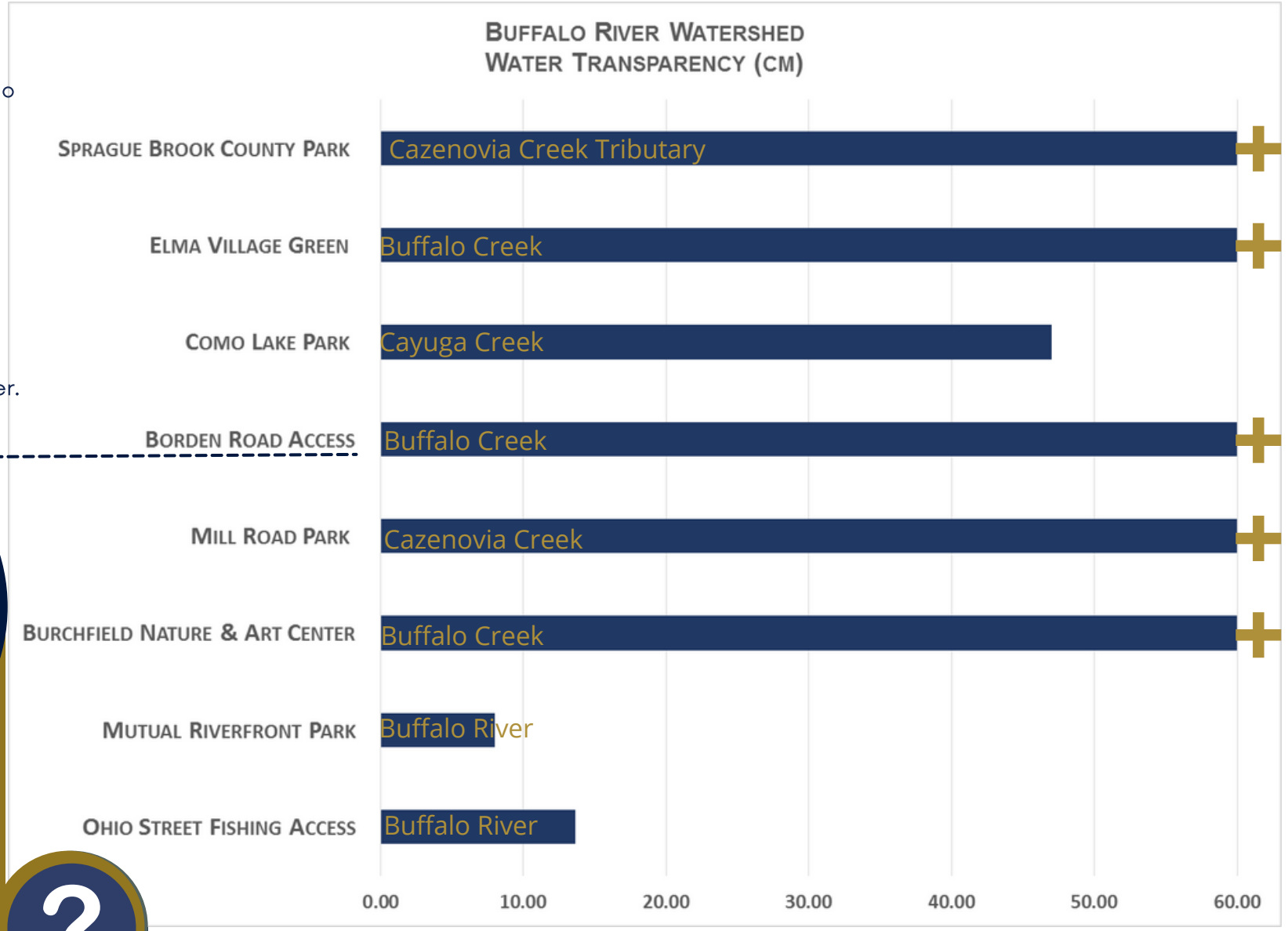
Nephelometric Turbidity Unit, or NTU, is a unit of measurement of the scattered light from the water samples at a 90-degree angle. These numbers were calculated using a mathematical conversion formula.

Key measurements to consider for water clarity:
>10 NTU = Fish and other aquatic wildlife begin to demonstrate signs of stress.
> 5 NTU = Not recommended for recreational use.

NOTE: Our measurement tubes only measure up to 60 cm, therefore we were unable to determine levels below 7 NTU.

Watershed Spotlight: Buffalo River

The Buffalo River has three major tributaries: Cazenovia Creek, Buffalo Creek, and Cayuga Creek. This graph shows water transparency measurements from the sampling sites further upstream along the tributaries to the Ohio Street Fishing Access sampling site near the mouth of the Buffalo River.

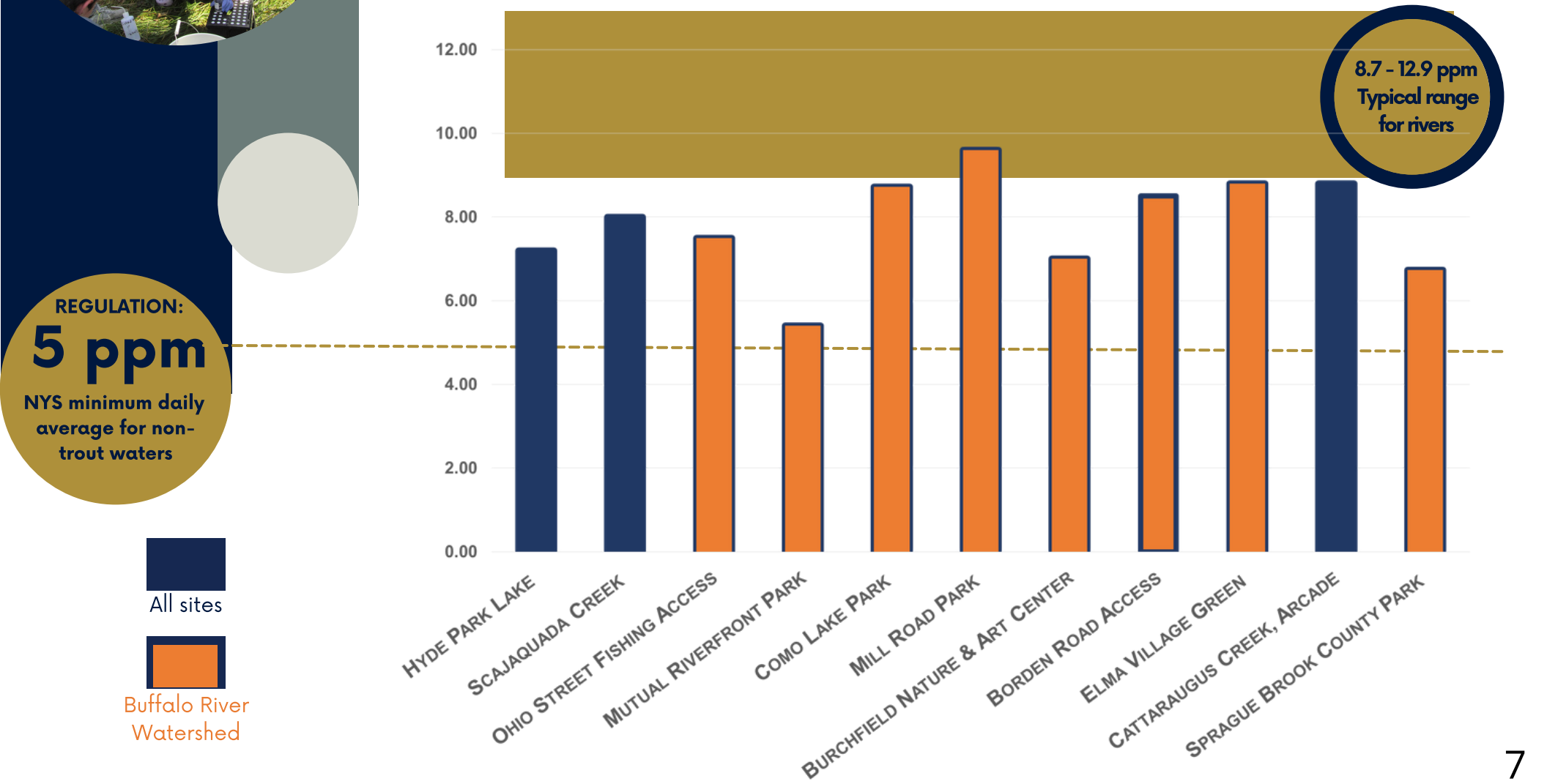


What do you notice when you compare water transparency upstream in the tributaries to water transparency downstream in the Buffalo River?

Dissolved Oxygen (ppm)

Dissolved oxygen (DO) is the amount of oxygen present in water. Dissolved oxygen is needed by fish and other aquatic organisms and each of these organisms requires a certain amount of DO. Dissolved oxygen levels rise when plants release oxygen during photosynthesis or when the wind stirs up the water. Daytime rates of DO can increase due to plant photosynthesis so it is important to record the time of day when measuring DO.

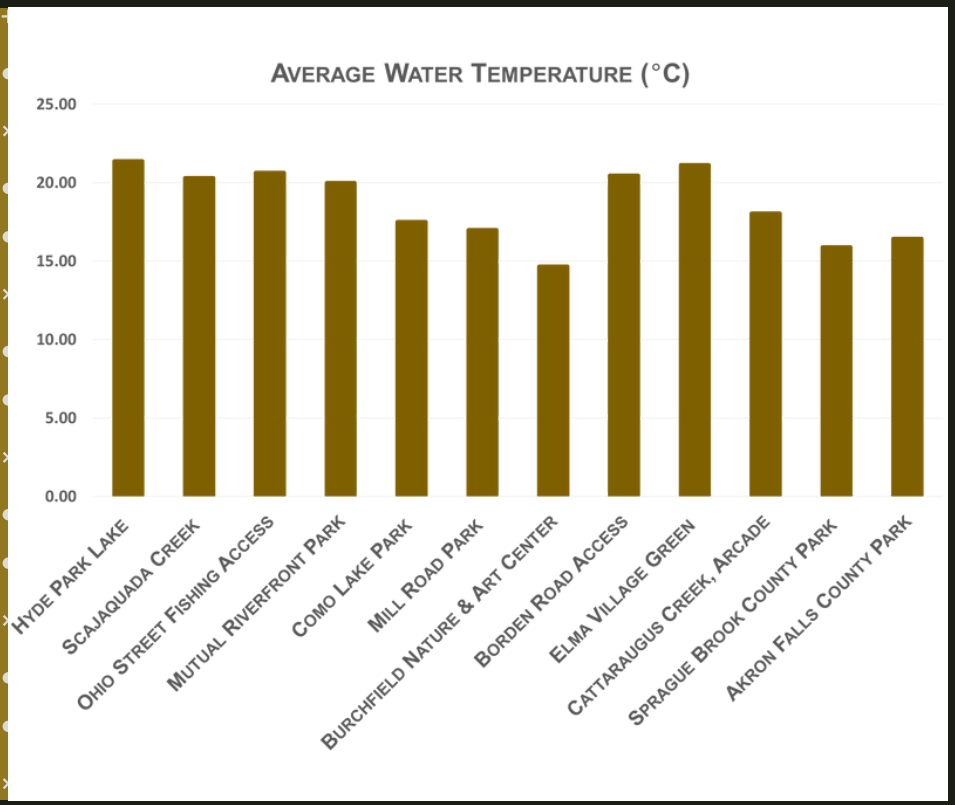
Cold water can hold more dissolved oxygen than warm water, and thermal pollution or a lack of shade can decrease DO. Some types of chemical pollutants also decrease oxygen in the water. Sewage wastewater from combined sewer overflows or leaking septic tanks, as well as farm and feedlot runoff and runoff from city streets, contain organic material. These materials use up oxygen in the water as they decompose. Algae populations grow with an increase in nutrients and similarly deplete oxygen levels when they decompose. Oxygen levels can drop to hypoxic levels— levels that would be considered unhealthy for aquatic organisms. Anoxic levels are levels where there is no oxygen available for aquatic organisms.

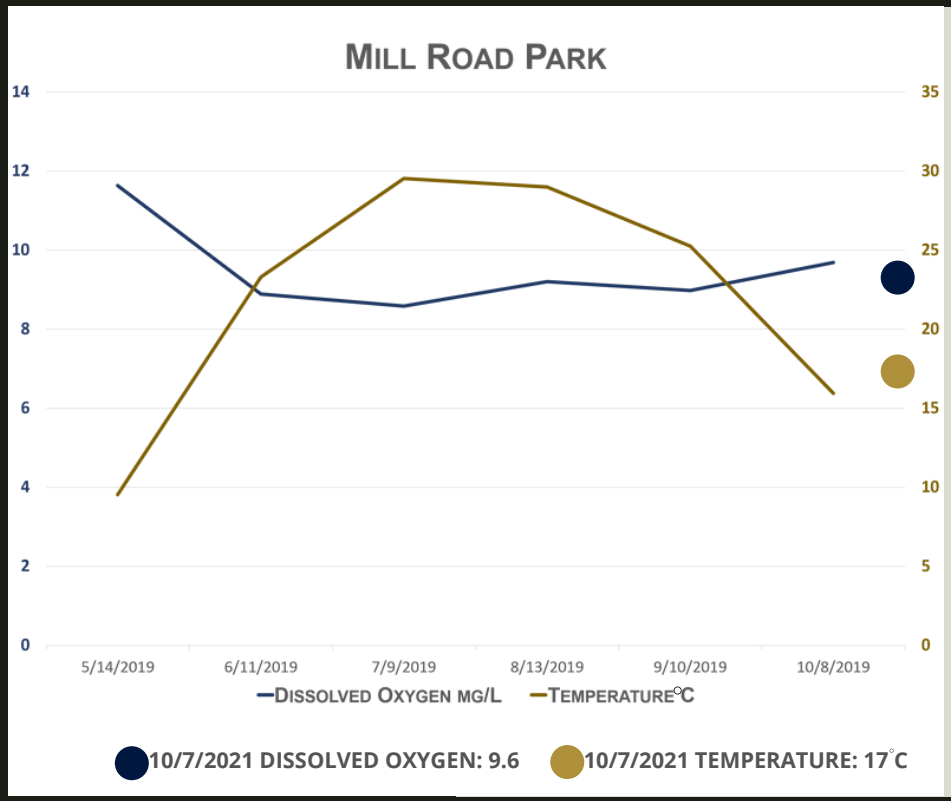


Temperature

The graph on the left shows the average water temperature at each site during the 2021 Day in the Life event. The graph on the right shows the dissolved oxygen levels and water temperature at Mill Road Park on six dates in 2019. This data was collected by Buffalo Niagara Waterkeeper. The circles show the data collected by Randolph Academy Hamburg Campus during the 2021 Day in the Life event.

How do dissolved oxygen and temperature change throughout the year? What is the correlation between dissolved oxygen and temperature?





Partner Spotlight:

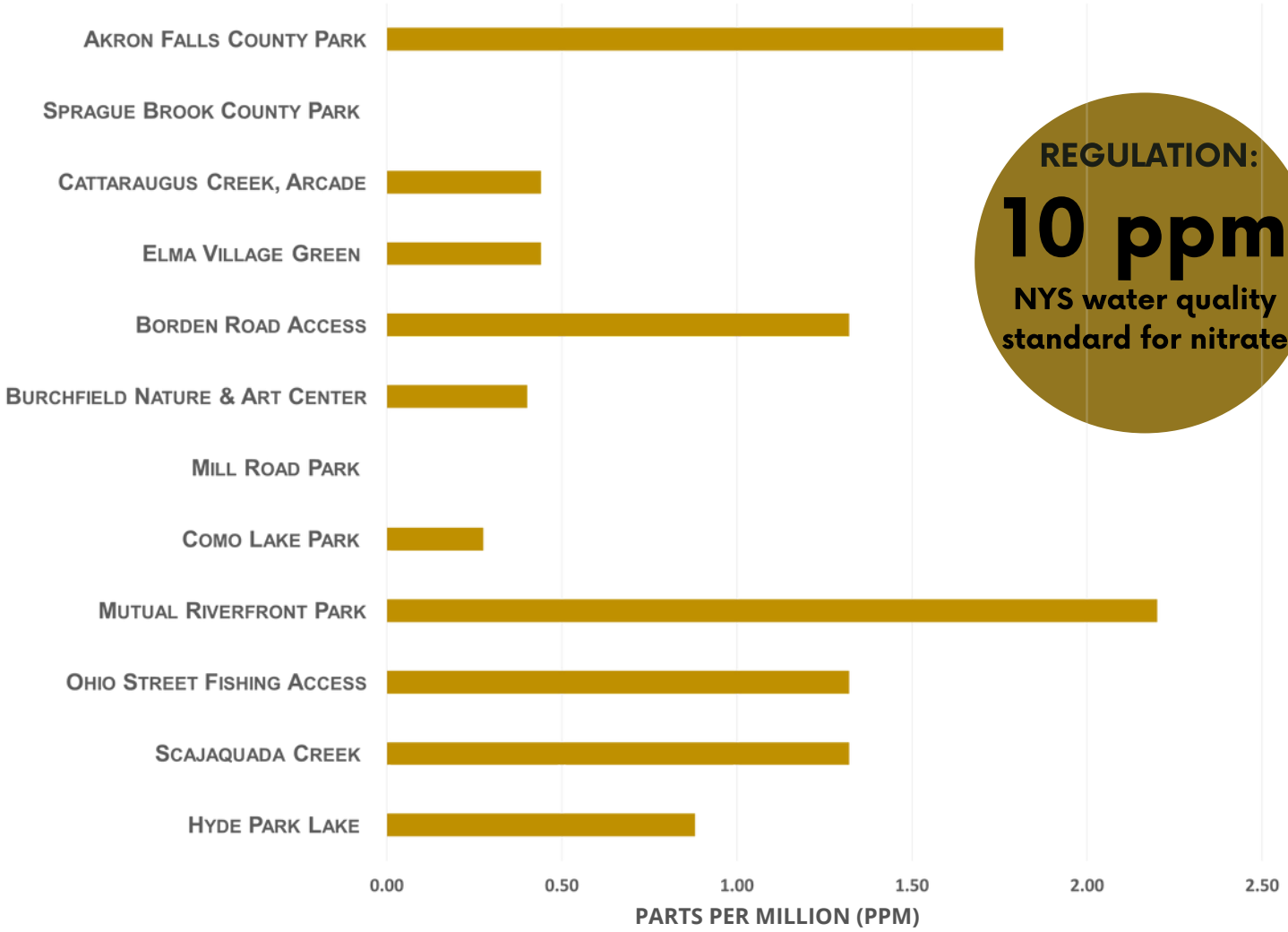
BUFFALO NIAGARA WATERKEEPER® Buffalo Niagara Waterkeeper is a partner organization for the "Day in the Life" event. Staff members assist at a field study site while sharing knowledge and expertise. Waterkeeper plays many important roles in the NRLE Watershed. Staff and volunteers work to protect watershed headwaters, revitalize waterways while opening up public access, restore vital shoreline habitats, and engage the community in taking care of waterways. Find out more at https://bnwaterkeeper.org/.

Nitrate (ppm)

Originating from nitrogen, nitrate is found naturally in our waterways and is an important component in plant growth. Nitrate can reach harmful levels. High levels of nitrate could potentially indicate pollution from:

- Wastewater discharge– human waste contains high nitrogen levels.
- Lawn runoff— plant fertilizers commonly contain nitrogen.
- Fertilizers or animal manure from agricultural runoff.

GASKILL PREP SCHOOL



REGULATION:

10 ppm

NYS water quality standard for nitrate

How would an increase in nitrates affect algae populations in Lake Erie?

HAB

Harmful Algal Bloom in Hyde Park Lake

When Buffalo Niagara Waterkeeper staff member Claudia Rosen arrived at Hyde Park on October 7, she immediately spotted the pea-green mats floating in Hyde Park Lake.

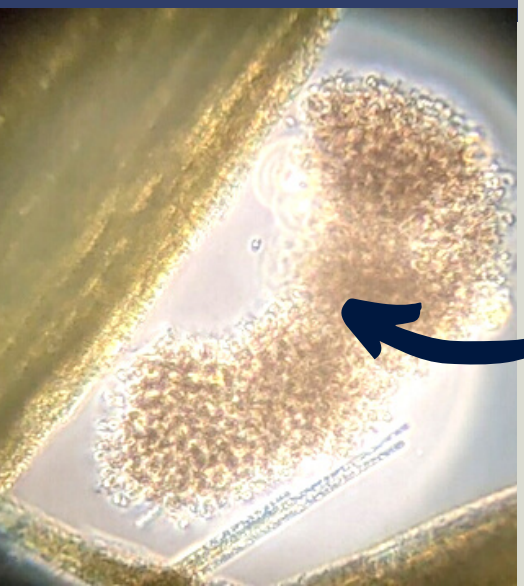
Claudia knew she could be looking at something more than unsightly scum. The green mass was characteristic of an algal bloom. Algae, like plants, perform photosynthesis and are an important part of the food web; however, some algae produce toxins that can be harmful to people and animals. Growths of algae that can produce toxins are referred to as **harmful algal blooms, or HABs.**

Thanks to a quick response from Niagara University professors Coleen Edwards and Dr. Bill Edwards, a water sample was collected and analyzed in a lab. The pair isolated and identified the following algal species in the water sample:

Aphanizomenon flos aquae
Algae type: Cyanobacteria
Notes: Common, often forms algal blooms. Many strains produce the toxins saxitoxin and cylindrospermopsin. (USGS)

Anabaena spirodes
Algae type: Cyanobacteria
Notes: Eaten by zooplankton, produces poisons that can cause illness & death in wildlife. (NYSDEC)

Microsystis
Algae type: Cyanobacteria
Notes: Produces the toxins microcystins and can form dense surface scums. (Ohio Sea Grant)



Due to the toxins produced by these species, students from Gaskill Preparatory School were asked to take additional precaution when working near and with the water. Students wore gloves when handling the equipment and did not perform some tests that would require them to have direct exposure to the water.

This is not a new situation for Hyde Park Lake. HABs were reported in the lake in 2016, 2018, 2019, and 2020. Many of the sightings were reported by Buffalo Niagara Waterkeeper staff, but the public can also report a suspicious algal bloom to the NYSDEC by submitting a Suspicious Algal Bloom Report Form online.

People can be harmed if they ingest or touch algae in a HAB. While Hyde Park lake may not be a popular swimming destination, the algal blooms could still be dangerous to pets and local wildlife.

Aphanizomenon flos aquae

What causes a HAB?
HABs are likely triggered by a combination of water and environmental conditions that may include: excess nutrients (phosphorus and nitrogen), lots of sunlight, low-water or low-flow conditions, calm water, and warm temperatures.

What do I do if I see an algal bloom?
AVOID IT! It can be hard to tell a harmful algal bloom from a non-harmful algal bloom, so it is best to avoid swimming, boating, fishing, or other recreation in discolored water that looks like it might have a bloom. Avoid eating fish caught from areas with a bloom.

IF CONTACT OCCURS:

- Rinse thoroughly with clean water.
- Stop using the water.
- Seek medical attention if vomiting, nausea, diarrhea, skin, eye or throat irritation, allergic reactions, or breathing difficulties occur.
- Report symptoms to the local health department or the NYS Department of Health.
- Take care to remove algae from pet fur.

Shared from NYSDEC HAB brochure

pH

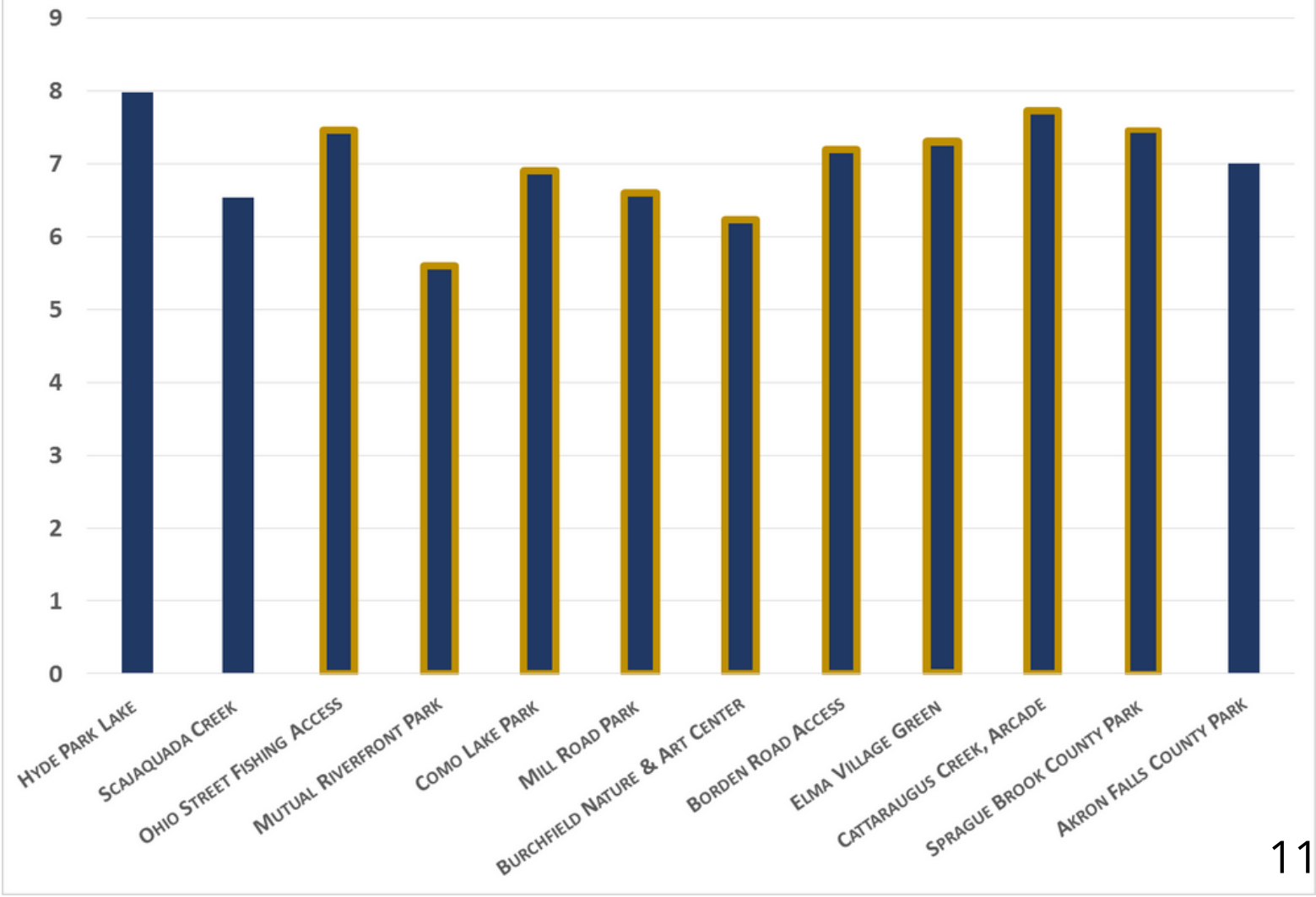
pH is a measure of how acidic/basic water is. The pH scale ranges from 0-14, with 7 being neutral. Values less than 7 are acidic and values more than 7 are basic.

Detergents and soap-based products released during sewage overflow events can increase pH levels. A pH exceeding 9 will start to affect growth rates of aquatic organisms.

A pH of 6.5 to 8.2 indicates suitable conditions for most fish.

Acidic waters can react with contaminated sediment, releasing heavy metals and other pollutants in the sediment into water.

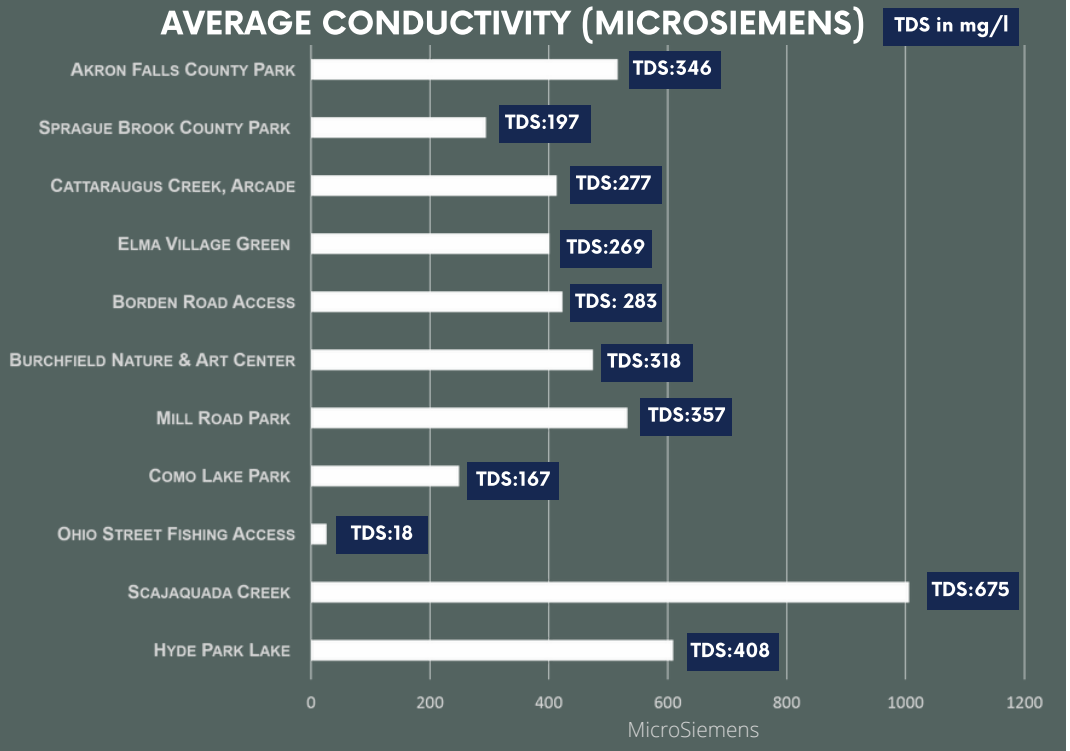
BUFFALO RIVER WATERSHED



Conductivity & Chloride

As the GLOBE program explains, "We call the amount of mineral and salt impurities in the water the total dissolved solids (abbreviated TDS). One way to measure impurities in water is to find out if it conducts electricity. Pure water is a poor conductor of electricity. When certain solids (typically salts) are dissolved in water, they dissociate and form ions. Ions carry an electrical charge (either positive or negative). More ions in water mean the water will conduct electricity better. The electrical conductivity meter measures how much electricity is being conducted through a centimeter of water.

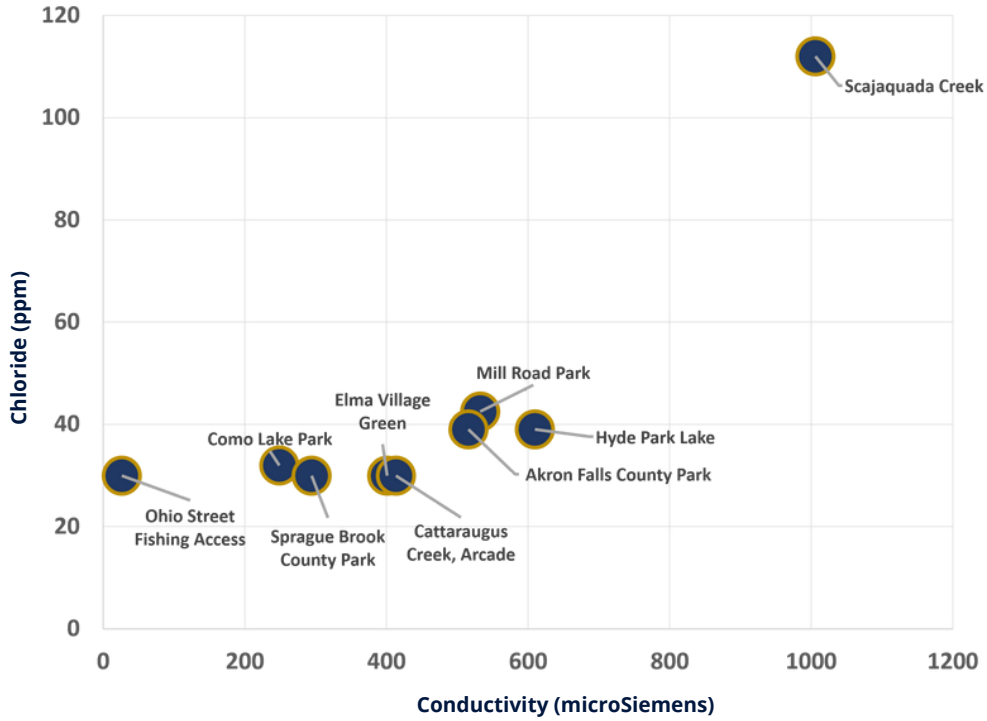
Scientists use conductivity data as a measure of water quality. High values can mean water that tastes bad or is too salty for watering crops. Most municipal water quality reports use conductivity or TDS measurements to show that their drinking water is within the locally established limits. Scientists also look for trends in the conductivity data. Seasonal trends are often observed for water bodies that receive a portion of their water directly from snowmelt in the spring, water bodies that are affected by land cover, or water bodies that are located in areas with definite rainy seasons. Scientists can use the seasonal data they obtain to forecast water quality issues for years to come. " - *The GLOBE Program, Electrical Conductivitiy Protocol*



REGULATION:
NYS standard for TDS in freshwater:

500 mg/L

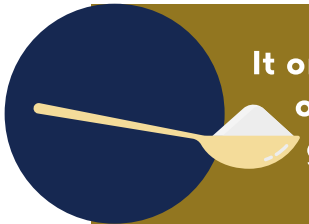
The graph below shows the relationship between average conductivity and chloride measurements at nine sites during the "Day in the Life" event. Chloride can enter the water through the weathering of bedrock, agricultural runoff containing fertilizer, industrial waste, wastewater treatment plans, and road salting. Sustained chloride levels above 230 ppm can be toxic to aquatic wildlife.



Do you see a relationship between chloride and conductivity levels?

What could be the source of high chloride levels at Scajaquada Creek in Buffalo?

How may this graph change in the winter?



It only takes 1 teaspoon of salt to pollute 5 gallons of water.

Macroinvertebrates

Small organisms in the water called macroinvertebrates can give us clues about water quality. Macroinvertebrate species have specific tolerances to pollution called a Pollution Tolerance Value (PTV). The presence of species that do not tolerate high levels of pollution may indicate good water quality; however, finding species that can tolerate high levels of pollution does not necessarily indicate poor water quality. If a system lacks the species that require clean water and is dominated by species that can tolerate high levels of pollution, it may indicate poor water quality.

GIANT WATER BUG
BUFFALO CREEK, ELMA

COMMON BURROWING MAYFLY
BUFFALO CREEK, WEST SENECA

BRUSH-LEGGED MAYFLY
BUFFALO CREEK, ELMA

tolerant of pollution » **somewhat tolerant of pollution** » » » **intolerant of pollution**

DAMSELFLY
CAYUGA CREEK,
LANCASTER

FINGER-NET CADDISFLY
BUFFALO CREEK, ELMA

WATER BEETLE LAVA
BUFFALO CREEK, ELMA

CASE BUILDING CADDISFLY
CATTARAUGUS CREEK,
ARCADE

DOBSONFLY
SPRAGUE BROOK,
GLENWOOD

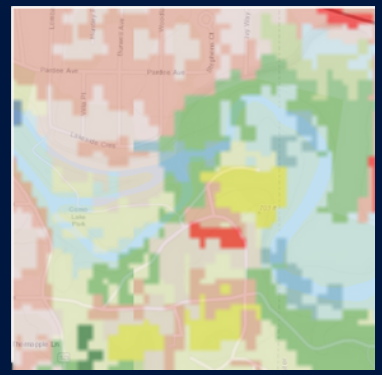
Comparing Sites

The following page shows the landcover surrounding the sampling sites and the Hilsenhoff Biotic Index (HBI) calculated using the macroinvertebrate data from each site.

Site Name → COMO PARK

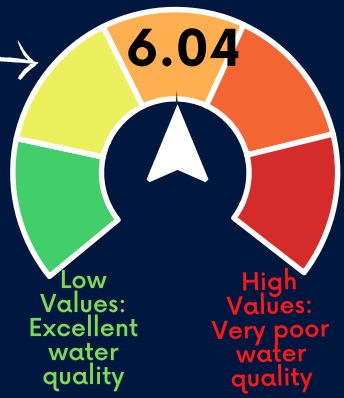
Land Cover →

One square kiliometer surrounding the sampling site.



Hilsenhoff Biotic Index →

Measures the tolerance of the organisms collected to organic pollution (sewage and animal wastes) and low dissolved oxygen levels. Tolerance values range from intolerant (0) to tolerant (10).

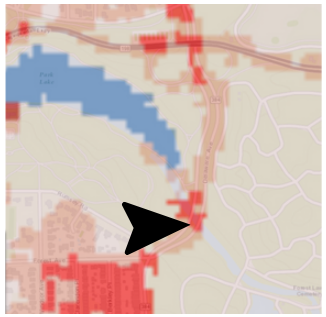


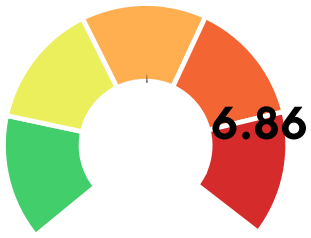
? How could land cover affect macroinvertebrate diversity?

NLCD Land Cover Classification Legend

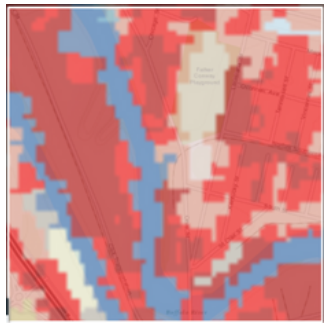
- 11 Open Water
- 12 Perennial Ice/ Snow
- 21 Developed, Open Space
- 22 Developed, Low Intensity
- 23 Developed, Medium Intensity
- 24 Developed, High Intensity
- 31 Barren Land (Rock/Sand/Clay)
- 41 Deciduous Forest
- 42 Evergreen Forest
- 43 Mixed Forest
- 51 Dwarf Scrub*
- 52 Shrub/Scrub
- 71 Grassland/Herbaceous
- 72 Sedge/Herbaceous*
- 74 Moss*
- 81 Pasture/Hay
- 82 Cultivated Crops
- 90 Woody Wetlands
- 95 Emergent Herbaceous Wetlands

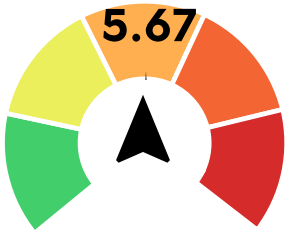
SCAJAQUADA



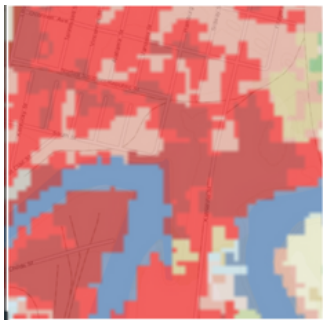


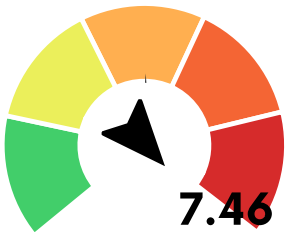
OHIO STREET



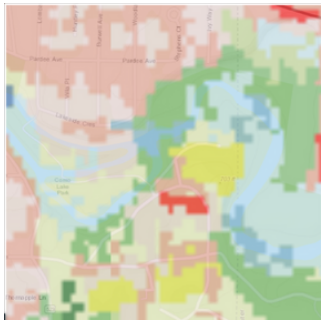


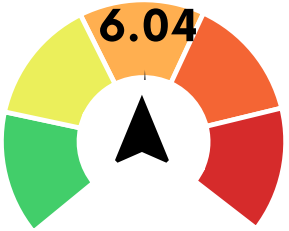
MUTUAL



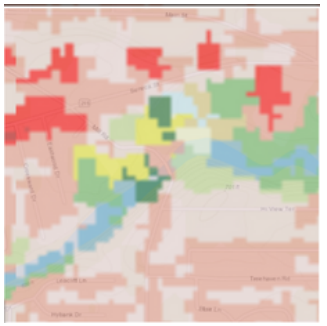


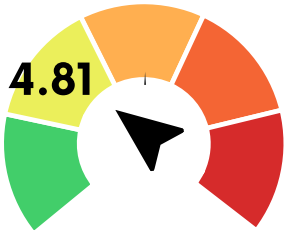
COMO PARK



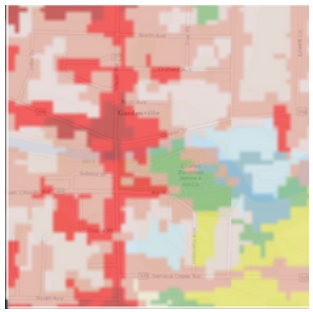


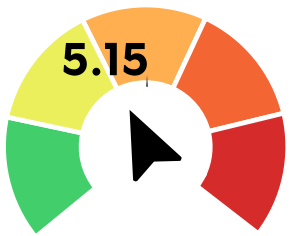
MILL ROAD



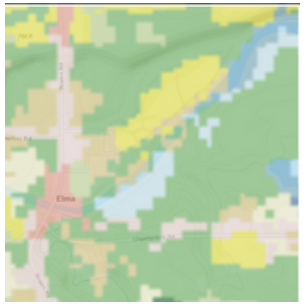


BURCHFIELD

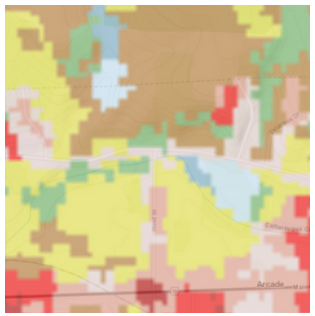


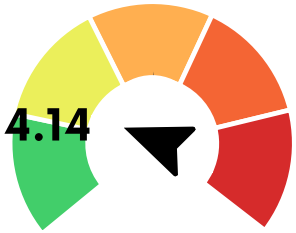


ELMA

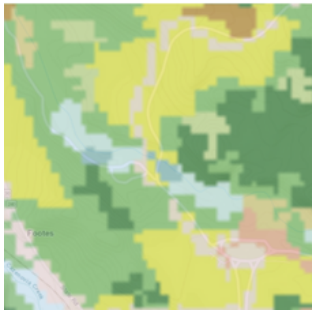


ARCADE

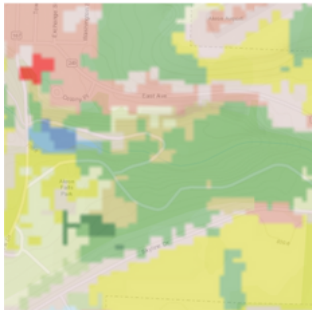


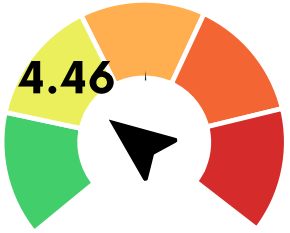


SPRAGUE BROOK



AKRON FALLS





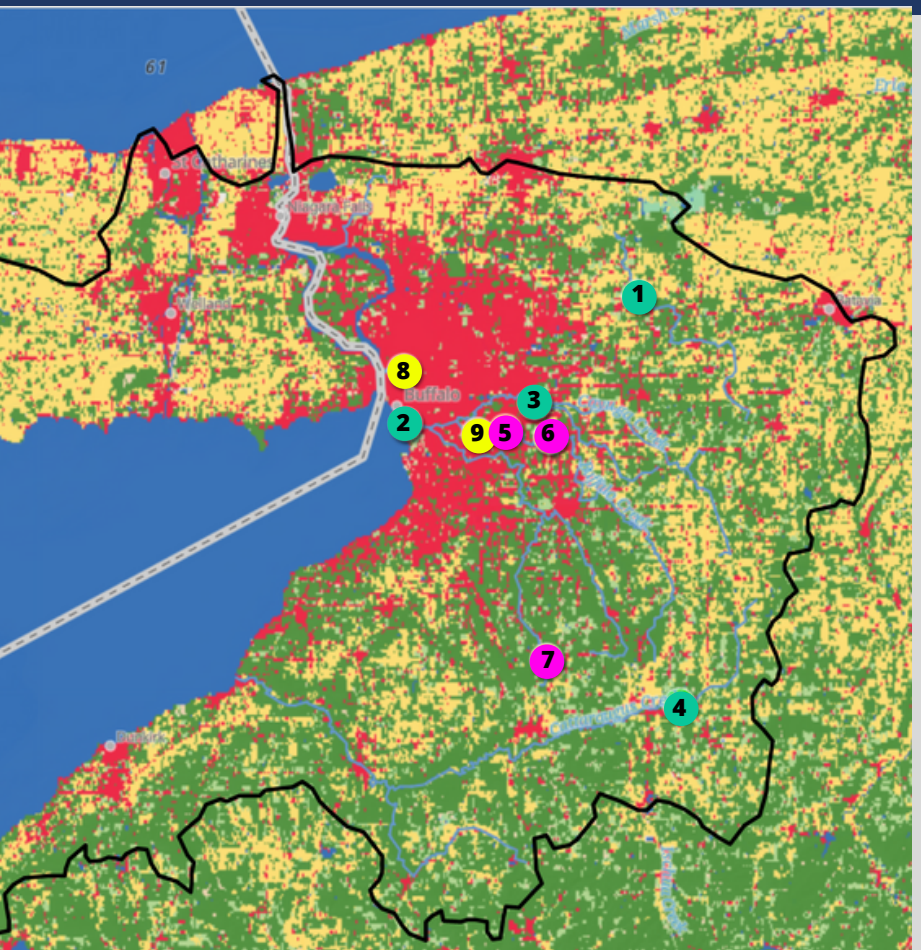
Coliform Bacteria

"The most basic test for bacterial contamination of a water supply is the test for total coliform bacteria. Total coliform counts give a general indication of the sanitary condition of a water supply. Total coliforms include bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste.

Fecal coliforms are the group of the total coliforms that are considered to be present specifically in the gut and feces of warm-blooded animals. Because the origins of fecal coliforms are more specific than the origins of the more general total coliform group of bacteria, fecal coliforms are considered a more accurate indication of animal or human waste than the total coliforms.

Escherichia coli (E. coli) is the major species in the fecal coliform group. Of the five general groups of bacteria that comprise the total coliforms, only E. coli is generally not found growing and reproducing in the environment. Consequently, E. coli is considered to be the species of coliform bacteria that is the best indicator of fecal pollution and the possible presence of pathogens." - New York State Department of Health

Sources of coliform bacteria in water include runoff from agricultural fields or feedlots, runoff containing pet or other animal waste, and human sewage from faulty or overwhelmed wastewater systems.



2021 "Day in the Life" Data: Coliform tests turned yellow in the presence of coliform bacteria. We placed yellow samples under UV light. If E. coli was present, it fluoresced.

***E. coli* present**
1. Akron Falls, Murder Creek
2. Ohio Street, Buffalo River
3. Como Lake Park, Cayuga Creek
4. Arcade, NY, Cattaraugus Creek,

Other coliform bacteria present
5. Borden Road, Buffalo Creek
6. Elma Village Green, Buffalo Creek
7. Sprague Brook County Park, Cazenovia Creek Tributary

Coliform bacteria present, not tested for *E.coli*
8. Delaware Park, Scajaquada Creek
9. Burchfield Nature and Art Center, Buffalo Creek

Land Cover

- Water
- Trees
- Grass
- Flooded Vegetation
- Crops
- Scrub/Shrub
- Built Area

?

Choose one of the sampling sites on the map.

What do you think is the biggest source of coliform bacteria at that site?

What evidence do you have to support your hypothesis?

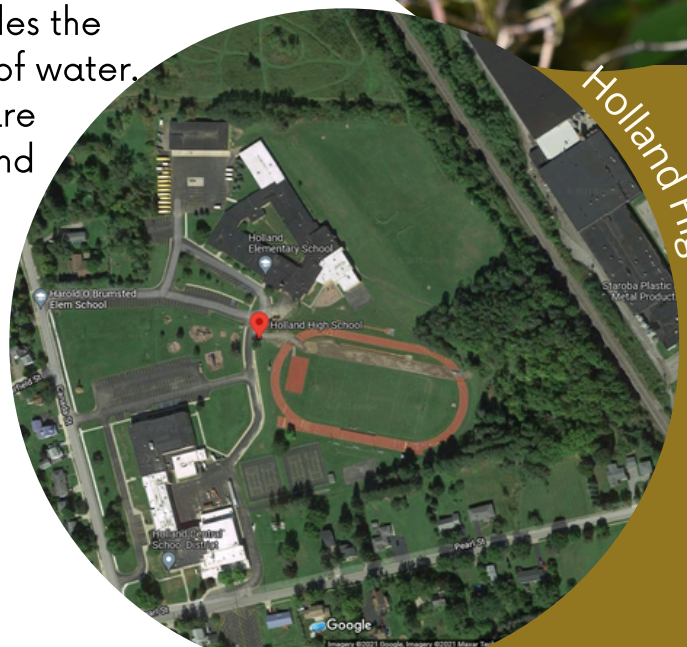
Next Steps: From Discovery to Action

Spotlight: Holland High School

Following their data collection event at Sprague Brook County Park, students from Holland High School took on a watershed stewardship project at their school. Using materials in Reinstein Woods' Invasives Species Stewardship Bin, students removed 3.5 large multiflora rose bushes from campus, a total of 27.5 pounds of the thorny plant! Multiflora rose was used in the 1930s for erosion control and shrub habitat restoration; however, it quickly outcompetes native shrubs and reduces biodiversity.

Multiflora rose

A watershed is more than rivers and streams. It includes the entire area of land that drains into a common body of water. In restoring the habitat at their school, the students are taking an active role in improving the biodiversity and ecosystem health of the entire Niagara River/ Lake Erie watershed.



Holland High School

Want to take action? Learn about other types of stewardship actions and the resources Reinstein Woods can offer at https://reinsteinwoods.org/explore/programs-services/dayinthelife/stewardship-actions/.