

Water Quality of the Grasse River & Little River in Canton: Historic Background, Pollution Concerns, and Current Water Monitoring Efforts

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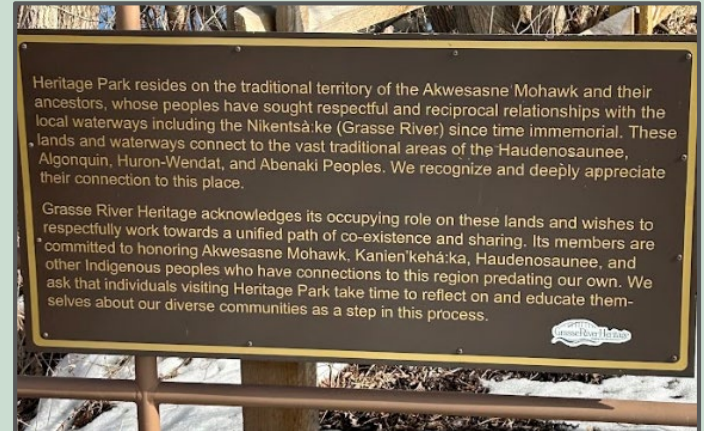
St. Lawrence University
Campus Climate Action Corps AmeriCorps Project
Spring 2024



Land Acknowledgment

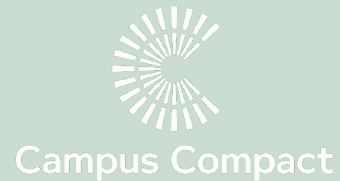
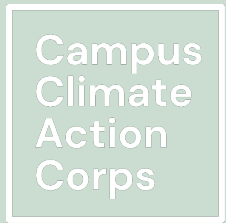
St. Lawrence University and the Village of Canton lie on the traditional territory of the Akwesasne Mohawk and their ancestors, who have been stewards of this land since time immemorial. The authors of this paper acknowledge that they are settlers on this unceded land, and they recognize and respect the connections Indigenous peoples have to the Grasse River and its surrounding lands and waterways.

Land Acknowledgement at
Heritage Park



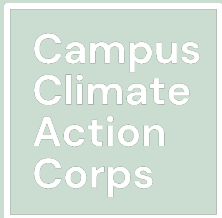
Agenda

1. Introduction to CCAC at SLU
2. Introduction to the Grasse River
3. Historic Land Use
4. Current Pollution Sources & Concerns
5. Recap of Previous Research
6. Our Project
7. Results (so far)
8. Future Work



Intro to the Campus Climate Action Corps at SLU

- SLU became a CCAC host site in November 2023
- Evelyn is an AmeriCorp Member serving as the Climate Action Lead
- November - July projects include Energy Navigator work, education events, water quality project, bike rack mapping, and working with the Village of Canton Sustainability Committee



Campus Compact



AmeriCorps



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Background on Grasse River

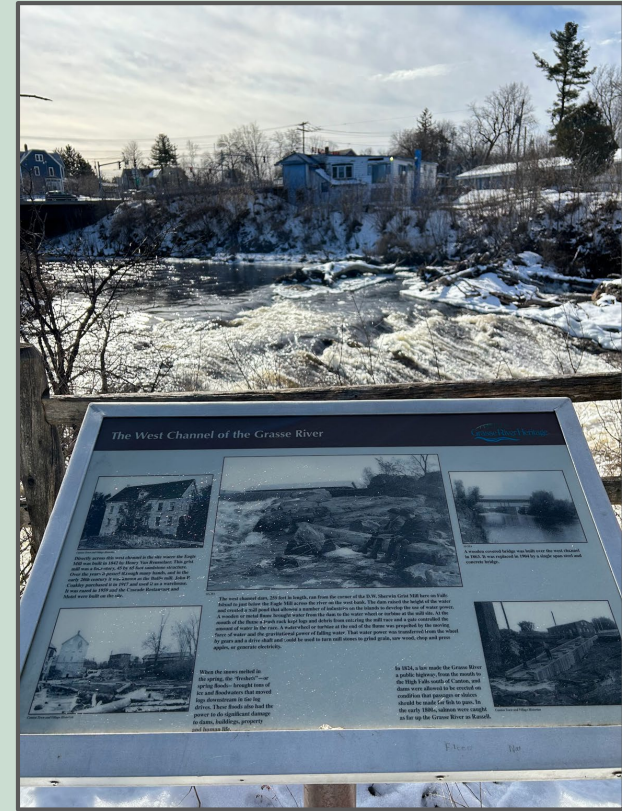
- Flows from the Adirondack Foothills to the St. Lawrence River in Massena
- Superfund site at Massena (Alcoa aluminum plant)
- Begins in protected forest, travels through dairy farmland and more populated communities like Canton
- The Little River is its largest tributary
- Dam in Madrid, hydroelectric facility in Pyrites
- B Rating by the NYSDEC, Little River potentially being evaluated for decreasing water quality



Map of St. Lawrence County with major towns, highways, drainage systems, and the Adirondack Park Boundary (Murphy, 2011).

Historic Land Use

- Agriculture (crops, dairy)
- **Falls Island (Heritage Park)**
 - 19th and early 20th century: Sawmills, gristmills, dams, sash and blind factory, tannery
 - Pollution from sawdust/edgings, factory toilet, fires caused by steam power
 - 1950s/60s: Bend in the River Park was a dump site

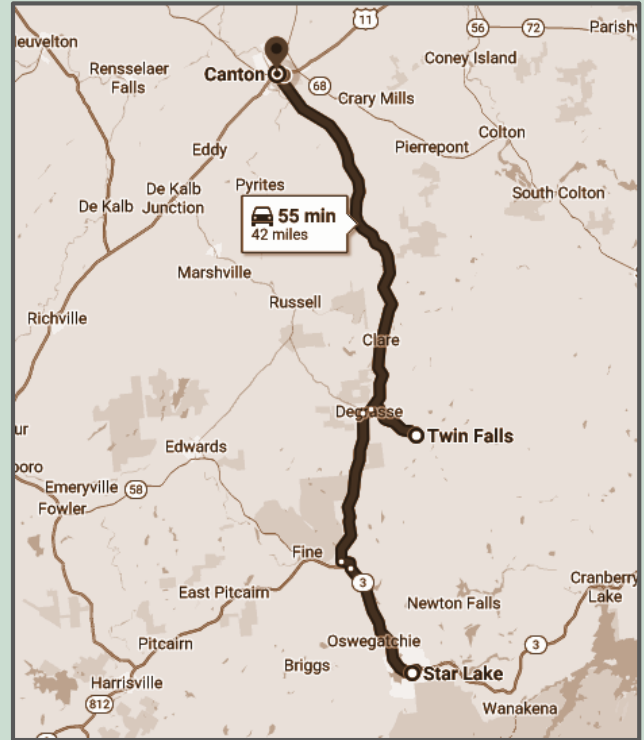


Photograph at Heritage Park featuring one of Grasse River Heritage's many interpretive signs.

Historic Land Use

Outside of Canton

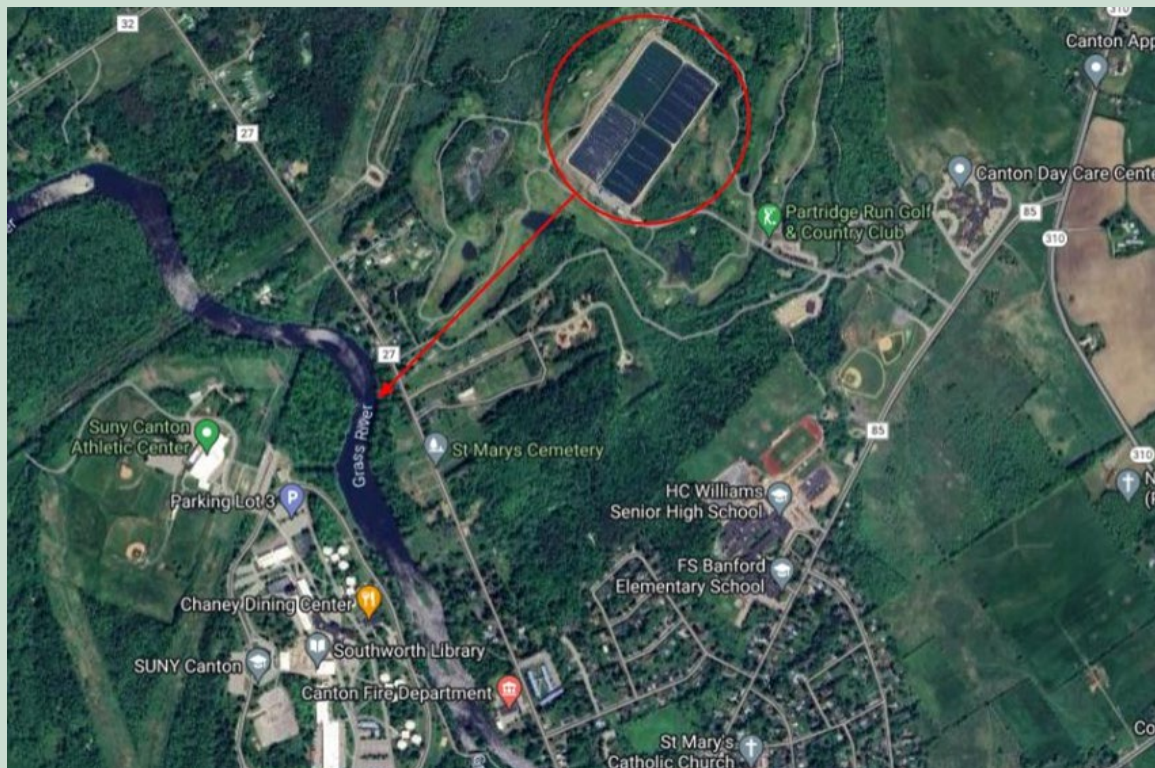
- Magnetite iron ore mill and blast furnace at Twin Falls during Civil War, WWII
- Sulfur and zinc mines in Stellaville, Edwards
- Mining and quarrying for iron, zinc, talc, sandstone, dolostone, marble
- Open pit iron mine near Star Lake until the 1970s



Screen capture from Google Maps.



Current Pollution Sources and Concerns: Wastewater Treatment Plant Outfall





Current Pollution Sources and Concerns: Road Salt & Stormwater Outfall

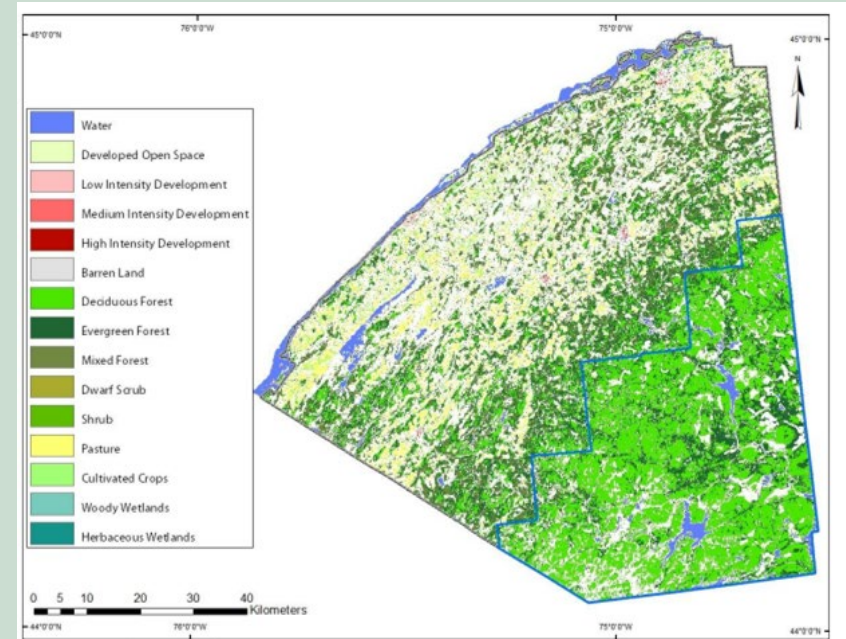




Current Pollution Sources and Concerns: Agricultural Runoff

- Pesticides
- Nitrogen/Phosphorus
- Bacteria from manure

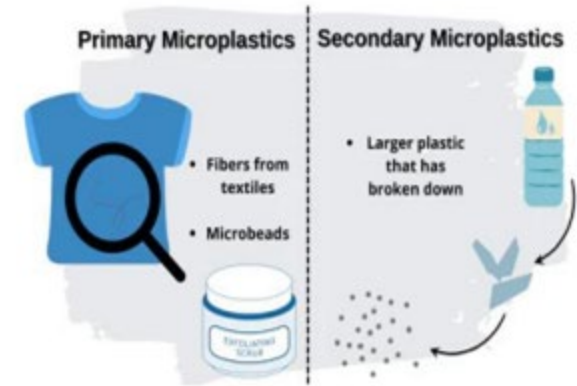
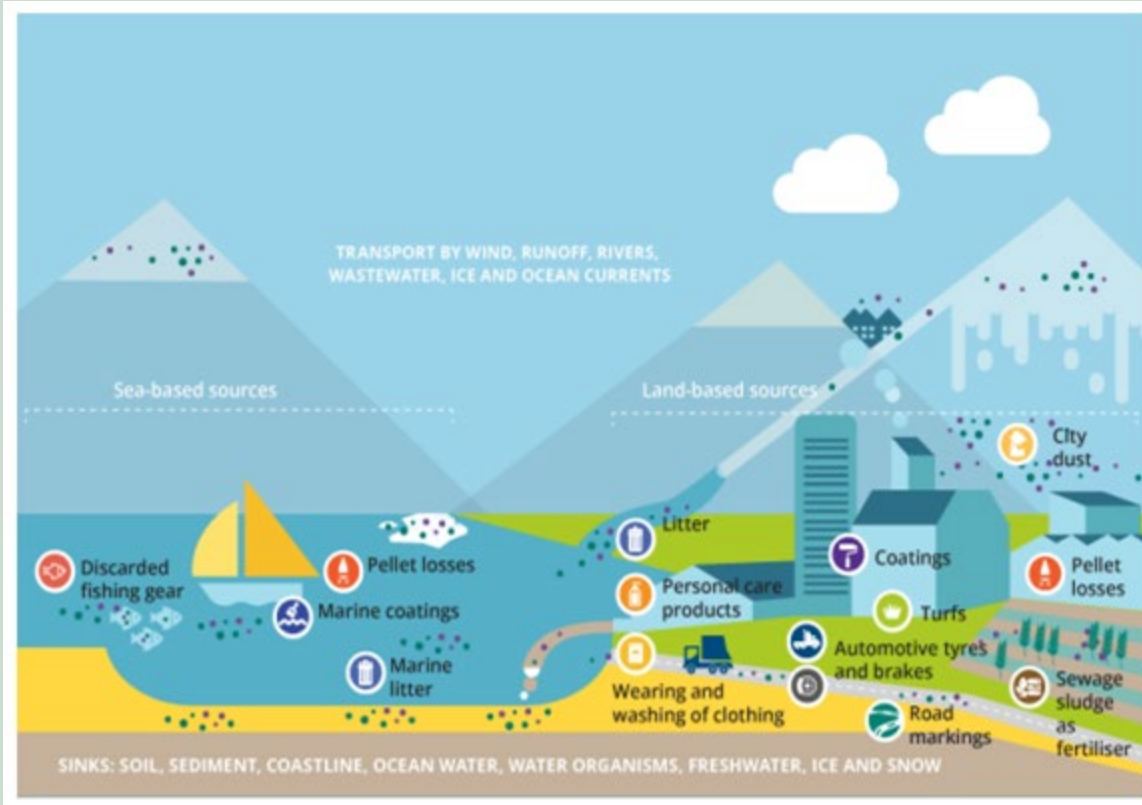
In St. Lawrence County, agriculture makes up 19-37% of land use, with dairy being a primary form (Murphy, 2011).



Land use map of St. Lawrence County (Murphy, 2011).



Current Pollution Sources and Concerns: Microplastics



Previous Water Quality Monitoring & Research

SUNY Canton Student Data

- 1990-2016, students performed lab exercises on the Grasse
- Much of the data was lost to a fire/changes in online platforms
- Professor Washburn provided the following info:
 - Macroinvertebrate data collected by students each fall consistently indicated high water quality
 - Total conductivity & chloride ion concentration in water decreased with distance from the road, indicating the impact of road salt in winter
 - However, conductivity and chloride ion concentrations on the Little River was found to be similar in the fall, prior to road salt applications

Previous Water Quality Monitoring & Research

St. Lawrence University Research Data

- Professor Jeffrey Chiarenzelli, Geology
 - Grasse River crosses three areas of bedrock (differences in topography, composition, metamorphic grade)
 - These characteristics influence neutralizing capacity, elemental ratios, and other water quality metrics
 - Specific Conductance on the Grasse River was found to decrease when sampled over June and July, potentially indicating the dilution of road salt inputs over the summer
 - Potential impacts of fertilizer applications were also observed based on elemental ratios

Previous Water Quality Monitoring & Research

St. Lawrence University Research Data

- Professor Jeffrey Chiarenzelli, Geology
 - Student John T. Murphy, Jr., also completed research
 - Little River sampled in June and July 2010:

	Temperature (°C)	DO %	DO (ppm)	pH	SpC ($\mu\text{S}\cdot\text{cm}^{-1}$)	TDS (g/L)	ANC (meq/L)
Maximum Values Round 1	22.160	120.000	11.970	8.400	441.100	0.282	4.444
Minimum Values Round 1	15.970	64.000	5.800	7.210	73.500	0.047	1.104
Range Round 1	6.190	56.000	6.170	1.190	367.600	0.235	3.340
Average Round 1	19.563	94.150	8.358	7.746	230.829	0.148	2.399
Standard Deviation Round 1	1.761	13.445	1.396	0.342	95.696	0.061	0.973
Maximum Values Round 2	21.760	81.000	7.470	8.130	380.900	0.244	3.797
Minimum Values Round 2	19.370	36.500	3.210	7.090	117.400	0.075	1.120
Range Round 2	2.390	44.500	4.260	1.040	263.500	0.169	2.677
Average Round 2	20.684	65.621	5.895	7.537	227.918	0.146	2.243
Standard Deviation Round 2	0.892	12.112	1.126	0.306	89.764	0.057	0.868
Average Round 1 & 2	20.124	79.886	7.126	7.641	229.373	0.147	2.321
Consistency (R^2)	0.934	0.932	0.939	0.936	0.931	0.919	0.704

(Murphy, 2011)

Previous Water Quality Monitoring & Research

Clarkson University Affiliated Research

- Dr. Abul Baki and graduate student Addrita Haque microplastic research
- On the Grasse River, mussels, water, suspended sediment load, and sediment (bed load), and was collected
- Results indicate microplastics are getting into bodies of aquatic organisms + water downstream from wastewater treatment plants likely has higher levels of microplastics present (CA EPA aquatic life threshold is 5 items of microplastics per liter)

Sampling Site	Microplastic Abundance Mussels (Item/individual)	Microplastic Abundance Water column (Item/L)	Microplastic Abundance SSL (Item/L)	Microplastic Abundance BL (Item/kg)
Grass River Upstream	1.2± 0.84	12	133.34	350
Grass River Downstream	2.2± 1.30	16	200.01	400

(Baki & Haque, 2024)

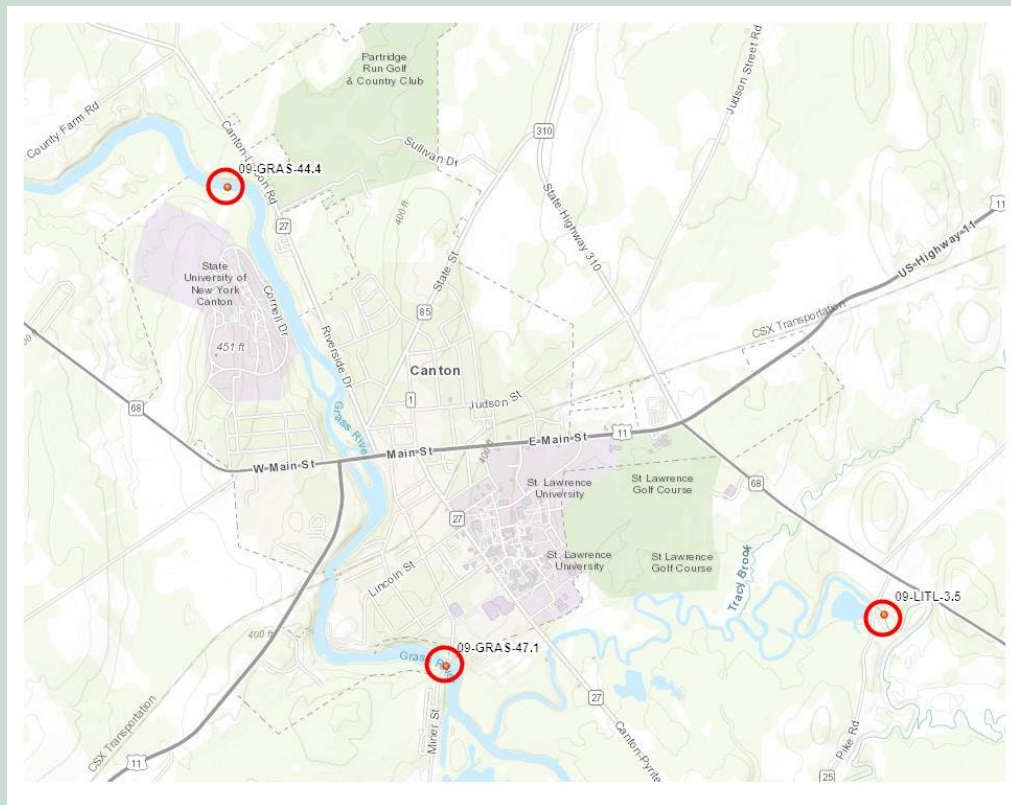
Previous Water Quality Monitoring & Research

Clarkson University Affiliated Research

- Dr. Tom Langen, Biology
- Roads & road salt impacts on ecosystems
- A study in the ADKs found that soils adjacent to the road were significantly altered by salt and sand use (+ dieback of woody vegetation)
- Soil found to have elevated concentration of sodium, but depleted of magnesium, calcium, and potassium. These soil-essential nutrients were found at elevated levels in the lakes adjacent to the roadway, likely due to sodium-mediated leaching
- Soils nutrient poor and erodible
- Chloride levels in nearby lakes 100-150 times higher than average ADK lake
- Chloride concentrations in lakes found to peak in summer; salt has infiltrated groundwater → lakes



Previous Water Quality Monitoring & Research: NYSDEC Monitoring



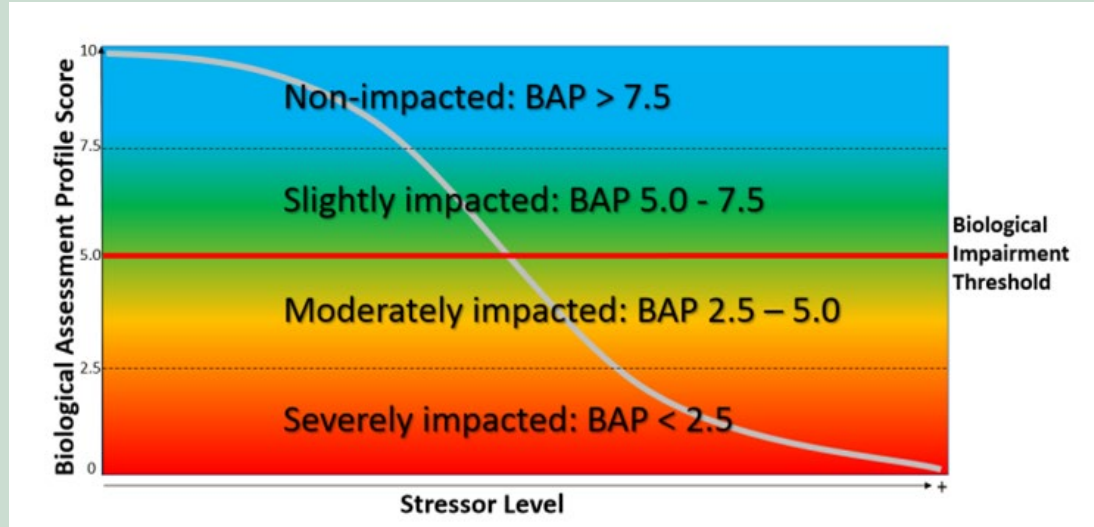
Within the town of Canton, NYSDEC has sampled the Grasse River at two locations, and the Little River at one location.

The Grasse River was sampled off of Route 27 in 1992, 2004, and 2009, and from the Miner Street Bridge in 2019.

The Little River was sampled near Pike Road in 2004, 2005, and 2014.



Previous Water Quality Monitoring & Research: NYSDEC Monitoring



The 2019 NYSDEC Grasse River BAP score indicates that the river is slightly impacted, as does the 2014 Little River Score, though the Little River scored higher (6.25 and 7.31, respectively)

An illustration of the BAP score compared to stressor levels from the NYSDEC “Fact Sheet on Assessment of Water Quality Impact in Streams and Rivers” (NYSDEC 2021).

Our Project

Working with Nature Up North
to Re-establish the MOW the
Grasse Community Science
Project

We tested the Grasse and
Little Rivers each one time in
December 2023 with a
HydroLab.



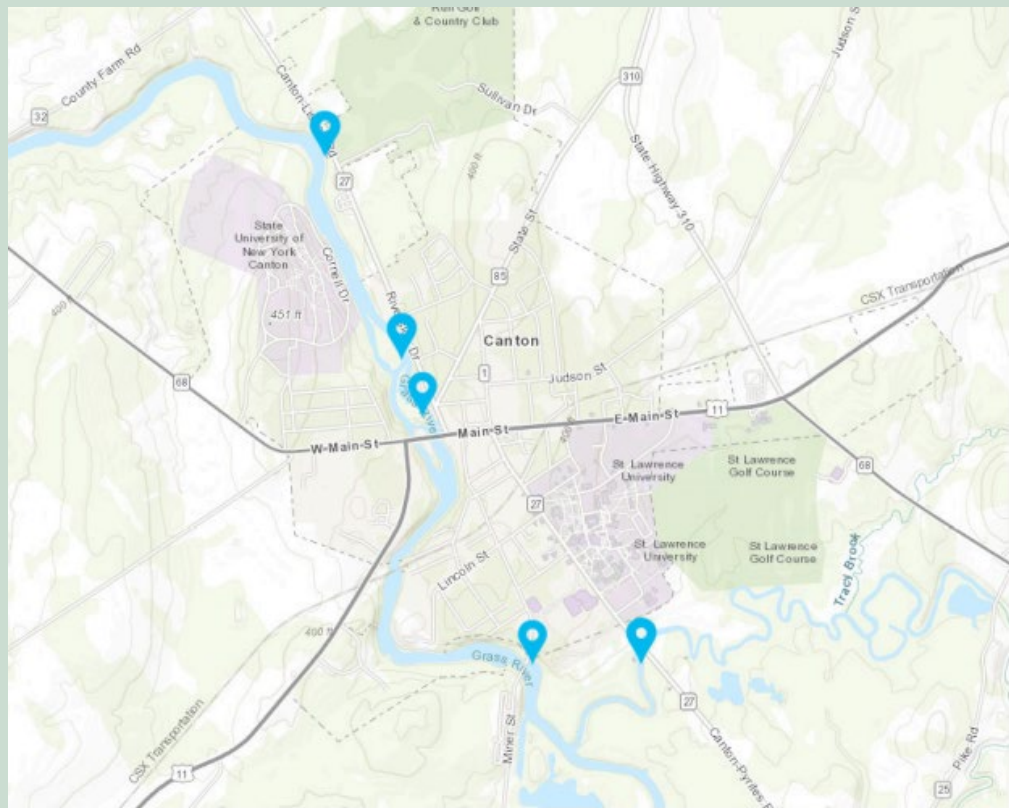
Our Project

- Nature Up North hosted two Community Based Learning students to help with this project
- Establishing community partnerships
- Editing monitoring procedure and manual
- Water monitoring in the spring





Results so far (click image to explore our data map)



- Preliminary data does not appear to indicate high levels of contamination
- However, the rivers were not tested for nutrients associated with agricultural runoff
- Future work with NUN Test Kits will allow for agricultural nutrient testing

Results so far

Table 5: Initial Water Quality Data from the Grasse River using a Hydrolab Instrument.

Date	Time	Coordinates	Site Name	Weather	Air Temp C	Depth of Sample (m)	Water Temp C	DO (mg/L)	%DO	pH	Conductivity (µS/cm)	Chlorophyll (µg/L)
12/20/23	15:24	44.58344N, 75.166163W	Miner Street Bridge	Cloudy, no precipitation, two days of intense rainfall preceding	1.11	--	1.78	10.82	92.7	7.38	97	3.09

Results so far

Table 8: One Time Sampling Data from the Grasse River Using a HydroLab Instrument in April 2024.

Date	Time	Coordinates	Site Name	Weather	Air Temp C	Depth of Sample (m)	Water Temp C	DO (mg/L)	%DO	pH	Conductivity (µS/cm)	Chlorophyll (µg/L)
4/10/24	16:41	44.599700N, 75.175877W	SUNY Canton Bridge	Windy, sunny with clouds	18	0.4	11.2	7.05	75.6	7.51	70.7	1.78
4/10/24	17:54	44.610406N, 75.181671W	Wastewater Discharge Point	Windy, sunny with clouds	18	—	11.6	9.15	99.2	7.62	94.5	1.94
4/16/24	16:30	44°35'48" N 75°10'28" W	Heritage Park	Partly Cloudy	13	—	9	8.69	93.3	7.72	79.4	2.24

Results so far

Table 6: Initial Water Quality Data from Little River using a HydroLab Instrument.

Date	Time	Coordinates	Site Name	Weather	Air Temp C	Depth of Sample (m)	Water Temp C	DO (mg/L)	%DO	pH	Conductivity (µS/cm)	Chlorophyll (µg/L)
12/20/23	15:44	44.583576N, 75.157953W	St. Lawrence Canoe Shack	Cloudy, no precipitation, two days of intense rainfall preceding	1.11	--	1.56	10.42	88.6	7.42	127.1	2.91

Table 7: One Time Sampling Data from the Little River using a HydroLab Instrument in March 2024.

Date	Time	Coordinates	Site Name	Weather	Air Temp C	Depth of Sample (m)	Water Temp C	DO (mg/L)	%DO	pH	Conductivity (µS/cm)	Chlorophyll (µg/L)
03/06/24	16:47	44.583522N, 75.158091W	St. Lawrence Canoe Shack	Raining, two days of 60 degree weather	41	--	8.06	8.66*	86.5	7.6	217.1	2.9

**Potential human reading error of the DO mg/L.*

Future Work

- Helping Nature Up North recruit & train community volunteers
- NUN plans to publicize data on their website
- More data will allow for statistical analysis



Acknowledgements

Professor Erika Barthelmess, St. Lawrence University, Nature Up North

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Tadd Ledoux and Adam Woodward, St. Lawrence Community-Based Learning Students

Dr. Abul Baki and Addrita Haque, Clarkson University

Dr. Tom Langen, Clarkson University

Village of Canton Sustainability Committee

Resources

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<https://doi.org/10.1016/j.jenvman.2018.07.085>

Thank You! *Any Questions?*

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