

Water Quality Monitoring in the Cape Tormentine Watershed Composite and Public Education



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By

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Cover photo: Scott Brook in the Cape Tormentine Watershed Composite (Credit EOS Eco-Energy)

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- Dr. Justin Liefer of Mount Allison University for partnering on a groundwater protection webinar
- And many others for supporting EOS and partnering in our efforts to monitor our watersheds and provide educational outreach

Summary

With support from the New Brunswick Environmental Trust Fund, EOS established the Chignecto Watersheds Committee and a long-term water monitoring program in 2017. Over the last five years, EOS has collected water quality data within the Tantramar River Watershed, Cape Tormentine Peninsula Watershed, and the Rockport & Dorchester area. In 2022-2023 the program returned to the Cape Tormentine Watershed. A second year of monitoring allowed EOS to compare 2022 with 2019 results, to better understand current baseline conditions. Concerns in the Cape Tormentine Watershed during 2022 were similar to those seen in 2019 with low dissolved oxygen numbers at some sites, elevated levels of E.coli in some locations, high phosphorus levels at most sites and concerns about many water quality parameters for Trout Brook. However, more temperature flags were observed in 2022 than in 2019. EOS disseminated the results of our water quality monitoring to the provincial government, the Chignecto Watersheds Committee and the general public.

EOS coordinated, promoted and hosted a series of free public events for youth and adults to help raise awareness of protecting water quality and addressing climate change issues in our local watersheds. We coordinated Water Rangers activities at Port Elgin Regional School for hands-on water testing experiences and we hosted webinars on living shorelines and groundwater protection. EOS also coordinated a bulk well water testing event with a particular focus on investigating the presence of saltwater. We planned two host 12 events (20 hours) for 180 people and met or exceeded all of our targets.

As a result of the current project, EOS recommends returning to the Rockport-Dorchester area in 2023-24, which was last sampled in 2020, to obtain a second year of information about the current state of water quality within that watershed. In addition, we wish to coordinate a webinar series on groundwater issues (building off the success of our webinar this past year) including topics such as saltwater intrusion, contaminants, development impacts, testing/tools/monitoring, and protection and action, etc. We recommend bringing our Water Rangers water testing kits to students and classes at Dorchester Consolidated School so that they too can connect their classroom learning to hands-on learning and contributing to water quality testing in their watershed. Finally, using the data collected up to and including the proposed 2023 water quality monitoring season, EOS recommends the creation of an integrated watershed management plan for the Chignecto Watersheds in 2023-24. This plan will pull together all of our findings and expert networks to chart a coordinated course for watershed management in the Chignecto border region for the future.

Introduction

Healthy watersheds are a vital component of healthy, vibrant communities and critical to the overall health and sustainability of New Brunswick. Water quality faces threats from climate change across the province and the Cape Tormentine peninsula region is among one of the most vulnerable regions to climate change impacts due to its low-lying coastal location. Water monitoring is essential in managing and protecting our water resources in the face of climate change. The New Brunswick Water Strategy (2017), as well as local sustainability, climate change adaptation, and emissions reduction plans (all funded by ETF) include the need to monitor water quality and maintain healthy aquatic environments within the Tantramar and Strait Shores regions. Monitoring provides data that can be used to provide benchmarks of water quality that we can strive to maintain and identify problem areas within our watersheds that we can work on improving.

With support from the New Brunswick Environmental Trust Fund, EOS established the Chignecto Watersheds Committee and a long-term water monitoring program in 2017. Over the last five years, EOS has collected water quality data within the Tantramar River Watershed, Cape Tormentine Peninsula Watershed, and the Rockport & Dorchester area. In 2022-2023 the program returned to the Cape Tormentine Watershed to obtain a second year of information about the state of water quality and provide public education and outreach about the importance of healthy watersheds and actions residents can take to help. The continuation of baseline data collection across all Chignecto Watersheds can be used to develop a watershed management plan that will ensure long-term, sustainable water resources which are essential for community resilience.

A second year of monitoring allowed EOS to compare 2022 with 2019 results, to better understand current baseline conditions and plan potential future restorations in the face of climate change impacts. Concerns in the Cape Tormentine Watershed during 2022 were similar to those seen in 2019 with low dissolved oxygen numbers at some sites, elevated levels of E.coli in some locations, high phosphorus levels at most sites and concerns about many water quality parameters for Trout Brook. However, more temperature flags were observed in 2022 than in 2019.

The benefits of this project are: increased understanding and awareness of watershed issues, how they might connect to climate change in our region, and contributing to a more resilient population.

This report summarizes the project goals, methodology, water quality monitoring, education and outreach activities, staff training, priority measures, benefits and recommendations.

Goals

The goals of the project were:

- (1) the execution of a water quality monitoring program;
- (2) a report summarizing the current state of our watersheds;
- (3) facilitate public outreach and education to build awareness of the importance of healthy watersheds in the face of climate change.

Methodology

The project methodology consisted of four interconnected parts. We followed all COVID-19 safety precautions and charted these steps:

1. Continue long-term water quality monitoring

A total of 12 sample sites were monitored in 2019 and revisited in 2022 for monthly monitoring over the field season (June - September). In-situ measurements were taken with a Hanna Multiparameter probe and water samples were collected and shipped to the RPC laboratory for the full suite of surface water analysis from June to September.



Map of Chignecto Watersheds including Cape Tormentine Area (Source: J. Campbell)

2. Review and disseminate data

EOS supported the New Brunswick Water Strategy (2017) Goal 1, Action 1 by issuing a report on the current state of water quality within the Cape Tormentine Watershed area. The report includes water quality scores using the Canadian Council of Ministers of the Environment's Water Quality to better communicate results to community members. Data collected through our monitoring program was sent to the New Brunswick Department of Environment and uploaded to the Atlantic DataStream database. All data collected were analyzed and summarized in a state of the watershed report that can be found on the EOS website: <https://eosecoenergy.com/en/projects/chignecto-watersheds-committee/>.

3. Bulk well water testing days

EOS promoted the importance of testing wells by hosting a bulk well water testing day. Well water quality is a growing concern for many property owners in rural and coastal areas but the cost and access to well water testing in the Cape Tormentine Watershed area can present a challenge for homeowners. To help reduce the cost and bring well water testing to the local area, EOS provided a subsidy of \$40 to homeowners and brought bottles for pick up in Port Elgin, Cape Tormentine and

Murray Corner. EOS returned to pick up the bottles and deliver the samples to the RPC Lab in Moncton. Paperwork was submitted on behalf of the homeowners who received copies of the results directly from RPC.

4. Public Workshops and Community Outreach

EOS coordinated, promoted and hosted a series of four free public events to help raise awareness of protecting water quality and addressing climate change issues in our local watersheds.

Youth Water Rangers

EOS brought the Water Rangers program to Port Elgin Regional School. We taught various classes in grade 6-8 about watersheds, water quality monitoring, the parameters we test and why, and the Water Rangers program. Hands-on outdoor sessions using Water Rangers test kits (<https://waterrangers.ca>) had students testing local waters near Port Elgin Regional School for parameters such as temperature, pH, conductivity, dissolved oxygen, etc. The data collected was shared to DataStream.

Watershed Health Education Stations at Local Nature Camp

EOS organised watershed education stations during an afternoon at a local Nature Camp. The stations included hands-on water monitoring with Water Rangers Kits, playing active games, and using the EOS model watershed table to talk about and experiment with point and non-point sources of pollution and solutions such as fencing, building wetlands, etc. The aim of the afternoon was to teach youth about watersheds, management, health, water sampling, risks to watershed health, actions they can take, etc.

Living shoreline Webinars

EOS hosted a free informational webinar on living shorelines where participants learned how to use plants to stabilize banks and prevent erosion. The Nature Trust of NB presented on invasive species and the importance of living shorelines, and the Petitcodiac Watershed Alliance presented on techniques for restoring living shorelines. A variety of suitable plants for such projects and tips and information for homeowners was shared with participants.

Groundwater Protection Webinar

EOS partnered with Dr. Justin Liefer (Mount Allison University) to provide a free public webinar all about groundwater. The groundwater 101 session was an introduction to what groundwater is, how it moves, what can impact it, and how to protect it.

Challenges

The 2022-2023 project year presented some challenges for EOS that were beyond our control. First, the project started later than hoped due to hearing about funding only in May as well as challenges to secure a rental vehicle in time for a May water quality sampling trip. The roads in the watershed were in poor condition making it impossible to use a smaller vehicle and the need to rent a larger one. We also discovered that our sampling stick was too small for small rental vehicles and that we

needed a longer sampling cable to properly and safely reach the centre of the brooks and rivers. We made due as best we could to sample safely with the equipment we had. Partway through the sampling the season our Hanna multi-parameter probe malfunctioned, and we scrambled to borrow one because we do not have a back-up device. We rented a YSI from the Atlantic Water Network's Equipment Bank at ACAP Saint John. A challenge with the equipment bank was the 3-week loan period which did not align well with our monthly sampling needs. Because of the distance between Sackville and Saint John it was difficult to access the equipment, things had to be mailed and it slowed down our field work. We also had technical problems with the unit they sent, and there wasn't anything that we could do about it without the proper maintenance/repair materials, which were not included with the rental unit.

We also borrowed equipment from the Petitcodiac Watershed Alliance which had been well maintained and worked properly, but it was difficult to access it and share it with another busy watershed group. However, in the end after finding solutions to our various challenges, we were able to sample 12 sites from June to September, making for a more difficult but successful overall sampling season. We submitted our monthly data to the New Brunswick provincial government, but have not received any responses about the ongoing elevated E.coli levels in the Cape Tormentine watershed, nor have we been aware of any government action to address our concerns.

Apart from water sampling challenges, EOS was not able to conduct the recreational water quality testing day for E.coli because our partners in the MTA Campbell Lab did not receive their ETF grant to analyse our data. We were also not able to do Chlorophyll A sampling due to a lack of MTA lab capacity to analyse the data. However, we replaced the Chlorophyll A sampling with temperature loggers and collected temperature data all season.

Water Quality Monitoring

During 2022, water quality measurements were taken from 12 sites across the Cape Tormentine Peninsula Watershed. In-situ measurements, consisting of pH, temperature, conductivity, dissolved oxygen, total dissolved solids and salinity were taken from June to September using a Hanna Multiparameter or YSI Meter. Water samples were collected from June to September and brought to the RPC Laboratory in Moncton for analysis of 59 parameters. This water quality report compiles and summarizes these results which will be used as a baseline of water quality moving forward.

The objective of this report is to establish a baseline of water quality in the Cape Tormentine Peninsula Watershed, with an intent to continue a long-term water quality monitoring program. This data will help us gain a better understanding of our watershed and could lead to the undertaking of any necessary restoration or protection activities, ultimately ensuring a healthy watershed, sustainable ecosystems and resilient communities. This knowledge could also be used to educate the public on local watershed issues and how they connect to climate change in our region.

The water quality results were compared to provincial and federal water quality guidelines, CCME water quality guidelines for the protection of aquatic health, and Health Canada Guidelines for

Recreational Activities. While we could speculate on some of the potential causes for variations between sites and years and fluctuations in parameter concentrations, this is only the second year of data collection in our Cape Tormentine Peninsula monitoring program. More years of data are required to look at trends and relationships within the water quality datasets.

Water temperatures at all sites experienced typical seasonal variation, with temperatures increasing from June through August and then cooling again into September. The ECCC recommended freshwater guideline temperature of 20 °C was exceeded a total of 23 times this season, affecting all sample sites except Rayworth Brook. In comparison, fewer temperature flags were observed in 2019 (6 sites in July and 2 sites in August; Croucher et al. 2020). A temperature data logger deployed in Oulton Brook recorded a mean temperature for the monitoring period of 22.7 °C, with temperatures ranging from 17.3 – 32.3 °C.

In-situ water pH was within CCME guidelines (6.5 – 9) for the most part, though values below guidelines were recorded at 6 sites in July: Blacklock Brook off Murray Road, Gaspereau River Port Elgin, McKay Brook, Scott Brook off Murray Road, Scott Brook Route 955 and Trout Brook off Murray Road and three sites in August: Gaspereau River Port Elgin, Gaspereau River Roundabout and Timber River.

Eighteen DO measurements below the New Brunswick guideline (6.5 mg/L) were recorded at 8 sites throughout the sampling season in June (one site), July (5 sites), August (7 sites) and September (5 sites). August was the hottest month this season with the highest water temperatures and dissolved oxygen decreases with increased water temperature. Trout Brook off Murray Road had DO levels below the recommended level across all months and Rayworth Brook had healthy DO concentrations across all months, similar to 2019.

Despite efforts to sample at or near low tide, our tidally influenced sites still had brackish water when they were sampled. This resulted in these sites displaying high levels of specific conductivity, TDS, salinity, and chloride concentrations.

The Canadian Recreational Water Quality Guideline single-sample maximum of 400 E. coli /100 mL was exceeded a total of 18 times at 9 sites throughout the season. The highest E. coli counts (9804 MPN) were seen at Trout Brook off Murray Road in July. Most of our samples exceeded the New Brunswick total phosphorus guideline of 0.03 mg/L for the protection of aquatic life and were in eutrophic (0.035 – 0.100 mg/L), with two sites at hyper-eutrophic (>0.100 mg/L) levels: Blacklock Brook Route 955 in August and September and Trout Brook off Murray Road in June and August. Surface water metals were mostly well below the detection limits, aside from aluminum (8 sites over limit) and iron (5 sites over limit). Our brackish samples were diluted prior to analysis due to their high ionic content, leading to results that were below the reporting limit and not quantified. More sampling is required.

Overall, EOS had a very successful year of water quality monitoring that provided us with additional valuable baseline data that can be used to ensure the health of the Cape Tormentine Peninsula Watershed area. This project was a further necessary step towards building a long- term water quality

monitoring program within the watershed. As we continue to collect more data, we will be able to identify trends in the water quality and develop a better understanding of what the “normal” water quality is in our waterways as well as how climate change may impact them.

Review and Disseminate Data

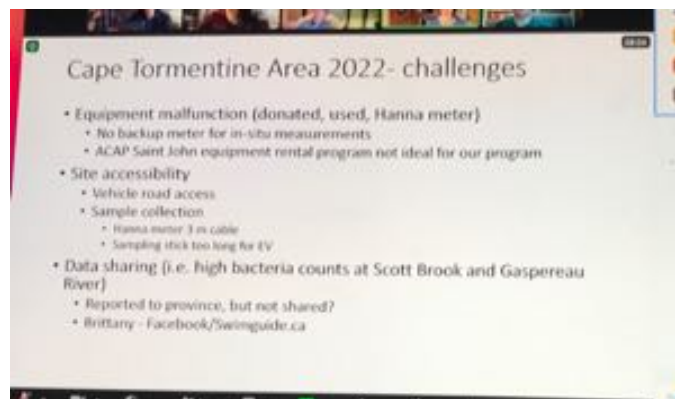
EOS shared results of the water quality monitoring in a number of ways including a state of the watershed presentation and a report (available at: <https://eosecoenergy.com/en/projects/chignecto-watersheds-committee/>). Data was also shared with New Brunswick Department of Environment and Local Government, and Atlantic Data Stream.

State of the Watershed Report

EOS supported the New Brunswick Water Strategy (2017) Goal 1, Action 1 by issuing a report on the current state of water quality within the Cape Tormentine Watershed. The full water quality report can be accessed on the Chignecto Watersheds page on the EOS website: <https://eosecoenergy.com/en/projects/chignecto-watersheds-committee/>.

Presentations and Promotion

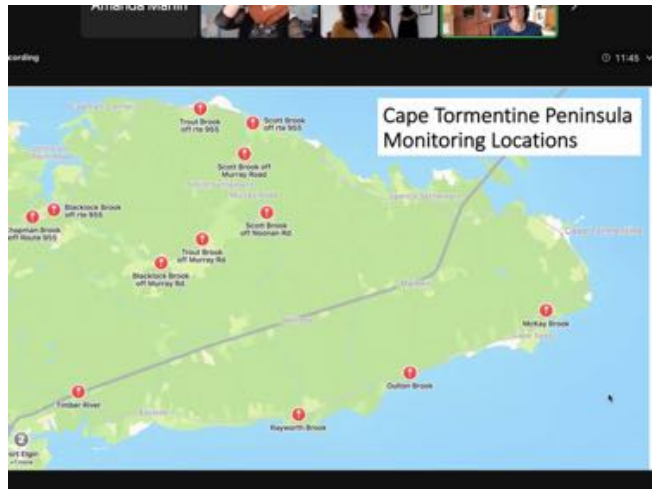
A virtual presentation on the water quality results was given to the Chignecto Watersheds Committee on October 26, 2022. There were many sites in the Cape Tormentine watershed composite with elevated levels of e.coli and phosphorus and sites with low levels of dissolved oxygen. The Committee brainstormed next steps, approaches and future projects and plans.



Chignecto Watersheds Committee Meeting October 2022

A virtual public presentation on the state of the Cape Tormentine Watershed took place at noon on Monday, February 13th, 2023 as part of Climate and Renewable Energy Week 2023. It was promoted via posters, social media posts and a press release. There were nine participants. A video recording of the webinar can be found on the EOS Youtube channel:

https://www.youtube.com/channel/UC4UJaDRkpCUMe9miBDFME_g



Public Presentation on State of the Cape Tormentine Watershed February 13th, 2023

Bulk Well Water Testing Day

EOS organised a bulk well water testing program to help residents and cottage owners in the Cape Tormentine Watershed area access inorganic water testing more easily and cost effectively. EOS was also asked to try and find out about the possible presence of saltwater intrusion in wells in this region. We provided a small rebate to help encourage participation and help reduce the cost (\$95 instead of \$135). On August 16th, 2022 we set up locations in Port Elgin, Cape Tormentine and Murray Corner for people to come and pick up the necessary bottles and sampling instructions. On August 18th we returned to each location so that people could drop off their samples and pay the testing fee. We then delivered the samples directly to the RPC lab in Moncton. Participants received confidential results directly from RPC about 10 days later. We asked participants if they would mind sharing their results with EOS because we were interested in the presence of saltwater intrusion in the area, so we were also sent copies of the results. In the end, there were 9 households that participated in the program. We also talked to and educated other passersby about well water testing, which added to the value of the activity.

There was also interest by some people for bacteria testing and to test for PFAs (Perfluoroalkylated substances). Unfortunately, the provincial drinking water inorganic test does not include PFAs, but it may be something that should be included in the future. Bacteria testing is available and is less expensive than the inorganic well water test and we encouraged residents to test their wells for bacteria often too.

Over the course of the year, EOS heard about anecdotal information that saltwater intrusion is in wells in the Murray Road area and in Aulac. The well water testing provided by RPC for potable water does not provide a maximum acceptable concentration for sodium but does provide an aesthetic objective at 200. These follow the Guidelines for Canadian Drinking Water Quality. Only one of the wells tested was above the aesthetic objective with a reading of 226. This well was found in the interior of the Cape Tormentine Peninsula in Woodside-Little Shemogue area. The next highest

reading was 69.9 found in the Port Elgin-Baie Verte area. The full results for sodium are found in the table below.

Sodium Levels in Drinking Water Wells in the Chignecto Watersheds

Test Locations	Sodium Results (Aesthetic Objective for Sodium = 200*)
Port Elgin, Baie Verte area	69.9
Woodside, Little Shemogue area	226 (above the aesthetic objective)
Cape Tormentine, Upper Cape area	30.7, 17.1, 12.8, 61.6
Sackville area	4.83, 18.6

*Guidelines for Canadian Drinking Water Quality.

It is hard to conclude if saltwater intrusion is taking place or how quickly it could be happening without additional tests over multiple years to assess any possible changes in sodium levels. Long-term monitoring of groundwater is a recommended project for the future.



EOS Well Water Testing Booths in Port Elgin and Cape Tormentine in August 2022.



**EOS ECO-ENERGY
WELL WATER
TESTING DAYS**

Save on well water testing with our Bulk Deal!
The first 20 people to sign up will get **\$40 off**
the \$140 price of a full inorganic water test.

How it works:

1. Sign up by contacting EOS by August 12th, 2022 to reserve your bottles.
2. Pick up bottles and instructions from EOS on August 16th, 2022 at the below locations and times.
3. Return filled bottles, forms and payment at drop off locations and times on August 18th, 2022.
4. Receive confidential and private results directly from RPC, a provincially accredited lab.

Pay via cash or cheque to EOS Eco-Energy or e-transfer to eosnb.aibn.com

Contact assistant.eos@nb.aibn.com or 506 536 4487 for more info

PICK UP BOTTLES ON AUGUST 16TH AND RETURN THEM ON AUGUST 18TH AT ONE OF THESE LOCATIONS AND TIMES

9-10am Village Office, Port Elgin
10:50-11:50am Cape Tormentine Beach Campground
12-1pm Murray Corner Provincial Park Campground

Bulk Well Water Testing Poster

Education and Outreach

Watershed education is key to enhancing sustainable, resilient communities across the Tantramar and Strait Shores communities. It's important to increase peoples' understanding of impacts in our watersheds and risks associated with poor watershed health. EOS hosted and partnered on a variety of workshops and outreach activities during 2022-23.

Youth Water Rangers at Port Elgin Regional School

On June 6th EOS went to Port Elgin Regional School (PERS) to conduct a day of water testing training with students in grades 6 to 8. EOS staff explained what EOS does, why we sample and monitor water ways, how to take samples, do the testing and what the results mean. Students worked alone or in pairs to collect samples from Rotary Pond, down a short trail from the school. Using Water Rangers Kits which EOS purchased a few years ago, students tested the water for Ph, temperature, conductivity, and dissolved oxygen. In total, 78 students participated as well as their teachers and

educational assistants. The collected data water later entered into Atlantic DataStream. Teachers were really pleased to have this hands-on activity as it aligned perfectly with what the students were learning about in class and helped make the theoretical lessons real and tied to local issues.



Students at Port Elgin Regional School test a local water body using EOS' Water Rangers Kits. Photo: A. Marlin

Watershed Workshops for Youth at Local Nature Camp

On July 8th EOS staff joined the Church by The Lake's summer nature camp at Silver Lake to host a few educational activities. The group was comprised of 40 children, ranging from the ages of five to thirteen, and the theme of the camp was 'nature and stewardship.' In keeping with this theme, EOS put on several nature-related activities. The first of which was a 'climate change dodgeball' which allowed students to act out the processes driving global warming and understand the greenhouse effect. The second was an interactive watershed model, which demonstrated point source and non-point source pollution that can occur in a body of water and how to help reduce pollution and its impacts. The last activity was utilizing the EOS Water Rangers kits, allowing the kids to take samples of the lake water and perform their own scientific readings of factors such as pH, TDS, dissolved oxygen, temperature, etc. All activities were followed by a discussion relating what the kids learned to their local town, as well as water safety tips and ideas on how to be a good steward of the Earth.

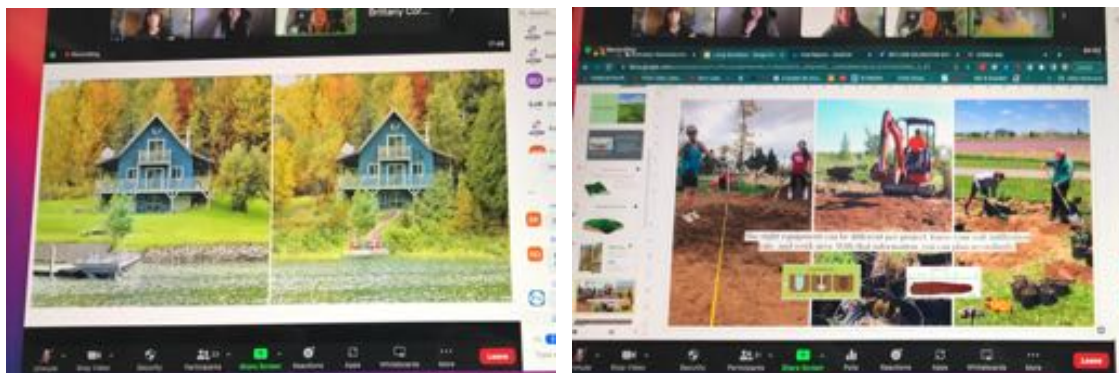
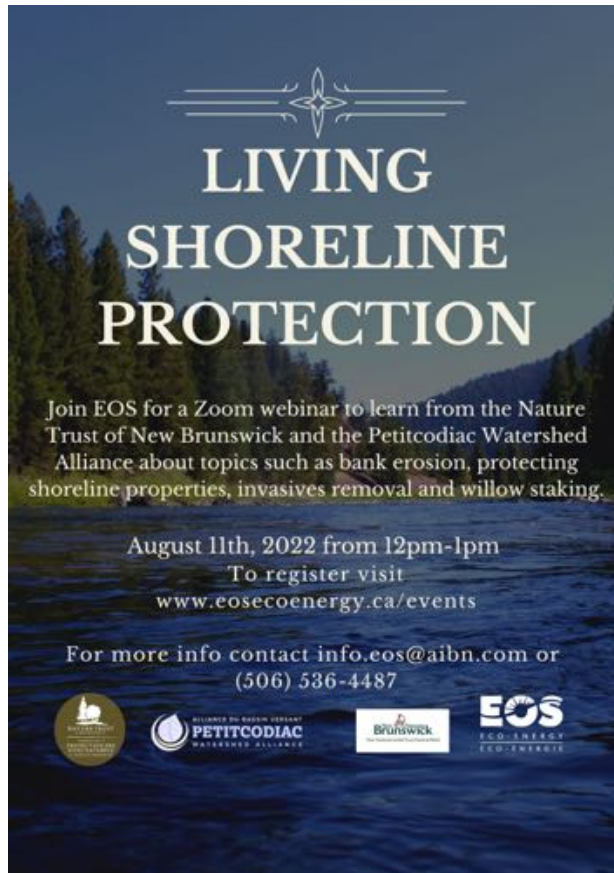


EOS with campers at a nature camp in summer 2022.

Living Shoreline Webinar

The EOS Eco-Energy Living Shoreline Protection webinar took place on Thursday, August 11th. Presenting at the webinar was Brittany Dixon and Freya Clark from the Nature Trust of New Brunswick (NTNB), and Brittany Cormier from the Petitcodiac Watershed Association (PWA). There were 23 people in attendance, a great turnout for EOS, and the webinar was recorded and is posted to EOS' YouTube channel. Brittany Dixon presented on shoreline stewardship, how to protect your riparian zone, and especially on willow staking. This topic was of particular interest to the guests present, and

several questions were received regarding how a property owner might get started with willow staking. Freya Clark presented on invasive species, and how to properly identify, remove, and dispose of them. The invasive species of note included Japanese Knotweed, Purple Loosestrife, Woodland Angelica, Japanese Barberry, Glossy Buckthorn, and Garlic Mustard. Brittany Cormier from the PWA presented on freshwater shorelines and natural infrastructure that provides protection and stabilization to a coastal edge, wildlife habitat, and climate change adaptation. She also discussed the importance of planting native, and alternatives to willow staking if willow trees are not native to one's area. Overall, the webinar was a great success, and EOS is very appreciative of the partnerships of both the Nature Trust of New Brunswick and Petitcodiac Watershed Alliance. The webinar can be viewed at: <https://youtu.be/eZb4X9p738c>



Living Shoreline Webinar

Groundwater Protection Workshop

On October 13th EOS and Dr. Justin Liefer of Mount Allison University provided an informative webinar on groundwater protection. Nineteen people participated from across the Maritimes including Sackville, Moncton, Fredericton and Halifax. Dr. Liefer teaches in the Biology Department and focuses on coastal ecosystems, effects on groundwater, algal blooms and aquatic microbes. Participants were provided with an overview of how groundwater works, what it is and how it moves. He said that 98% of available freshwater is groundwater. Groundwater is one-third of all drinking water supply in Canada and up to 80% in rural areas. Groundwater flows to rivers, oceans and can carry contaminants. Dr. Liefer asked the group what they are concerned about and what they wanted to learn about. There were many topics raised and we quickly realized that one webinar is not enough and that EOS could provide many groundwater-related workshops in the future. Curiosities and concerns included:

- Saltwater intrusion into groundwater
- Drought and wells going dry
- The recharge rate of groundwater
- Lack of monitoring of groundwater
- Water quality of groundwater
- And more issues

Dr. Liefer explained that groundwater is connected and is located in layers and different depths. Those that are deeper have more pressure on them and can take longer to recharge. In fact, groundwater under confined layers, known as artesian wells, may not replenish in our lifetime if it gets depleted. Groundwater also holds the pollution of the past. He said some of the main concerns impacting the quality of groundwater are leaching landfills. In terms of recharging groundwater, we must focus on keeping land permeable so that rainwater can recharge groundwater. Saltwater intrusion is another main concern, especially in the Maritimes. Saltwater creates more pressure and can move into groundwater. Drought and lower water tables will allow more salt to enter from the coast and sea level rise will put more pressure on our groundwater. Saltwater deposits in the ground can also start to dissolve and cause saltier wells. The main message of the presentation was to take better care of our groundwater. If we need to pave, consider permeable pavement options, let the water get down there. Education and awareness of the importance of water conservation is key as well. There may be lots of water around, but only a small portion is potable.

Eight participants filled in the online evaluation form for the groundwater webinar. All respondents gave the webinar a 4 or 5 out of 5 for overall event experience. Only a couple of respondents said they had a lot of knowledge about groundwater and all respondents said they learned more as a result of participating in the webinar. When asked what they found most interesting, the most common response was issues and explanations around saltwater intrusion. Other items of interest to participants were:

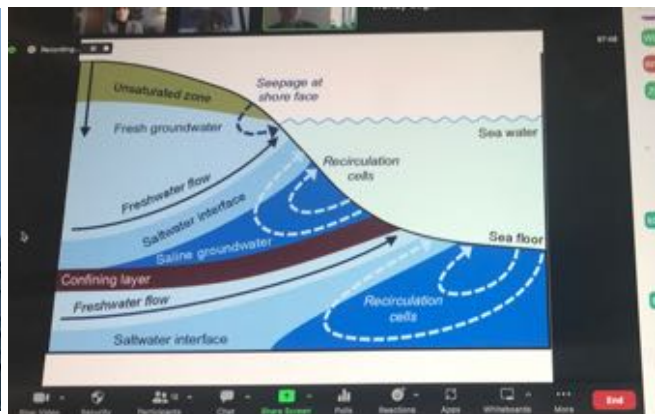
- *Linking groundwater loss to impermeable surfaces.*
- *Graphics were very accessible and highlighted important processes for how water moves through the ground.*

- The content and the discussions were particularly interesting, grounding the challenges to local issues and concerns.
- The overall discussion of groundwater issues. I would like to see follow-up technical talks.

Participants plan to use what they learned from the webinar in a variety of ways including:

- Watching our water use.
- Groundwater use is important and I will take into account how certain things affect groundwater consumption.
- Planning to learn more!
- I had minimal knowledge of [the] topic; presumed groundwater was water that accumulated in the ground from rainfall. What fascinated me is the interconnectedness of processes which result in fresh groundwater - or alternately salt ground water and the ramifications thereof. As water generally is a necessity for all life, issues affecting the planet's groundwater need to be in our focus.
- To better interpret local water quality data.

Participants want to learn more and would like additional groundwater webinars and workshops. One respondent said, "Justin was a wonderful presenter! A very engaging presentation."



Groundwater Protection Webinar

Professional Development

Because EOS is still building capacity for our long-term water quality monitoring program, we continue to access any available training, workshops and learning opportunities. Here are just some of the events we attended during 2022-2023:

- Atlantic Water Network Wetpro Training – April 2022
- First Aid Training – June 8-9 (workplace standard first aid course with CPR C & AED)
- Hanna Probe training
- DataStream data entry training
- NBEN Watershed Caucus Meetings

Results: Priority Measure Indicators

1. Protecting our Environment - Water quality improvements (e.g. water quality monitoring, benthic invertebrate sampling).

We aimed to complete 1 management action, which was water quality monitoring of 12 sites in the Cape Tormentine Watershed Composite. We achieved this priority measure indicator successfully.

2. Increasing environmental awareness

Increasing environmental awareness is measured by the number of events, type of events, number of participants and number of hours. As the results table below indicates, we met or exceeded all of our priority measure indicators.

Results of Efforts to Increase Environmental Awareness

Events/Initiatives	Targets <i>(According to June 2022 Updated Workplan and Priority Measures Submission to ETF)</i>	Results
Public workshops (active discussions)	3 events 50 people 3 x 2 hours = 6 hours	3 events: Nature camp workshops for youth (3 hours, 40 youth), living shoreline webinar (1.5 hour, 23 people), groundwater webinar (1.5 hour, 19 people) Total = 6 hours and 82 people
Water Rangers (active learning)	6 classes 60 students 6 classes x 1 hr = 6 hrs	6 classes/events 78 students 6 hours (1 hour per class)
Well water testing day (active learning)	1 event 10 homes (20-40 people) 1 day	1 event over two days 9 homes (more than 20 people) 3 hours for people to pick up bottles 4 hours for people to drop off samples = 7 hours Total
WQ presentations (observing)	2 presentations 60 people 2 hours	Presentation of results to Chignecto Watersheds Committee Oct 26 th (1.5 hours, 6 people) Public presentation: Total = 2 events, 9 people, 2 hours
Totals	12 events (active and observing) 180 people 20 hours	12 events 195 people total 21 hours total All Targets Met or Exceeded

Impacts and Community Benefits

The project had a positive impact on communities, environments, and aquatic resources in the Tantramar-Strait Shores region. The collection, review and dissemination of additional baseline water quality data helped EOS and local citizens to gain a better understanding of our watershed and was a necessary step towards building a long-term watershed management plan. As EOS continues to collect more data, we will be able to identify trends in water quality and develop a better understanding of what the “normal” water quality is in our waterways, how climate change may impact them, and ultimately work to protect and restore the watershed. Our bulk testing of well water helped homeowners and EOS better understand groundwater in the region. Through a partnership with Dr. Liefer we helped raise awareness of groundwater issues and the need for protection. Finally, our variety of education and outreach activities with students and the general public resulted in increased understanding and awareness of watershed issues, living shorelines, water quality monitoring, which all helped contribute to a more resilient population.

Summary and Recommendations

Overall, EOS had a very successful year of water quality monitoring and public education. This project provided us with valuable additional baseline data that can be used to ensure the health of the Cape Tormentine Watershed area. Furthermore, it has given us the opportunity to better understand our watershed and share our findings with the public. The continuation of baseline data collection across all Chignecto Watersheds can be used to develop a watershed management plan that will ensure long-term, sustainable water resources which are essential for a resilient Tantramar - Strait Shores region. As we continue to collect more data, we will be able to identify trends in the water quality and develop a better understanding of what the “normal” water quality is in our waterways as well as how climate change may impact them.

EOS would like to see that the knowledge gaps in our watersheds continue to be addressed through our long-term water quality monitoring program. We would also like to expand our knowledge of our watersheds through the collection of CABIN data, hydrological data, riparian health data, and fish and habitat data. EOS recommends returning to the Rockport-Dorchester area in 2023-24, which was last sampled in 2020, to obtain a second year of information about the current state of water quality within that watershed. In addition, we wish to coordinate a webinar series on groundwater issues (building off the success of our webinar this past year) including topics such as saltwater intrusion, contaminants, development impacts, testing/tools/monitoring, and protection and action, etc. We recommend bringing our Water Rangers water testing kits to students and classes at Dorchester Consolidated School so that they too can connect their classroom learning to hands-on learning and contributing to water quality testing in their watershed. Finally, using the data collected up to and including the proposed 2023 water quality monitoring season, EOS recommends the creation of an integrated watershed management plan for the Chignecto Watersheds in 2023-24. This plan will pull together all of our findings and expert networks to chart a coordinated course for watershed management in the Chignecto border region for the future.