

# FRESHWATER ACTION ON PLASTIC POLLUTION



**ACAP**  
SAINT JOHN



## Freshwater Action on Plastic Pollution

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# Acknowledgement

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*Freshwater Action on Plastic Pollution* is a true grassroots project that only exists through the selfless efforts of thousands of community volunteers, and through the organizations, community groups, and businesses that contribute to its success. We are proud to say that the list of dedicated contributors is large and ever-growing, and we sincerely appreciate the contribution of every individual, in making Saint John a more restorative environmental city.

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**SAINT JOHN**

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## Introduction

With global production of plastics increasing rapidly, numerous plastics are being released in the environment during their life cycle. Given the durability and stability of plastics, and the rate at which they degrade, they have been found to remain in our environment for a long time.

ACAP Saint John's *Freshwater Action on Plastic Pollution* project aimed to improve freshwater in the Saint John region by taking direct action in removing plastics from our waterways through community cleanups and enabling behavioral changes in regards to plastic use by educating youth and community members about the environmental risks of single use plastics.

With support from Environment and Climate Change Canada's EcoAction Community Funding Program, ACAP Saint John was able to create and deliver comprehensive educational workshops focusing on the reduction of harmful plastic pollution in freshwater and recommend actions participants can take to improve water quality in their daily routine. With the support from ACAP Saint John's extensive volunteer network, we were able to improve the quality of freshwater throughout the Greater Saint John region by organizing and participating in numerous cleanups, reducing the amount of debris from entering our waterways.

Through direct engagement, in-field and in-class education programs, community cleanups, citizen science and outdoor activities, citizens develop a sense of understanding and ownership over their environment and are more likely to support other initiatives that promote good stewardship and sustainable development, ultimately improving freshwater in our region.

## Community Cleanups

For decades, ACAP Saint John has helped community stakeholders organize cleanups throughout Greater Saint John and is recognized as a credible and trusted environmental champion. ACAP Saint John staff have proved successful in their efforts to develop a strong volunteer base and educate the public on the extent of littering and illegal dumping in the region. These actions are maintained through a trusted partnership with the City of Saint John for logistic support, EcoAction for financial support, and in ACAP Saint John's ability to maintain an established and dedicated network of volunteers.

To support volunteers who are interested in organizing a neighbourhood or a shoreline cleanup, ACAP Saint John provided essential items, such as gloves, garbage bags, safety tips, garbage disposal (via the City of Saint John or a rented dumpster), and a cleanup site if necessary. This helped volunteers to be prepared and ensured they had all the materials needed to complete a fun, safe, and successful cleanup.

Each cleanup was unique and the coordinator’s duties depended on each group’s needs. Some groups conducted cleanups on their own and only required supplies and garbage disposal, while other groups needed ACAP Saint John to oversee the necessary cleanup logistics. Cleanup sheets were filled out after each cleanup, recording specific details including number of bags (or weight if known) collected, number of volunteers, and the duration and location of the cleanup (Figure 1). Unless otherwise stated, each garbage bag collected has been assumed to weigh 3.5 kg for consistency in recording.

Through a wide array of media channels including social media, ACAP Saint John’s webpage, local media outlets, as well as community outreach events, ACAP Saint John was able to engage more than 1,400 volunteers to remove over 11,000 kg (24,000 lbs) of debris from the environment and our waterways between June 2021 and November 2022. ACAP Saint John provided supplies for a total of 47 cleanups throughout Greater Saint John contributing to over 3,500 volunteer hours.

## Riparian Cleanups

Saint John is home to more than 500 km of freshwater lakes and streams that host a number of native aquatic species. When garbage and debris accumulate along roadsides, parks or greenspaces, it can easily become aquatic trash if it is not properly disposed of. When

**ACAP SAINT JOHN** 2022 Cleanup Sheet

Cleanup Location: \_\_\_\_\_

Cleanup Date: \_\_\_\_\_

Number of Volunteers: \_\_\_\_\_

Number of Bags of Garbage Collected: \_\_\_\_\_

*Check off any items that you find during your cleanup. If you find a lot of one item feel free to add an estimated number that you collected. Be a cleanup superstar by writing down any additional litter items that are not on this list!*

<input type="checkbox"/>	Plastic water or pop bottle	<input type="checkbox"/>	Cigarette butts
<input type="checkbox"/>	Plastic bottle cap	<input type="checkbox"/>	Paper packaging (i.e., boxboard)
<input type="checkbox"/>	Coffee cups (i.e., cup, lids)	<input type="checkbox"/>	Electronics (i.e., batteries)
<input type="checkbox"/>	Plastic packaging (i.e., food wrappers, plastic wrapping)	<input type="checkbox"/>	Plastic cutlery
<input type="checkbox"/>	Plastic bag (i.e., grocery, ziplock)	<input type="checkbox"/>	Clothing / Footwear
<input type="checkbox"/>	Plastic straw	<input type="checkbox"/>	PPE (i.e., gloves, masks)
<input type="checkbox"/>	Discarded fishing gear (i.e., rope/line, lobster bands)	<input type="checkbox"/>	Styrofoam
<input type="checkbox"/>	Small plastic pieces (unknown origin)	<input type="checkbox"/>	Beverage cans
OTHER ITEMS:			

Submit your results online: [www.acapsj.org/cleanup](http://www.acapsj.org/cleanup)

Thank you for helping to keep our environment healthy and beautiful!

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Figure 1. Cleanup sheet distributed to volunteers conducting a volunteer cleanup.

garbage is littered on the ground, rain and wind often carries it into storm drains, streams, and rivers. This will ultimately lead to poor water quality and can have a detrimental effect on wildlife (i.e., entanglement, ingestion) that inhabit these watersheds and their riparian areas. If action does not take place to remove this type of litter, it may flow into the Saint John Harbour and reach the Bay of Fundy, contributing to marine debris and other environmental health problems.

Through funding from the EcoAction Community Funding Program, ACAP Saint John was able to facilitate riparian cleanups around the Saint John area. These areas included coastal shorelines, urban streams, and freshwater beaches.

## Great Fundy Coastal Cleanup

The Great Fundy Coastal Cleanup (GFCC) is an annual province-wide initiative led by the Nature Trust of New Brunswick. The focus is to eliminate marine debris throughout New Brunswick and along the shorelines of the Bay of Fundy. Organizations across the Southwestern New Brunswick coast host cleanups for volunteers to participate in to further protect our coastal ecosystems and the wildlife that call these shorelines home.

ACAP Saint John has been involved with the GFCC for the past few years as hosts in the Saint John region. Each year, volunteers help remove shoreline debris and trash along beaches to improve the water quality and protect urban wildlife.

### 2021

ACAP Saint John hosted the 2021 GFCC event at the Long Wharf Beach near the Harbour Passage walking trail as it is easily accessible, has a lot of foot traffic, and is often overlooked in terms of beach cleanup locations.

Throughout the two-hour cleanup, 14 volunteers collected approximately 9 bags of garbage, one camping chair (in perfect condition), and some construction material (Figure 2). Most of the debris collected was common marine debris including small plastics, Styrofoam, small pieces of rope, and an abundant amount of cigarette butts.

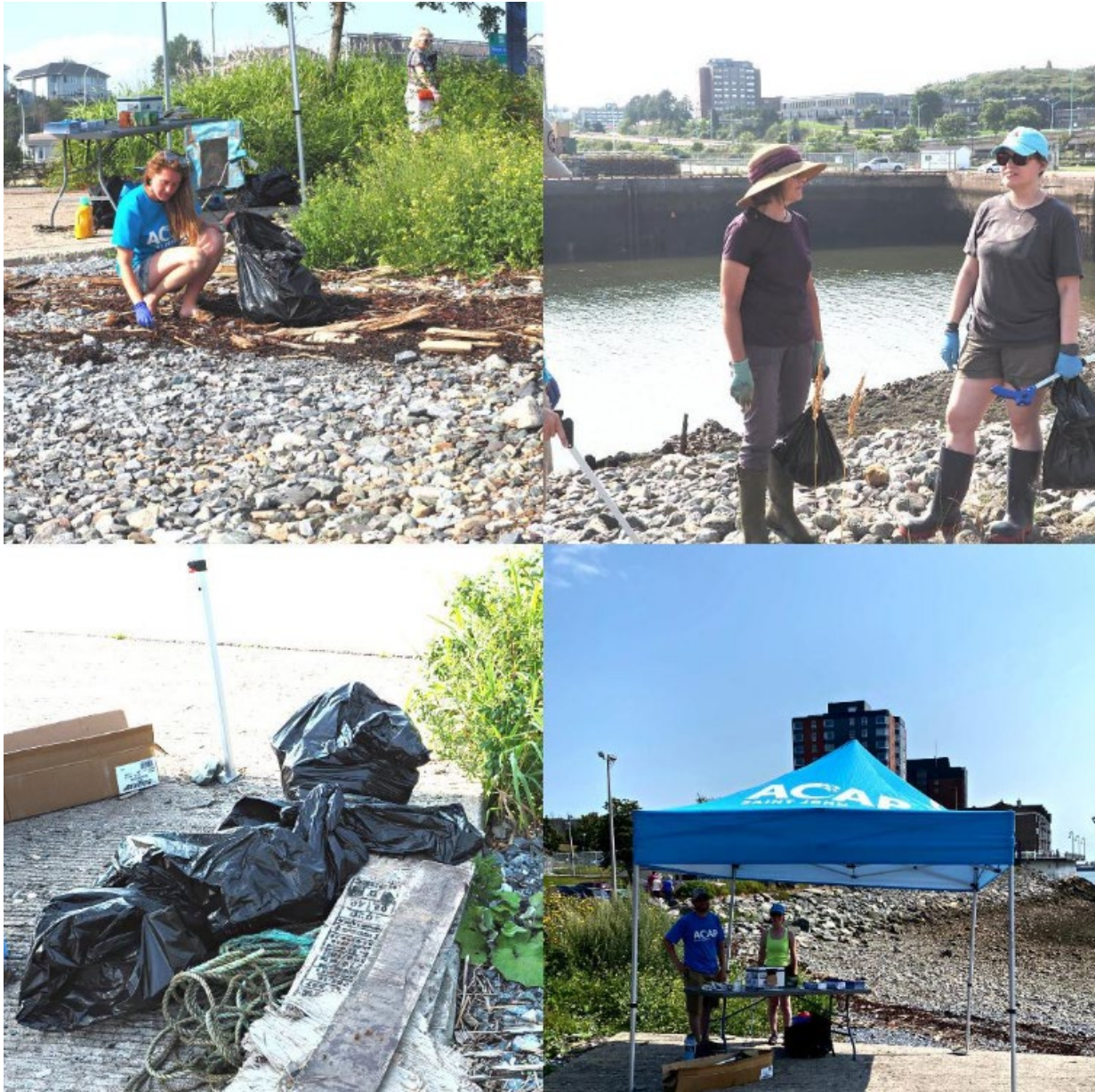


Figure 2. Great Fundy Coastal Cleanup at Long Wharf in August 2021.

## 2022

As part of 2022 GFCC event, ACAP Saint John partnered with In Step Adventures, a local adventure tourism group, to pick up litter and shoreline debris on Rayworth Beach Nature Preserve, a parcel of land owned by the New Brunswick Nature Trust on Long Island. Located in the middle of the Kennebecasis Bay, Long Island is home to little cottages, sheer rock faces, beaches and private coves.



On August 20th, 2022, nine volunteers kayaked to the island and participated in an hour-long cleanup around the preserve. Although frequently visited by boaters and cottage owners, the island was fairly clean with only two bags of trash collected (Figure 3).

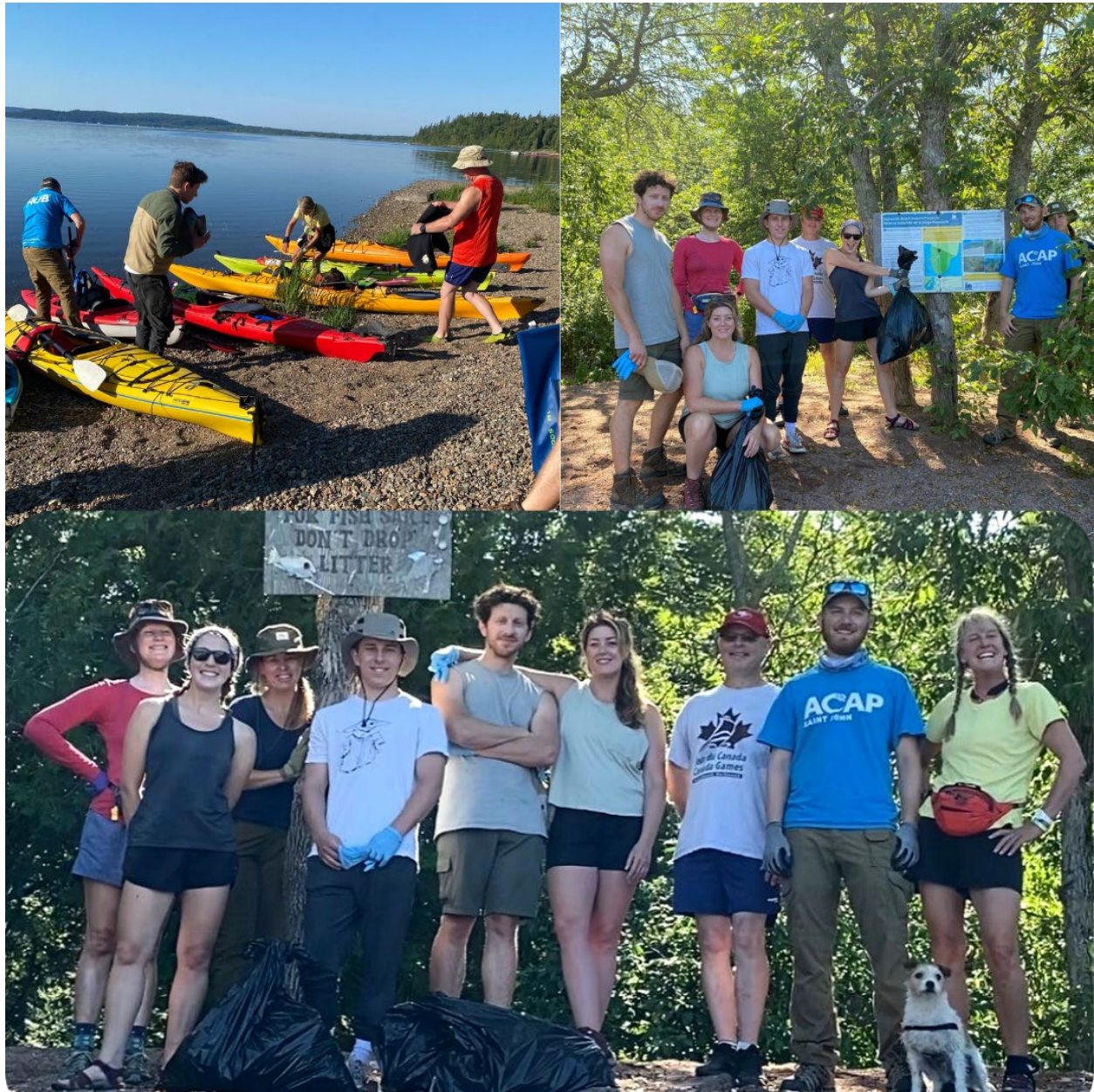


Figure 3. In Step Adventures and volunteers conducting a cleanup on Long Island on August 20, 2022.

Despite the small amount of trash picked up from the island, it was nevertheless a successful cleanup event. Volunteers had the opportunity to learn about nature preserves in their own backyard and the importance of keeping them clean.

## Marsh Creek Cleanup

ACAP Saint John's Marsh Creek Cleanup is a renowned, annual event that brings together various volunteers within Greater Saint John to pick up tonnes of debris in and around the watershed, specifically the Majors Brook and Cold Brook tributary. The Marsh Creek Cleanup event has been on hiatus for the last two years due to the global pandemic. With health restrictions lifted, ACAP Saint John was able to bring back the anticipated volunteer event to clean up trash and debris around the Marsh Creek watershed.

On May 7th, 2022, 74 volunteers met outside the Irving Oil Field House (headquarters) before being separated into 9 different teams. Each team was assigned a team leader and a location around the commercial district (Figure 4).

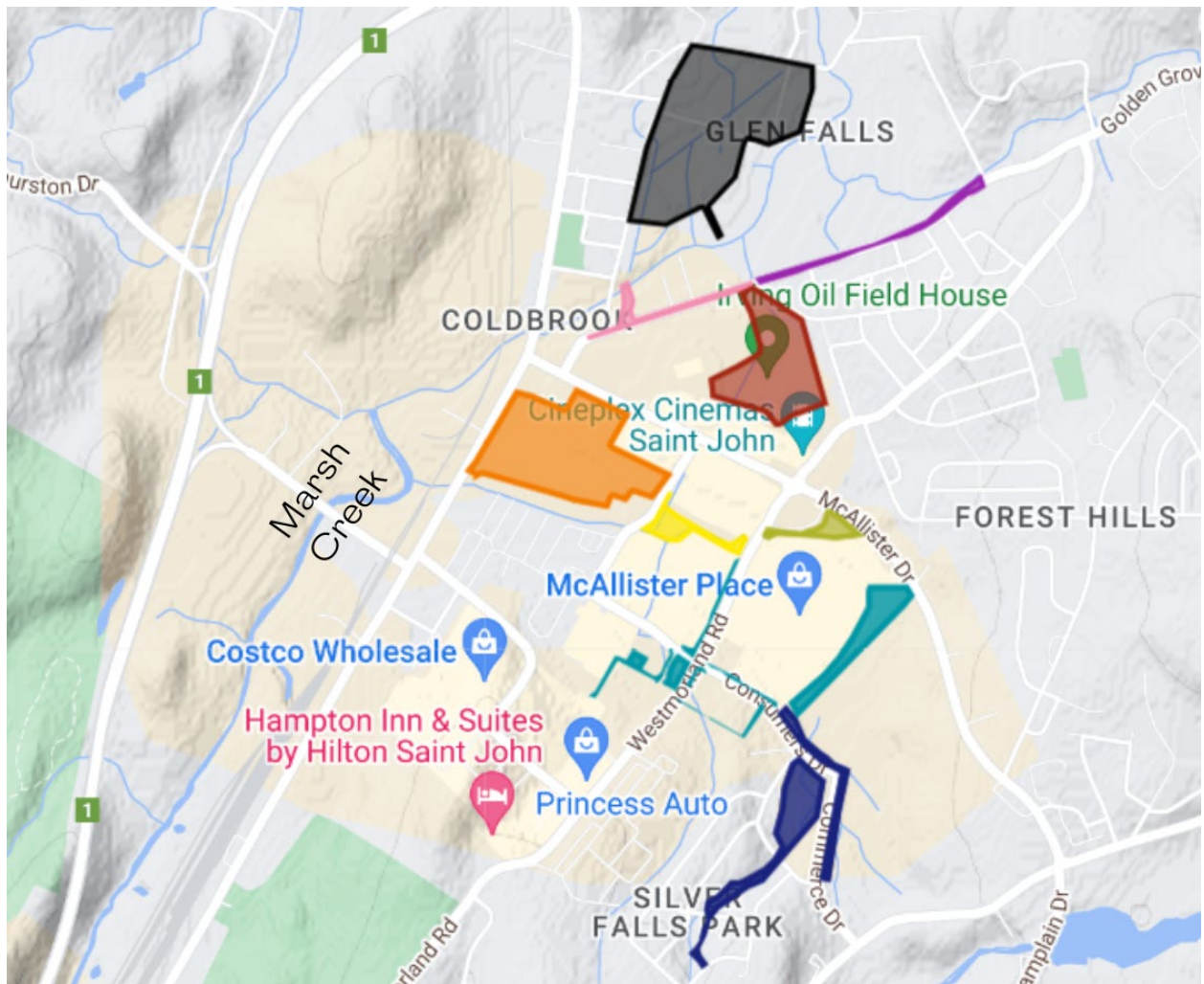


Figure 4. Map of cleanup locations located on the East Side shopping district during the 2022 Marsh Creek Cleanup.

For approximately three hours, each team picked up garbage around their assigned location. Both small and large items were removed including shopping carts, a hockey net, couch, mattress, lumber and bags of Styrofoam (Figure 5). Prizes were donated from local businesses (i.e., River and Trail, Timber Top, Bubbles and Balms, etc.) and were awarded to teams who collected the

most unique item. Over the course of the event, 1,730 kg of trash was picked up by the volunteers, placed into rented dumpsters and brought to the landfill.



*Figure 5. Volunteers participating in the annual Marsh Creek Cleanup (2022).*

New this year, was having experienced kayakers from River Bay Adventures kayak along the main stem of Marsh Creek (adjacent to Rothesay Avenue) to remove debris found on the bank and within the creek (Figure 6). ACAP Saint John is ecstatic to partner with such an amazing local company that is willing to volunteer their time to help keep our watersheds clean.



*Figure 6. Steve and Jim (River Bay Adventures) posing next to their muddy kayaks after paddling along Marsh Creek during the Marsh Creek Cleanup.*

Hosting this annual event is crucial in our community as the commercial district and the neighbourhood nearby accumulate a large amount of debris and trash in just one year. Our volunteers are always so excited to be a part of this event, and our team hopes to continue this annual cleanup for years to come.

## Beaches

Saint John, New Brunswick is home to many beaches that are accustomed to the accumulation of litter from both the daily tide cycle and the spring freshet. When planning a volunteer cleanup event, organizers are drawn to keeping the region's beaches cleaned from debris and often will choose to participate in a shoreline cleanup.

Throughout this project, ACAP Saint John helped organize 15 beach cleanups. During these events, our staff were able to emphasize the importance of cutting back plastic consumption and reducing it from entering waterways. A significant volume of waste was collected throughout the course of this project with the most common items being single use plastics (Figure 7). Since Canada's ban on single use plastics came into effect in December 2022, it should be noted that

moving forward, beach cleanup results will show a significant decrease in the amount of plastics removed during these events.

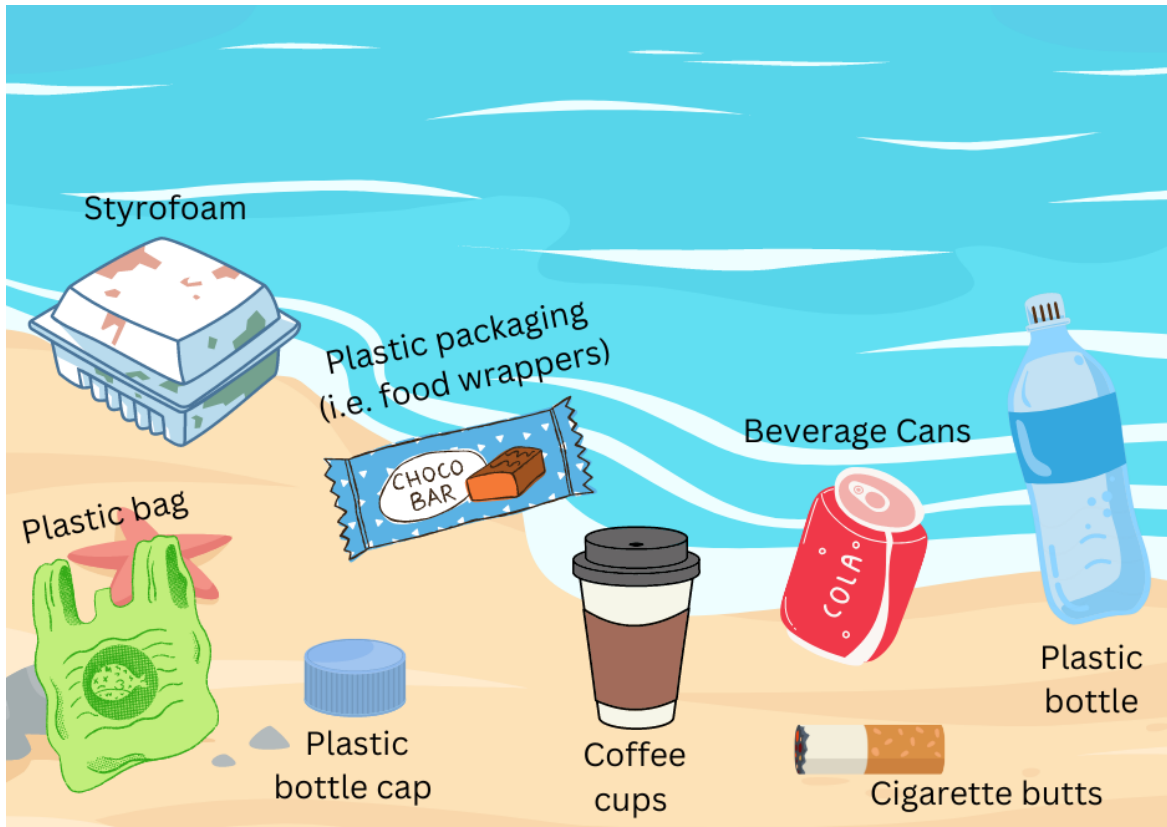


Figure 7. Commonly found items during shoreline cleanups.

## Neighbourhood Cleanups

Throughout this project volunteers gathered to specific areas of the city to remove trash before it was able to reach our freshwater watercourses, improving our greenspaces, environment and ultimately our riparian zones. Throughout these events, staff were able to educate volunteers about plastic waste, the importance of plastic reduction, and learning more about the impacts of microplastics.

Year after year, old and new volunteers reach out to ACAP Saint John to help organize community cleanups. Positive feedback is always received from participants, and community members, regarding how much fun they had, and how great the experience and support was. These large-scale cleanups are not possible without the helping hands of these incredible volunteers (Figure 8).



Figure 8. Community cleanups organized by individual groups with the support of ACAP Saint John.

## Environmental Education

### Microplastics

Humans have been mass producing plastics since the early 1950s, and the demand for plastic products has been consistently increasing over the recent years. While this type of pollution is not a new issue, it is recently growing as a global concern. Initially, scientific research and public education was mostly focused on large plastic debris, however over the last few years, microplastics have received an increasing attention and now have become a new area of

research. Microplastics are very small pieces of plastic (less than 5 mm) that enter our rivers and oceans, and pose threats to a multitude of aquatic life. Sources of microplastics include, but are not limited to, stormwater runoff, clothing (i.e., synthetic fibers), microbeads in hygiene products, fishing equipment, and public littering (Figure 9).

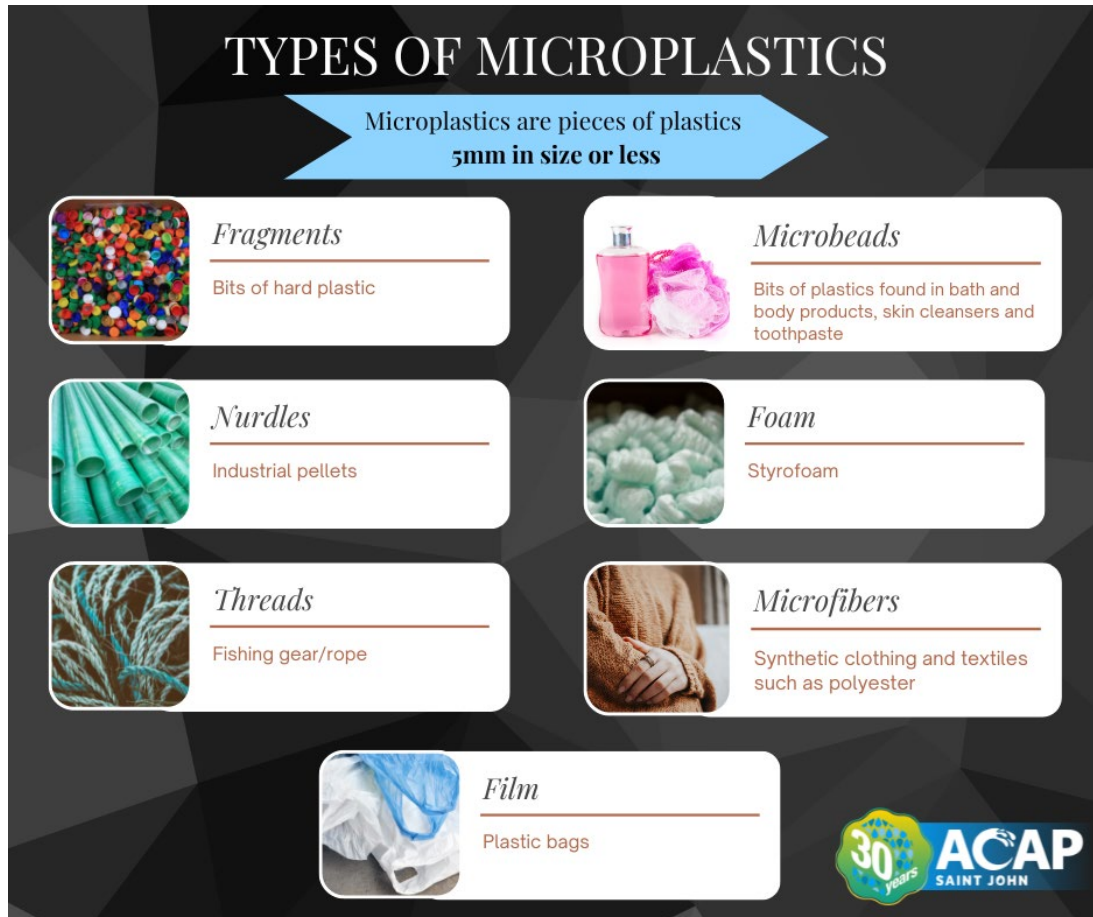


Figure 9. Types of microplastics that can be found in the environment.

In the water, these plastics are often confused with food and are ingested by aquatic biota. This can lead to detrimental health issues or death of aquatic life caused by blockages or toxic contaminants leaching from plastics.

Plastic contamination is a newly emerging field of study and while there has been some work in biota and sediments within New Brunswick, very little sampling of this type has been done in our watersheds. With an ever-persistent reliance on plastic products within our community and nation, ACAP Saint John began to collect baseline data on microplastics throughout the region to learn about the magnitude of plastics in our watersheds.

Since 2018, ACAP Saint John has analyzed microplastic samples collected from sediments and surface water along freshwater rivers and the Saint John Harbour to look at both quantity and types of plastics in our environment. Throughout the initial analysis, it was found that microplastics are present in these water bodies, with microfibers being the most abundant. This conclusion has

led ACAP Saint John to raise awareness of how single-use-plastic impacts our environment by breaking down into microplastics, with a focus on what research is currently being done in the Maritimes and how citizens can help reduce the amount of microplastics from entering our environment.

## Case Study - Lint LUV-R Filter - Citizen Science Project

Researchers estimate that 4.8 million tons of synthetic microfibers (i.e., polyester and nylon) have entered our waterways and terrestrial environments since the 1950s (Erdle et al., 2021). Once these microfibers are released into the environment, they become extremely difficult to remove and researchers are now focusing their attention on understanding ways in which microfibers shed, their sources and pathways into the environment, and different technologies to capture microfibers at their emission source (Erdle et al., 2021).

Researchers have found that washing our clothes using a washing machine is one of the major contributors of microfibers to the environment (Browne et al., 2011). During a regular laundry cycle, microfibers shed from clothing into the wash water, and it is estimated that an average household load of laundry can shed thousands to millions of microfibers in a single wash (Browne et al., 2011).

With this knowledge, ACAP Saint John was interested in implementing a citizen science project for community members with the goal to bring awareness to the microfibers litter problem in our freshwater systems and ways to reduce them from further entering our environment. Compiling this data over the course of 12 months will illustrate how many microfibers and other particles can be removed from our wastewater treatment plants and will demonstrate how effective microfiber filtering systems are when they are properly hooked up to a household washing machine.

### Methods

ACAP Saint John held multiple webinars and lunch-and-learns for interested community members with an informative presentation reaching close to 100 people. These presentations focused on what microplastics are, what research is currently being done, and how the participants can contribute to ongoing microplastic research through the citizen science program. Participants of the workshops that were interested in assisting in our research received an innovative filter (Lint LUV-R) that would be installed to their household washing machines to remove untreatable synthetic solids from laundry cycle discharge. Ultimately installation of the Lint LUV-R will reduce household microplastics entering our waterways and oceans, and thus improving water quality (Figure 10).



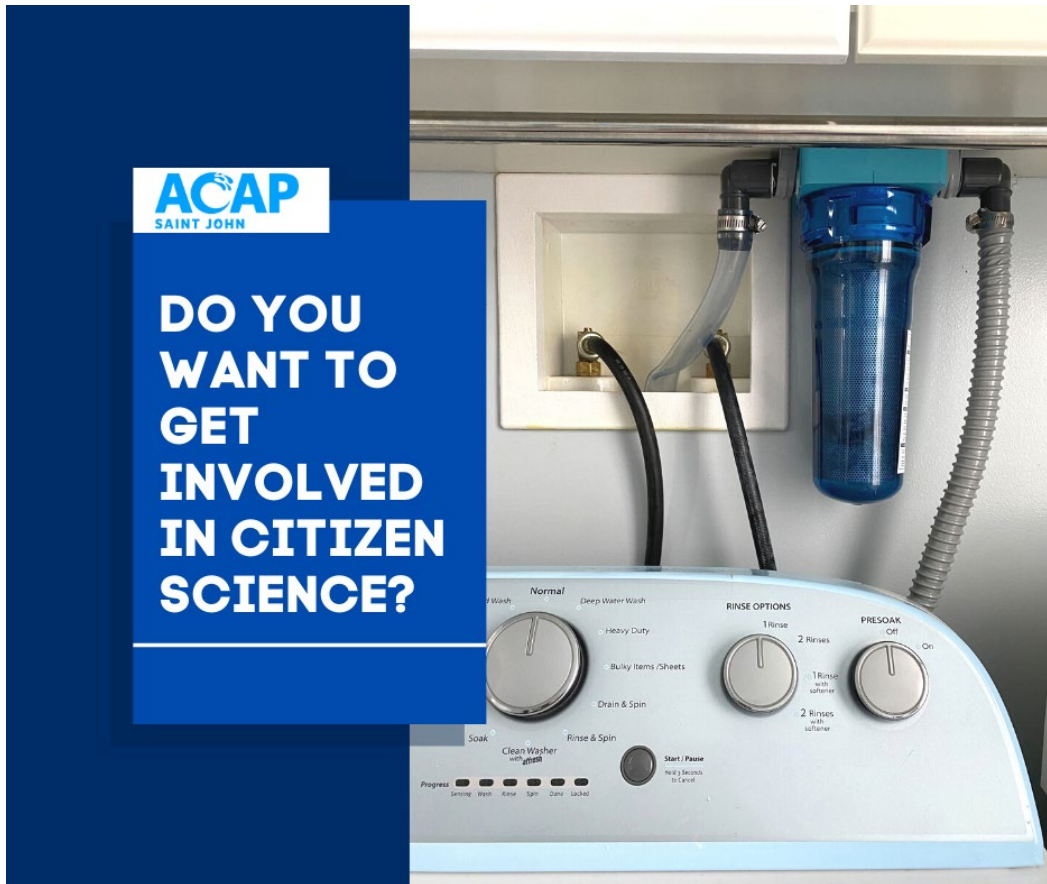



Figure 10. Sample graphic used to engage community members in the citizen science project. The Lint LUV-R filter is featured in the image.

Through funding from EcoAction and the New Brunswick Environmental Trust Fund, ACAP Saint John purchased 60 filters to distribute to citizens interested in collecting data and contributing to our research. Each participant was provided resources on how to install their filter on their washing machine, and record any data collected as they cleaned their filter. It was recommended that filters were cleaned every 2-3 weeks or after 15 loads of laundry. The contents collected from the filter was to be dried and weighed (each participant was given a kitchen scale) (Figure 11). Data was then recorded and uploaded on ACAP Saint John's website (Figure 12).



Figure 11. Images that show the process of lint collection, drying, and weighing.



**MY ROLE IN REDUCING PLASTICS FROM WASTEWATER**

*Capturing and removing microfibers from our laundry using the LINT LUV-R filter.*

**CITIZEN SCIENCE DATA FORM**

Name \*

First Name Last Name

Email \*

**My washing machine is connected to**

Municipal Waste Water Treatment  
 Septic Tank

**My washing machine is a**

Top load  
 Front load

**I wash my clothes with**

Hot water  
 Cold water

**Number of people in my household**

**I am using a \***

Lint LUV-R Filter  
 Guppyfriend Garment Bag

**Number of loads completed before filter cleaning**

Only answer if using the Lint LUV-R

Figure 12. A simple submission form was available on ACAP Saint John's website for citizen scientists to upload their data.

## Results

Over the course of this project, ACAP Saint John aimed to distribute 60 filters to households. Out of the 60 participants, we received washing machine information and Lint LUV-R data from 23 households. There was a total of 10 front load and 13 top load washing machines. Across all participants, ACAP Saint John was interested in quantifying the amount of total captured household lint (i.e., microfibers, microplastics, outdoor debris, pet hair, etc.).

We recorded a total lint mass of 1,651 g (dry weight) after a total of 2,522 loads completed by participants. Lint mass varied between households and ranged from 0.01 to 5 g/load with an overall average lint mass of 0.6 g/load.

Hartline et al. (2016) found that there was a significant difference between the weight of microfibers collected in the filter from top loading machines compared to front load washing machines. To test this with the results of our study, a t-test was performed to compare the amount of lint collected between top load and front load washing machines. Our results found that

although participants with top load washing machines yield more lint ( $0.699 \pm 0.775$ ) compared to front load ( $0.473 \pm 0.632$ ), there was no significant difference between the two models ( $t_{0.05}(2),116 = -15802$ ,  $p\text{-value} = 0.1168$ ) (Figure 13). Although our results do not support other literature, this is likely due to the small sample size of both front load and top load participants within our study.

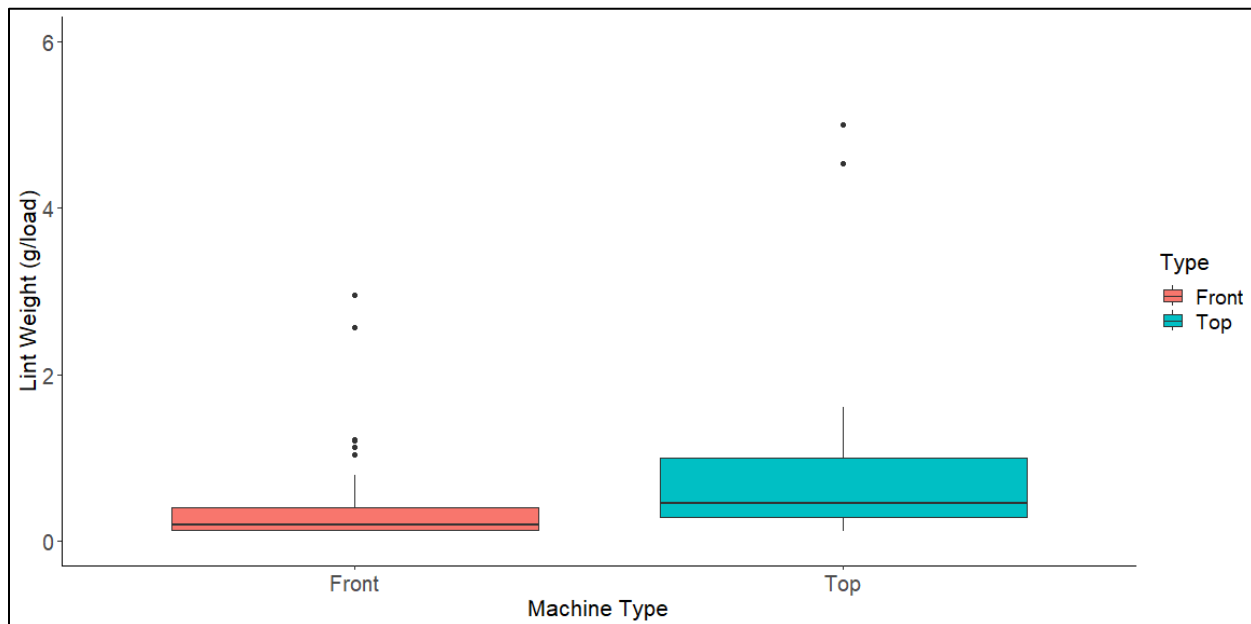


Figure 13. Comparison of lint weight (g/load) of lint collected per load of laundry between front load washing machines and top load washing machines. Black dots represent outliers in the data and the median is represented by a black line in the box plot.

Since lint collected in the filter is a combination of microfibers and other materials, we calculated the total microfiber count per mg of lint using Erdle et al. (2021) methods where the average microfiber count per mg of lint analyzed was  $45.5 \pm 21.4$  microfibers per mg. The total number of microfibers collected from this project is estimated to be 74,295,000.

Overall, this citizen science project was well received by participants, while also capturing and removing a significant amount of microfibers from our waterways. Participants were encouraged to keep their filters installed permanently to continue to capture microfibers from clothing that are shed during a laundry cycle.

### Challenges

Despite 60 filters being distributed to citizen scientists, ACAP Saint John only received data from 23 participants. Although participation results were less than ideal, folks that did contribute to our citizen science project had positive reviews in regard to the program.

When contacted, participants admitted that they had their filters installed but didn't collect weight data and some confessed to be too busy/forgot to install their filters but still had intentions of hooking them up after the end of this project. With this, microfibers will still be collected when shed during a laundry cycle, thus keeping our waterways cleaner from plastic debris.

## Classrooms

ACAP Saint John has a well-established network of educators from schools around the Saint John area that often invite our staff to present to their students on a wide range of topics. This year, classroom presentations were centered around ACAP Saint John's microplastics research, including what microplastics are and their effect on the environment, the ongoing microplastics work in the Saint John Harbour/Wolastoq [St. John River], and ways to limit the contribution of microplastics in our waterways. In the presentations to classes, students were asked to think about how they use plastics in their everyday routine and become more aware of where they can cut back. When possible, these classroom presentations were followed by a cleanup around their school property or hands-on educational activities (Figure 14).



Figure 14. ACAP Saint John engaged with local schools to deliver presentations, conduct cleanups and outdoor educational activities.

## Local Farmers Markets

ACAP Saint John staff visited five farmers markets during the duration of the project to display current microplastics research being conducted throughout the city. Staff were able to engage with interested community members about our ongoing EcoAction project and to share any results that had been collected (Figure 15). Through these events, ACAP Saint John was able to engage with over 200 community members.



*Figure 15. Shayelin set up at the AREA 506 Container Village displaying ACAP Saint John's microplastics project.*

## Summer Camp & Youth/Community groups

ACAP Saint John visited various community groups during the duration of this project including Girl Guides of Canada, YMCA of Greater Saint John (Newcomers Connection), Big Brothers Big Sisters of Saint John, and the Saint John Learning Exchange (Women's Empowerment Group). Each year ACAP Saint John staff are delighted to visit with local groups to provide hands-on educational activities.

## School Curriculum

ACAP Saint John developed curriculum pieces (for all ages) to be distributed to teachers to use in the classroom. These pieces included information about plastics and microplastics, a series of activities for students and youth, and a call to action with specific actions that the students can take at home or in their school. Packages were developed for elementary school, middle school, and high school students that included informative videos and worksheets that can be distributed to students to fill out as an activity (Figure 16).

The image shows a worksheet titled "Itty Bitty, but everywhere!" with the ACAP Saint John Microplastics logo. It includes a video reference "2.1 VIDEO 1—WHAT ARE MICROPLASTICS?" and a section for "Discussion Topics / Questions". The main heading is "WHAT IS PLASTIC?". There are three numbered questions with sub-questions (a and b) and corresponding blank lines for answers. An illustration of plastic bottles and a watermelon slice is also present.

**ACAP SAINT JOHN Microplastics**

**Itty Bitty, but everywhere!**

2.1 VIDEO 1—WHAT ARE MICROPLASTICS?

**Discussion Topics / Questions**

**WHAT IS PLASTIC?**

1. One of the motivators behind the invention of plastic was to replace organic materials used in products. Materials like ivory from elephant tusks and whale bone (baleen) were becoming scarce due to overhunting, so plastic was seen as an innovation to replace these. Many sources state that the invention of plastic had an altruistic motive; that of saving endangered species.

a. While the outcome may have seen a decrease in the use of products from endangered species, do you think this was ever a true motive or simply a positive side-effect?

b. What may have been an alternative motivation?

2. Plastic is used in so many ways today that you might not even think of. While single-use plastics get a lot of attention as a mass pollutant, what are other plastics that you may come across in your daily life?

a. Consider materials in your home, vehicle, and classroom. Are there alternative materials that could be used to replace these?

3. Think about the motivators behind the continued use of plastic. Like other known pollutants (i.e. fossil fuels), why do we continue to produce them when we know how dangerous they are?

1

These curriculum pieces were sent to the Anglophone School District - South's Science and Innovation Coordinator. From there, each package was sent to the respective educators in the Saint John Region.

Figure 16. Sample of activity sheet created schools across New Brunswick.

# Communications

Beyond in-person engagement, ACAP Saint John shared the success of this EcoAction project through the organization's website and social media platforms.

## Website

The ACAP Saint John website is a simple way for community members to learn more about our organization, our current research, and ways to get involved. The website is regularly updated with project updates and current volunteer events/workshops. Throughout the duration of this project, ACAP Saint John included all community cleanup events and any workshops that were being held on the website's event page. The microplastics page also has detailed information on the Lint LUV-R initiative, what microplastics are, and our current research, as well as the educational videos created for teachers and educators. At the end of March 2023, ACAP Saint John had 300 page views.

## Social Media

During the global pandemic, society has increased the amount of time spent on social media. ACAP Saint John utilized this opportunity to keep followers connected and informed through educational posts, public event announcements, and virtual engagement, encouraging a connection between community members and nature like never before. ACAP Saint John found that engagement through social media was most effective, where posts are easily and quickly distributed through wide networks.

Throughout the project *Freshwater Action on Plastic Pollution*, ACAP made 23 social media posts focusing on building awareness around plastic pollution and microplastics in the Greater Saint John, reaching over 13,000 people. This form of communication allows for educational content to be shared easily and directly to people who are interested in helping our environment.

By the end of March 2023, ACAP Saint John had 4,300 followers on the organization's Twitter account, 1,450 followers on Instagram, 2,600 followers on Facebook, and 260 followers on LinkedIn.

## Conclusion

Throughout the success of this project, ACAP Saint John was able to improve the quality of freshwater throughout the Greater Saint John region by organizing and participating in numerous cleanups, reducing the amount of debris from entering our waterways, and by creating and delivering comprehensive educational presentations that focused on the reduction of harmful plastic pollution in freshwater. ACAP Saint John facilitated a total of 47 community cleanups removing over 11,000 kg of waste from our environment. Through education and awareness, and a citizen science project, this project has demonstrated why action is necessary, provided examples of simple actions citizens can take to reduce plastics and provided opportunities for the community to participate in the reduction of plastic pollution around our region, all to improve freshwater quality.



This project's success demonstrates not only ACAP Saint John's ability and passion to improve the environment and freshwater in our region, but also the power of our volunteers and community connections to participate in our programming to help improve our waterways through daily actions.

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