Severn Sound
Environmental Association

Severn Sound Citizen Science: 2021 Data Report

Acknowledgements

The SSEA is grateful for the support we received from the TD Friends of Environment Foundation and the Lake Huron Georgian Bay Community Action Initiative in developing these programs, which will help promote environmental awareness and stewardship in the Severn Sound watershed.

We also want to acknowledge and thank YOU, the citizen scientists who volunteer your time and energy in collecting information about the places that are important to you. Your efforts help to collect and analyze data that will assist in making conservation related decisions across the watershed. Without your contributions, this program would not be possible.

TD Friends of the Environment Foundation

Lake Huron - Georgian Bay Watershed
A Canadian Framework for Community Action

June 2022

Table of Contents

Map Disclaimer: All maps are produced by the Severn Sound Environmental Association with Data supplied in part from the County of Simcoe, the Ontario Ministry of Northern Development, Mining, Natural Resources and Forestry (© Queen's Printer 2022) and under License with Members of the Ontario Geospatial Data Exchange, 2022. While every effort has been made to accurately depict the data, errors may exist. Any party relying on this information does so at their own risk. Not for navigational purposes.

Photo and Data Disclaimer: All images and data from volunteers are used with permission as per Media and Data Release forms signed by participants.

Introduction

Lakes and rivers have value to us all, whether we own waterfront property, visit waterfront parks and beaches, spend time fishing or boating, use it for drinking water, or appreciate aquatic ecosystems as a passer-by. The more we know about our local lakes and tributaries, the better we can protect them. Citizen science programs allow the Severn Sound Environmental Association (SSEA) to increase our capacity to observe environmental conditions across the Severn Sound watershed while increasing community engagement and knowledge of local environmental issues. Citizen scientists can collect valuable water quality data in areas that staff would otherwise either be unable to visit or to collect data from with enough frequency to be meaningful.

When collected consistently and frequently, observations from lakes and tributaries allow us to track indicators of climate change, such as changes in thermal stability of streams, habitat quality, invasive species spread, or algal bloom events. This data can be used in multiple ways to monitor environmental conditions in Severn Sound, including:

- Tracking relationships between blue-green algae blooms and environmental factors such as wind direction and temperature
- Collecting sightings of invasive species and species at risk for proactive management
- Identifying areas in need of beach clean-ups or habitat restoration
- Tracking indicators of climate change, such as water and air temperature and wind speed
- Determining thermal classification of streams, which provides rationale for protection of cool and cold water fish habitats

Observation site on Copeland Creek

Noticing these events or changes early allows more preventative measures to be taken to protect vulnerable areas and improve areas of concern.

The loosening of COVID-19 pandemic restrictions made the 2021 citizen science season easier than the previous year. We still had COVID protocols in place to protect our staff and volunteers such as virtual training sessions and contactless drop off/pick-up of citizen science equipment. As always, our citizen scientists are critical to our ongoing monitoring of environmental conditions in Severn Sound, as without them we would have fewer eyes on the ground.

Two citizen science programs were initiated in 2020, Shore Watch and Stream Watch. A third program was introduced in 2021 called Invasive Species Spotters, which focused on a terrestrial and an aquatic species. The aquatic portion of that program had a few volunteers who were also participating in our Shore Watch program monitor for an aquatic invasive macroalgae called Starry Stonewort. Collectively, these programs had 22 volunteers gathering observations from 21 sites across the Severn Sound watershed. Water quality data collected by volunteers provided valuable information about algae growth, water temperature, weather conditions, human impacts and restoration needs. Volunteers also recorded general sightings of invasive species (IS) and species at risk (SAR) to assist the SSEA in identifying areas of concern, and proactively identify IS spread and promote SAR conservation.

Shore Watch, Stream Watch and Invasive Species Spotters operate alongside SSEA's Ice Spotters program, which tracks dates of ice on and ice off for Severn Sound and local lakes, and Water Level Watch, which tracks water levels on Farlain Lake. These programs complement SSEA's lake and tributary environmental quality and climate monitoring programs.

Monitoring Methods

Prior to monitoring, volunteers were provided with field kits containing scientific equipment to ensure consistency when measuring variables, which are described below. Volunteers chose a consistent monitoring site on their chosen water body, and it was left to volunteers to decide on monitoring frequency. Details on methods can be found in the Shore Watch and Stream Watch Field Manual, which was provided to volunteers.

Weather Conditions

Air Temperature:
Air temperature is an important climate change indicator, and influences many physical and biological environmental processes, such as timing of lake ice out and plant growth. Air temperature was recorded in the shade using a pool thermometer or Hanna meter.

Wind Direction and Speed (Shore Watch program only):
High winds can have an impact on water quality by stirring up sediment, causing temporary changes in water levels, and preventing harmful algae blooms from rising to the surface. Wind direction can also affect wave and water quality conditions depending on whether it is onshore or offshore. Volunteers determined wind direction using a weathervane and a compass. Using the Beaufort wind force scale, which relates wind speed to observed conditions on the water or on land, volunteers


Rain gauge mounted on a pole

gauged the wind strength at the time of each of their monitoring sessions. Each Beaufort number corresponds to a range of wind speeds, and the average of this range was used as a wind speed estimate.

Rainfall:
Rainfall can have an impact on water quality and temperature depending on the potential for local overland runoff at each monitoring site. Volunteers installed rain gauges away from any objects that could prevent rainwater from entering the gauge (e.g. buildings, trees), and were instructed to check the rain gauge daily to ensure it was free of debris and record any accumulations of rainfall.

Water Conditions

Water Temperature:
Water temperature is often closely linked to air temperature, and plays a large role in controlling algae growth as well as determining the timing of biological processes such as insect emergence and fish reproduction. Temperature was recorded using either a pool thermometer or Hanna meter at the water surface. Some volunteers also installed Onset Tidbit temperature loggers, provided by SSEA, at their site. Loggers were placed approximately 1 metre below the water surface and recorded water temperatures every 30 minutes for stream sites and every hour for lake sites. This provided detailed information on temperature fluctuations, which can be influenced by air temperature as well as water currents and wind events.

Conductivity and pH:
Conductivity measures the capacity of water to pass electrical currents, which is related to the amount of dissolved material in the water. It can be used to indicate the influence of storm events, or changes in the proportion of contributing water sources (i.e. groundwater versus surface water). pH indicates whether the water is “acidic” (low pH), or “basic/alkaline” (high pH), based on a scale of 1-14. A value of 7 is neutral. Waters on the Canadian Shield have a lower pH compared to waters off the Shield. Using a Hanna meter, conductivity and pH levels were measured at the water surface.


Measuring Secchi depth

Wave Direction (Shore Watch program only):
Wave direction is important for putting water quality observations into context since large onshore waves can stir up sediment, while calm conditions can favour algae growth. Volunteers utilized a compass to determine wave direction.

Secchi Depth (Shore Watch program only):
Secchi depth provides an estimate of water clarity, or cloudiness, which can be caused by suspended

particles, algae or tea-coloured tannins (dissolved organic carbon) in the water, and provides an indicator of water quality. A higher Secchi depth number indicates clearer water, and often better water quality. A Secchi disk with a rope attached was used to determine Secchi depth. On the shaded side of a dock or boat, a Secchi disk was lowered into the water until the volunteer could no longer see it, and a clothespin was used to mark the rope at the water surface. After raising the disk out of the water, volunteers measured the distance from the disk to the clothespin to determine the Secchi depth in metres.

Stream Velocity (Stream Watch Only (Optional))
Streamflow has a significant impact on water and habitat quality. Volunteers could estimate flow by comparing it to their knowledge of the stream and assigning a low, medium or high flow value. An optional float method could also be used to get a more accurate measurement of flow conditions. This method uses a floating object tossed into the stream and timed over a measured distance. This was repeated three times, and the average was taken to determine stream velocity.

Site Depth:
Using the same method as for Secchi depth, site depth was measured at Shore Watch sites by lowering the disk down to the lakebed and measuring the length of rope used.

Stream Watch participants measured stream depth in the centre of the stream using a metre stick.

General Observations

Plants and Animals, Invasive Species (IS), and Species at Risk (SAR):
Volunteers were encouraged to record any observations of wildlife that they saw while monitoring. Observations include sightings of IS and SAR.

Starry Stonewort (Shore Watch only (Optional)):
A few Shore Watch volunteers also participated in the Invasive Species Spotters program to monitor for Starry Stonewort. Volunteers completed aquatic plant rake tosses that dredged up aquatic plants and then recorded the presence or absence of Starry Stonewort. Three rake tosses were completed on each monitoring date between July to October.

Algae, Water Colour:
Volunteers submitted observations and photos of algae and algal blooms, along with water colour. If a blue-green algae bloom was suspected, volunteers were instructed to collect a sample for submission to SSEA staff.

Water Level Impact and Human Disturbances:
Volunteers were encouraged to record any sightings of shoreline or streambank damage (e.g. erosion, storm damage) and signs of human disturbance (e.g. litter, signs of vehicle presence, shoreline alterations).

Restoration Work:
If volunteers believed restoration work was warranted (e.g. invasive species removal, beach cleanup, shoreline stabilization), this was documented.

Results

In the first part of this section, results are shown by lake or tributary as illustrated in Figure 1. In some cases, there were multiple observers on one water body (e.g. Gloucester Pool), and in this case, data were aggregated. For each water body, a summary showing the number of sites and observations is given, along with the range of site depths and a summary of field measurements taken. The minimum, average and maximum values are shown for each variable measured.

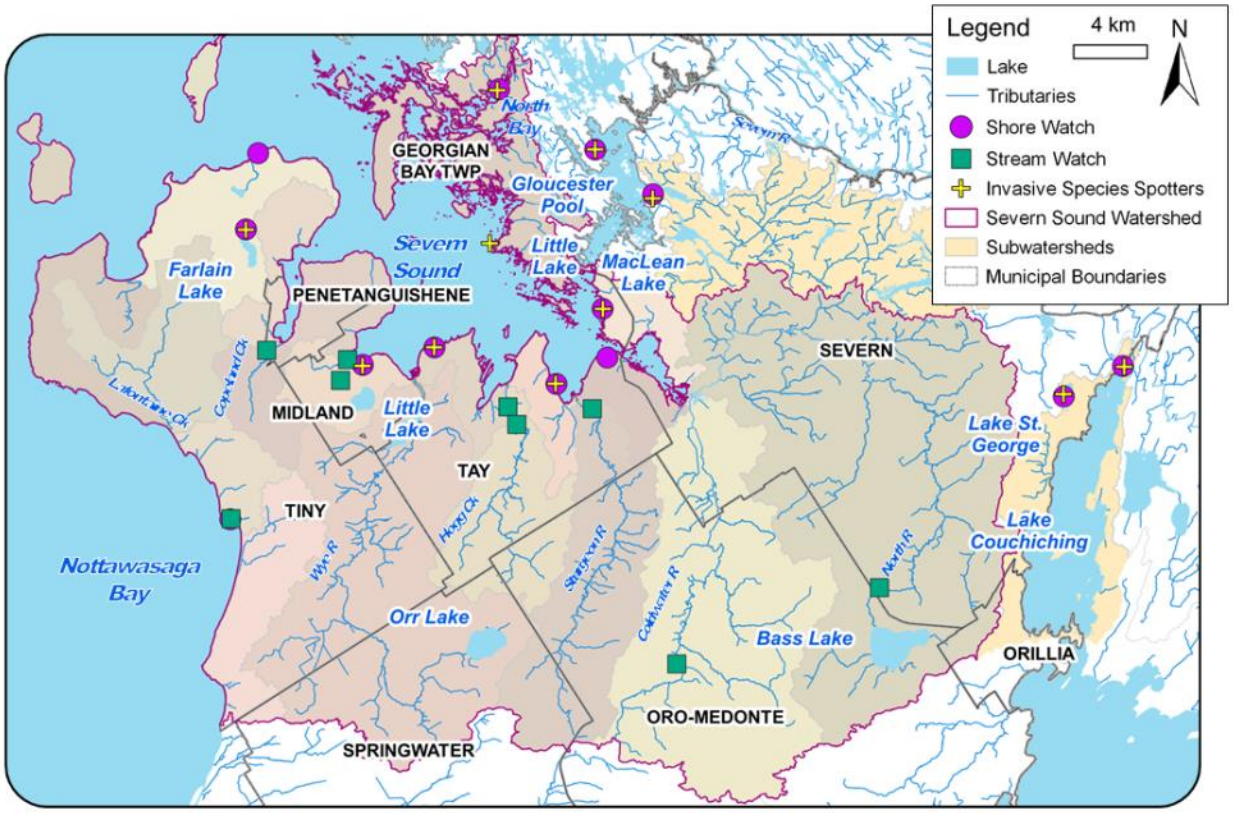


Figure 1. Overview map showing all monitoring sites for Shore Watch, Stream Watch and Invasive Species Spotters, along with the Severn Sound watershed and major tributary subwatershed boundaries.

Site Maps: The approximate monitoring location is shown for each site. In order to protect the privacy of volunteers who were monitoring on their own private property, monitoring areas are shown as larger circles so that a specific location is not discernable. Monitoring sites that are on publicly accessible land are shown as small, filled circles.

Plants and Animals: Sightings of common flora and fauna, as well as SAR and IS, are documented in this section. Note that SAR and IS are listed as observed by volunteers; sightings have not been confirmed by SSEA staff.

Other Observations: This section includes observations of algae, water colour or debris, water level impacts from lake levels or tributary flood conditions, human impact, and whether restoration was needed at the site.

Water Temperature (logger): For sites that had a temperature logger installed, a graph is shown that displays water temperature as a 3 hour moving average. Loggers record data every hour or half hour, so using a moving average is useful for smoothing out the "noise" in the data. A table is also provided showing water temperature statistics, including the minimum, average and maximum over the entire monitoring period, the minimum, average and maximum daily range, and monthly averages.

Thermal Stability: Specific to tributaries, this refers to the ability of a tributary to maintain cool water temperatures while air temperature rises. For example, a stream that gets very warm during the hottest days of the summer would have low thermal stability and would be classified as a warm-water tributary that would likely support warm water fish communities. Conversely, a stream that remains cold even as air temperature rises would have high thermal stability and would be classified as a cold-water tributary that would likely support cold water fish communities. Cool-water tributaries are somewhere in the middle. Thermal stability increases with more groundwater inputs to a tributary, and also with increasing amounts of vegetation cover on the streambank, known as the riparian zone. Stewardship efforts that maintain the thermal stability of cool and coldwater streams, or increase the stability of warm water streams, will help to protect cool and coldwater fish communities, which are important for ecosystem health.

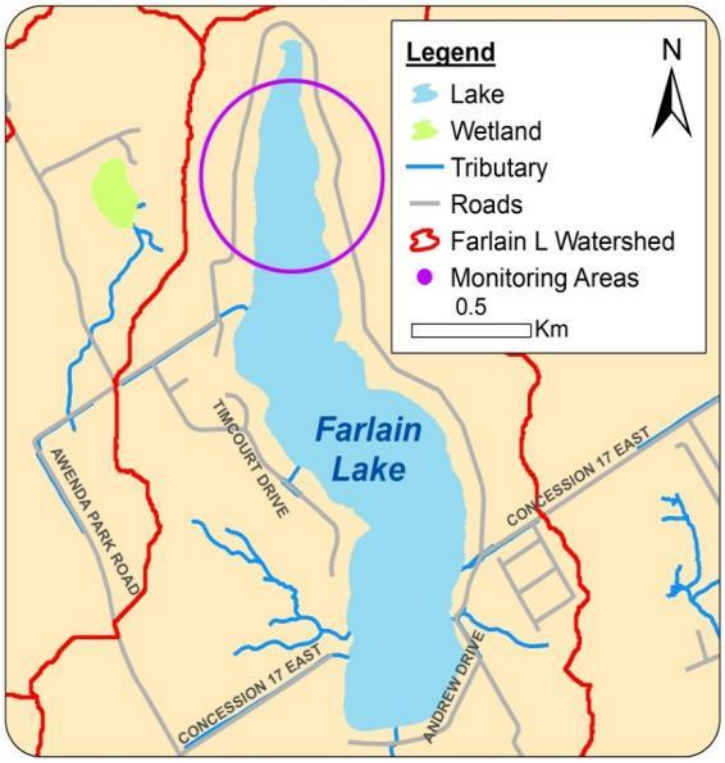
Thermal stability is calculated by comparing water and air temperature observed between 4:00-4:30 pm on days where maximum air temperature is above 24.5°C, based on the method described in Stoneman and Jones (1996). Note that temperature data must be recorded from the beginning of July to the end of August in order for the classification to be valid.

In the second part of the Results section, results are compared to other data sources for verification purposes.

Inland Lakes

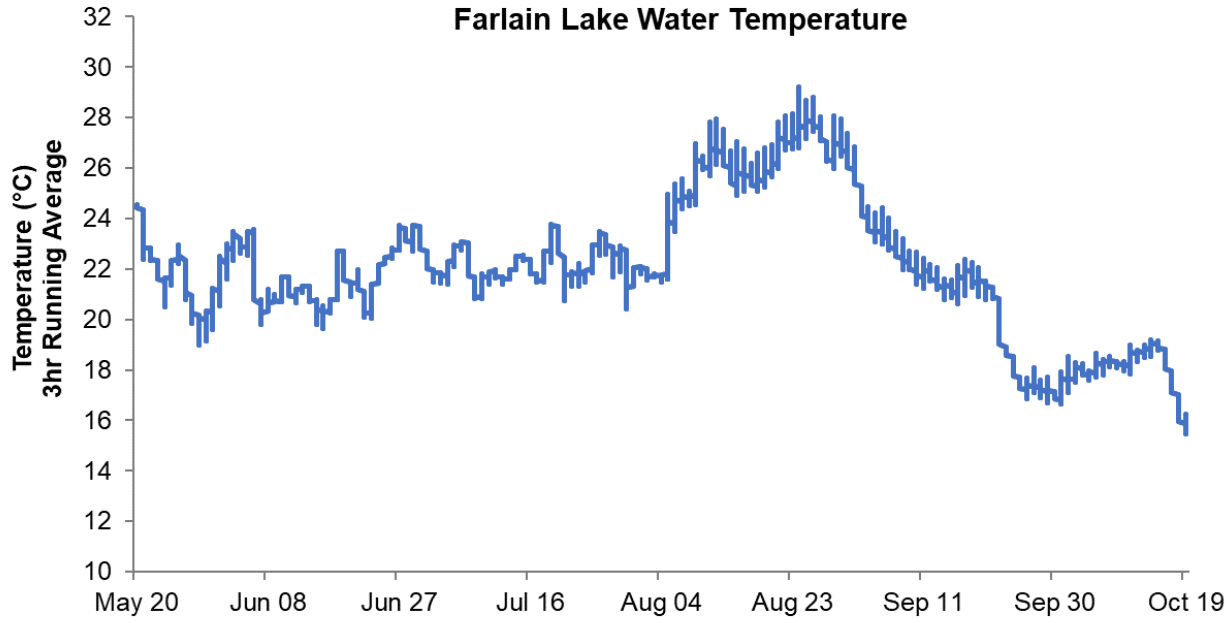
FARLAIN LAKE

Farlain Lake is a kettle lake with no surface outflow located south of Awenda Provincial Park in Tiny Township.



Number of Sites: 1

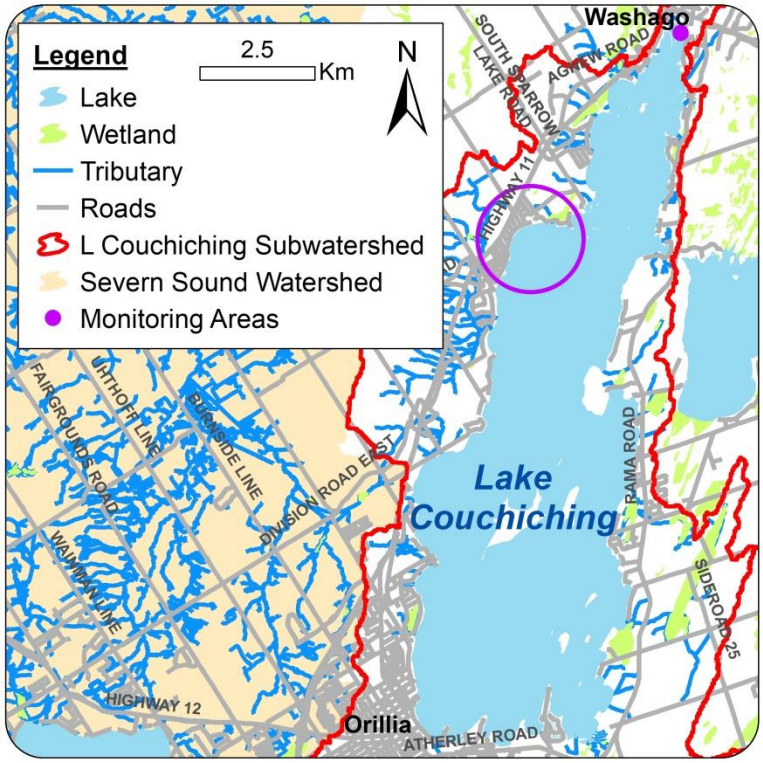
Water Temperature (logger):



Temperature Logger Stats: May 20th – October 19th, 2021	
Overall Minimum	15.44
Overall Average	21.93
Overall Maximum	29.37
Minimum Daily Range	0.17
Average Daily Range	1.10
Maximum Daily Range	4.02
May 20th -May 31st Average	21.30
Jun Average	21.66
Jul Average	21.98
Aug Average	25.66
Sept Average	20.98
Oct 1st- Oct 19th Average	17.97

LAKE COUCHICHING

Lake Couchiching is a large inland lake that is connected to Lake Simcoe at the Atherley Narrows, and is part of the Trent Severn Waterway. The Severn River flows out of the north end of the lake, and discharges into Severn Sound.



Number of Sites: 2

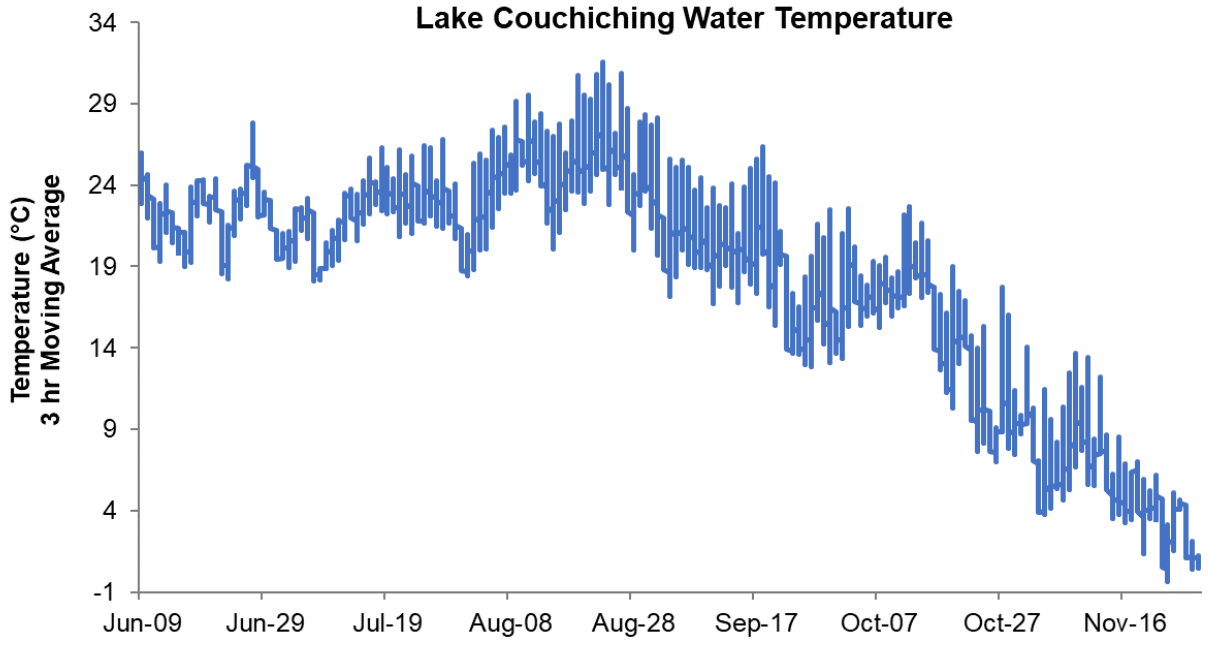
Number of Observations: 6

Summary: Jun 7 – Aug 24

	Water Temp (°C)	Cond (µS/cm)	pH
Min	19.7	325	8.3
Avg	23.0	352	8.5
Max	25.0	374	8.7

	Air Temp (°C)
Min	11.0
Avg	20.1
Max	24.5

Water Temperature (logger):



Temperature Logger Stats June 9th – November 28th, 2021	
Overall Minimum	-0.59
Overall Average	18.21
Overall Maximum	32.46
Minimum Daily Range	0.68
Average Daily Range	4.69
Maximum Daily Range	10.55
Jun 9th - Jun 30th Average	22.24
Jul Average	22.10
Aug Average	24.96
Sept Average	19.55
Oct Average	14.92
Nov 1st - Nov 28th Average	5.53

Plants and Animals:

- Loon, Canada Geese, Gulls, Ducks
- SAR – nothing reported
- IS – Eurasian Watermilfoil, Starry Stonewort*

* This observation was not confirmed by SSEA staff

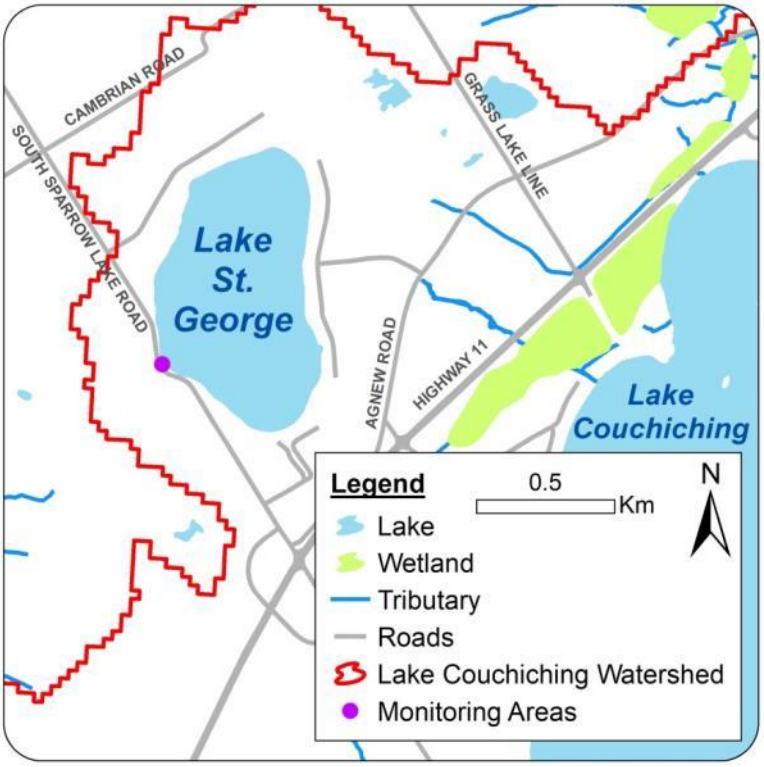
Volunteer completing an aquatic rake toss on Lake Couchiching

Other Observations:

- Algae – filamentous algae on rocks
- Water Colour/Debris – clear, green blue, light blue, light green with brown tones
- Other Water Observations – some foam and loose vegetation washed up on shore
- Water Level Impacts – high water levels noted on two occasions
- Human Impact – some litter on shore, beach gear left behind (e.g. pail, towel, charcoal & cigarette butts)

LAKE ST. GEORGE

Lake St. George is a small inland lake west of Lake Couchiching in Severn Township. It has no mapped outflow but lies within the Lake Couchiching watershed.



Number of Sites: 1

Number of Observations: 6

Summary: Jun 7 – Aug 24

	Water Temp (°C)	Cond (µS/cm)	pH
Min	20.8	214	8.6
Avg	23.8	217	8.7
Max	26.3	221	8.8

	Air Temp (°C)
Min	10.5
Avg	19.7
Max	24.5

*The Lake Couchiching watershed was derived using the Ontario Flow Assessment Tool (MNRF, 2015) and is shown as a proxy for the Lake St. George watershed. Lake St. George has no mapped outlet, preventing delineation of its watershed using the tool.

Plants and Animals:

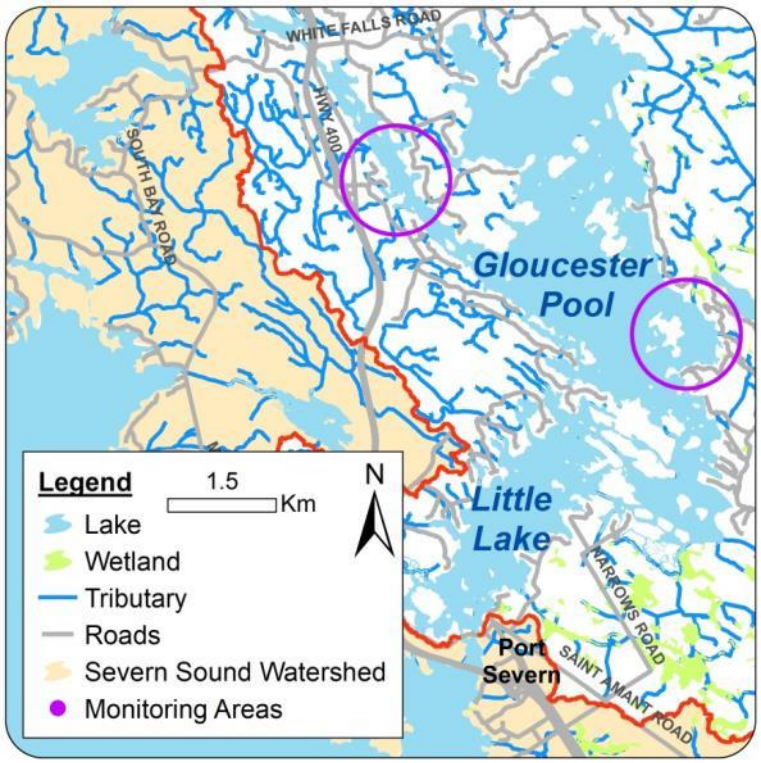
- Gulls, Canada Geese, Ducks
- SAR – nothing reported
- IS – Eurasian Watermilfoil

Other Observations:

- Water Colour/Debris – clear, brown, light brown to clear brown
- Other Water Observations – pollen floating on water, and small amounts of foam
- Human Disturbances – small amount of litter (e.g. cigarette butts & beer cans)

GLOUCESTER POOL

Gloucester Pool is an embayment of the Severn River in Severn and Georgian Bay Townships which functions as an inland lake. It is part of the Trent Severn Waterway and discharges into Severn Sound via Little Lake and the Severn River. Monitoring was done in the Burrows Bay and Little Go Home Bay areas.



Number of Sites: 2

Number of Observations: 29

Site Depth: 2.1-2.7 m (Avg 2.5 m)

Summary: Jun 28 - Oct 19

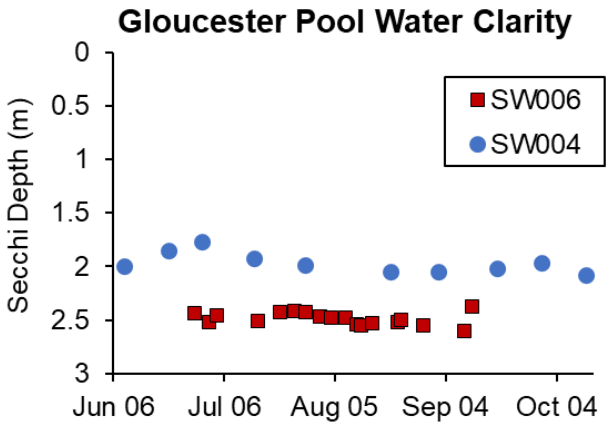
	Water Temp (°C)	Secchi Depth (m)	Air Temp (°C)
Min	10.0	1.8	11.0
Avg	23.8	2.3	23.4
Max	29.0	2.6	30.0

Plants and Animals:

- Bass, Blue Heron, Common Loon, Mink, Caspian Tern, River Otter, Muskrat, Cormorant
- SAR – Northern Map Turtle
- IS –Eurasian Watermilfoil, Spongy moth caterpillars & adults

Other Observations:

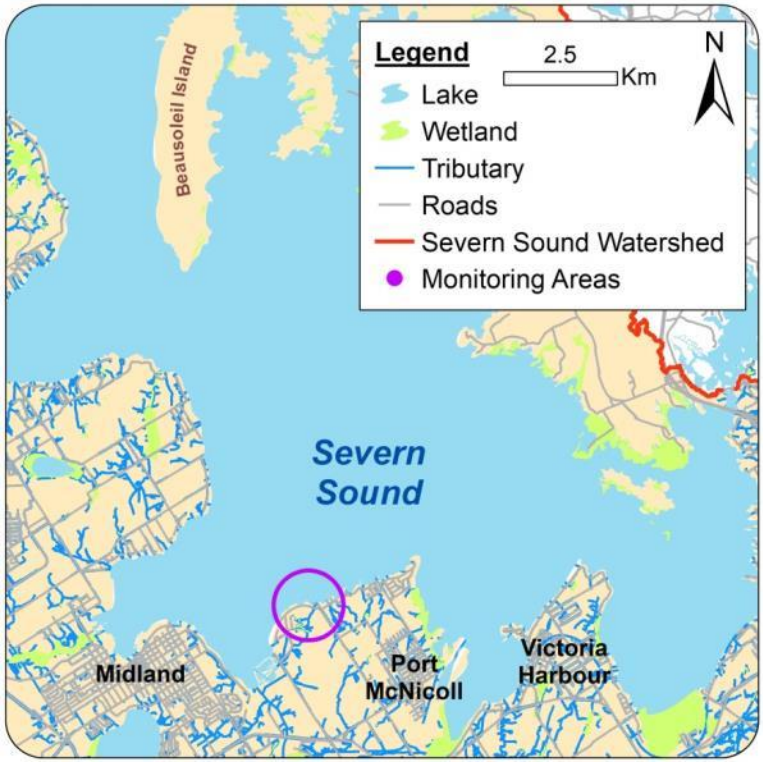
- Algae – brown and green algae present on rocks by the shore
- Water Colour/Debris – water varies from light green to brown, some pollen noticed
- Human Impact – none reported



Severn Sound and Georgian Bay

Open Severn Sound

Severn Sound is a collection of bays in the Southeastern portion of Georgian Bay. It receives inflows from seven major tributaries. Monitoring was done along the Tay Township shoreline just east of Midland Bay.



Number of Sites: 1

Number of Observations: 12

Site Depth 1-3 m (Avg 1.2 m)

Summary: Jun 8 – Oct 24

	Water Temp (°C)	Cond (µS/cm)	pH
Min	14.0	191	8.5
Avg	22.7	222	9.0
Max	27.1	250	9.6

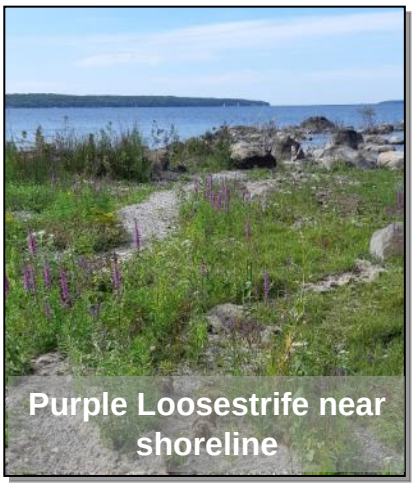
	Air Temp (°C)
Min	11.0
Avg	23.0
Max	29.0

Plants and Animals:

- Painted Turtles, Mallard, Mergansers
- SAR – nothing reported
- IS – Purple Loosestrife

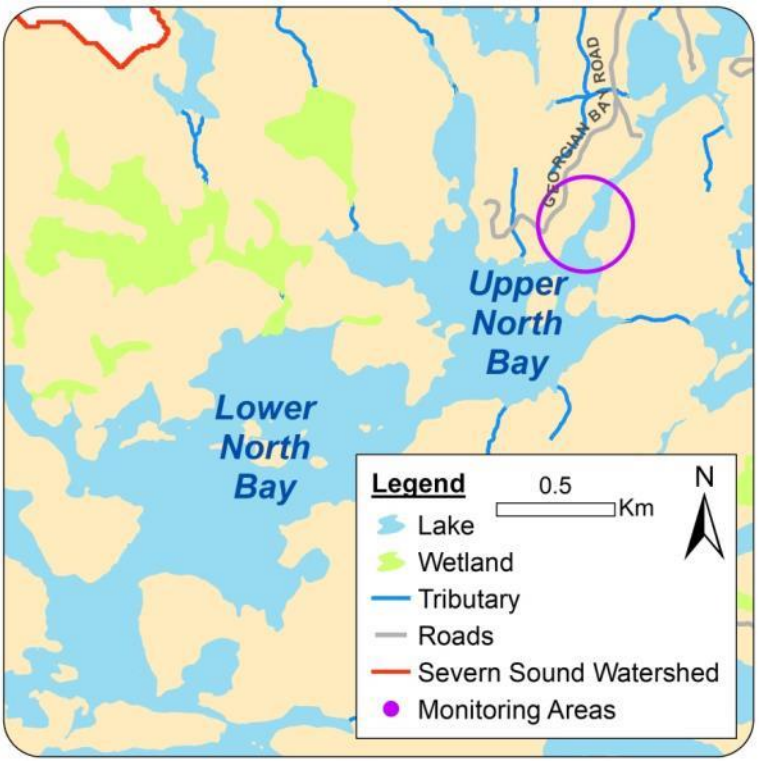
Other Observations:

- Water Colour/Debris – ranged from green to light green, some pollen and duckweed at shore
- Algae – filamentous algae on rocks, suspended green algae, small algae blooms
- Water Level Impacts – heavy storm runoff, erosion, and crumbled asphalt at waterfront
- Restoration Needed – shore erosion at Midland Bay Woods Park, needs shoreline stabilization


Purple Loosestrife near shoreline

NORTH BAY

Upper and Lower North Bay is located in the northern portion of Honey Harbour in Georgian Bay Township. Its waters are considered tributary to Severn Sound.



Number of Sites: 1

Number of Observations: 9

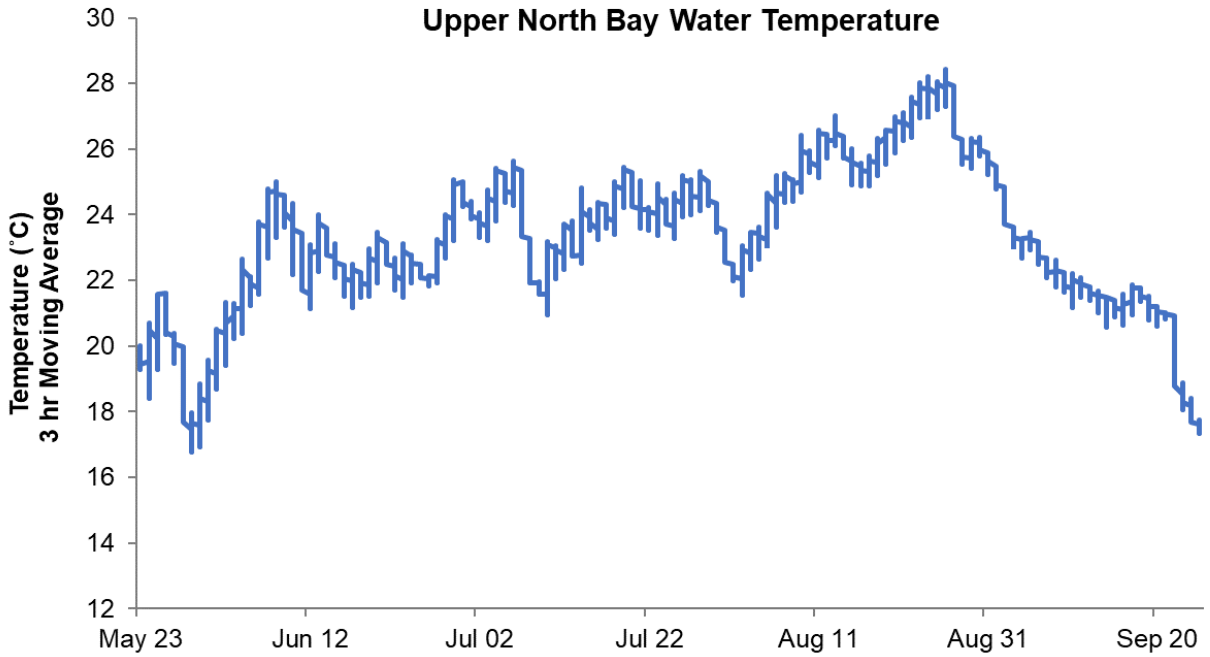
Site Depth: 2.2 m – 2.7 m (Avg 2.4 m)

Summary: Jun 5 - Oct 2

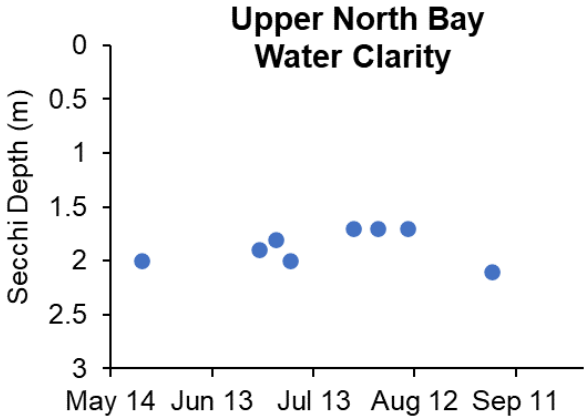
	Water Temp (°C)	Cond (µS/cm)	pH
Min	18.5	154	4.2
Avg	23.3	194	7.3
Max	26.0	270	9.2

	Air Temp (°C)	Secchi Depth (m)
Min	18.0	1.7
Avg	23.6	1.9
Max	28.3	2.1

Water Temperature (logger):

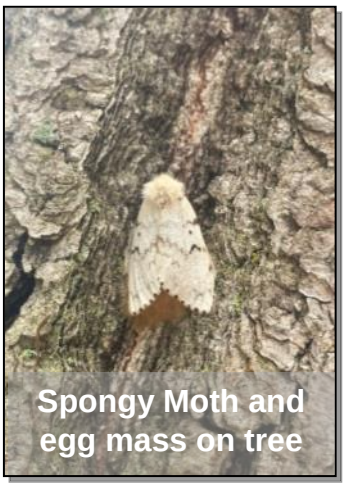


Temperature Logger Stats: May 23rd – October 18th, 2021	
Overall Minimum	16.73
Overall Average	23.14
Overall Maximum	28.79
Minimum Daily Range	0.29
Average Daily Range	1.44
Maximum Daily Range	4.21
May 17th - May 31st Average	19.14
Jun Average	22.39
Jul Average	23.79
Aug Average	25.51
Sept 1st - Sept 25th Average	21.58



Plants and Animals:

- Caterpillars, Dragonflies, Spiders, Turkey Vulture, Garter Snakes, Salamander, Terns, Blue Heron, Fishing Spider, Water Snakes, Bull Frogs & Leopard Frogs
- IS – Spongy Moth caterpillars and adults
- SAR – Massasauga Rattle Snake


Spongy Moth and egg mass on tree

Other Observations:

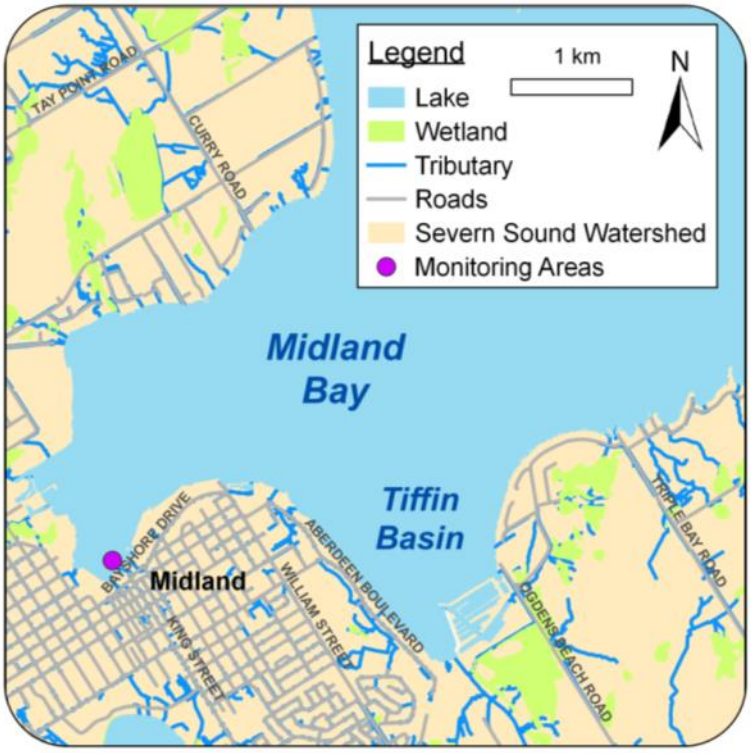
- Water Colour/Debris – brown
- Algae – not reported
- Human Impact – garbage on shore


Northern Water Snake


Aquatic plant sample from rake toss

MIDLAND BAY

Midland Bay is in the southern portion of Severn Sound, and receives flows from Vindin Creek and the Wye River. Midland Bay is bordered by Midland, Penetanguishene and Tay Township.



Number of Sites: 1

Number of Observations: 23

Site Depth: 8 m

Summary: May 30 - Oct 24

	Water Temp (°C)	Cond (µS/cm)	pH
Min	14.6	176	7.3
Avg	20.9	185	7.9
Max	25.5	208	8.4

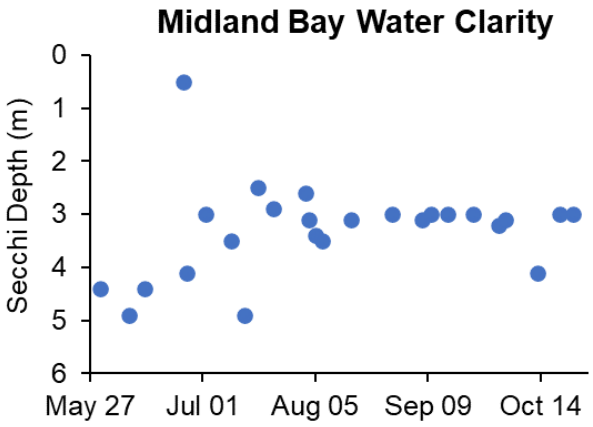
	Air Temp (°C)	Secchi Depth (m)
Min	12.0	0.5
Avg	22.8	3.3
Max	30.0	4.9

Plants and Animals:

- Geese, Seagulls, Mallards
- SAR – nothing reported
- IS – Eurasian Watermilfoil

Other Observations:

- Water Colour – ranging from clear to greyish to green and yellow tinge
- Algae – attached algae on edge of pier, small specks in water, algae specks and clumps in water column especially on surface



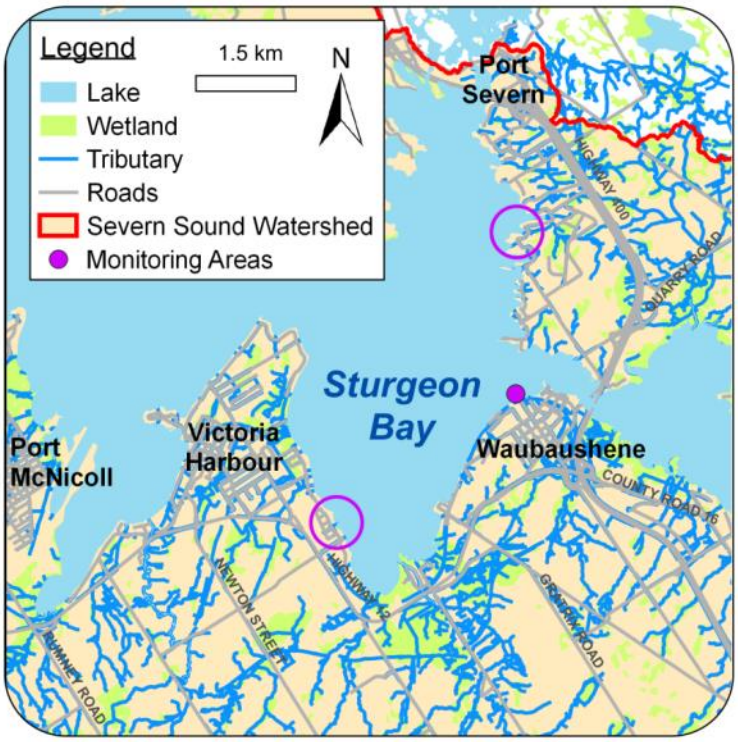
- Other Water Observations – Fishy smell, some foam on surface, plant debris and mayfly casings on surface
- Native plants observed, including Flat-stem Pondweed, Narrow-leafed Pondweed, Pondweed sp., Northern Watermilfoil, *Najas flexilis*, Tapegrass, Canada Waterweed, and Coontail
- Human Impact – CSS Frontenac offloading grain at elevators, oil-gas slick off of pier

Eurasian Watermilfoil growth near shoreline

Blue-Green algae growth on water surface at town docks

STURGEON BAY

Sturgeon Bay is a plant-dominated shallow bay in the east end of Severn Sound in Tay Township. It receives flows from the Sturgeon River and is also influenced by flows from Matchedash Bay and the Severn River.



Number of Sites: 3

Number of Observations: 39

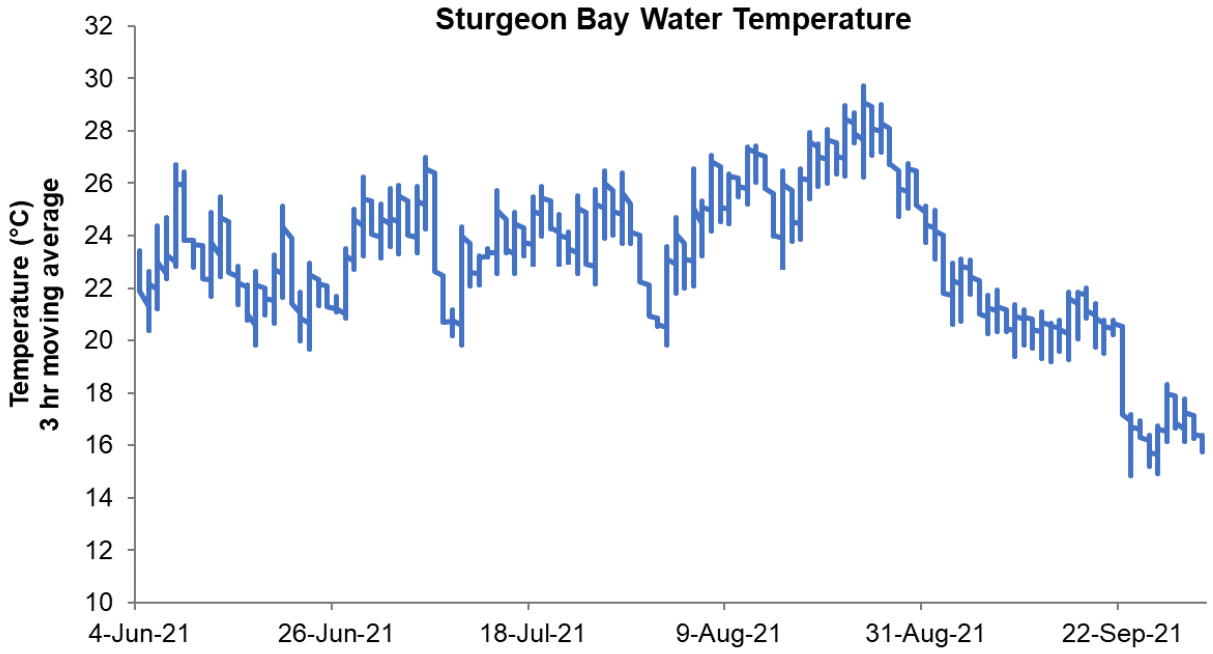
Site Depth: 1.0-5.0 m
(Avg 2.9 m)

Summary: Jun 4 – Oct 9

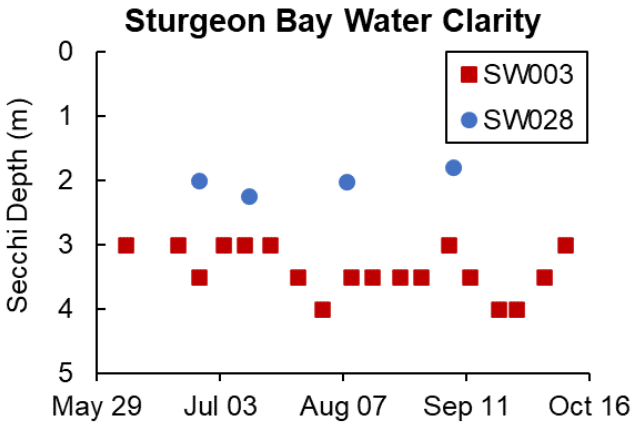
	Water Temp (°C)	Cond (µS/cm)	pH
Min	16.5	166	7.4
Avg	22.3	247	8.3
Max	28.0	333	9.2

	Air Temp (°C)	Secchi Depth (m)
Min	16.4	1.0
Avg	22.8	2.8
Max	30.0	5.0

Water Temperature (logger):



Temperature Logger Stats: June 4th – October 1st, 2021	
Overall Minimum	14.55
Overall Average	22.92
Overall Maximum	29.87
Minimum Daily Range	0.40
Average Daily Range	2.08
Maximum Daily Range	4.86
Jun 4th - Jun 30th Average	22.67
Jul Average	23.70
Aug Average	25.50
Sept 1st - Oct 1st Average	19.70

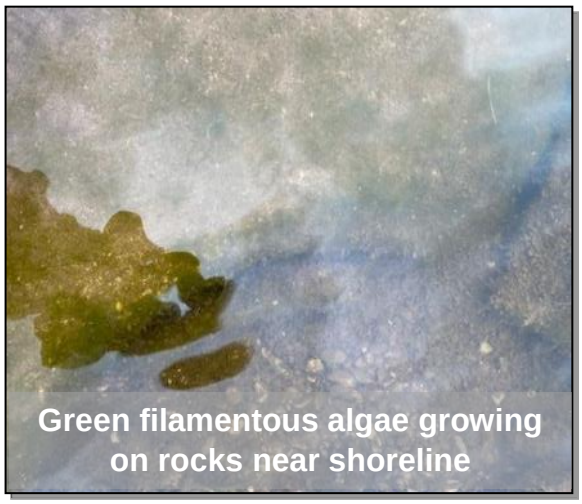


Plants and Animals:

- Loons, Geese, Ducks, Turtles, Trumpeter Swans, Common Egrets, Beaver, fish jumping, Minks, Caspian Tern, Great Blue Heron, Kingfisher, Cormorants, Largemouth Bass, Rock Bass, Gulls, Muskrat, Turkey Vultures, Woodpecker, Mayflies
- IS – Spongy Moth caterpillars and adults, Zebra Mussels, Phragmites
- SAR – none reported

Other Observations:

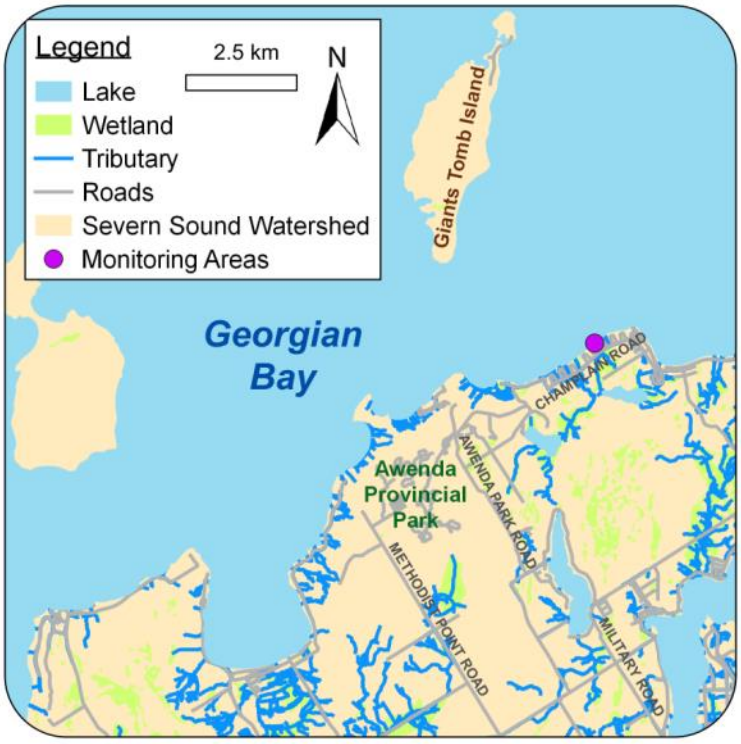
- Water Colour – clear, blue, greenish brown, brown
- Algae Observations – a lot of algae growing near shoreline and on rocks, green “furry” algae onshore
- Other Water Observations – lots of aquatic plants sometimes growing to surface, pollen on surface, plants and woody debris washed up on shoreline
- Water Level Impacts – Canada Geese nesting sites flooded
- Human Disturbances – Shoreline work, Increased boat traffic, larger than normal boats onsite
- Restoration Needed – invasive species control (Phragmites removal)



Green filamentous algae growing on rocks near shoreline

OPEN GEORGIAN BAY

The open waters of Georgian Bay lie to the northwest of Severn Sound. The monitoring site is located along the northern shoreline of Tiny Township in Sawlog Bay.



Number of Sites: 1

Number of Observations: 20

Summary: Jun 4 – Oct 9

	Water Temp (°C)	Cond (µS/cm)	pH
Min	14.5	181	7.5
Avg	20.6	189	8.5
Max	24.5	200	8.7

	Air Temp (°C)
Min	6.5
Avg	20.7
Max	28.5

Plants and Animals:

- Mergansers, Gulls, Birds, Mallard, Cormorant, Plover
- SAR – nothing reported
- IS – nothing reported

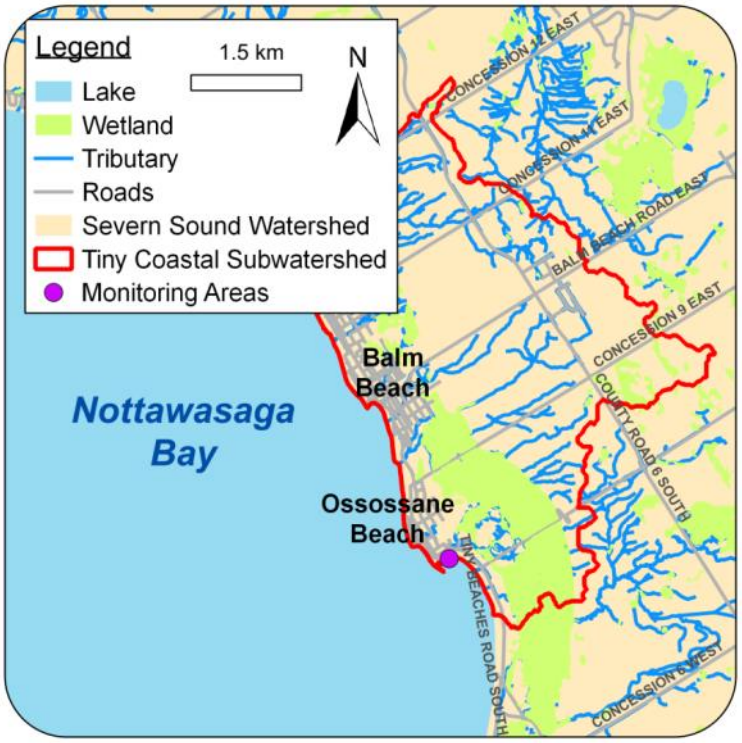
Other Observations:

- Water Colour/Debris – ranged from varying shades of grey, blue, brown, green
- Human Disturbances – vehicle tracks on shore
- Water Level Impacts – erosion damage from major storm in September

View of shoreline at Sawlog Bay

NOTTAWASAGA BAY

The open waters of Nottawasaga Bay lie to the west of Tiny Township. The monitoring site is located along the shoreline near Jackson Beach.



Number of Sites: 1

Number of Observations: 10

Summary: May 3 - Oct 11

	Water Temp (°C)	Cond (µS/cm)	pH
Min	18.0	206	6.9
Avg	21.3	216	8.2
Max	25.3	223	8.5

	Air Temp (°C)
Min	21.3
Avg	23.8
Max	27.0

Plants and Animals:

- Geese
- SAR – nothing reported
- IS – nothing reported

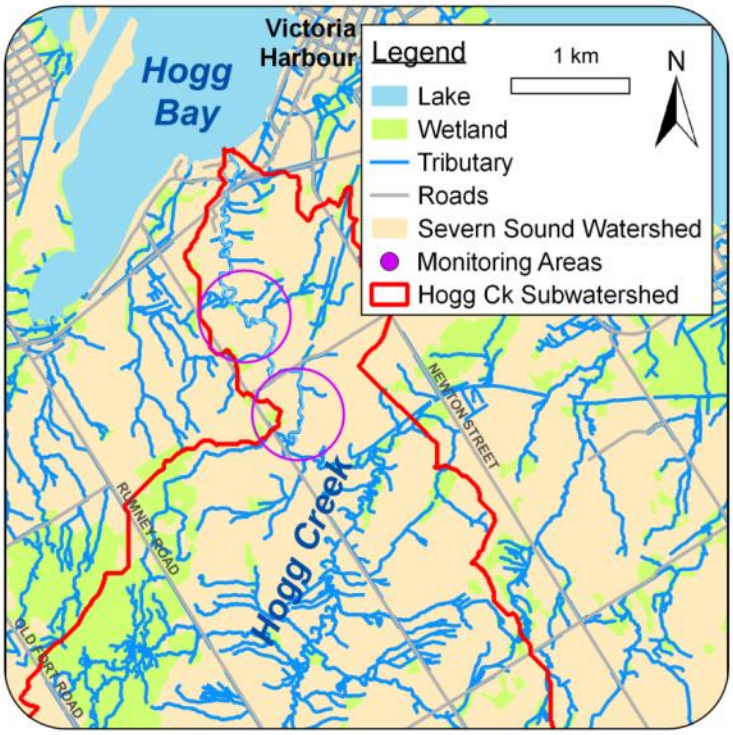
Other Observations:

- Water Colour/Debris – clear
- Other Water Observations – leaf debris and dead moths onshore, pollen and feathers in water
- Human Disturbances – shoreline retention work done and machines at shore during week placing rocks on neighbouring property

Tributaries

HOGG CREEK

Hogg Creek runs through Springwater, Oro-Medonte and Tay Townships, and discharges into Hogg Bay. Monitoring sites are located in the lower section of the creek.



Number of Sites: 2

Number of Observations: 18

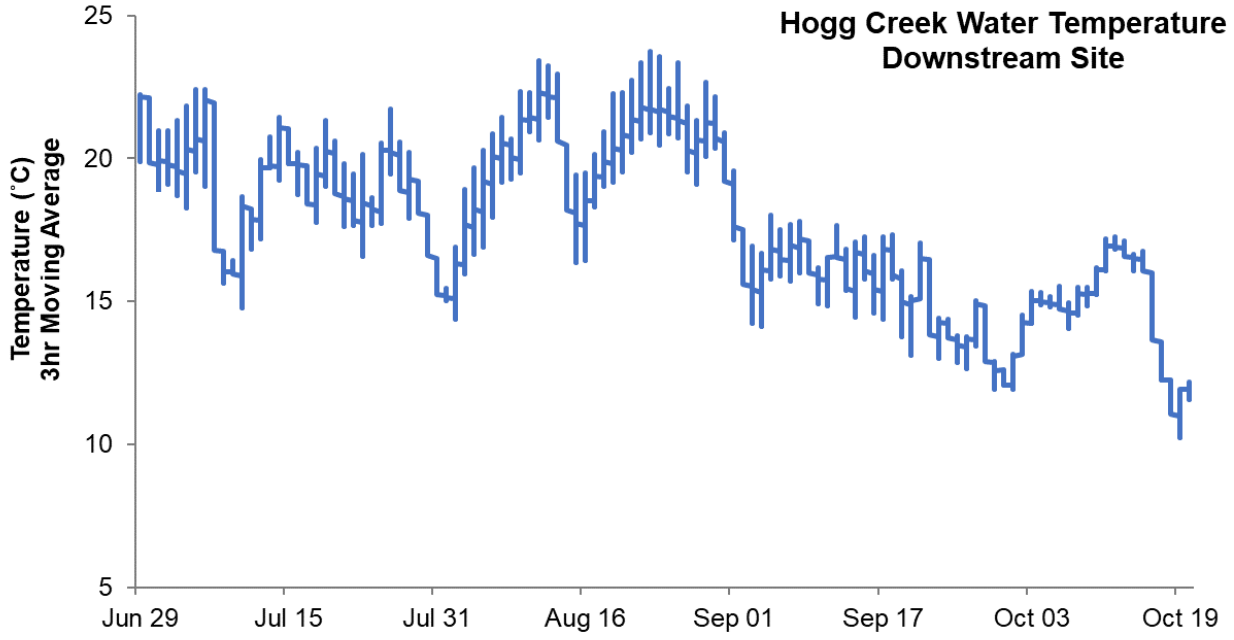
Stream Depth: 20-93 cm
(Avg 43 cm)

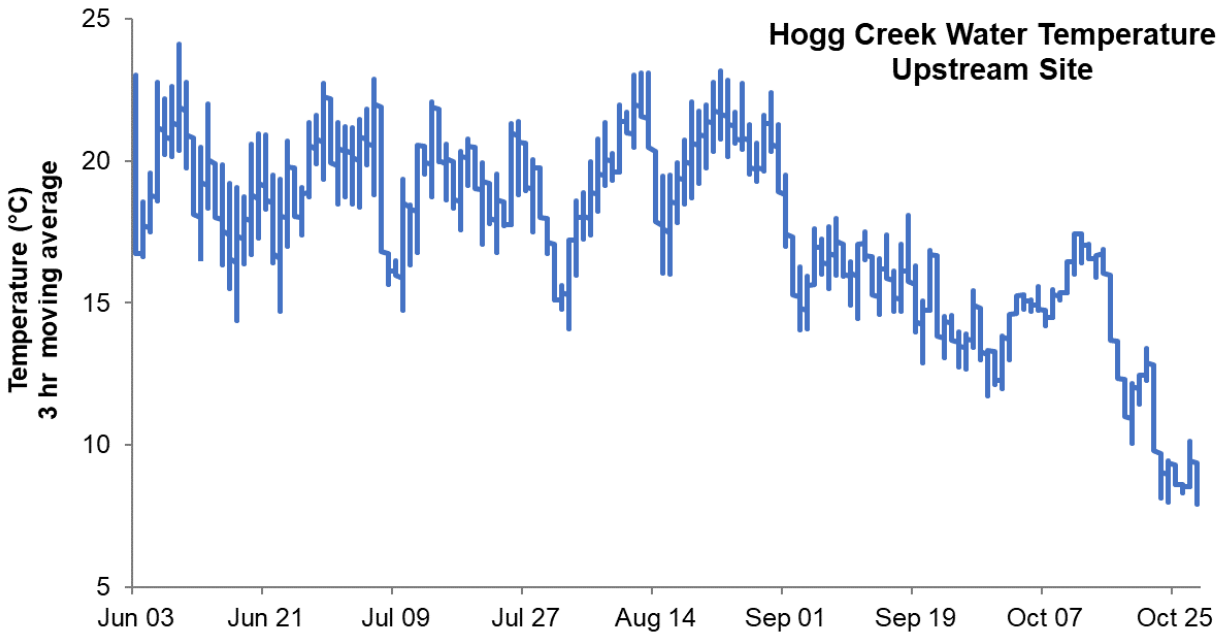
Stream Velocity: 0.23-1.47 m/s
(Avg 0.61 m/s)

Summary: Jun 3 - Oct 28

	Air Temp (°C)	Water Temp (°C)	pH
Min	8.0	7.0	8.3
Avg	20.3	17.8	8.4
Max	29.0	22.5	8.5

Water Temperature (logger):

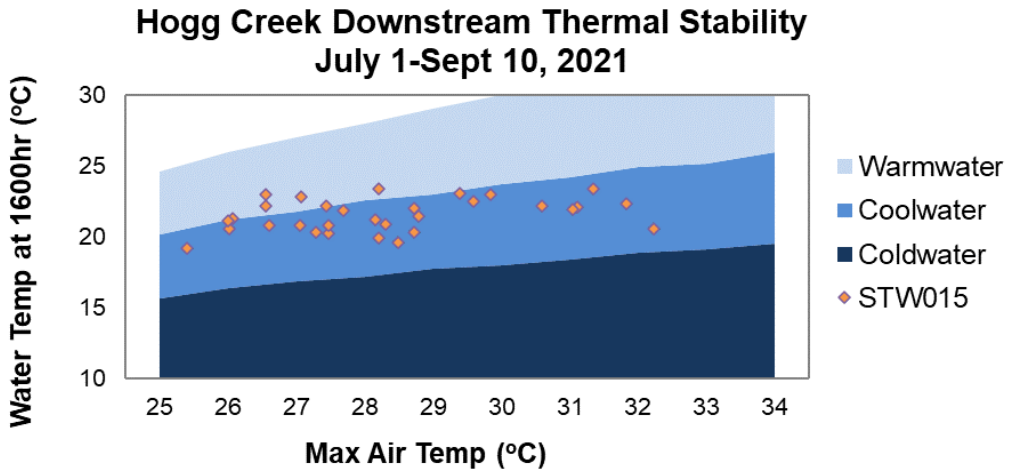


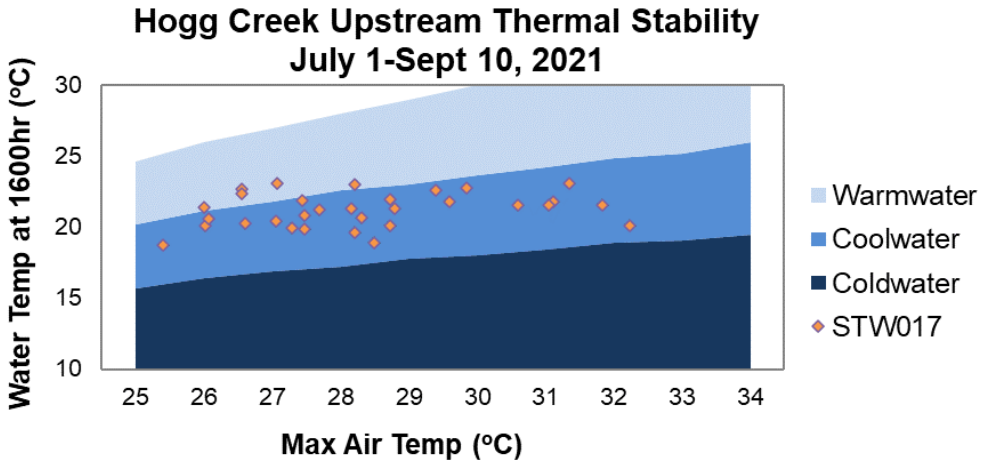


Downstream Site Temperature Logger Stats: June 29th – October 20th, 2021	
Overall Minimum	10.20
Overall Average	17.62
Overall Maximum	23.86
Minimum Daily Range	0.36
Average Daily Range	1.98
Maximum Daily Range	5.22
Jun 29th - Jun 30th Average	21.20
Jul Average	19.00
Aug Average	20.08
Sept Average	15.40
Oct 1st - Oct 20th Average	14.66

Upstream Site Temperature Logger Stats: June 3rd – October 28th, 2021	
Overall Minimum	7.90
Overall Average	17.40
Overall Maximum	27.78
Minimum Daily Range	0.22
Average Daily Range	2.26
Maximum Daily Range	10.98
Jun 3rd - Jun 30th Average	19.20
Jul Average	18.96
Aug Average	19.85
Sept Average	15.34
Oct Average	13.29

Thermal Stability:



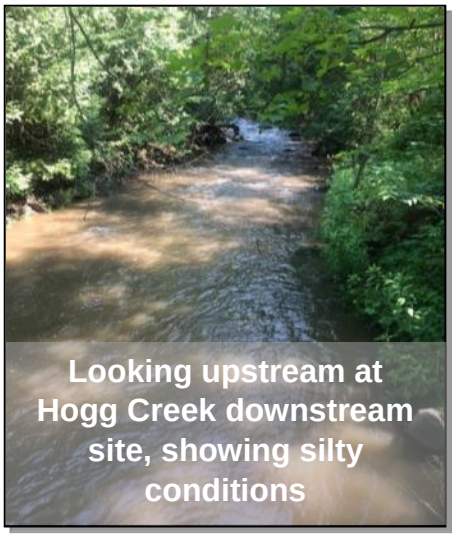


Plants and Animals:

- Chipmunk, Coyote, Beaver, Birds, Kingfisher
- SAR – nothing reported
- IS – Spongy Moth caterpillars and adults

Other Observations:

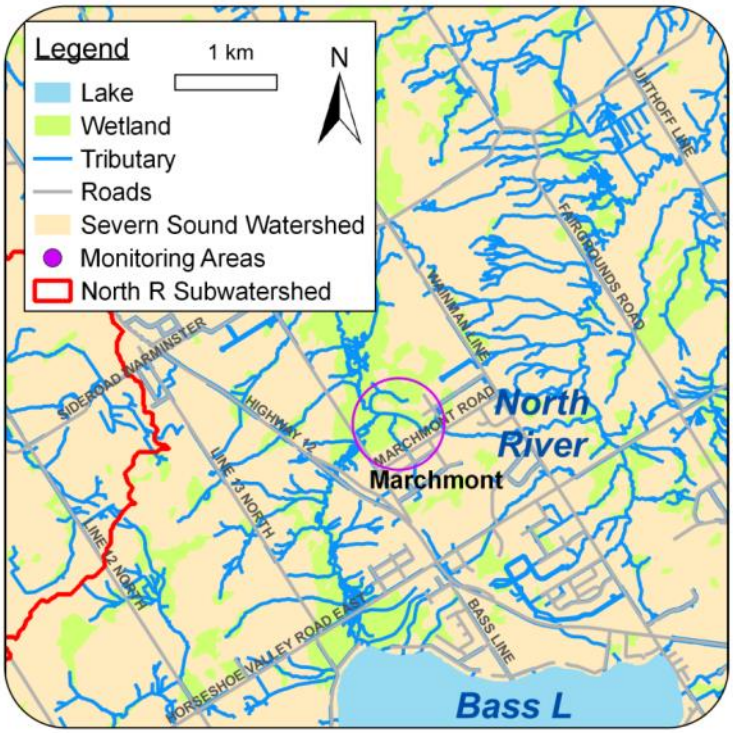
- Water Colour/Debris – ranging from clear to brown



Looking upstream at Hogg Creek downstream site, showing silty conditions

NORTH RIVER

North River runs through Severn Township and discharges into Matchedash Bay and then into Severn Sound. The monitoring site is located near the headwaters where the river exits Bass Lake.



Number of Sites: 1

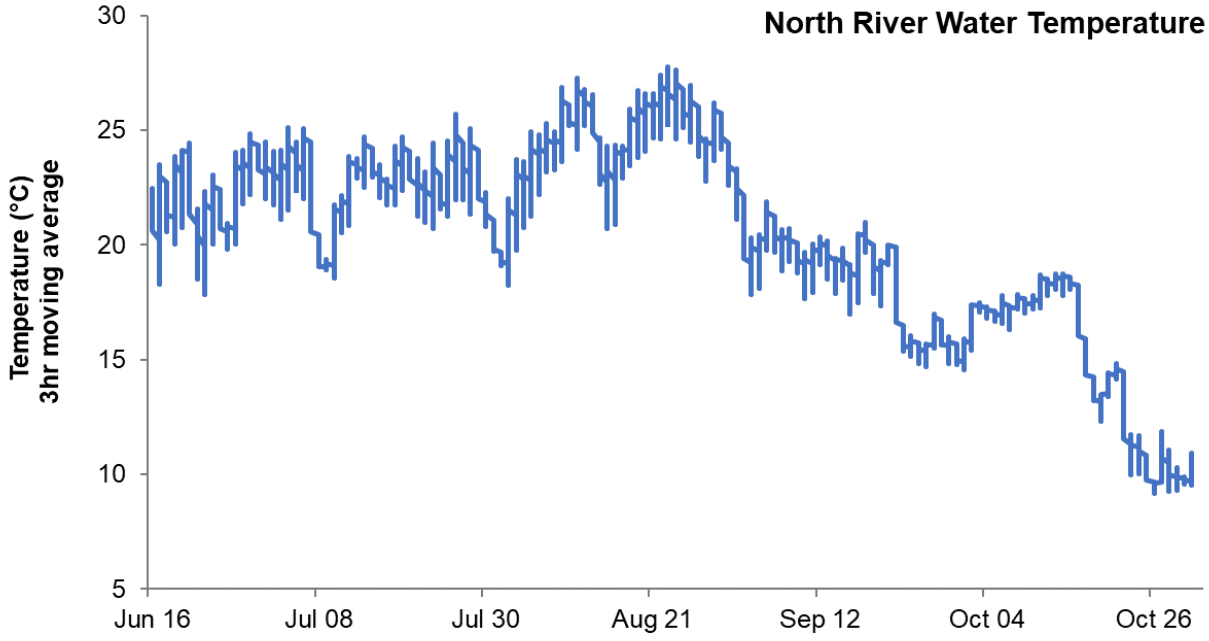
Number of Observations: 4

Stream Depth: 158 cm

Summary: Jul 2 – Jul 10

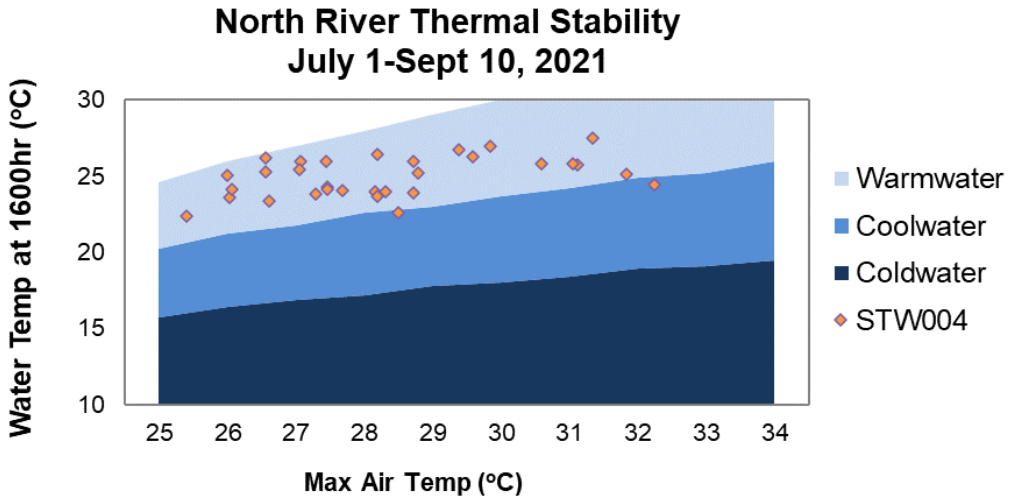
	Air Temp (°C)	Water Temp (°C)
Min	19	22
Avg	22	23
Max	25	26

Water Temperature (logger):



Temperature Logger Stats: June 16th – October 31st, 2021	
Overall Minimum	9.14
Overall Average	20.14
Overall Maximum	27.83
Minimum Daily Range	0.35
Average Daily Range	2.08
Maximum Daily Range	5.32
Jun 16th - Jun 30th Average	21.75
Jul Average	22.42
Aug Average	24.23
Sept Average	18.43
Oct Average	14.61

Thermal Stability:



Plants and Animals:

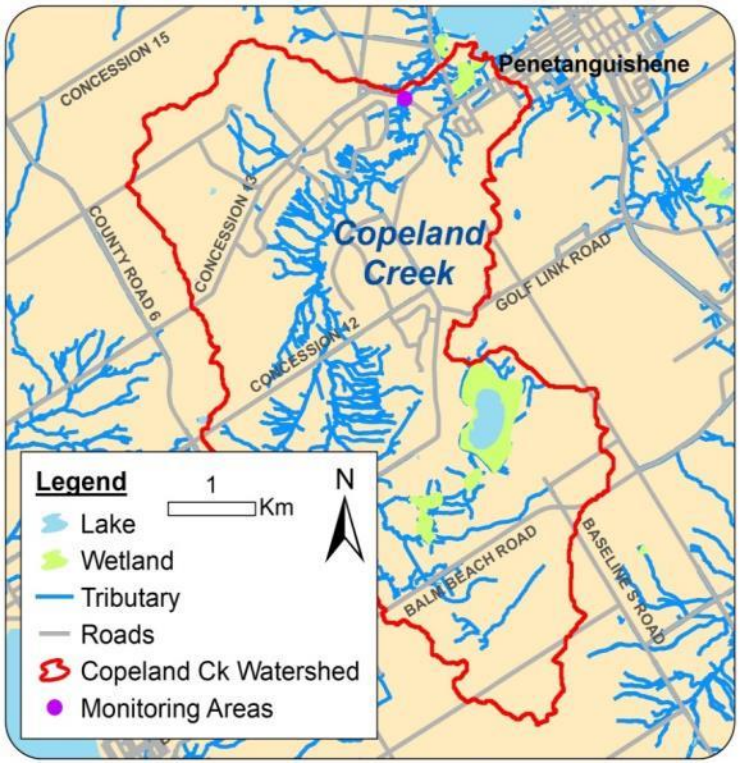
- Catfish, Tadpoles, Ducks, Minnows, Frogs, Painted Turtle, Beaver
- IS – nothing reported
- SAR – nothing reported

Other Observations:

- Water Colour/Debris – dark green to very dark green
- Other Water Observations – pollen on water surface and lily pads
- Algae – lots of algae with more algae near shore

COPELAND CREEK

Copeland Creek runs through Tiny Township and Penetanguishene, and discharges into Penetang Harbour. The monitoring site is located in the lower portion of the creek.



Number of Sites: 1

Number of Observations: 26

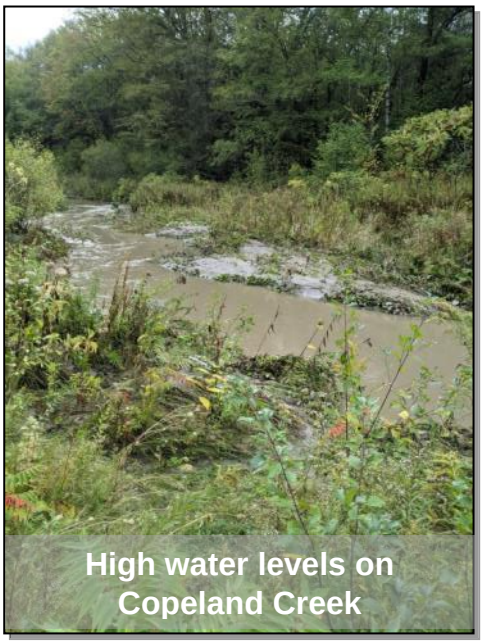
Stream Depth: 9.0-15.5 cm (Avg 11.6 cm)

Stream Velocity: 0.12-0.63 m/s (Avg 0.18 m/s)

Summary: Jun 1 – Oct 24

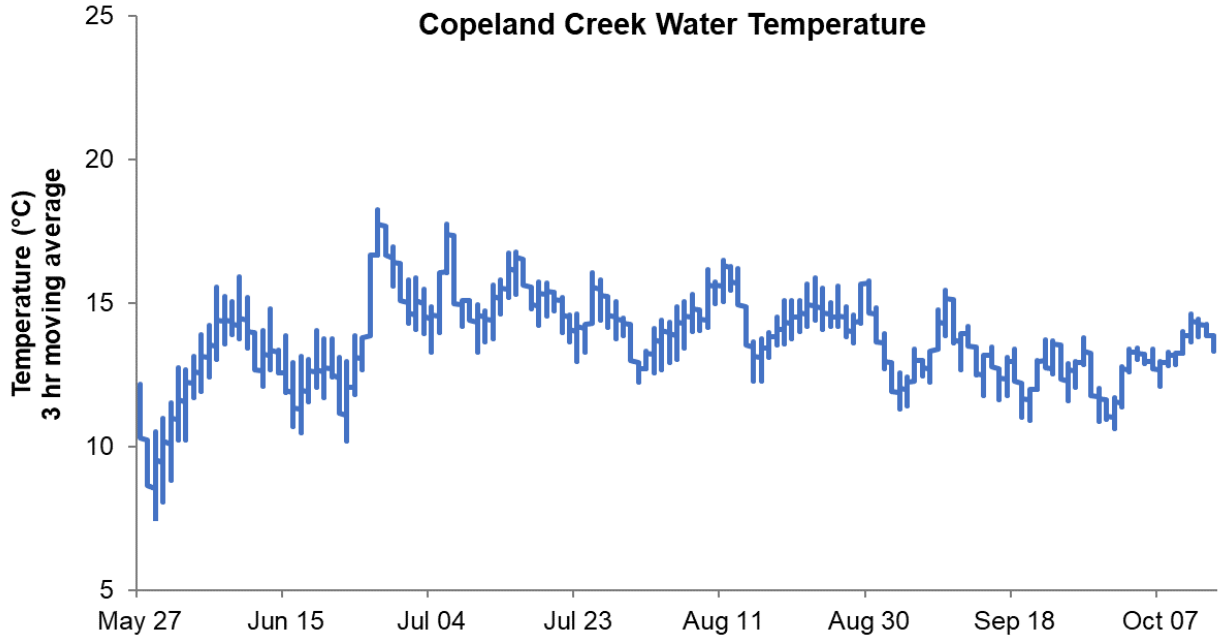
	Water Temp (°C)	Cond (µS/cm)	pH
Min	8.5	181	7.2
Avg	14.9	290	7.9
Max	18.0	312	8.2

	Air Temp (°C)
Min	12.0
Avg	23.1
Max	30.0



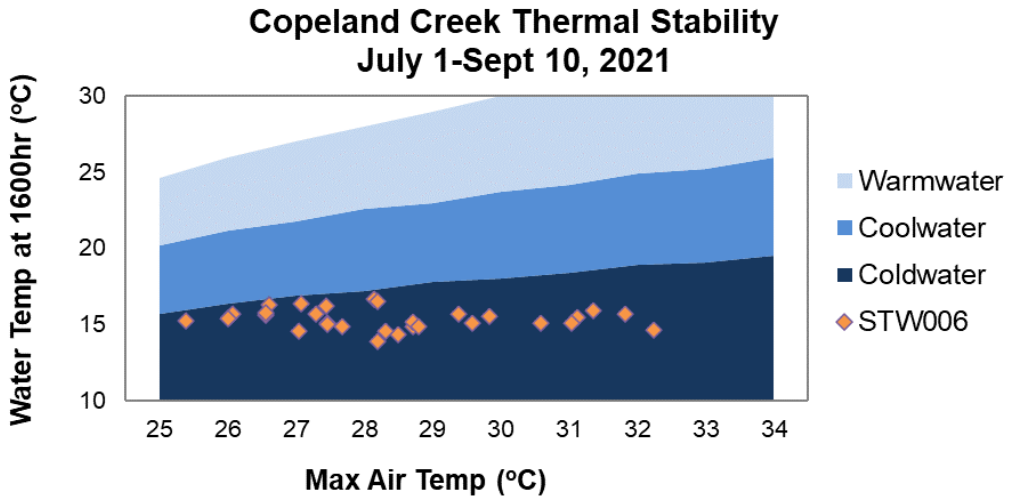
High water levels on Copeland Creek

Water Temperature (logger):



Temperature Logger Stats: May 27th – October 14th , 2021	
Overall Minimum	7.49
Overall Average	13.65
Overall Maximum	18.27
Minimum Daily Range	0.39
Average Daily Range	1.42
Maximum Daily Range	3.17
May 27-May 31	9.74
June Avg	13.44
July Avg	14.80
August Avg	14.39
September Avg	12.74
Oct 1- Oct 14	13.11

Thermal Stability:



Plants and Animals:

- Milkweed, Muskrat, Eastern Tiger Swallowtail, Bee, Snail, Northern Crescent Butterfly, Caddisfly
- SAR – nothing reported
- IS – Spongy Moth caterpillar


Benthic algae in Copeland Creek

Other Observations:

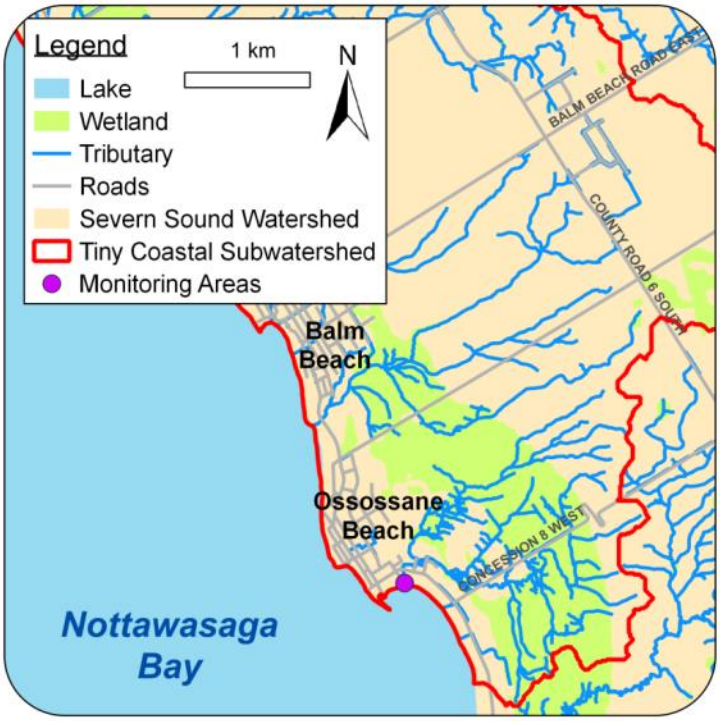
- Water Colour/Debris – clear, brown, turbid
- Other water observations – banks have been flooded, sand-silt deposits 20cm higher than normal water level
- Algae – clumps of attached green algae, benthic algal mats, bleached, green & brown filamentous algae (likely *Mougotia*)


Spongy Moth caterpillar


Northern Crescent on Milkweed

UNNAMED CREEK, TINY TWP

The unnamed creek is located in western Tiny Township, and discharges into Nottawasaga Bay at Jackson Beach. The monitoring site is located in the lower portion of the creek just before it discharges into the Bay.



Number of Sites: 1

Number of Observations: 12

Stream Depth: 14-34.5 cm (Avg 23.0 cm)

Stream Velocity: 0.10-1.31 m/s (Avg 0.20 m/s)

Summary: Jun 5 – Oct 2

	Water Temp (°C)	Cond (µS/cm)	pH
Min	13.2	434	7.9
Avg	15.4	497	8.2
Max	17.1	751	8.5

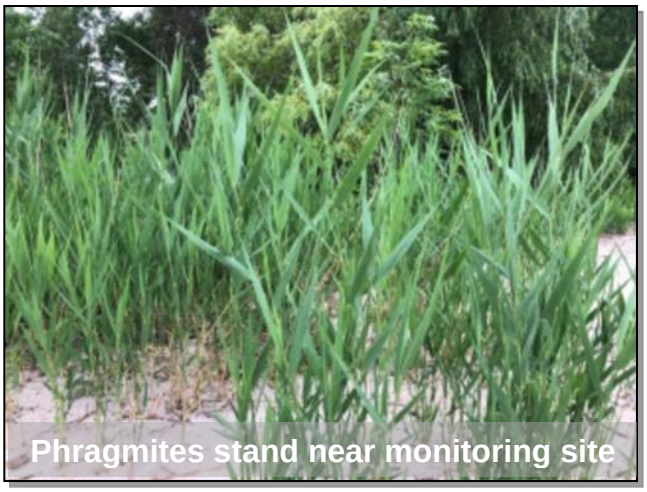
	Air Temp (°C)
Min	21.3
Avg	24.3
Max	28.2

Plants and Animals:

- Minnows, Geese
- SAR – nothing reported
- IS – Spongy Moth caterpillar and adults, Phragmites

Other Observations:

- Water Colour/Debris – range from clear to brown
- Algae – nothing reported
- Other Water Observations – muck noticed on stream bottom
- Water Level Observations – concerned that sand being added to Jackson Beach will impact depth of stream



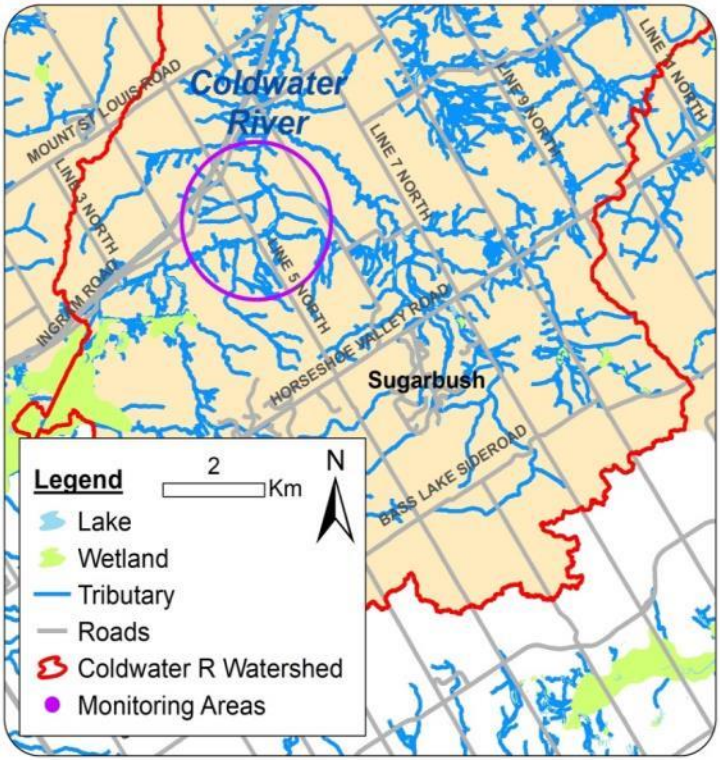
Phragmites stand near monitoring site

- Human Disturbances – dead bird found in stream; several dead fish found on shore north of the mouth of the stream

Unnamed creek monitoring site, looking downstream

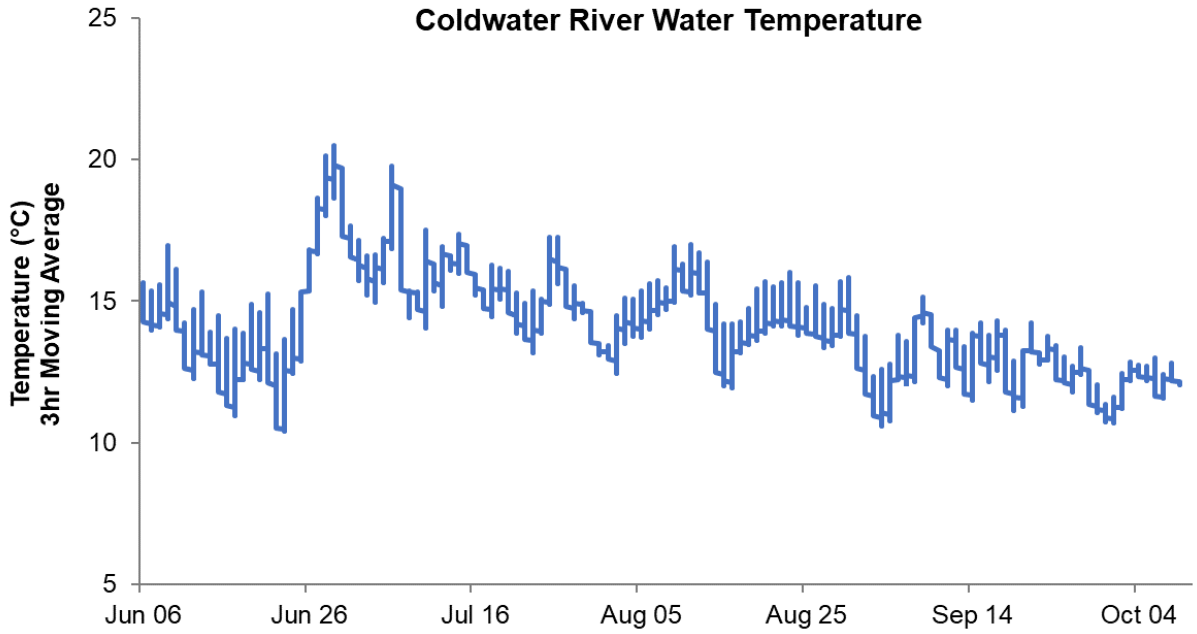
COLDWATER RIVER

The majority of the Coldwater River headwaters are located in Oro-Medonte Township. The river flows north through Severn Township and the village of Coldwater. The river discharges at Matchedash Bay where it meets the North River. The monitoring site is located in the headwater portion of the river, east of Copeland Forest.



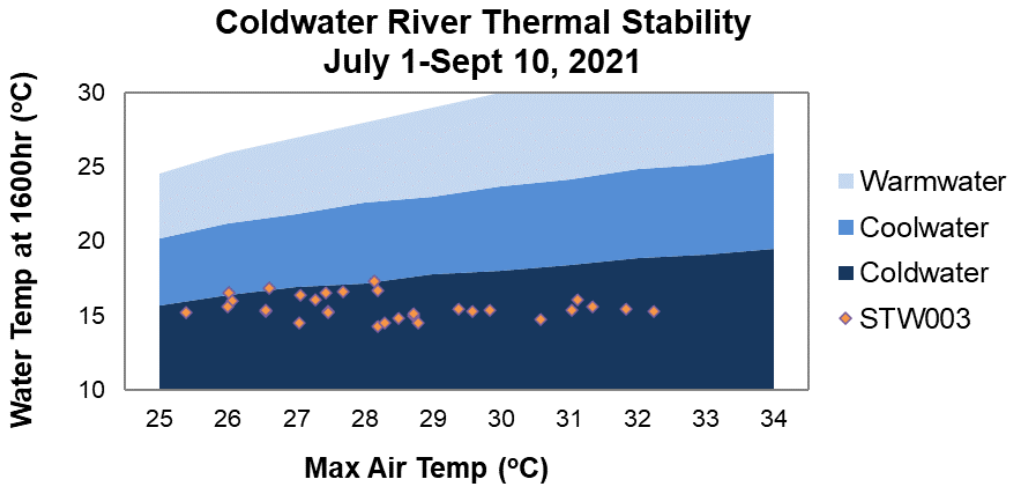
Number of Sites: 1

Water Temperature (logger):



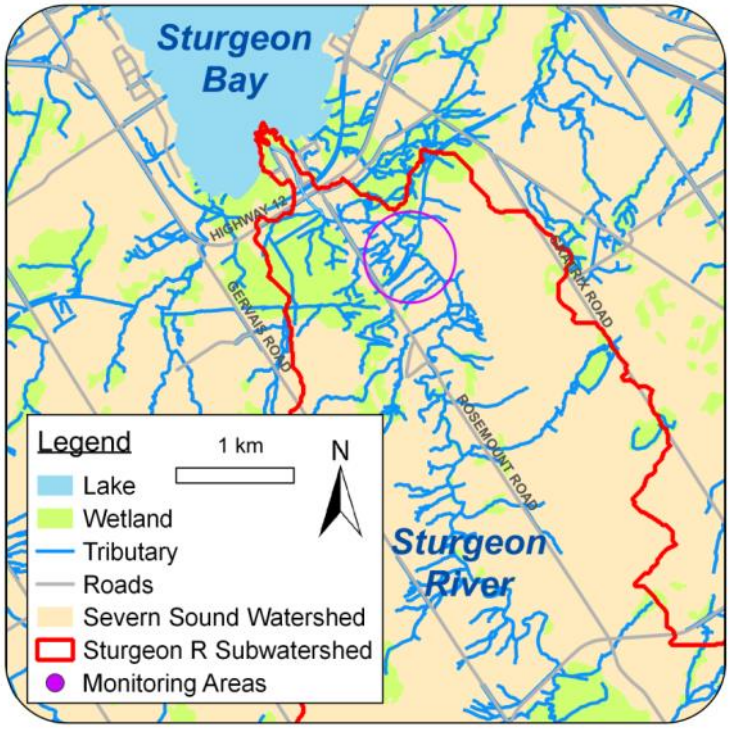
Temperature Logger Stats: June 6th – October 9th	
Overall Minimum	10.39
Overall Average	14.26
Overall Maximum	20.51
Minimum Daily Range	3.81
Average Daily Range	0.19
Maximum Daily Range	1.60
Jun 10th - Jun 30th Average	14.56
Jul Average	15.66
Aug Average	14.56
Sept Average	12.83
Oct Average	12.19

Thermal Stability:



STURGEON RIVER

The Sturgeon River runs through Springwater, Oro-Medonte and Tay Townships, and discharges into Sturgeon Bay. The monitoring site is located in the lower reach of the river.



Number of Sites: 1

Number of Observations: 14

Stream Depth: 25-45 cm
(Avg 33 cm)

Stream Velocity: 0.69-1.74 m/s
(Avg 0.97 m/s)

Summary: Jun 17 – Sept 30

	Air Temp (°C)	Water Temp (°C)
Min	12	11
Avg	24	17
Max	31	20

Plants and Animals:

- Mosquitos, Frog
- SAR & IS – nothing reported

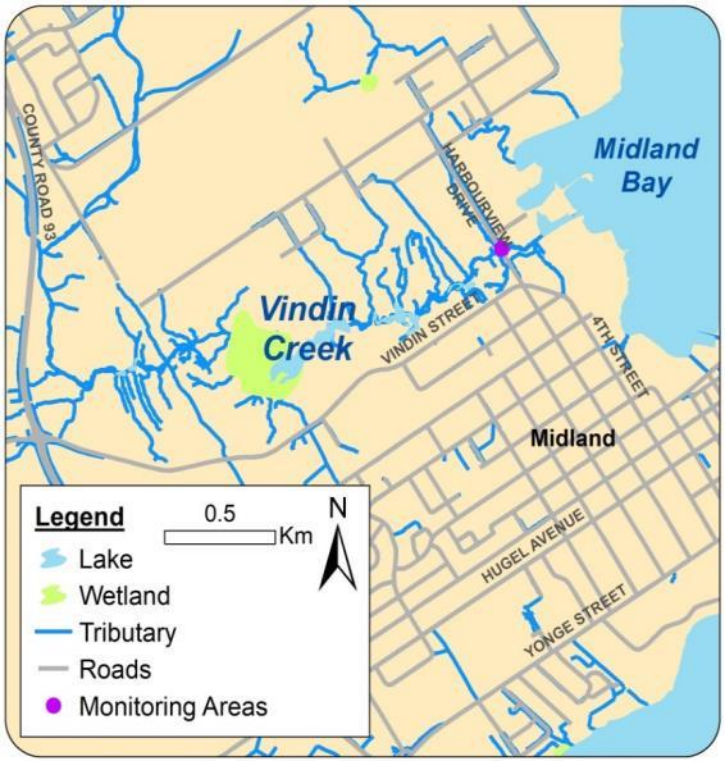
Other Observations:

- Water Colour/Debris – clear, brown, cloudy
- Algae – none observed
- Other Water Observations – stream bed changed due to flow from storm end at the of September
- Human Impact – debris in stream and plants trampled on shore from human traffic

Sturgeon River monitoring site

VINDEN CREEK

Vindin Creek is located in Midland, and discharges into Midland Bay. The monitoring site is located in the lower portion of the creek.



Number of Sites: 1

Number of Observations: 25

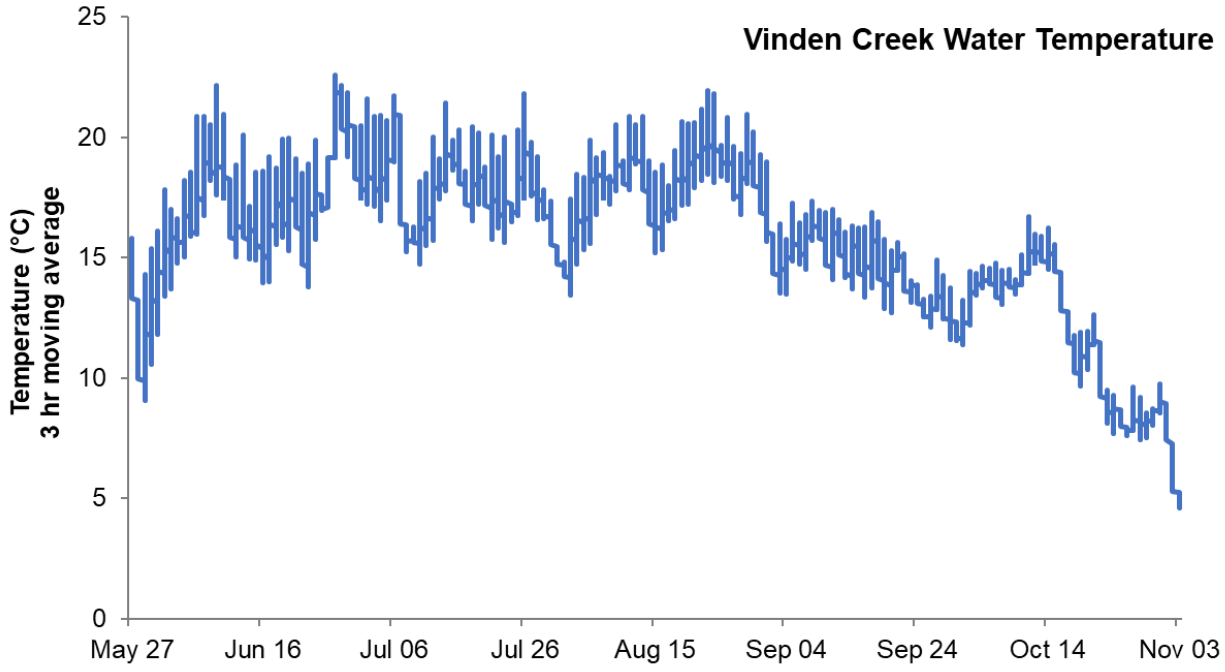
Stream Depth: 16 - 25 cm (Avg 19 cm)

Summary: June1 – Oct 24

	Water Temp (°C)	Cond (µS/cm)	pH
Min	9.1	268.0	7.0
Avg	17.6	462.4	7.8
Max	21.6	492.0	8.3

	Air Temp (°C)
Min	12.0
Avg	23.4
Max	30.0

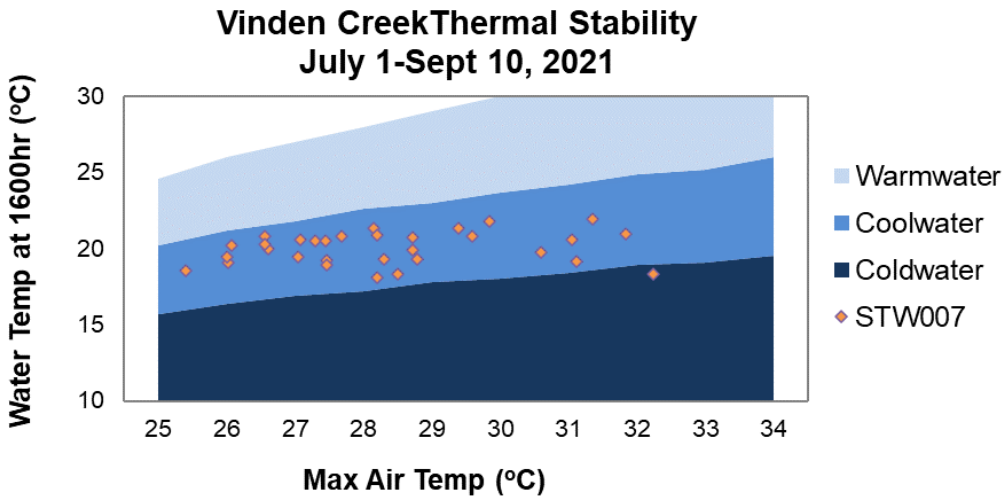
Water Temperature (logger):



Temperature Logger Stats May 27th – November 3rd, 2021	
Overall Minimum	4.58
Overall Average	15.87
Overall Maximum	22.63
Minimum Daily Range	0.43
Average Daily Range	2.56
Maximum Daily Range	5.54
May 27th -May 31st Average	12.75
Jun Average	17.60
Jul Average	17.97
Aug Average	18.22
Sept Average	14.74
Oct Average	11.97
Nov 1st - Nov 3rd Average	6.97

Vindin Creek site looking upstream and show high flows and silty conditions

Thermal Stability:



Plants and Animals:

- Ebony Jewel Wing, Stonefly, Eight- Spotted Forester, Caddisfly
- SAR and IS – nothing reported

Other Observations:

- Water Colour/Debris – clear, green to turbid
- Water Level Impact Observations – low banks flooded in fall, water level 40 cm down from top of culvert
- Human Disturbances – lots of debris in the stream
- Algae – brown and green attached filamentous algae

Data Validation

In any environmental monitoring program, it's important to examine results for data quality, and compare to other data sources if available. Weather related variables collected by volunteers (temperature, rainfall, and wind conditions) can be compared to data collected at Environment and Climate Change Canada (ECCC) weather stations, and to data collected by SSEA. Strong comparisons between datasets give confidence that volunteer data can be considered accurate and representative of conditions in the watershed.

Rainfall

Rainfall was measured using rain gauges by participants at 5 different locations. In one case, the rain gauge location was not the same as the stream site being monitored; however it was close enough to be representative of local precipitation conditions (Midland gauge site used for Vindin Creek). Participants recorded several large rain events greater than 30 mm, the most significant being at the end of September (Figure 2 and Figure 3).

Volunteer data can be compared to rainfall measured at SSEA rain gauges across the watershed (Figure 2 and Figure 3). Volunteer and SSEA data were comparable throughout the monitoring season. Major rain events line up across volunteer and SSEA rain gauges.

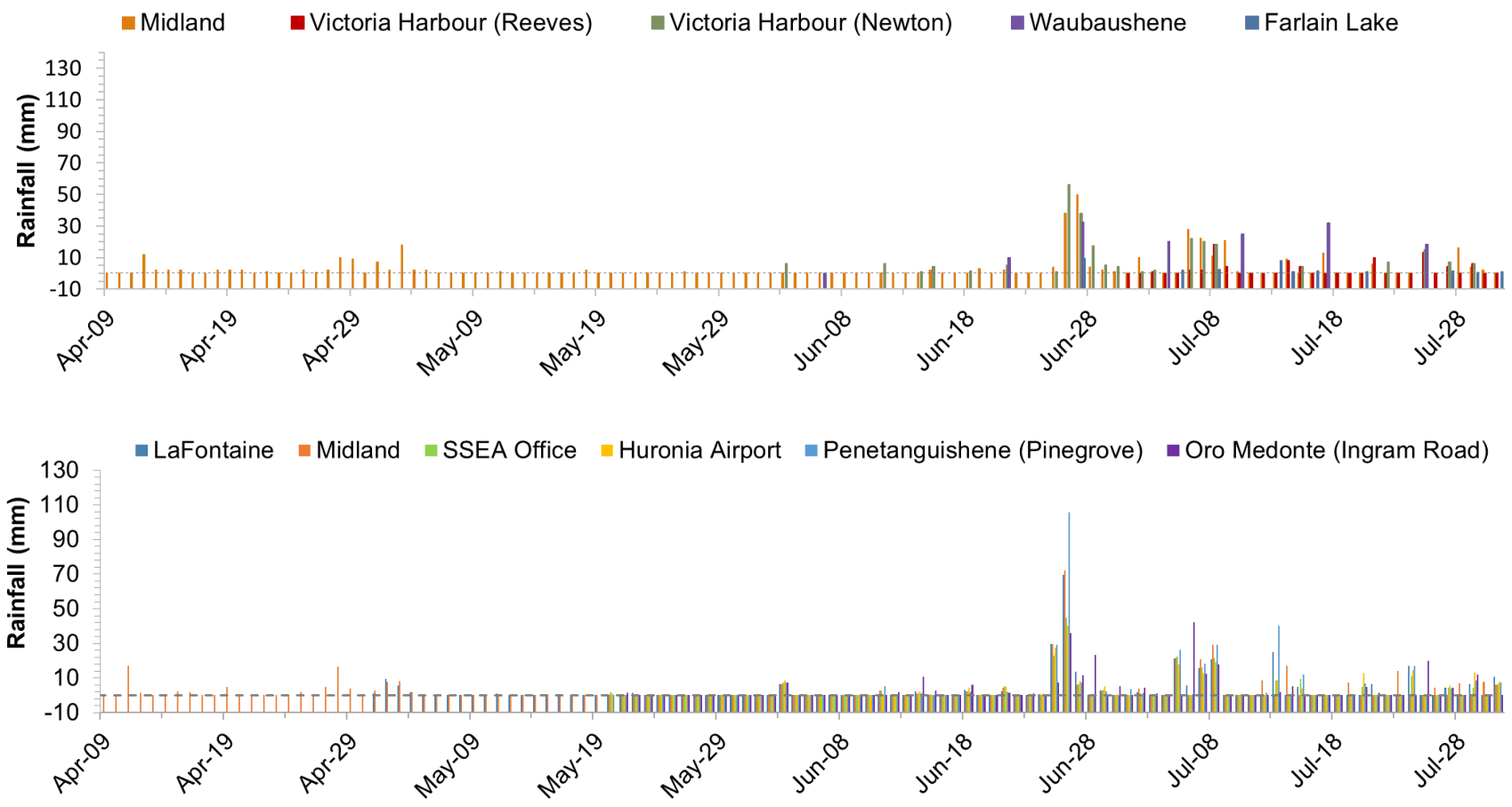


Figure 2. Rainfall (mm) measured from April 9th to July 30th at all volunteer sites (top) and at SSEA rain gauges (bottom).

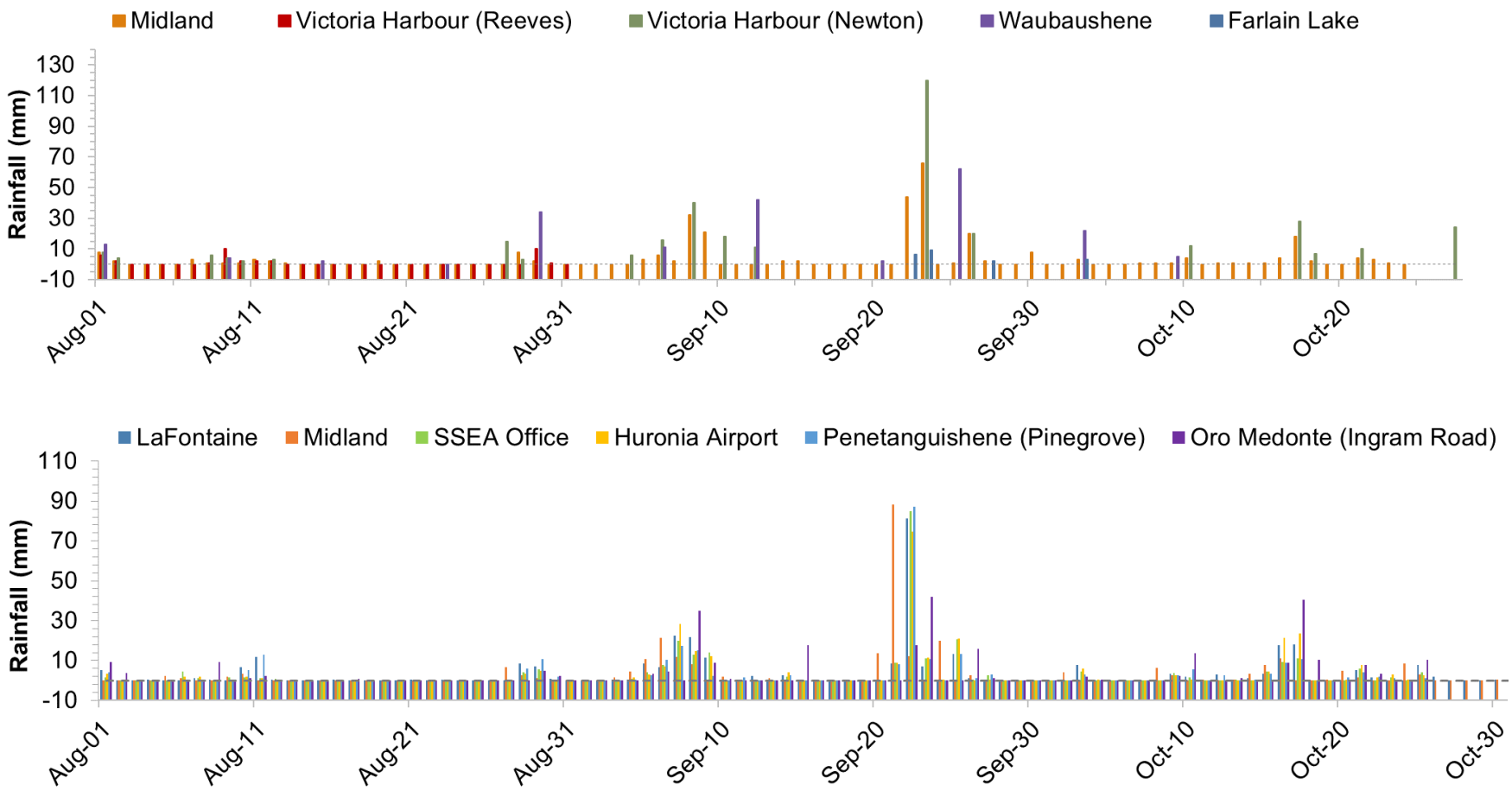


Figure 3. Rainfall (mm) measured from August 1st to October 30th at all volunteer sites (top) and at SSEA rain gauges (bottom).

Air Temperature

As expected, there were some differences in air temperatures measured by volunteers compared to daily maximums from ECCC's Coldwater station, and SSEA's Huronia Airport station (Figure 4). Overall, however, the data compared fairly well as indicated by the correlation coefficient (r^2) and small deviation from a 1:1 line (Figure 5). This means that volunteer observations are relatively reliable. Factors causing differences include site conditions where air temperature was measured (sheltered vs exposed location, sun vs shade), proximity to a large water body, and time of day the measurement was taken.

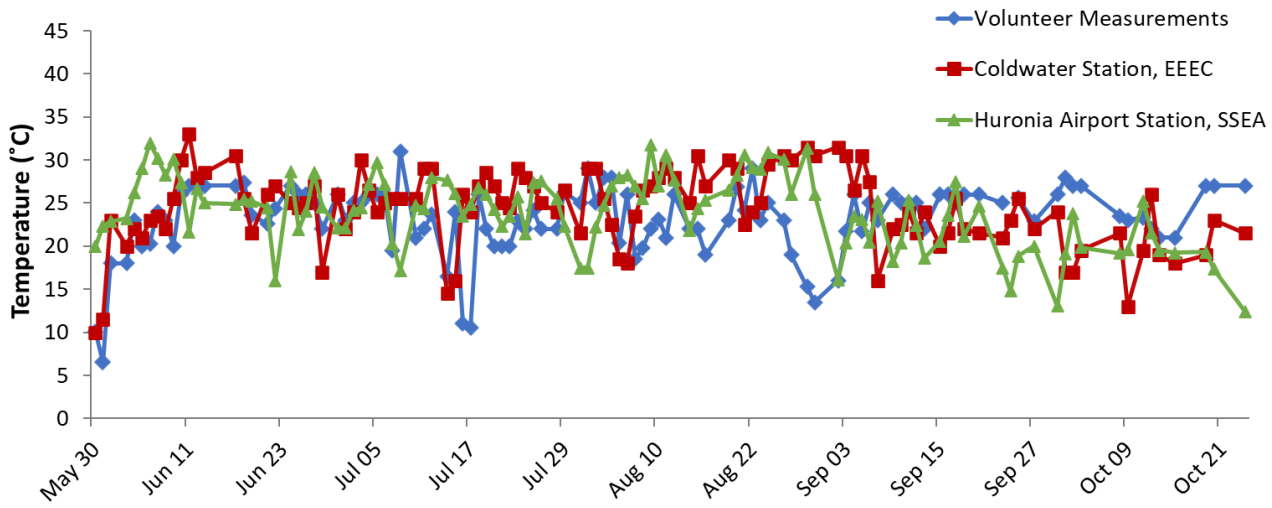


Figure 4. Comparison of air temperature from volunteers versus maximum daily temperatures from ECCC Coldwater and SSEA Huronia Airport stations.

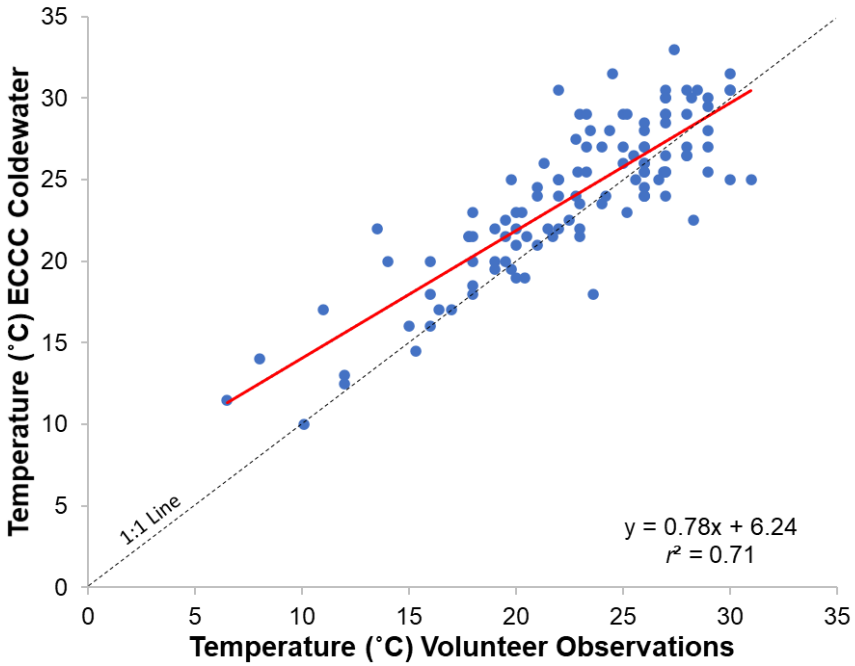


Figure 5. Air temperature measured by volunteers versus maximum daily air temperature at ECCC Coldwater Station. A 1:1 line (black dashed) and regression line (blue solid) are also shown, along with the regression equation.

Water Temperature

Comparisons were made between temperature logger data and data from Hanna meters or pool thermometers for five participants that had both loggers and meters and thermometers. The data correlated very closely with the exception of a few outliers, indicating that the Hanna meters provided reliable temperature data (Figure 6).

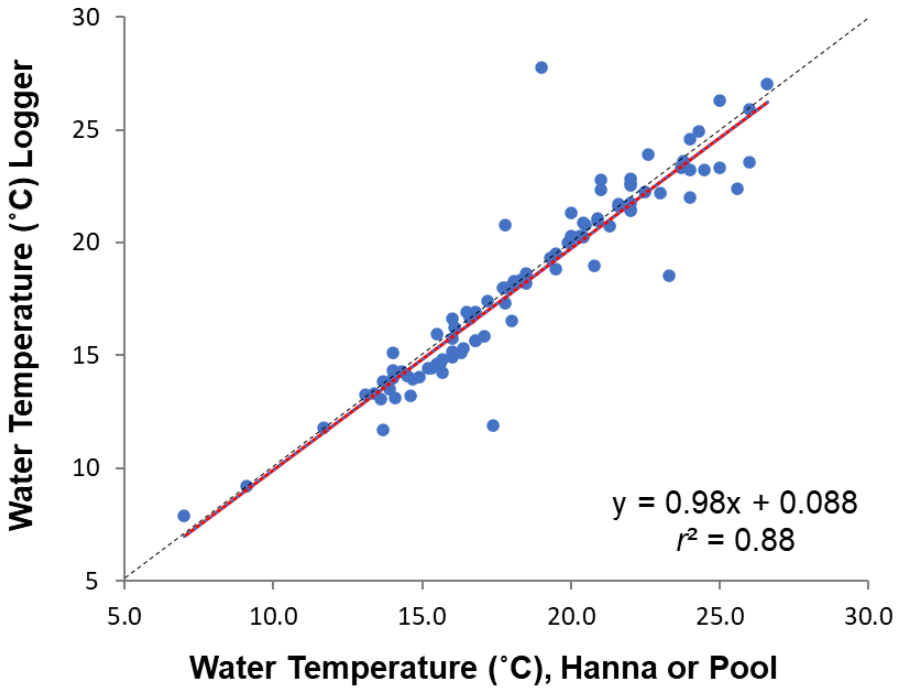


Figure 6. Temperature measured using a Hanna meter or pool thermometer versus using a temperature logger.

Wind

Wind data is very difficult to validate since it varies so much from place to place, and reliable sources of wind data are relatively far from the Severn Sound area. Depending on the location, volunteer data was compared to hourly wind data from one of three ECCC weather stations: Lake Simcoe Airport, Western Islands, and Muskoka Airport. The Western Islands weather station was missing wind data from dates in mid-summer so volunteer data could not be compared to ECCC data on those dates. Volunteers used the Beaufort Wind Scale, which uses observations of waves and movement of trees and loose objects to estimate wind speed, along with a weathervane and compass to estimate wind direction. This method introduces additional variability, as does the location of measurement (sheltered vs exposed) and whether winds were gusty or steady. Comparisons show that volunteers tended to underestimate wind speeds, and that wind direction was often not comparable between volunteer locations and ECCC weather stations (Figure 7).

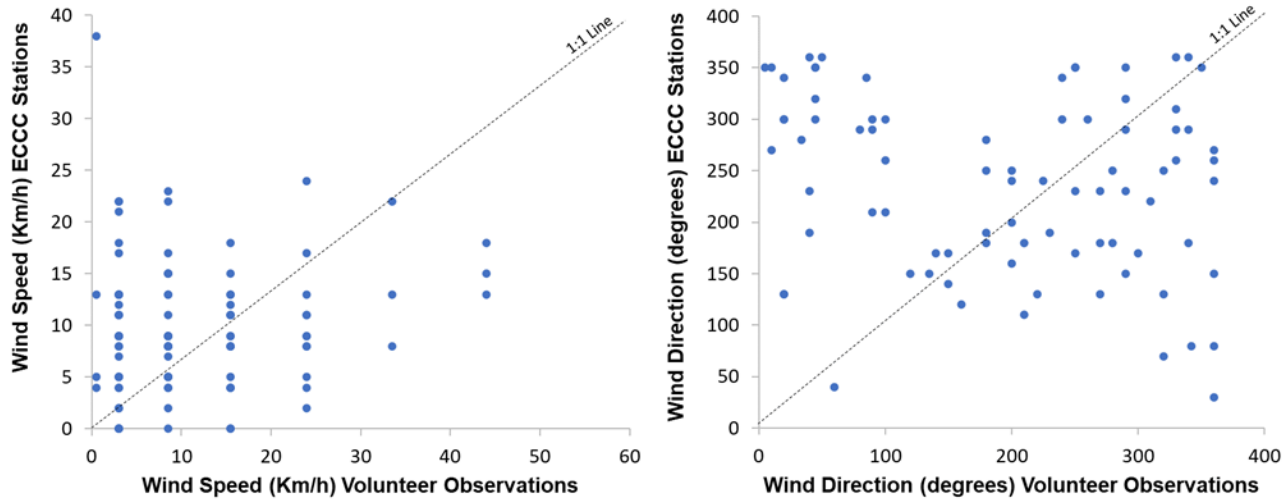


Figure 7. Wind speed (left) and wind direction (right) measured by volunteers versus measurements at ECCC stations. A 1:1 line (black dashed) is shown to aid comparison.

Conductivity and pH

SSEA has conducted water quality surveys on all of the lakes and most of the tributaries sampled by volunteers, and data can be used to verify expected values. SSEA values are from samples taken from the deepest part of each lake or bay, or at downstream locations on tributaries and analyzed at a lab, so it is not unexpected for there to be differences between volunteer and SSEA data. Overall, volunteer data fell within the ranges measured through SSEA monitoring, with the exception of conductivity for Midland and North Bay which were lower and higher than SSEA values, respectively. With regards to pH values, Midland Bay and North Bay, volunteer measurements were higher than SSEA ranges (Table 1). The Hanna meters often overestimate pH compared to analysis by a lab, so this was not unexpected.

Table 1. Minimum, average, and maximum conductivity and pH values measured by volunteers compared to data collected in the most recent survey by SSEA for each lake or bay.

Waterbody	Most Recent SSEA Data	Volunteer Conductivity (µS/cm)			Volunteer pH			SSEA Conductivity (µS/cm)			SSEA pH		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
Lake Couchiching	2019	325	352	374	8.33	8.55	8.75	375	388	406	8.06	8.25	8.34
Midland Bay	2021	176	185	208	7.35	7.88	8.44	207	218	242	7.84	8.01	8.27
North Bay	2021	206	216	223	8.32	8.40	8.51	144	150	161	7.34	7.51	7.73
Sturgeon Bay	2021	166	247	333	7.41	8.29	9.18	157	221	290	7.68	8.03	8.87
Copeland Ck	2019	181	290	312	7.22	7.89	8.18	268	337	375	8.06	8.15	8.23

Interpretation and Discussion

Water Quality

Using monitoring data collected by volunteers, water quality can be assessed by examining patterns in conductivity, water clarity (Secchi depth), and using observations of water colour and algae growth. Many Shore Watch volunteers reported a greenish hue to the water, which likely indicates the presence of floating algae in the water column. In some areas, water was observed to have a brownish colour. Dissolved organic carbon from the breakdown of plant matter contributes to this “tea” colour in lakes, particularly those that are on the Canadian Shield and receive inflows from wetlands (e.g. North Bay).

Water clarity was measured at deeper sites off docks or from boats, where the lake bottom was generally not visible from the volunteer’s vantage point. Clarity was low to moderate on Gloucester Pool, low in North Bay, moderate in Midland Bay, and moderate to high in Sturgeon Bay.

Shore Watch observers also reported foam on the water or on shore. As wind or currents stir the water of a lake or river, foam is produced and may accumulate on windward shores in bays or in stream eddies. When aquatic organisms (such as algae, aquatic plants and invertebrates) die and decompose, a variety of organic compounds are released. These act as surfactants, and if sufficiently aerated, can produce foam. Organic compounds leached from soil can also cause foam.

Stream Watch observers occasionally reported turbid conditions, which were associated with rain events. This likely indicates sources of erosion or stormwater runoff upstream. Interestingly, at Copeland and Vindin Creeks, conductivity was lower during rain events

despite high turbidity, which could indicate a dilution of dissolved constituents despite an increase in particulates which causes higher turbidity.

Water Temperature

Compared to 2020 water and air temperatures, lake temperature was less closely related to water temperature, with 44% of the changes in water temperature being explained by changes in air temperature (Figure 8). This relationship appears to be influenced by several outlier data points where water temperature was high when air temperature was low. This may have been due to rapid changes in weather, or be a result of the time of sampling where air temperature was low but waters were warm following a previous period of warm weather. As climate change continues, it is expected that water temperatures will continue to rise. This increase may be more pronounced in shallow, sheltered locations compared to deeper exposed sites. Higher water temperatures can increase the growth of aquatic plants and algae, and also increase the risk for blue-green algae blooms.

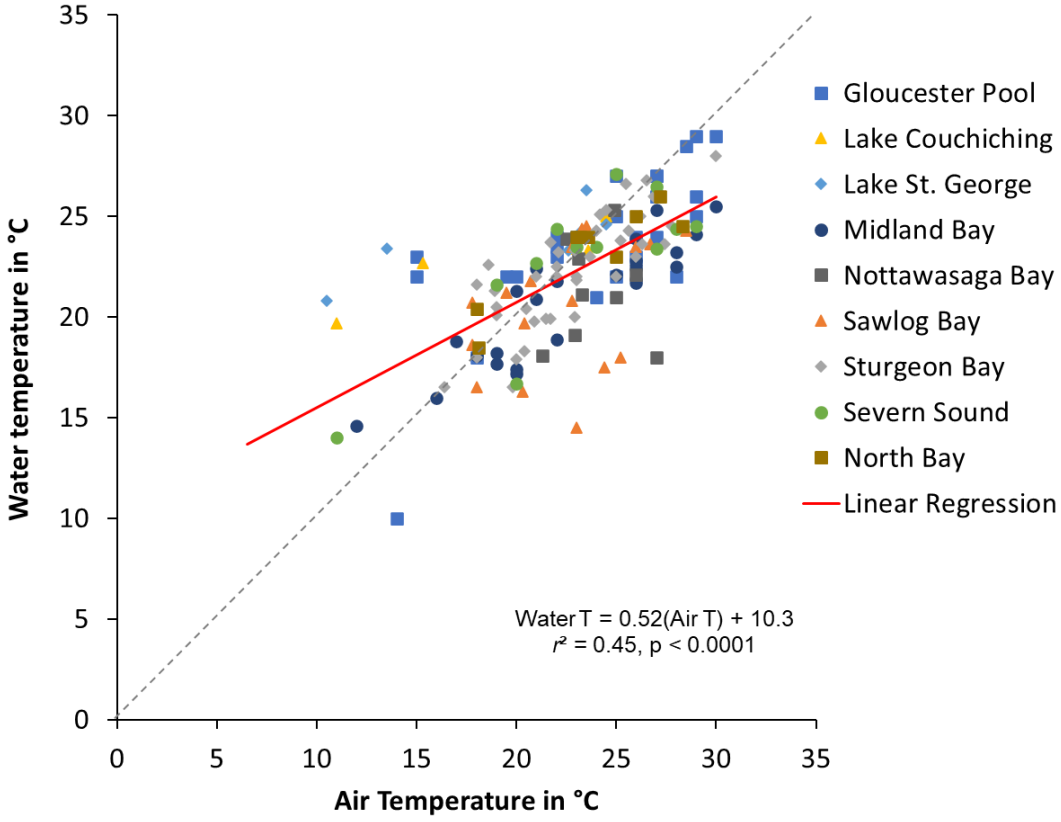


Figure 8. Water vs air temperature at all lake monitoring sites. The red line shows the linear relationship between the two variables. The dashed line shows a 1:1 relationship, which allows deviations from this relationship to be easily seen.

A comparison of temperatures between lake sites showed that areas across Severn Sound and in local inland lakes followed similar seasonal patterns (Figure 9). Warm

weather in late August caused an increase in water temperature, reaching nearly 30°C at some sites.

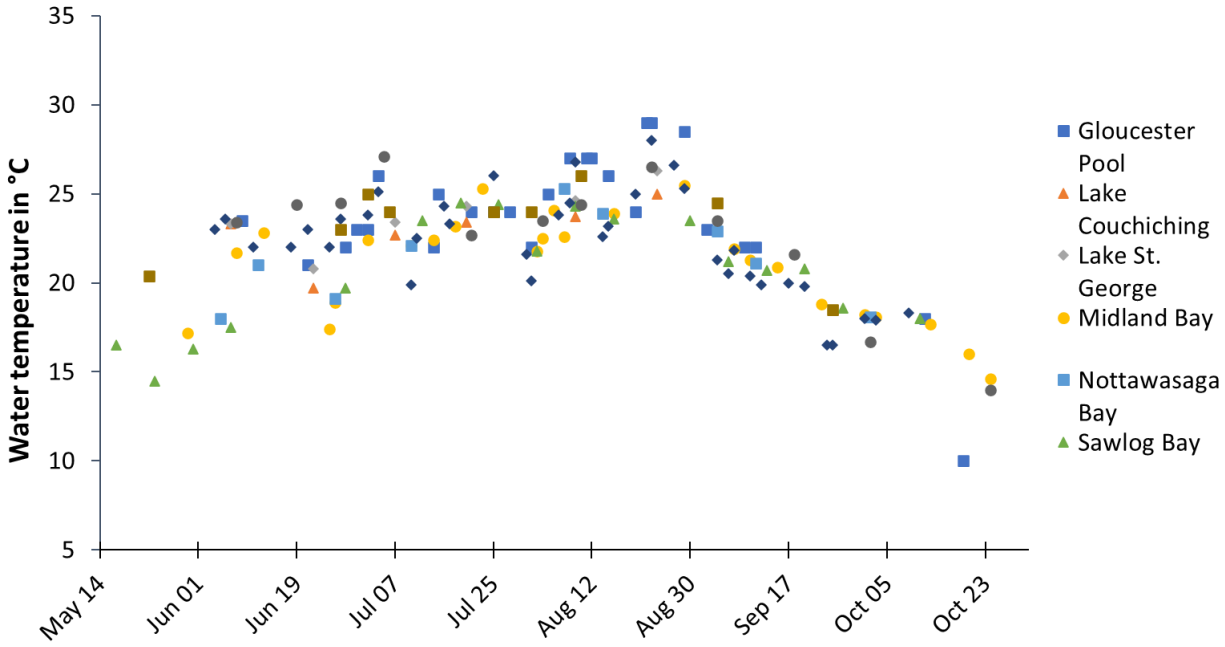


Figure 9. Water temperature at all lake monitoring sites.

The relationship between air and water temperature from stream sites is not strong, with a much lower correlation coefficient of 36% (Figure 10). This is likely due to the influences of groundwater inputs and shading along the streambank at some sites, resulting in stable, cold water temperatures that aren't as readily influenced by increasing air temperature.

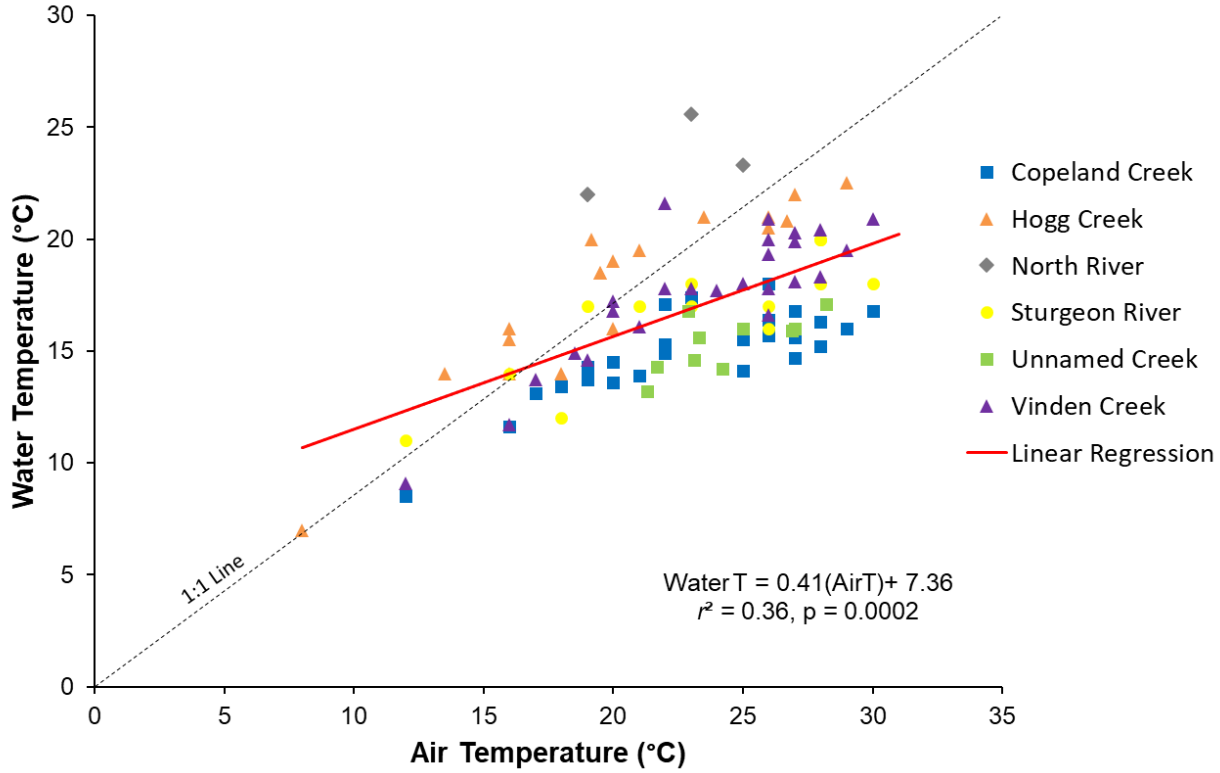


Figure 10. Water vs air temperature at all tributary monitoring sites. The red line shows the linear relationship between the two variables. The dashed line shows a 1:1 relationship.

Thermal stability analysis for stream sites yielded the classifications in Table 2. These classifications are specific to the monitoring site and can change upstream or downstream depending on groundwater influences, inputs from other tributaries, and shading from overhanging vegetation. Classifications indicate the type of fish community that could be supported in a particular location.

Table 2. Thermal classifications for tributary sites.

Tributary	Thermal Classification
Coldwater River	Cold water
North River	Warm water
Copeland Creek	Cold water
Vinden Creek	Cool water
Hogg Creek (upstream) Hogg Creek (downstream)	Cool water Cool water

Plant and Animal Sightings

Sightings included various types of mammals, birds, reptiles, amphibians, fish invertebrates and plants, including those detailed in Table 3.

Table 3. Plant and animal sightings across all monitoring sites.

	Species Found
Mammals	Otter, Mink, Muskrat, Beavers, Chipmunks, Coyote
Birds	Kingfisher, Ducks, Blue Heron, Loon, Canada Geese, Seagulls, Caspian Tern, Mallard, Merganser, Cormorants, Plover, Turkey Vultures, Trumpeter Swans, Bald Eagle**, Egrets, Woodpecker, Crows
Reptiles	Painted Turtles, Garter snakes, Northern Map Turtle**, Fox Snake**, Massasauga Rattlesnake**, Northern Water Snake, Five-Lined Skink**
Amphibians	Tadpoles, Frogs, Salamander, Bullfrogs, Leopard Frogs
Fish	Catfish, Minnows, Bass, Largemouth Bass, Rock Bass
Invertebrates	Mosquitos, Bee, Adult Stonefly, Caddisfly, Eight-Spotted Forester Moth, Eastern Tiger Swallowtail, Northern Crescent Butterfly, Hydropsychidae, Spongy Moth*, Spiders, Dragonflies, Mayfly, Zebra Mussels*, Snail
Plants	Milkweed, Eurasian Watermilfoil*, Purple Loosestrife*, Phragmites*, Flat-stem Pondweed, Narrow-leafed Pondweed, Pondweed sp., Northern Watermilfoil, *Najas flexilis*, Tapegrass, Canada Waterweed, Coontail

* Invasive species **Species at Risk

Species at Risk Sightings

Sightings included Northern Map Turtle (*Graptemys geographica*), Fox Snake (*Pantherophis gloydi*), Massasauga Rattlesnake (*Sistrurus catenatus*), Five-Lined Skink (*Plestiodon fasciatus*) and Bald Eagle (*Haliaeetus leucocephalus*), all of which are known to occur in the area. Northern Map Turtle, Five-Lined Skink and Bald Eagle are listed as Special Concern, while Fox Snake and Massasauga Rattle Snake are listed as Threatened (MECP, 2018).

Invasive Species Sightings

Starry Stonewort

In 2021, the Severn Sound Environmental Association (SSEA) implemented a new citizen science program called Invasive Species Spotters. As part of this program, 10 Shore Watch volunteers located across the Severn Sound watershed completed rake tosses to monitor for Starry Stonewort (SSW) and other aquatic invasive species. The

locations of Shore Watch volunteers participating in this program are shown on the monitoring site map (Figure 1). Most volunteers did not find Starry Stonewort in their rake tosses (Table 4). One volunteer reported a Starry Stonewort observation in Lake Couchiching, but the identification was not confirmed by SSEA staff.

Table 4. Presence or absence of Starry Stonewort at monitoring locations.

General Location	SSW presence/ absence	Location Notes
Lake Couchiching, Washago, Severn	Present	Identification not confirmed by SSEA; Trent-Severn Waterway
Gloucester Pool, Severn	Absent	Trent-Severn waterway
Sturgeon Bay, Tay	Absent	Open water
Farlain Lake, Tiny	Absent	Inland Lake
Gloucester Pool, Georgian Bay	Absent	Trent-Severn waterway
North Bay, Georgian Bay	Absent	Open water
Midland Bay, Midland	Absent	Open water
Midland Bay, Midland	Absent	Open water
Moore Point, Georgian Bay	Absent	Open water
Sturgeon Bay, Tay	Absent	Open water

General Invasive Species Sightings

Sightings included:

- Eurasian Watermilfoil (*Myriophyllum spicatum*)
- Purple Loosestrife (*Lythrum salicaria*)
- Phragmites (*Phragmites australis spp. australis*)
- Zebra & Quagga Mussels (*Dreissena polymorpha* and *D. bugensis*)
- Spongy Moth, formally called Gypsy Moth (*Lymantria dispar*)

Algae

Several areas (Lake Couchiching, Gloucester Pool, Midland Bay, Sturgeon Bay, and open Severn Sound) had filamentous and film-like algae growth on hard surfaces. While not harmful to human health, these types of algae can cause slipping hazards, and can indicate an imbalance in the aquatic ecosystem. This imbalance can be the result of excess nutrients entering the water, changing physical conditions (temperature, light), or a lack of grazers (mainly invertebrates). Two samples of floating algae were submitted by volunteers in Midland Bay and open Severn Sound and were found to be blue-green algae. Since this type of algae has the potential to produce toxins, it was reported to the

Ministry of Environment, Conservation and Parks Spills Action Centre and the Simcoe Muskoka District Health Unit.

Filamentous green algae patches were reported in Copeland and Vindin Creeks, and the North River; this may also be a sign of high nutrient conditions.

Human Impacts

Indications of human impact included: litter (Lake Couchiching, North Bay, Lake St. George), beach gear being left behind after a weekend (Lake Couchiching), plants on streambank being trampled by human foot traffic (Sturgeon River), sand being added to Jackson Beach and shoreline retention work being done on private properties (Nottawasaga Bay), large boats and increased boat traffic (Sturgeon Bay), and vehicles being driven on beach areas (Sawlog Bay).

Water Level Impacts

Water level impacts reported by volunteers in either Shore Watch or Stream Watch programs were mainly related to erosion, as well as flooding of waterfowl nesting sites.

Restoration Needs

Restoration suggestions included invasive species removals for species like Phragmites (Sturgeon Bay, unnamed creek) and shoreline clean ups (North Bay). Shoreline stabilization was suggested for a site at Midland Bay Woods Park.

Summary

Over the 2021 season, volunteers observed environmental conditions across the Severn Sound area. Major findings are summarized below:

- High air temperatures in late August resulted in peak water temperatures at lakes sites.
- Several rain events over 30 mm occurred. A large rain event in late September resulted in turbid conditions in local tributaries.
- Climate variables (rainfall, air temperature and wind) measured by volunteers compared well to other data sources, with the exception of wind conditions, which are highly variable from place to place.
- Water clarity was low to moderate in Gloucester Pool, low in North Bay, moderate in Midland Bay, and moderate to high in Sturgeon Bay.
- Low water clarity in tributaries was generally related to rain events.
- Water quality variables were generally within expected ranges based on existing SSEA data.
- Tributaries ranged in thermal classifications from cold to warm water.
- Four species at risk were reported: Northern Map Turtle, Massasauga Rattlesnake, Eastern Fox Snake and Bald Eagle.
- Numerous invasive species were reported, with the most common observations being Spongy Moth (formally Gypsy Moth) Phragmites and Eurasian Watermilfoil.
- Several lake and tributary sites had filamentous green algae growth. Samples of floating algae were submitted by volunteers in Midland Bay and open Severn Sound and were found to be blue-green algae. This was reported to the Spills Action Centre and the Simcoe Muskoka District Health Unit.
- Human impacts included littering, yard waste, discarded beach equipment, large boats and excessive boat wakes, shoreline work, and vehicle impacts.
- Some erosion impacts from high water levels or storm events were observed this year by volunteers.
- Some restoration needs were pointed out relating invasive species removal (Phragmites) shoreline cleanups and shoreline stabilization.

This information will allow SSEA to identify sites for future restoration work as opportunities arise (e.g. invasive species removal projects, streambank stabilization, beach clean-ups), identify sites in need of protection (e.g. SAR habitat, coldwater tributaries), and track climate impacts on algae growth and on tributary runoff.

The 2021 citizen science monitoring season was a successful continuation of our programs that will hopefully continue to grow and document changes in the watershed. As more information is gathered for each site, year to year changes can be documented.

A huge Thank-You to all of our volunteers, and to TD FEF and the Lake Huron-Georgian Bay Community Action Initiative for making this year such a success!

References

Ministry of Natural Resources and Forestry. 2015. Ontario Flow Assessment Tool. Retrieved from: www.ontario.ca/page/watershed-flow-assessment-tool

Ministry of Environment, Conservation and Parks. 2018. Species at Risk in Ontario. Retrieved from: www.ontario.ca/page/species-risk-ontario

Stoneman C.L., and M.L. Jones. 1996. A Simple Method to Determine the Thermal Stability of Southern Ontario Trout Streams. North American Journal of Fisheries Management. 16:4, 728-737.

Appendix A: Lab Verification of Hanna Meter Readings

Conductivity and pH

To further verify the measurements taken using the Hanna meters, pH and conductivity measurements taken during SSEA drinking water intake monitoring were compared to values from the MECP Dorset lab where SSEA samples are sent. Hanna meter pH was between 13% lower and 26% higher than lab pH with an average difference of 2% higher. When considering the percent difference between Hanna meter values and those measured by the lab, the majority of pairs have a difference of less than 10%. The relationship between Hanna meter and lab conductivity was fairly strong with a significant linear regression and a slope close to 1 (Figure A1). Hanna meter conductivity ranged from being 40% lower to being 62% higher than lab conductivity with an average difference of 0%. The relationship between Hanna meter and lab pH was not as strong with a lower correlation coefficient (Figure A2). For both pH and conductivity comparisons there is some diversion from the 1:1 regression line, meaning that there is some error being introduced by the Hanna meter. Since the pH relationship between the Hanna meter and lab is weaker (lower correlation coefficient and greater deviation from slope of 1), there is more error introduced in the pH measurement. This can likely be related to the maintenance and storage of the equipment. While there is no lab data available to directly compare to citizen science volunteer Hanna meter measurements, it is likely that some error is being introduced by the Hanna meter to volunteer readings. It is important to take this into account when looking at volunteer data that is submitted, especially as more data is collected and differences are examined between sites and from year to year.

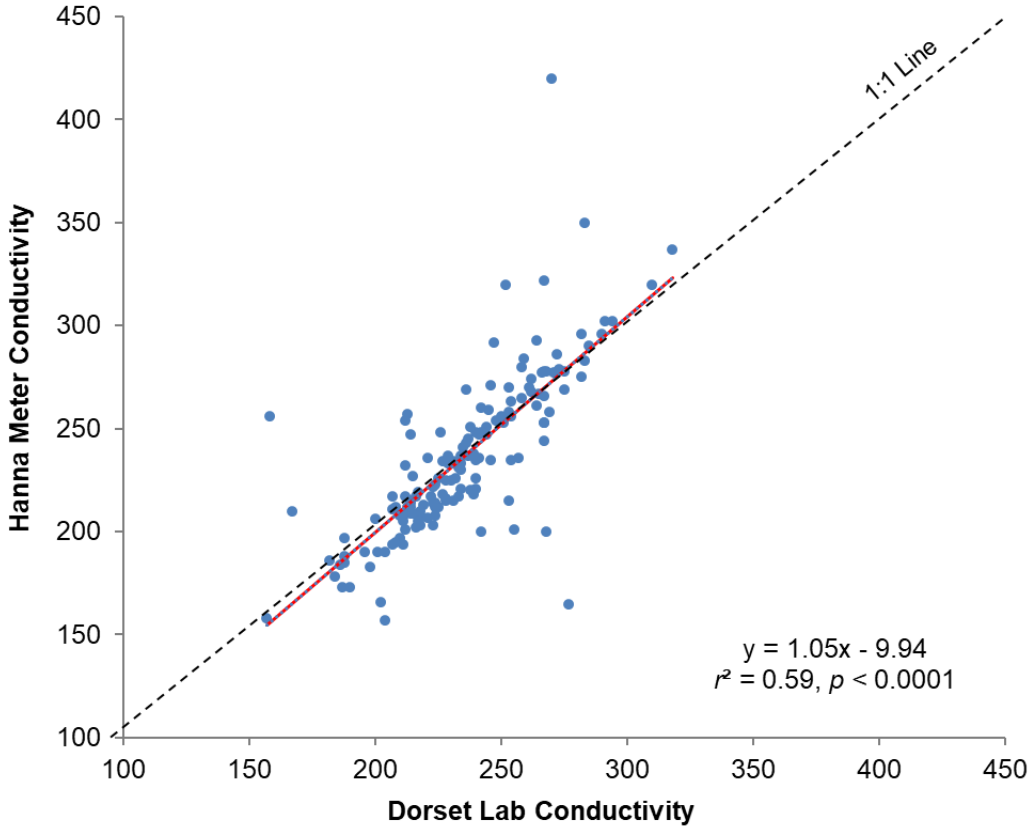


Figure A1. Conductivity measurements from the Dorset lab compared to those taken with Hanna meters by SSEA staff at two drinking water intake monitoring sites from 2011-2021. The red line shows the linear relationship between the two variables. The dashed line shows a 1:1 relationship.

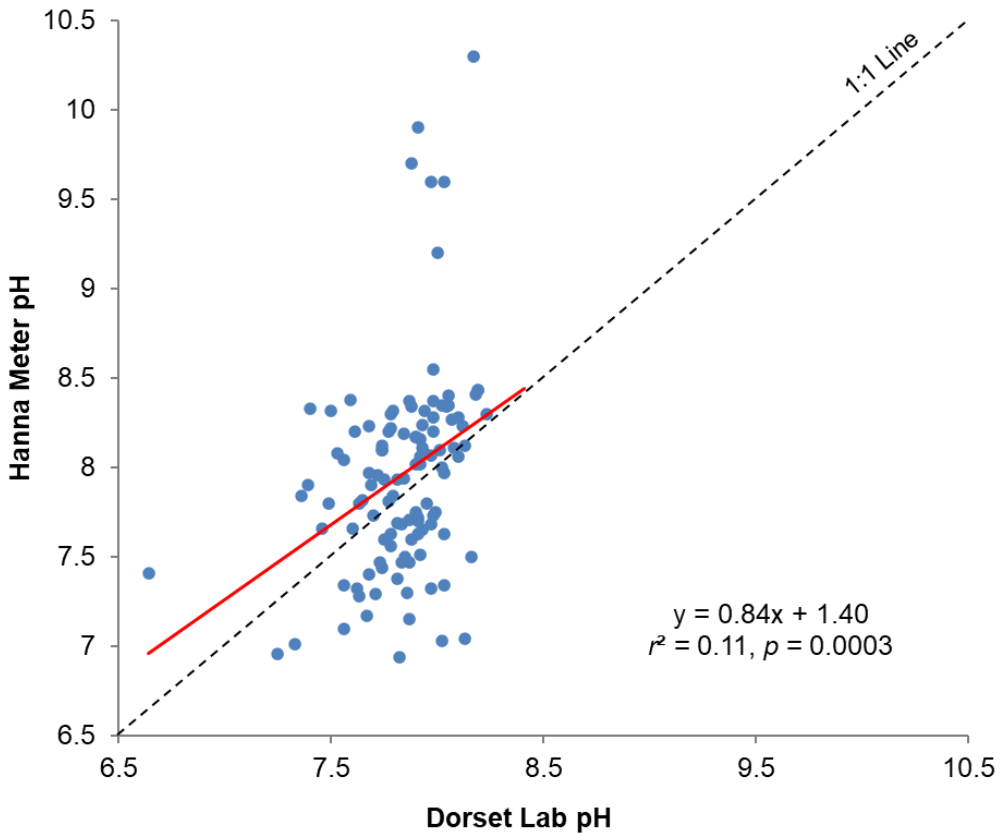


Figure A2. pH measurements from the Dorset lab compared to those taken with Hanna meters by SSEA staff at two drinking water intake monitoring sites from 2011-2021. The red line shows the linear relationship between the two variables. The dashed line shows a 1:1 relationship.