DAY IN THE LIFE OF THE NIAGARA RIVER/LAKE ERIE WATERSHED

STUDY • ANALYZE • SHARE • ACT

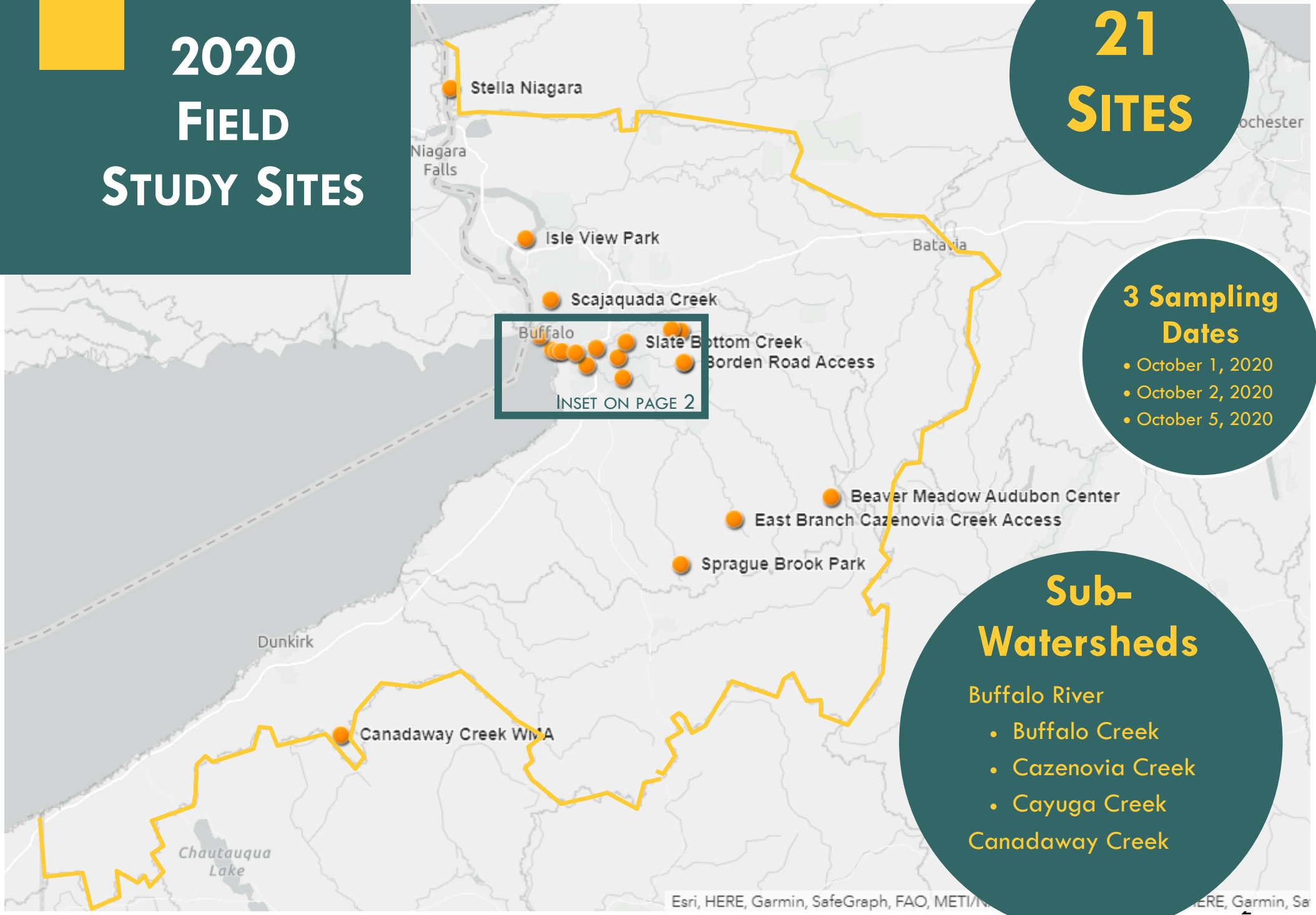
2020 Summary Report

NEW YORK STATE Department of Environmental Conservation

FRIENDS OF Reinstein WOODS

NOAA B-WET

2020 Field Study Sites



21 Sites

3 Sampling Dates

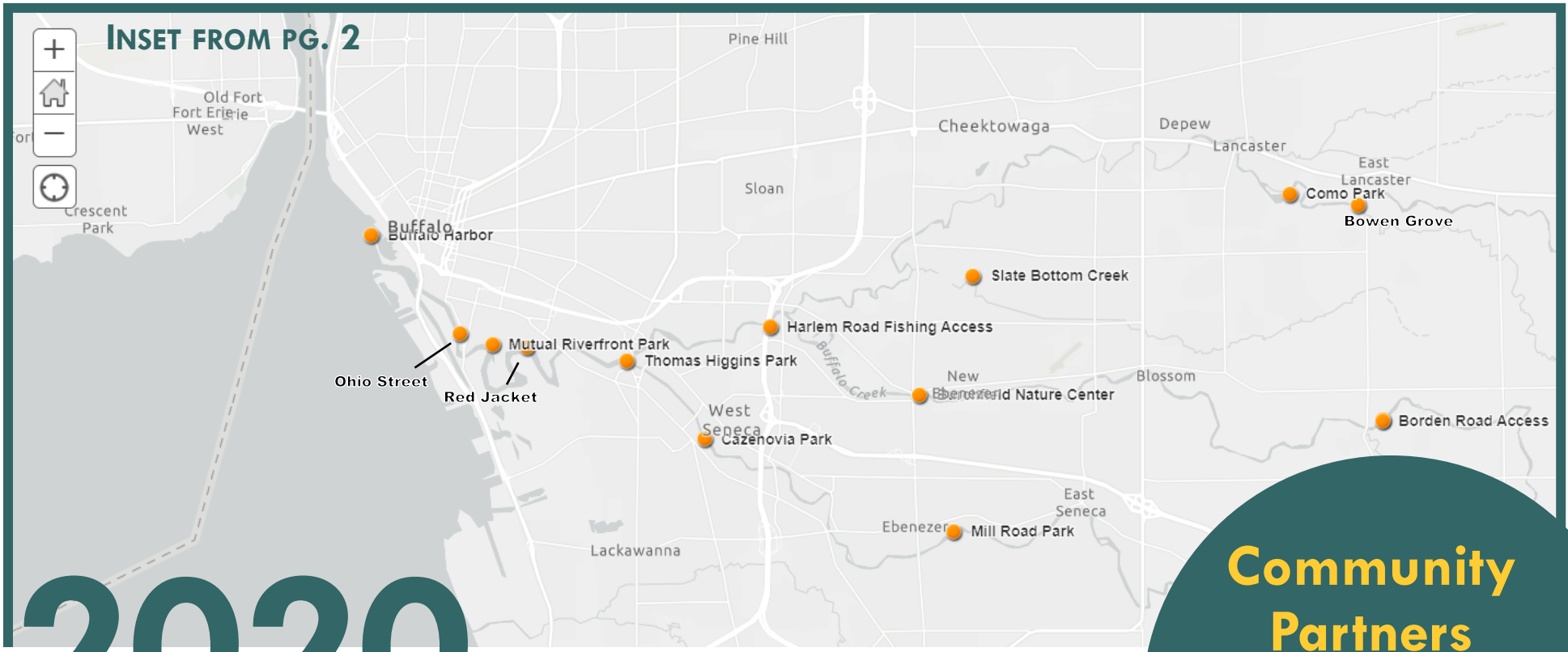
- October 1, 2020
- October 2, 2020
- October 5, 2020

Sub-Watersheds

Buffalo River

- Buffalo Creek
- Cazenovia Creek
- Cayuga Creek

Canadaway Creek



2020 SUMMARY REPORT

Despite limited school participation due to the COVID-19 pandemic, Reinstein Woods staff and volunteers, four local schools, and multiple community partners worked together to collect water quality data at 21 different field study sites in the Niagara River/Lake Erie Watershed. This report shows the compiled results from the "Day in the Life" 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 citizen scientists from around the world.

2020 marked the 8th year for the "Day in the Life" program which expanded from the Buffalo River Watershed to the entire Niagara River/Lake Erie Watershed in 2019 through a NOAA Great Lake Bay Watershed Education and Training (B-WET) grant. This grant was extended to support the 2020 program.

Community Partners

- Buffalo Audubon
- Buffalo Niagara Waterkeeper
- NYSDEC
- Friends of Reinstein Woods

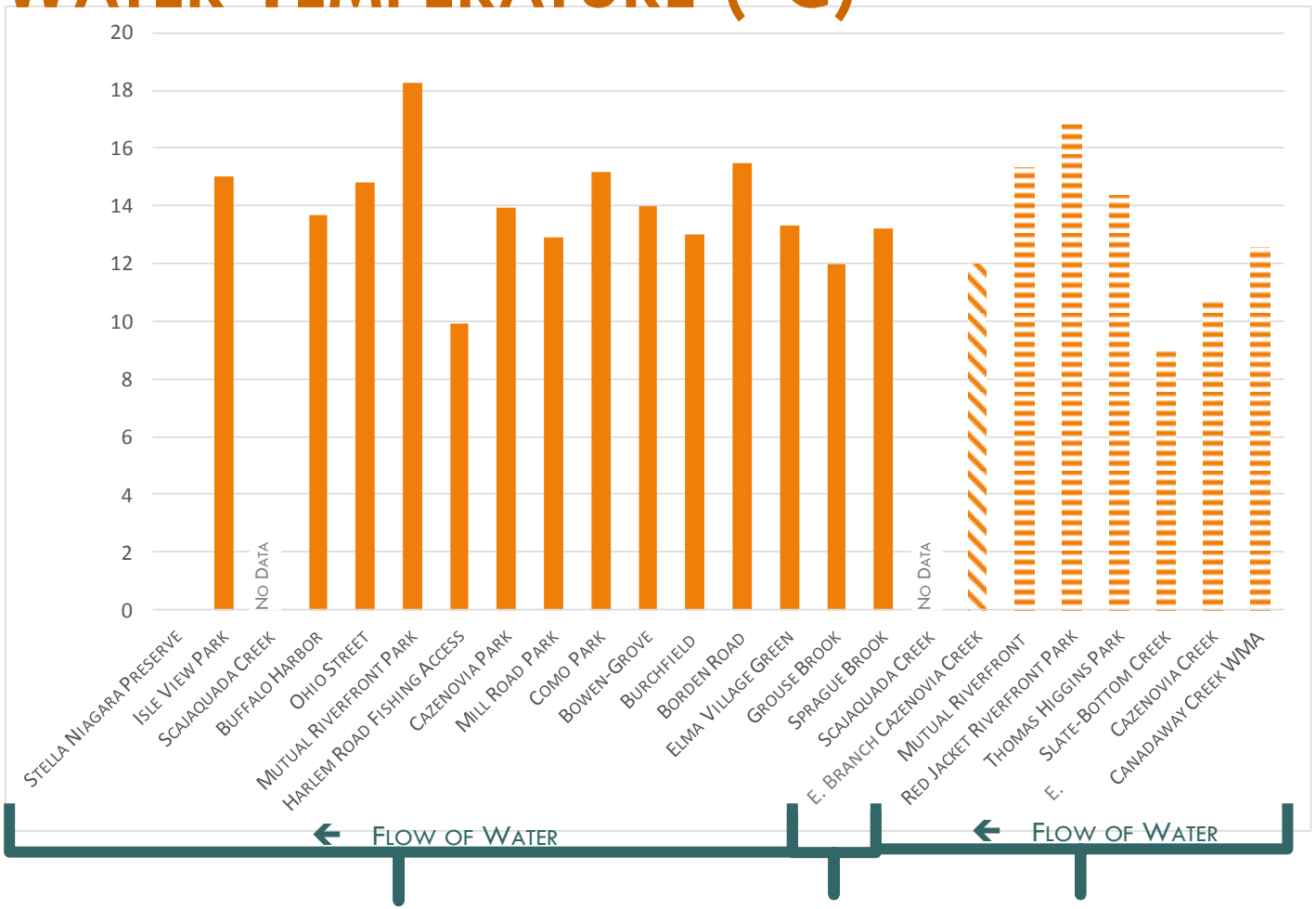
Participating Schools:

- Stella Niagara
- Nichols School
- West Seneca Christian School

Tips for Reading This Report:

Each graph in this report compiles data from multiple field study sites on three sampling dates. Each field study site location is labeled on the horizontal axis. Participants collected data at sites from the Stella-Niagara Preserve to Sprague Brook County Park on October 1, 2020. Students sampled at Scajaquada Creek and the East Branch of Cazenovia Creek on October 2. Participants collected data from Mutual Riverfront Park to Canadaway Creek on October 5, 2020. You can observe trends and changes in data as you follow the flow of water from upstream to downstream on each date.

Water Temperature (°C)



October 2 & 5 dates may be shown with alternate color or pattern

This symbol indicates a question for group discussion. You can also find a space to record your answers on the fillable PDF.

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.

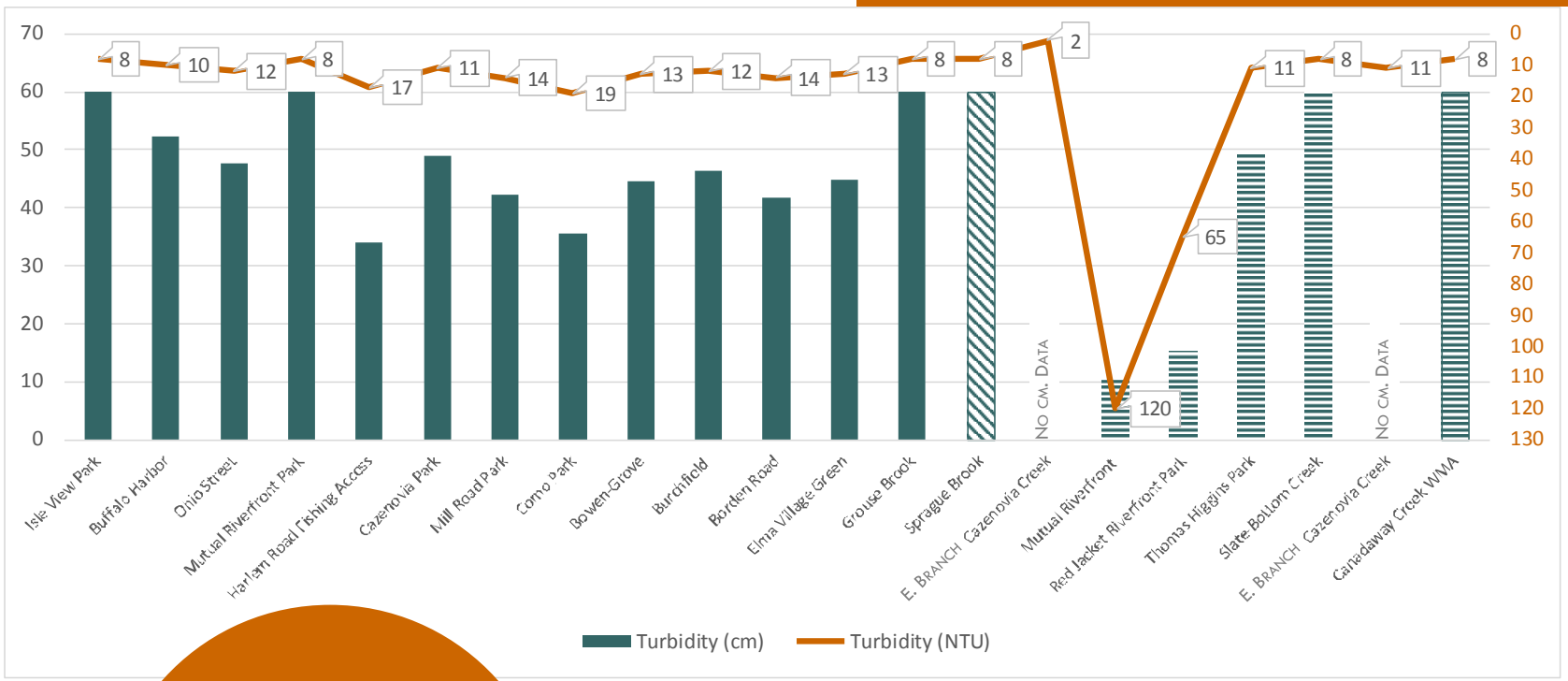
Nephelometric Turbidity Unit, or NTU, is a unit of measurement of the scattered light from the water samples at a 90 degree angle. These numbers were calculated using a mathematical conversion formula.

Key measurements to consider for water clarity:

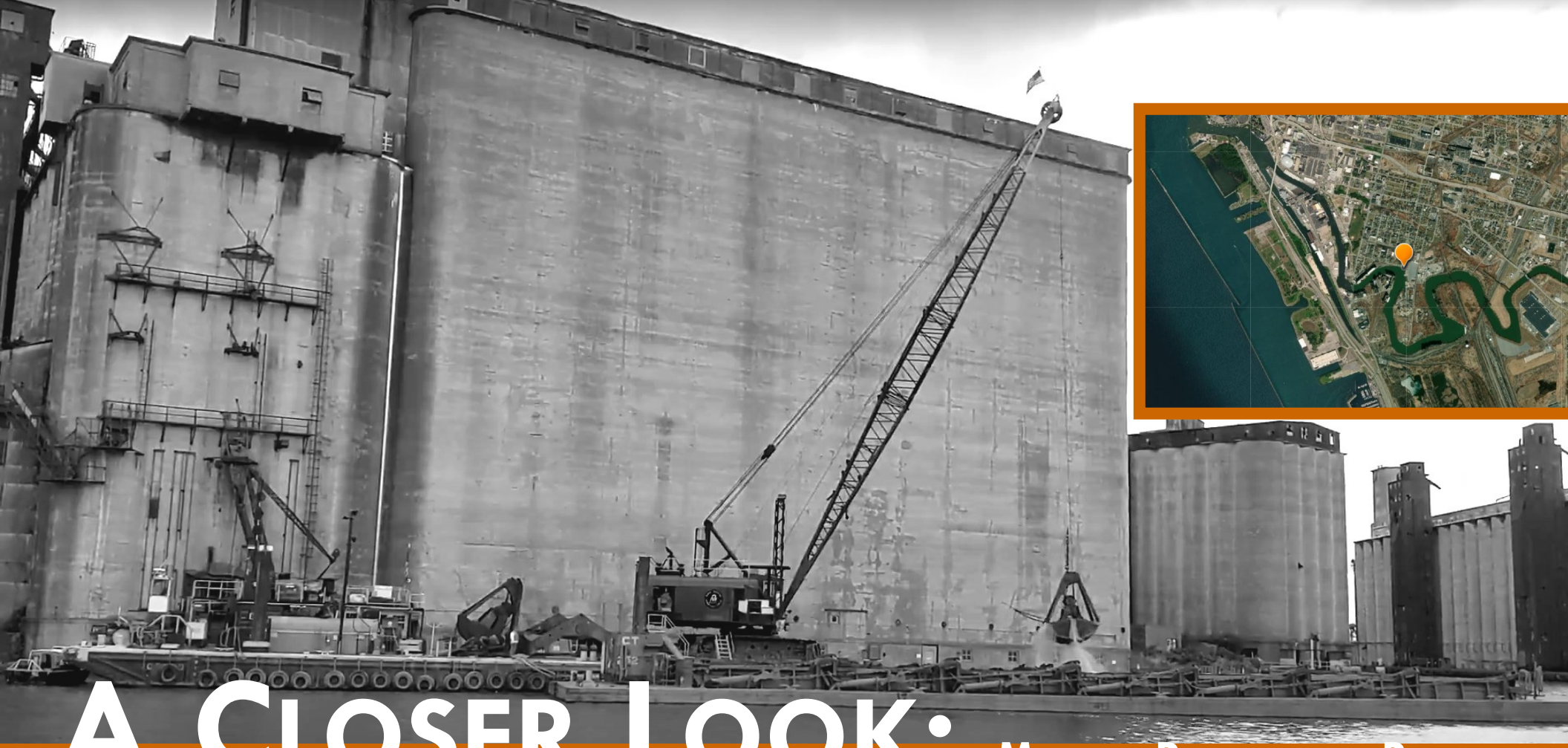
>10 NTU = Fish and other aquatic wildlife begin to demonstrate signs of stress.

> 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 8 NTU. Holland Central School used a electronic probe to record data at E.Branch Cazenovia Creek that was able to make more accurate measurements.



Healthy turbidity levels:
HIGH centimeter values
LOW NTU values



A Closer Look: Mutual Riverfront Park

On both October 1 and 6, we observed dredging– the removal of sediments from the bottom of lakes, rivers, harbors and other water bodies— near Mutual Riverfront Park. The NYSDEC reports that from 2011-2015, one million cubic yards of contaminated sediment, enough to fill a football field 40 stories high, were dredged from the river as part of the river restoration.[1] "The river's sediments contain elevated levels of metals, PCBs, PAHs, and numerous other chemicals. A river's history is reflected in its sediment. For the industries along the Buffalo River, the river was not only a transportation link between suppliers and markets, it was also a source of necessary fresh water as well as a receiver of industrial waste by-products. Portions of the Buffalo River sediment have been contaminated by these industrial discharges, as well as municipal and agricultural discharges, and waste disposal." [2]

According to the Army Corps of Engineers, "the harbor requires approximately 100,000 cubic yards (CY) of dredging every two years to maintain the navigation channel. Dredging was last completed in 2018, which removed 125,000 CY of material. The dredged material was beneficially used for ecosystem restoration at nearby Unity Island."[3]

Do you think dredging has an impact on turbidity? Why or why not? Do the transparency results from Mutual Riverfront Park support your claim?

[1]https://www.dec.ny.gov/chemical/54166.html [2]https://www.dec.ny.gov/chemical/66968.html [3]https://www.lrb.usace.army.mil/Media/News-Releases/

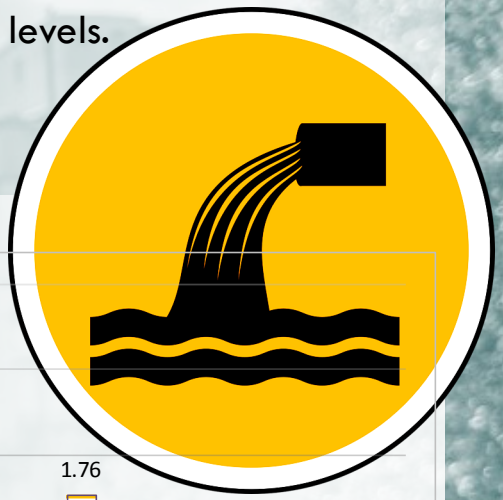
NITRATE (PPM)

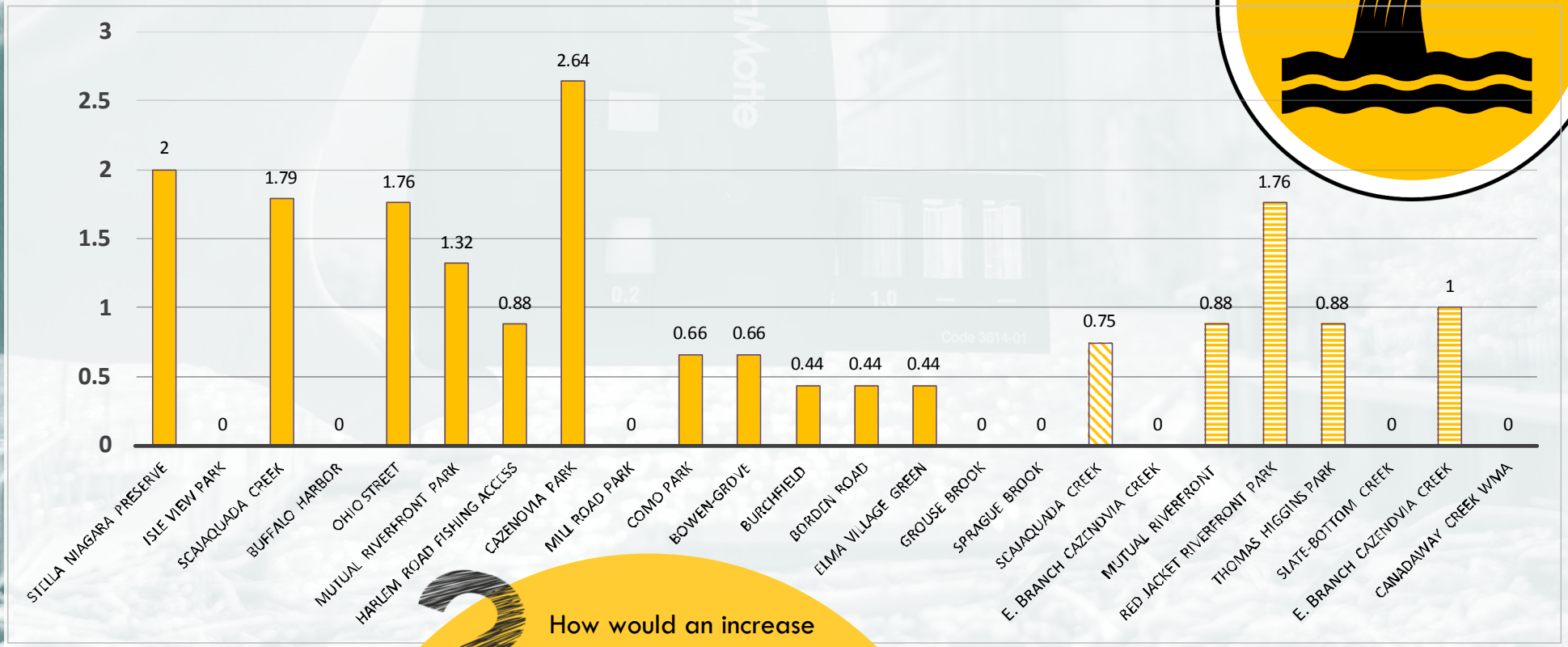
10 ppm

NYS water quality standard for nitrate

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.





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

A Closer Look: CSOs and Environmental Justice

Many older cities, including Buffalo and Niagara Falls, have Combined Sewer Overflow Systems (CSOs). In this system, storm water and wastewater flow into the same sewer system. A heavy rainfall or snowmelt event can easily overwhelm the treatment system and result in the dumping of untreated sewage and storm water directly into a local body of water.

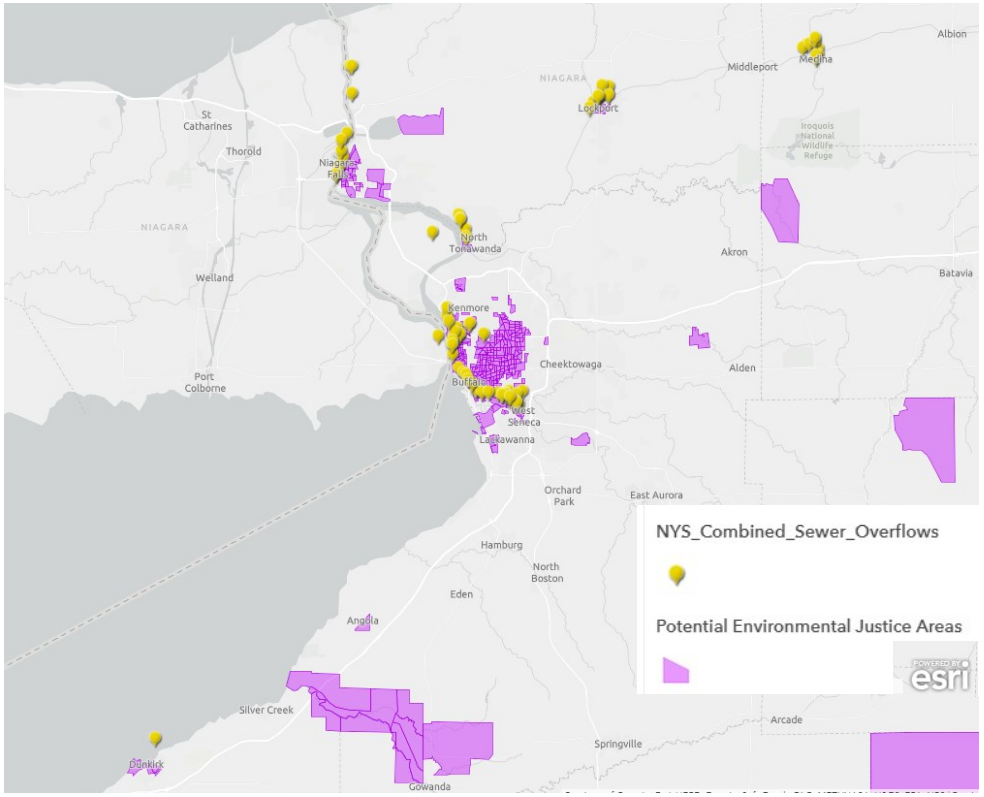
Courtesy: LynchburgVa.gov

"Research shows that in New York City and other major cities, those living within a half mile of CSO outfalls are disproportionately low-income and people of color." [1]

New York State designates communities having a low-income population equal to or greater than 23.59% of the total population or having a minority population equal to or greater than 51.1% in an urban area and 33.8% in a rural area of the total population as Potential Environmental Justice (EJ) Areas. [2]

The map to the right shows potential EJ areas and CSO discharge points. After reviewing this map and the information on this page, do you think CSOs are an environmental justice issue? What evidence do you have to support your argument?

Sewage is a source of nitrogen in the watershed but can also affect dissolved oxygen, pH, and turbidity. According to the EPA's Great Lakes Sewage Report Card, "pollutants found in sewage include oxygen depleting substances (referred to as Biological Oxygen Demand or BOD), and suspended solids and nutrients, such as phosphorus and nitrogen-based compounds — each of which carries a heavy ecological toll when released into a fragile ecosystem. Large concentrations of toxic chemicals, such as oil, tend to wash from the urban environment into the sewer system when it rains or the snow melts. Toxic metals and synthetic organic chemicals — such as cadmium, lead, mercury, silver, zinc and PCBs — are commonly found in sewage and pose serious dangers to human health and the environment." [3]



[1] https://www.nyc-eja.org/wp-content/uploads/2018/04/NYC-Climate-Justice-Agenda-Final-042018-1.pdf
[2] https://www.dec.ny.gov/docs/permits_ej_operations_pdf/cp29a.pdf
[3] https://www.ecojustice.ca/wp-content/uploads/2014/08/FINAL-The-Great-Lakes-Sewage-Report-Card-2013.pdf

Dissolved Oxygen (ppm)

Dissolved oxygen (DO) the is the amount of oxygen present in water.

Dissolved oxygen is needed by fish and other aquatic organisms and each of these organisms require a certain amount of DO. Dissolved oxygen levels rise when plants releases oxygen during photosynthesis or when 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 water. Sewage wastewater from CSOs or leaking septic tanks, as well as farm and feedlot runoff and runoff from city streets contain organic material that use up oxygen in water at 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.

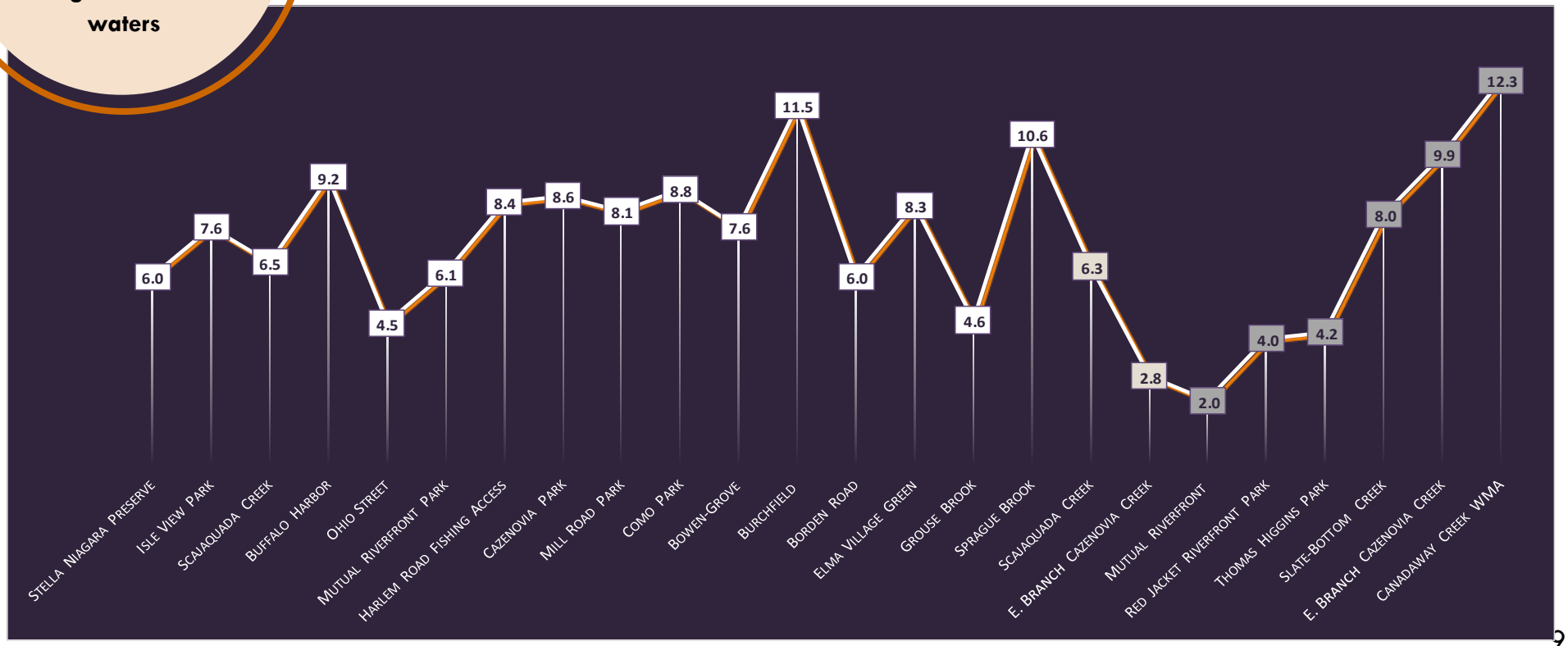
5 ppm

NYS minimum daily average for non-trout waters

Do you notice any trends as you move upstream on **October 2 (Stella Niagara to Sprague Brook)** or on **October 5 (Mutual Riverfront to Canadaway Creek)**?

Which of these factors may be affecting this trend? How?

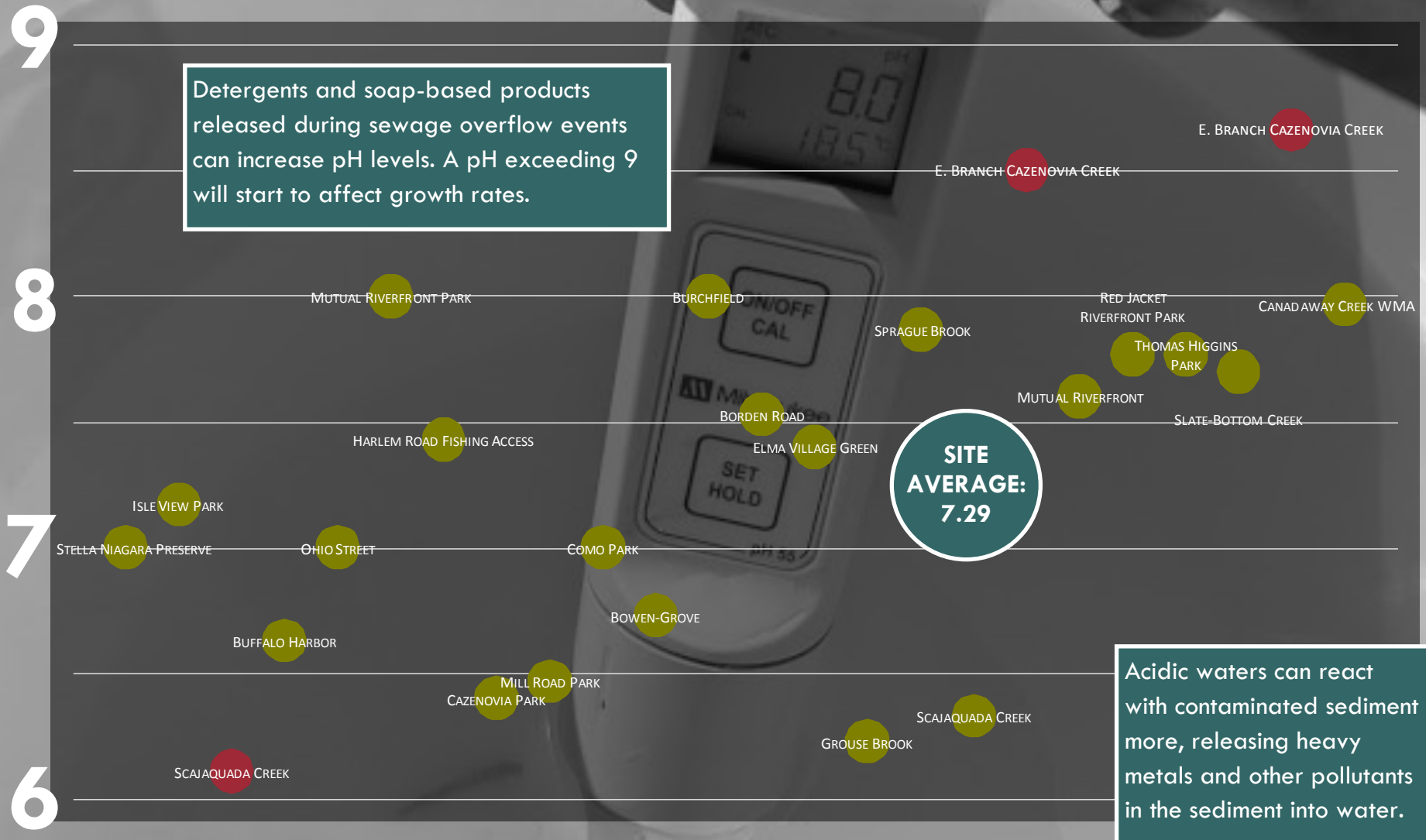
- Land cover and land use
- Wastewater
- Turbidity
- Water temperature



pH

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

- Healthy Range
- Unhealthy Range



MACROINVERTEBRATES

Determining Water Quality with Bugs

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.

The **Leaf Network Pollution Tolerance Index (PTI)** is calculated using the number of organisms found and their individual Pollution Tolerance Values. This final value can indicate potential water pollution.

Poor Fair Good Excellent

Hilsenhoff Biotic Index (HBI) measures the tolerance of the organisms collected to organic pollution (sewage and animal wastes) and low dissolved oxygen levels.

Poor Fair Good Excellent

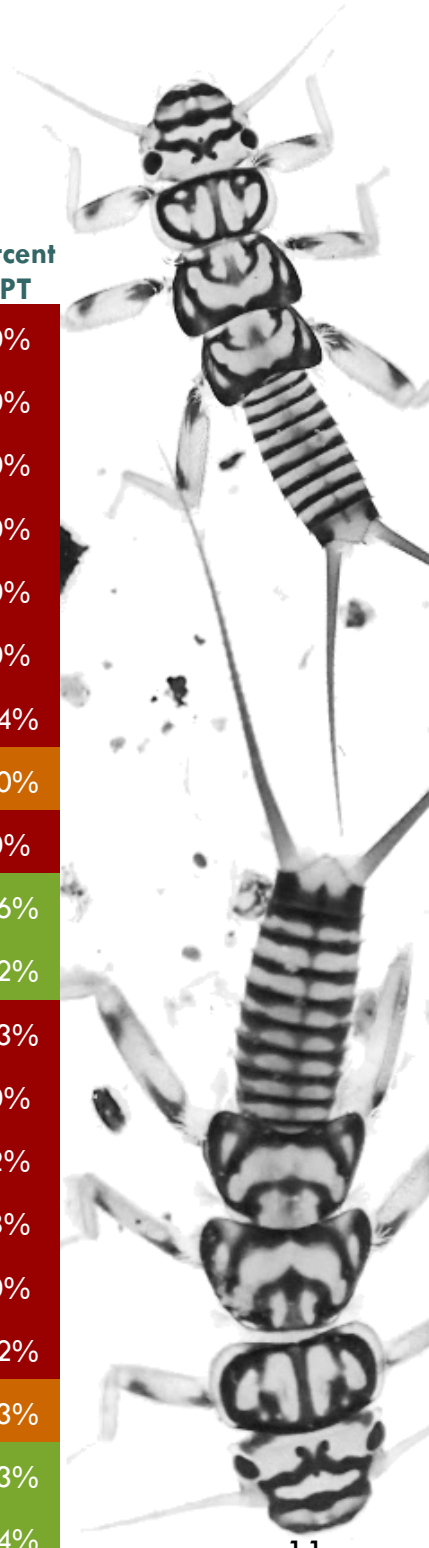
Percent EPT

"The total number of *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), and *Trichoptera* (caddisflies) is used to find the **Percent EPT**– another index value. Many species within these three groups are sensitive to changes in water quality. In general, the more EPT taxa, the better the water quality."

Leaf Pack Network®

Poor Moderate Good

Site Name	Leaf Pack PTI	HBI	Percent EPT
Stella Niagara Preserve	4	1.6	0%
Isle View Park	2	6	0%
Scajaquada creek	2	8	0%
Ohio Street	7	6.6	0%
Mutual Riverfront Park	3	4	0%
Mutual Riverfront	2	5.7	0%
Red Jacket Riverfront Park	6	5.1	14%
Thomas Higgins Park	6	5.5	50%
Harlem Road Fishing Access	3	6.8	0%
Cazenovia Park	9	4.6	56%
Mill Road Park	9	3.8	82%
Slate-Bottom Creek	7	5.5	23%
Como Park	0	5	0%
Bowen-Grove	3	4.9	2%
Burchfield	17	5.4	8%
Borden Road	11	3.5	0%
Elma Village Green	14	5.7	12%
Grouse Brook	7	5	43%
Sprague Brook	14	3.7	73%
Canadaway Creek WMA	10	3.9	64%



MACROINVERTEBRATES

2020 SPECIES LIST Quantity indicated by word size

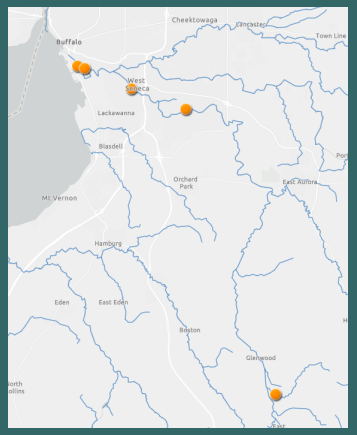
Aquatic sowbug
Aquatic Beetle
Netspinner caddisfly
Snipefly
Mosquito
Mayfly
Backswimmer
Dobsonfly
Water strider
Stonefly
Clam
Worm
Scud
Dragonfly
Water mite
Water Penny
Mussel
Damselfly
Leech
Cranefly
Snail
Casebuilder caddisfly
Flatworm
Midge

ADDITIONAL SPECIES:

- FOUR-TOED SALAMANDER LARVA
- RING-BILLED GULL
- GOLDFINCH
- GREAT BLUE HERON
- HAWK
- BEAVER
- COMORANT
- CANADA GOOSE
- MALLARD DUCK
- KINGFISHER

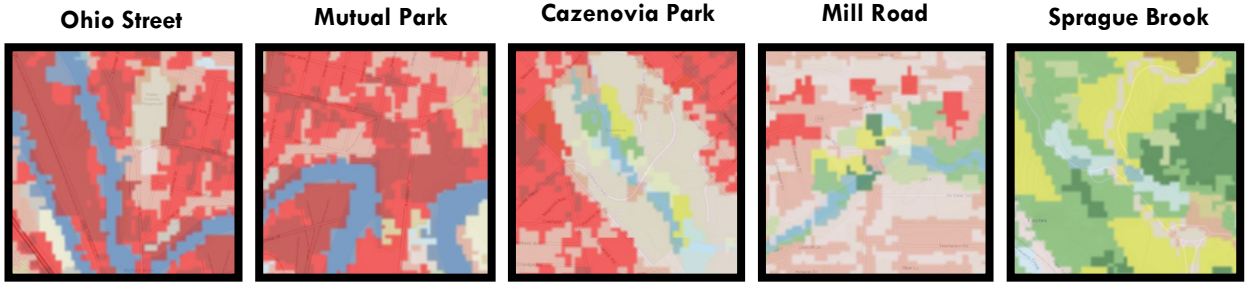
A Closer Look:

Downstream to Upstream



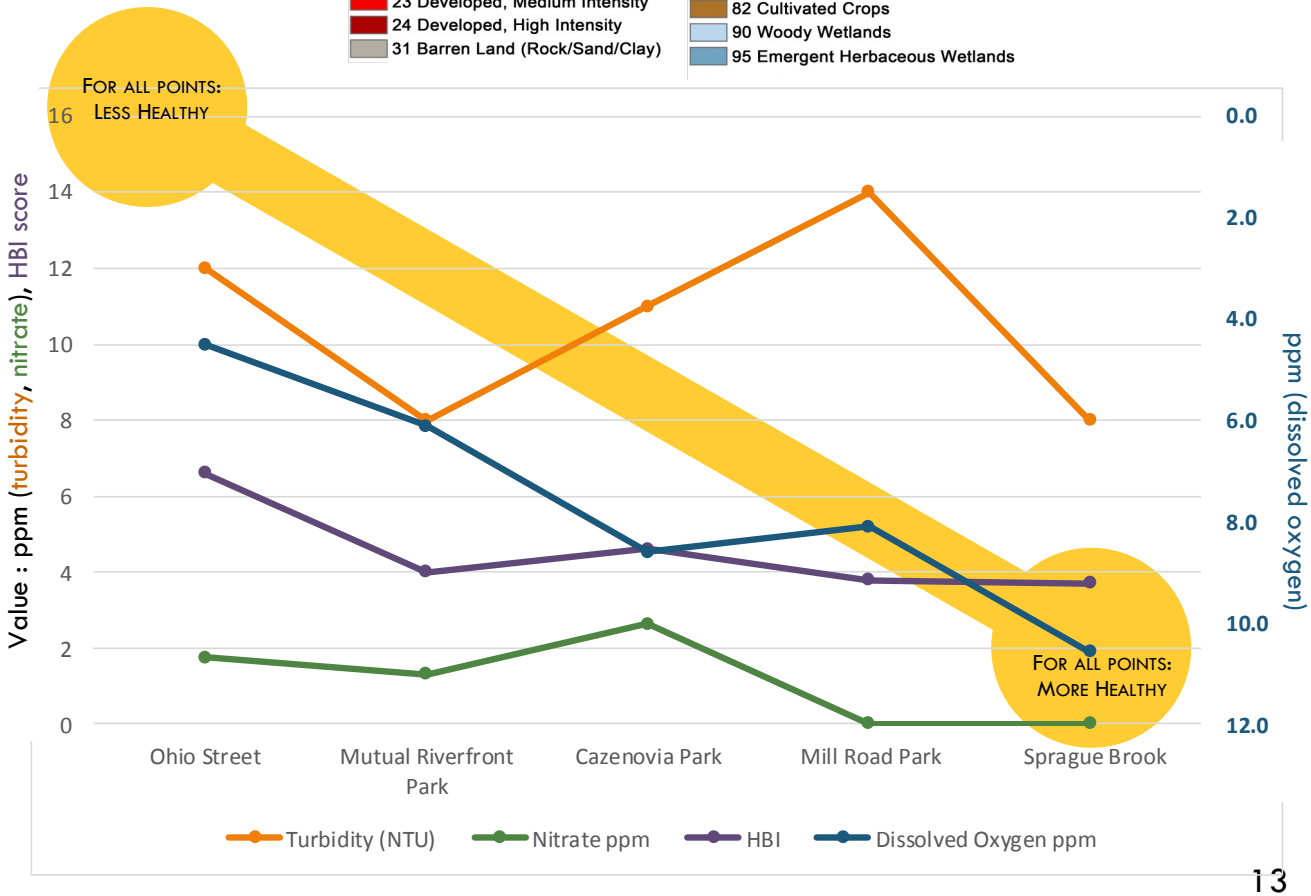
- How does land cover change as you move from Sprague Brook to Ohio Street?
- How could land cover affect water quality?
- The yellow line shows a sample trend from less healthy to more healthy. What do you notice as you move upstream from Ohio Street to Sprague Brook?
- What questions do you have after reviewing the information on this page?

Direction of Water Flow



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
- 81 Pasture/Hay
- 82 Cultivated Crops
- 90 Woody Wetlands
- 95 Emergent Herbaceous Wetlands



THANK YOU

We took on an ambitious challenge of sampling as many field study sites as possible during a pandemic year. The data collected and reported in 2020 would not be possible without our community partners:

- Buffalo Audubon Society
- Buffalo Niagara Waterkeeper
- Friends of Reinstein Woods Volunteers
- New York State Department Of Environmental Conservation Division of Water | Great Lakes
- SUNY Fredonia

A special shout-out to the teachers and students who overcame multiple obstacles to participate in our field study this year:

- Holland High School
- Nichols School
- Stella Niagara Education Park
- West Seneca Christian School

Thank you to Great Lakes B-WET for providing funding for teacher training, individual student sampling kits, and much more!