2020 FINAL REPORT

PROJECT P2100011

Supporting Alewife Restoration, Creation of Map & Document Library, & Youth Engagement Program

International Joint Commission
International St. Croix River Watershed Board

Submitted by:
ELIZABETH HYSLOP
Executive Director

April 26, 2021

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Message from our Co-Chairs

The 2020 season was like no previous year as we all have been affected by the uncertainties of COVID-19.

The staff of the St Croix International Waterway Commission (SCIWC) rose to the challenge and were able to complete all the projects planned for 2020, even if their timelines had to be modified as the season progressed.

Flexibility and resourcefulness where key skills as our staff completed their projects on the lower and upper sections of the Waterway. At the same time the Commission explored new and exciting projects for future years. Initiatives that will benefit the people, wildlife, and resources of the St Croix Waterway as we go forward into 2021 and beyond.

David Whittingham, Canadian Co-Chair

G. Bob Wallace, US Co-Chair

Executive Director Report

2020 was the second full year in my role as Executive Director of the St. Croix International Waterway Commission. The transition from the insurance and corporate world to this position has been a wonderful challenge made as successful as it has been through the support of the Board, Liaisons, Partners, and Staff. Each group were willing to take the time to teach me and support my growth in this role. There are far too many to thank individually but I do want all to know that your time and effort are so greatly appreciated.

The information shared in this report I trust will demonstrate the hard work and effort exhibited by our Board and Staff and provide a greater understanding of our work.

Elizabeth Ann Hyslop, BBA, FCIP

Operational Summary 2020

2020 was a successful, and difficult year, for the St. Croix International Waterway Commission that was marked by continued improvements in our processes, adapting to a pandemic, and the launch of three new projects. We were able to implement, with delays and modifications, the Heritage River Recreation, Supporting Alewife Restoration in the St. Croix River Watershed Anadromous Fish Counts at Milltown Dam, and Water Quality Monitoring on the St. Croix Watershed programs. Additionally, we added Benthic Invertebrates Sampling, Map and Document Library Catalogue, and Youth Engagement programs. To follow in subsequent sections will be a brief overview of each program.

The corona virus pandemic impacted our programs and operations, as it had with our communities and nations collectively, with layoffs, closure of our administration office in Calais and that of our partners, US

Canadian Border closing, adapting to the various emergency orders, and the requirement for staff to work remotely. The restricted operations of others impacted operations in several areas, just as:

- Our financial documents for 2019 audit were submitted in March but the final audit document was not received until January 4, 2021, as both our bookkeeper and auditor's operations were severely impacted. This resulted in delays in filing required tax returns and the Commission taking on the duties of bookkeeping from the previously retained accounting firm.
- CABIN Training program was cancelled, and it was difficult arranging for CABIN qualified individuals to meet the terms of our contract for the Benthic Invertebrate Sampling project.
- Pandemic safety protocols enforced by NB Power and the DFO, resulted in extreme limitations in the access to the Milltown Dam fishway for the anadromous fish count, forcing our Lead Biologist to be the sole individual allowed on site for the duration of the fish run.
- Both the Province of NB and State of Maine issued Emergency Measures that closed all recreation sites, in addition to other restrictions, that delayed the hiring for the Heritage Recreation Program, cancellations and refunds for site rentals in NB, and delayed site maintenance from April 20, by three weeks, to May 11.
- There was the substantial delay in obtaining the necessary Work Permits submitted to *Immigration, Refugees and Citizenship Canada (IRCC)* for our two American staff members, including our Program Coordinator. The applications are usually issued directly at the Ferry Point Canada Border Service (CBSA) office, but all such operations were ceased locally, and the process had to be completed online. This resulted in a process that usually takes 1 2 hours being delayed by nearly four weeks for our Recreation Krew staff member and nearly two months for our Program Coordinator. Therefore, neither could not participate in any work in Canada and were prevented from completing their duties.

The personal impact to our staff was a delay in hiring for the programs and layoffs. Two employees were laid off in March for approximately a month but did qualified for the Canada Emergency Response Benefit (CERB), reducing the impact of the layoff. Our Program Coordinator was laid off in April and our office was nearly total closure. We were able to qualify and received financial assistance US federal Payroll Protection Plan (PPP) and Canadian Canada Emergency Wage Subsidy (CEWS) funding. These funds permitted us to continue operations until such time as alterations were made to our various programs to comply with COVID 19 Protocols.

During the six-week period of March 19 – May 5 and beginning October 1, 2020, and into 2021, the Calais administration office was closed, forcing the Executive Director and Program Coordinator to work from home. The Peskotomuhkati Nation graciously provided office space from November 6 20, until their office was closed with the Emergency Order going back to Phase Orange on November 20. As many have experienced, working from home is difficult because of the lack of interaction and support with key personnel, limited access to materials and resources, and office set ups that are not conducive to continued good physical and mental health. It also takes over personal space in the individual's home, reduces their ability to utilize and enjoy that space, and does not provide the healthy separation of work and home.

The office closure in October resulted in the third layoff for the employee working on the Map & Library Catalogue project. With the office closed and the border restricted, this employee would no longer had access to the files for the Map & Library Catalogue project. Additionally, the Youth Engagement project was set do deliver the curriculum to grade 5 students in early December but was cancelled due to the pandemic concerns. As a result, the two employees working on these two projects found alternative full-time employment, October, and December respectively, and we are recruiting for a replacement.

The region experienced an unusual heat wave in July that restricted access to remote areas to protect against fires and reduced the ability of staff to work safely outdoors. During this period, the water quality sampling was restricted, and the campsites were closed.

In September, there were two break ins at our St. Croix Outdoor Centre location and several thousand dollars in equipment was stolen. The police were notified, a file opened but no charges have been laid.

Despite these unusual challenges, we were able to maintain the employment of our Program Coordinator, a huge triumph as the Commission's core funding does not cover the basic operations. Additionally, we rehired one of our American and six of our Canadian employees from last year, and four new employees.

In addition to our focus above, the Commission continued to actively seek opportunities to form partnerships with the public, government, and others. More details can be found in the EVENTS & PUBLIC ENGAGEMENT Section for the various events and activities.

Partners

Regional Governmental Agencies

Province of New Brunswick

- Department of Natural Resources and Energy Development (K. Kinney, L. Wilbur)
- Office of the Premier (L. Leger)

State of Maine

- Maine Dept. of Agriculture, Conservation & Forestry (A. Cutco)
- Bureau of Parks & Lands) M. Deroche)

Maine State Legislature, District 6 (Senator M. Moore)

St. Croix International Waterway Commission

- Elizabeth Hyslop, BBA, FCIP, Executive Director
- Gloria Tinker, Program Coordinator

- Pandemic was the most serious and far-reaching issue encountered in 2020.

- Core funding continues to present a significant financial challenge, as the funds allocated from the State of Maine and Province of New Brunswick are not enough to meet the basic operational and administrative activities of the SCWIC. In 1986, the funding was $50,000 CND from PNB plus $50,000 USD State of ME, but these amounts are currently half at $25,000 CND plus $25,000 USD. To have these funds increased, the State of Maine must first pass Bill LD 450 of Maine State Legislature. Once the bill is passed, the Province of New Brunswick will allocate matching funds. Bill LD 450 was approved by the House and Senate by April 2019 but declared 'dead' in November 2020. The process will begin again with the 130th Legislature.
- July Heat Wave
- NB Power decommissioning of the Milltown Dam that presents challenges in continuing the Fish Count program, including providing student work placement.

Our Structure

The SCIWC was established in 1987 through a signing of a Memorandum of Understanding (MOU) between the Province of New Brunswick and the State of Maine.

In New Brunswick, Commissioners are appointed by the Premier's office and is considered one of the Provincial agencies, boards and commissions in which the provincial government does have exclusive authority over appointments. Included in these entities are include self-regulating professions, trusts, and federal and municipal boards, each with a corresponding Provincial Legislative Act, which in the case of the SCIWC, the act defines the structure, purpose, and authority of the commission (Government of New Brunswick, 2021).

There is currently one position for a Canadian commissioner.

In Maine, Commissioners are appointed by the Governor's Office and is considered a Personal Appointment, which do not require a public hearing or approval of the State Legislature. Persons appointed to Personal Boards must be sworn in by a Dedimus Justice within 30 days of their appointment. If the appointee is not sworn in within 30 days, they may not serve until they are reappointed by the Governor (Maine.gov, 2021).

The Board of Directors met three (3) times in 2020, missing the second quarterly meeting due to pandemic restrictions; one (1) special meeting, five (5) committee meetings, and ten (10) Co-Chair and Management meetings.

Based on the MOU and legislation, a Board of Directors overseas the operations of the Commission, as illustrated in the **Organizational Chart and Current Board** below.

Current Board of Directors

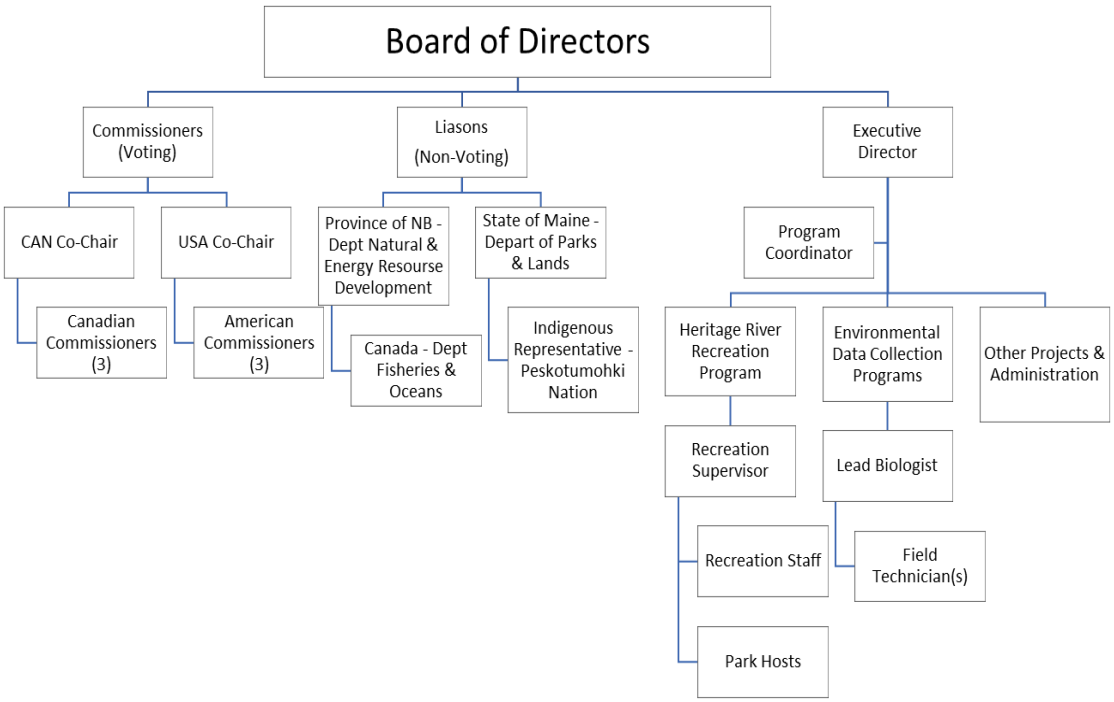
David Whittingham	Canadian Co Chair	**G. Robert Wallace**	US Co Chair
Cleveland Allaby	Canadian Commissioner	**David Apgar**	US Commissioner
George Guimond	Guimond	**Richard Scribner**	US Commissioner
Constance McDougall	Canadian Commissioner	**Honorable Madonna Soctomah**	US Commissioner
Liaisons	Government of Canada, Department of Oceans and Fisheries		

State of Maine, Maine Dept. of Agriculture, Conservation & Forestry, Bureau of Parks & Lands

Province of New Brunswick, Department of Natural Resources and Energy Development

Indigenous Representative

Peskotomuhkati Nation at Skutik – Passamaquoddy Tribe



The Board of Directors met three (3) times in 2020, missing the second quarterly meeting due to pandemic restrictions; one (1) special meeting, five (5) committee meetings, and ten (10) Co Chair and Management meetings.

Staff

The Management Team of *Elizabeth Hyslop, BBA*, Executive Director and *Gloria Tinker*, Program Coordinator worked together with our Lead Biologist, *Rebecca Goreham, B.Sc.* and Heritage River Recreation Supervisor, *Gareth Whittingham, BA* in delivering the 2020 projects, and ensuring safe and productive work environments. We were fortunate to have Rebecca and Gareth return in their important roles, as well as our two Park Hosts *Dale Jackson* and *Pat Olsen*, and *Jason Deveau*, *Xochitl Rodriquez* and *Dylan Eggleton, B.Sc.* for the Heritage River Recreation Program. Dylan also worked on the Map Catalogue of the 723 regional maps in our possession.

Additionally, we recruited and hired four new staff members – Grace, Brandy, Lauren, and Rhonda. *Grace Huys* and *Brandy Johnston* joined our Recreation Krew this summer, both are from the St. Stephen area. Grace graduated from attended St. Stephen High School in 2020 and started her Bachelor of Business Administration in September at Acadia University. Brandy completed her first year at University of New Brunswick in the Environmental Management program. Lauren Mahon Hodgins, B.Sc., a graduate of Marine Biology & Sustainable Development, at Dalhousie University, worked with Rebecca in the collecting the water quality samples. Our final new hire for 2020, was Rhonda Sage, B.Sc. with a degree in Agriculture and Environmental Sciences (Aquatic

Biology), from University of Guelph, and extensive experience as a Nature & Forest School Educator in Ontario. Rhonda developed the curriculum for the Youth Engagement Program for grade 5 students and tested the curriculum in August at day camps.

Our Purpose

The St. Croix International Waterway Commission is unique in geography, partnerships, and processes as they relate to the joint management of a transboundary river system. The 1987 Memorandum of Understanding MOU (Brennan & Hatfield, 1986, p. 3), that outlined the guiding principles and the purpose of the commission, was a collaboration between two countries to formally commit to working together on a shared interest. Although worded slightly different, the subsequent legislation enacted by the Premier of New Brunswick (Province of New Brunswick, 2014, p. 5) and Governor of Maine (State of Maine, 1987, p. 7) demonstrate the shared interest. For the past 35 years, this commitment has remained intact and continues to be the basis of operation of the SCIWC and staff.

Table 1: MOU & Legislation Comparison

MEMORANDUM OF UNDERSTANDING (1987)	CHAPTER 133: Province of New Brunswick (1987, 2014)	Chapter 8: State of Maine (1987, 2014)
Protect and manage valuable natural and recreational resource.	To encourage the conservation and management of the natural resources of the Waterway,	Encourage wise use - Encourage continued wise use of the river system and adjacent lands for maximum economic benefit of the people of the region;
	To coordinate the efforts of the Province and the State of Maine in managing and developing the resources of the Waterway,	Protect recreational resources - Protect and coordinate the management of an increasingly valuable natural and recreational resource for current and future usage;
Encourage and maintain a high-quality back country recreational and educational experience for users of the resource	To promote preservation and public awareness of the heritage of the early inhabitants of the Waterway, including that of native peoples and the early European settlers,	Encourage back country experience - Encourage and maintain a high quality back country recreational and educational experience for users of the resource;
Encourage tourism, based on identified themes, with resultant economic benefits to the region;	To encourage tourism in the Waterway	Encourage tourism - Encourage tourism, based on identified themes, with resultant economic benefits to the region;
Protect and promote awareness of human heritage resources including both Indian and Early European	To encourage the use of the natural and historical resources of the Waterway for educational and recreational purposes,	Promote heritage - Protect and promote awareness of human heritage resources, including both Indian and early European;
Ensure coordination-in the planning and management of a shared resource	To establish working committees to study the present and potential utilization of the resources of the Waterway and to recommend resource management strategies to the Commission,	Coordinate Shared resources - Ensure coordination in the planning and management of a shared resource
Establish the mechanisms and processes to be used to ensure fair representation of all user groups thereby minimizing conflicts	To encourage the conservation and management of the forest resources of the Waterway while facilitating the optimal commercial utilization of this resource,	Ensure fair use - Establish the mechanisms and processes to be used to ensure fair representation of all user groups, thereby minimizing conflicts; and
And obtain optimal benefits from recreational and educational use of the resource while, recognizing the historic and current economic importance of the forest resource including its management and commercial utilization.	To encourage and facilitate consultation with residents of the Waterway and groups who make significant use of the Waterway, and	Obtain optimal benefits - Obtain optimal benefits from recreational and educational use of the resource, while recognizing the historic and current economic importance of the forest resource, including its management and commercial utilization.
	To encourage the development of public education programs to promote public awareness of the joint efforts of the Province and the State of Maine.	

Projects and Programs

Each year, the SCIWC works with local, regional, and federal stakeholders on a variety of projects that align with our operating purpose, as defined in our MOU and legislation. In 2019 we had been working on the following projects that are now complete:

ST. CROIX RIVER GEOMATICS INFORMATION SYSTEMS STORY MAP: Canada, Canadian Heritage River System has launched the site and the web-based story map of the St. Croix River can be viewed at https://chrs.ca/en/rivers/st croix river. This project was sponsored by Parks Canada, Canadian Heritage River Systems, and the Province of New Brunswick, Department of Energy and Natural Resources.

LAUNCHED MOBILE APP VAMONDE: www.vamonde.com is a web and mobile creative tool that allows a service provider to develop a tourist experience platform to engage with its audience. This application was launched with the support of the Washington County Community College (WCCC).

In 2020, the SCIWC undertook six (6) projects, including three (3) new projects.

Table 2: 2020 Active Project List

Description	Funder	Contract No.	Status	
Water Quality Monitoring in the St. Croix Watershed	Province of NB, Environmenatl Trust Fund	200189	Completed	Renewable
Benthic Inverterbrate Sampling on the St. Croix River	Province of NB, Environmenatl Trust Fund	200169	Partially Completed	Non-renewable
Supporting Alewife Restoration in the St. Croix River Watershed	International Joint Commission	P2100011	Completed	Renewable
Creation of Map & Document Library	International Joint Commission	P2100011	Partially Completed	Non-renewable
Youth Engagement Program	International Joint Commission	P2100011	Partially Completed	Non-renewable
Heritage River Recreation Project	Various	Various	Completed	Renewable

UPDATE THE RECREATION MAP OF THE ST. CROIX RIVER: We will continue to work with Taylor Printing Group Inc. to update the 'St. Croix International Waterway Commission Recreation Map". In 2021, the next step is to secure funding.

COMMEMORATIVE PLAQUES: The CHRS (Canadian Heritage River Systems) had new commemorative plaques made that are in the three languages to represent the Indigenous, English & French history of the region. Fundraising will be required to cover the cost of having the plaques erected.

Community Engagement

The Commission continues to develop a community engagement culture within the organization. In addition to the weekly email distribution of a Milltown River Herring Count newsletter to 130 individuals and organizations, and in compliance with the necessary pandemic safety protocols, we participated in various teleconferences

and virtual meetings. We continued to connect with others through our website and social media updates in Facebook, Twitter, and Instagram.

To promote the Commission, we concentrated on finding ways each month to interact with others in our communities and bring awareness to the organization and its funders. In addition to the various activities and events attended, the Executive Director was become a board member of the St. Stephen Area Chamber of Commerce until April, WCCC Adventure Recreation and Tourism Advisory Committee, and the NB Power Milltown Dam Community Liaison Committee (Co Chair). The Commission is also a member of the Maine Tourism Association.

As a representative of the SCIWC and the community, the Executive Director has been a member and co-chair of the NB Power Community Liaison Committee (CLC), as it pertains to the decommissioning of the Milltown Hydro Power Dam. The CLC has met monthly since March 2020 to discuss the process and progress of the decommissioning. The current goal of the CLC is to identify a legacy project that will honor the past, present, and future of the dam.

To follow is a snapshot of the community engagement activities we attended or participated in 2020.

Month	Activity
January	• Board Meeting St. Stephen Area Chamber of Commerce (St. Stephen) • Meeting with Southwest NB Service Commission St. Croix Corridor Plan Update Discussion (St. Stephen) • Southwest NB Service Commission Office Visit to review map collection (St. Croix) • NB Power Milltown Dam Decommissioning Information Session – Garcelon Civic Centre (St. Stephen)
February	• Coordinating Planning Session for St. Croix Beach – Village of McAdam (St. Stephen) • Changing Minds Workshop (2 days) – Mental Health Training Canadian Mental Health Association of New Brunswick (St. Stephen) • Charlotte County Heritage Fair (we had a display and attended the workshops) – Garcelon Civic Centre (St. Stephen) • Vamonde Website and App Training – Washington County Community College (Calais) • Future Ready NB Community Session – St. Stephen University (St. Stephen)
March	• Meeting with SIM Corp to identify possible collaborations (St. Stephen) • Ed Bassett Office Visit to review map collection (Calais) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen) • Constituency Meeting with MP John Williamson (St. Stephen)
6 Week Office Closure and Restrictions on In Person Meetings	
April	• "How to work Productively from Home under Extraordinary Circumstances" LearnSphere Canada (Virtual Webinar) • "Answers Now: Keeping your business running during the Covid 19 Outbreak" – ADP USA (Virtual Webinar)
May	• "Responsibilities of Directors During and After a Pandemic" LearnSphere Canada (2-part Virtual Webinar) • Forest City Dam Proposal Meetings (Teleconferences) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen)
June	• IJC IWI Partners – International Watershed Board Meeting (Virtual Meeting) • Forest City Dam Proposal Meeting (Forest City, NB) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen) • Eco Canada & Huntsman Marine Benthic Invertebrate Collaboration (Virtual Meeting) • ACAP Saint John – Meet staff and collect equipment borrowed from Atlantic Water Network (Saint John)

July	• Tourism NB Workshop – hosted Aquila Tours (Virtual Meeting) • Discussion with NB Power on assisting in upcoming projects (Virtual Meeting) • Next Steps Working Group Meeting – First Nations lead (Virtual Meeting) • Hosted Volunteer Event – Spednic Lake Park Clean Up Saturday (Spednic Lake) • Meeting on North Lake Beach Proposal – PNB (Virtual Meeting) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen)
August	• Meeting with SIM Corp to discuss possible Mussel Study (St. Stephen) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen) • Review of library and map collection with Lee Sochasky (St. Croix)
September	• William Francis Ganong Heritage Sculpture Unveiling (St. Stephen) • IJC International St. Croix River Watershed Board Meeting (Virtual Meeting) • Ganong Nature Park Various discussions looking for ways to collaborate (St. Stephen)
October 1 to December 31, 2020 – Calais Office Closed	
October	• PGR Meeting – Chief Akagi (Teleconference) • NBCC Student Project Meeting to Scope Project Requirements (Teleconference)
November	• KAIROS Collaboration – developing relationships with the Indigenous Nations (Teleconference) • NB Power Community Liaison Committee Meeting – Garcelon Civic Centre (St. Stephen)
2 Weeks Temporary Office Space in Peskotomuhkati Nation Office	
December	• Consultation and Stakeholder Engagement – NB Power (Virtual Meeting) • Local Education Offerings by Community Members – Hosted by Future St. Stephen & Local School Representatives (Virtual Meeting)
	• **STUDENT EXPERIENTIAL ENRICHMENT:** We have contacted New Brunswick Community College to act as a Host Organization for the Business Administration Program group project in early 2021.

INTERNATIONAL JOINT COMMISSION (IJC)

INTERNATIONAL WATERSHEDS INITIATIVES (IWI), INTERNATIONAL ST. CROIX RIVER WATERSHED BOARD

Project No: P2100011	**Project Term:** **April 1, 2019 – March 31, 2020**

In 2020, the IJC IWI supported the Commission with three (3) projects:

1. Supporting Alewife Restoration in The St. Croix Watershed Anadromous Fish Counts at Milltown Dam
2. Map and Library Cataloguing
3. Youth Engagement Program

Supporting Alewife Restoration in The St. Croix Watershed - Anadromous Fish Counts at Milltown Dam

Partners

International Joint Commission (IJC)

1717 H Street NW, Suite 835, Washington, DC 20006

234 Laurier Avenue West, 22nd Floor, Ottawa ON K1P 6K6
www.ijc.org
R. Phillips

International Watersheds Initiatives (IWI), International St. Croix River Watershed Board

U.S. Army Corps of Engineers New England District, Concord 01742 MA
Environment and Climate Change Canada Atlantic Region, Dartmouth B2Y 2N6 NS
https://ijc.org/en/scrwb
B. Blumeris, K. Parlee

Énergie NB Power

Milltown Hydro Power Dam, PO Box 336, St. Stephen, NB E3L 1K4
www.nbpower.com
J. Babcock A. Bielecki, E. Fournier, M. Gorman

Government of Canada, Department of Oceans and Fisheries (DFO)

PO Box 1009, St. George, NB E5C 3K6
www.dfo mpo.gc.ca
H. Millar, E. Stuart

Regional Governmental Agencies

State of Maine
Maine Dept. of Marine Resources, Division of Sea Run Fisheries and Habitat
21 State House Station, Augusta, ME 04330
www.maine.gov/dmr/science research/searun/index.html
S. Ledwin, M. Pasterczyk

Peskotomuhkati Nation at Skutik

27 King St, Saint Stephen, NB E3L 2C1
qonaskamkuk.com

Passamaquoddy at Sipayik

Sipayik Environmental Department
PO Box 343, Perry, ME 04667
www.wabanaki.com

St. Croix International Waterway Commission

Rebecca Goreham, BSc., Lead Biologist

Executive Summary

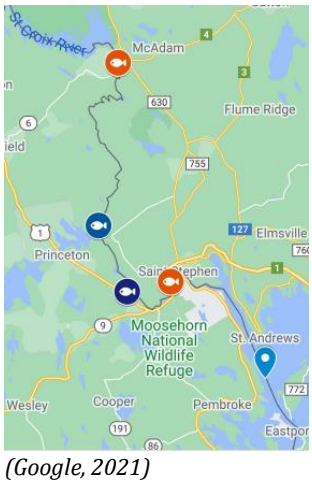
The project supports both St. Croix International Waterway Commission and the International St. Croix River Watershed Board (IWI SCRWB) mandates related to the joint management of the environmental, economic, and natural resources of the transboundary St. Croix River. The IWI SCRWB has worked with the

SCIWC and its partners to proactively assist in preventing and resolving disputes regarding the boundary waters of the St. Croix and this project (Milltown fish count) aligns with the IWI SCRWB Board's work plan priority to facilitate and support partners in the restoration of river herring to the St. Croix. The IWI SCRWB Board played a key role in helping to resolve the long running dispute over allowing river herring access to the St. Croix watershed and now has an important role in encouraging the watershed's diverse stakeholders to work together toward river herring restoration and multi species fish management. This project provides critical research to monitor and evaluate the return and restoration of alewife to the river, supports development and validation of an alewife population dynamics model and establishing future alewife restoration plans and targets, as well as supporting better overall understanding of the ecological health of the watershed.

As in prior years, in 2020 the St. Croix International Waterway Commission operated the Milltown Research Trap and collected relevant data under agreements, licenses partnerships with Canadian Department of Fisheries & Oceans, NB Power, the International Join Commission (IJC), Maine Department of Marine Resources (DMR), Peskotomuhkati Nation, and Sipayik Environmental Department. These partnerships were essential to the successful completion of the fish count process.

Introduction – History of the Project

Anadromous fish, fish that migrate from the sea up rivers to spawn, include species such as salmon and river herring. Although salmon have not been observed in the area for several years, the herring populations have been steadily increasing. To reach their spawning habitat, anadromous fish entering the St. Croix River pass through up to four (4) dam systems, equipped with fish passageways. The first dam in the fish upstream passage is the Milltown Hydro Power Station (Milltown Dam), then the Woodland Pulp (Woodland Dam), followed by Grand Falls Dam and ending at Vanceboro Dam.



(Google, 2021)

The Milltown Dam is located at the head of tide on this international boundary water between Maine and New Brunswick and is owned by the New Brunswick Power Corporation (Énergie NB Power). The fishway and research trap are on the Canadian side of the river and are under the jurisdiction of Canada's Department of Fisheries & Oceans (DFO). The SCIWC has worked closely with NB Power, who has provided annual safety training and access to the facilities to conduct the counts. DFO and NB Power are currently updating the Safety Operational Plan for the use of the DFO provided research trap.

In response to the local stakeholder interest in the river herring population in the St. Croix Watershed, a fish count process has initiated in 1981 and DFO installed a research trap at the NB Power Milltown Hydro Power Station fishway.

From 1981 to 2006 the counting facility was operated seasonally for up to seven months each year to document all inbound fish but notably Atlantic salmon (*Salmo salar*) and river herring [alewives or Gaspereau (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*)]. Beginning in 2007 and

continuing to the present, the counting facility was operational from May July and primarily focused on documenting the annual river herring run.

Fish passage in the St. Croix River was limited during the period of 1995 – 2013 when the upstream fishways at the Woodland and Grand Falls dams were blocked, preventing passage of the spawning river herring. This resulted in a decrease in number of fish counted from the record high of 2,624,700 in 1987 to the record low of 900 fish counted in 2002. Measures were implemented to facilitate the growth of the fisher. In 2001 the Department of Fisheries & Oceans Canada began to restock the river by transporting a portion of the spawning run from Milltown to Woodland Flowage, past the Woodland Dam. Additionally, barriers in the fishways were removed. First the Woodland Dam fishway barrier was removed in 2008 and the Grand Falls Dam fishway barrier was removed in 2013, allowing river herring access the upper watershed. The following graph demonstrates the fluctuations in fish count totals from 1981 to 2020.

2022 is the anticipated decommissioning of the Milltown dam by Energy NB Power (Energy NB Power, 2021) and will impact the ability to count and monitor fish passage.

Financial Summary

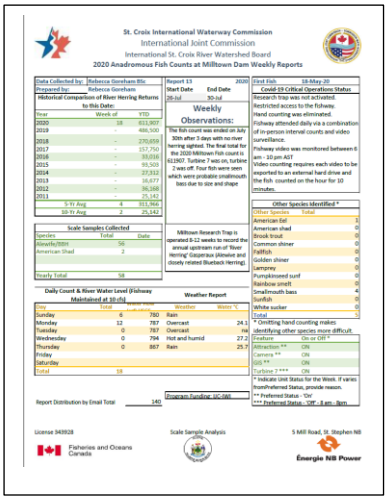
Based on the reduced access to the Milltown Dam and related decrease in wage expenses, the 2020 budget was reduced to $16,204.

Table 3: Financial Summary 2020

Account Name	Revenue	Expense
Balance forw ard	$ -	$ -
TWSE - CND Temporary Wage Subsidy	$ 676.26	
CEWS - CND Emergency Wage Subsidy	$ 1,522.33	
IJC -IWI Grant	$ 16,204.00	
Office & Miscellaneous		$ 618.05
Postage & Courier		$ 38.55
Project Suppllies		$ 159.06
Travel - Employee Mileage		$ 105.01
Travel - Meals and Accommodations		$ 28.42
Wages - Canadian Employees		$ 13,609.39
Wages - US Employees		$ 1,938.28
Vacation Earned		$ 484.74
CPP Expense		$ 671.68
EI Expense		$ 366.13
WHSCC Expense		$ 40.81
SOCSEC - FED Social Security		$ 92.89
FED Medicare - Employer US		$ 21.71
ME 940ME - State Unemployment		$ 4.03
	$ 18,402.59	$ 18,178.75
REVENUE minus EXPENSE	$ 223.84	

Key Dates

The Milltown research trap is operated for an 8-to-12-week period each year to record the run of alewives (or Gaspereau) and closely related blueback herring, collectively called river herring. Other fish entering the trap are also documented.


St. Croix International Waterway Commission
International Joint Commission
International St. Croix River Watershed Board
2020 Anadromous Fish Counts at Milltown Dam Weekly Reports

Weekly Observations:

Fisheries and Oceans Canada

Energie NB Power

Weekly Trap Reports were issued Thursdays following the final trap check each Wednesday evening. Based on the requests of various end users, the report was updated in include additional information, such as the daily count, weather, and water levels. In total, 13 reports were prepared and distributed. These reports were made available to the public by request, through social media and through an email distribution list of approximately 140 individuals and organizations. This data is available to agencies, legislators, and involved parties to support evolving restoration plans.

Key Dates:

April 15, 2020 – Fishway activated.

April 27, 2020 – Camera installed in fishway.

May 20 21, 2020 – Camera malfunction and not data recorded.

May 18, 2020 – First Fish

May 19, 2020 – Turbine 7 turned off during the day.

May 22, 2020 – Lights installed in fishway.

June 29, 2020 – NB Power adjusted head pond levels.

July 27, 2020 – Last Fish

July 30, 2020 – End of Season.

On April 15, 2020, the research trap was opened and fishway activated by NB Power. At the time of activation, spring river flows were 4440 cubic feet per second (cfs). Due to the configuration of the Milltown dam and fishway, river flows greater than 5000 cfs significantly limit attraction and effective operation of the fishway. River flows did not exceed 4440 cfs during the 2020 fish count.

The operation of the research trap and access to the facilities were severely impacted by the safety protocols initiated in response to the COVID 19 pandemic. Access to the fishway was restricted to the Lead Biologist only and no other persons were granted access by NB Power. Additionally, DFO did not authorize the use of the research trap.

Because of the Provincial State of Emergency, access to the Milltown Dam was initially denied. With the assistance of NB Power and DFO, access was granted in time to prepare for the fish count and on April 27, 2020, NB Power installed a security camera. This camera was installed over the fishway, looking down upon the "whiteboard" – the area of the fish ladder where passing fish are counted. The camera was wired to a laptop in the SCIWC building on site, where video could be saved and viewed. Video recorded daily between 6 am 10 pm each day, and the recording were saved on a 2 TB external hard drive for viewing. The size of the video files was substantial enough that less than a week of videos could be stored. Between click counting, the fish could be counted from the video, therefore reducing the number of hours and staffing required at the dam. From the installation date to the end of the season, July 30, the camera operated effectively with two (2) days of lost data (May 20 – 21) when the camera failed to record.

Biologist Season Summary Report

Submitted by Rebecca Goreham, BSc. Rebecca has been an active participant in this study over the last number of years and is exceptionally well versed in operations of the fish count.

Introduction

Anadromous fish inbound to spawn in the St. Croix/Skutik River have been counted at the research trap at the Milltown dam fishway since 1981. The dam is located at the head-of-tide on this International Boundary water between Maine and New Brunswick and is owned by the New Brunswick Power Corporation (NB Power). The pool and weir style fishway and research trap are on the Canadian side of the river and are under the jurisdiction of Canada's Department of Fisheries & Oceans (DFO).

From 1981 to 2006 the counting facility was operated seasonally for up to seven months each year to document all inbound fish, notably Atlantic salmon (Salmo salar) and the fishes collectively known as river herring / Gaspereau / siqonomeq – more specifically known as alewives (Alosa pseudoharengus) and blueback herring (Alosa aestivalis). Since 2007 a reduced operation has focused primarily on documenting the annual river herring run from May to July.

In 2020 the St. Croix International Waterway Commission (SCIWC) conducted fish counts at the Milltown hydroelectric dam and collected relevant data under agreements and/ partnerships with DFO, NB Power, the U.S. Fish & Wildlife Service (USFWS), the International Join Commission (IJC), Maine Department of Marine Resources (DMR), and the Sipayik Environmental Department.

The operation of the research trap was affected by the pandemic of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Due to the outbreak of SARS-CoV-2, and its resulting infection, Coronavirus Disease 2019 (Covid-19), access to the fishway and the fish trap were restricted, especially during the beginning of the fish count.

Only one staff member of the SCIWC was given clearance to enter the Milltown Generating Station site. Access was not initially given to the fishway, where fish count and sampling take place. On April 27, 2020, NB Power installed a surplus security camera over the fishway, looking down upon the "whiteboard" – the area of the fish ladder where passing fish are counted (see photo 1). The camera was wired to a laptop in the SCIWC building on site, where video could be saved and viewed. Videos were backed up to a 2 TB external hard drive. Video was recorded between 06:00 and 22:00 each night. Due to the size of the files (50 gigs/day) the videos were not retained long after viewing.

At the time of activation, spring river flows were 4440 cubic feet per second (cfs). Due to the configuration of the Milltown dam and fishway, river flows greater than 5000 cfs significantly limit attraction and effective operation of the fishway. River flows did not exceed 4440 cfs during the 2020 fish count.

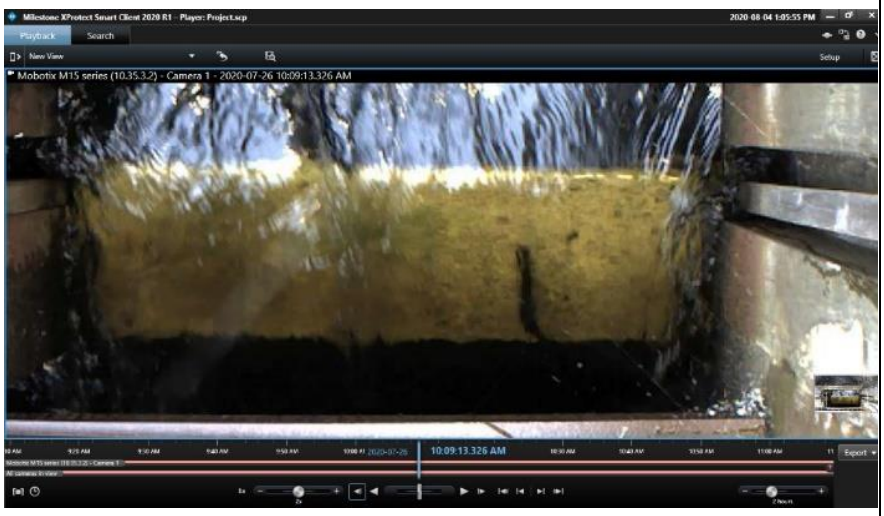
Methods

The Milltown fishway was activated by NB Power staff on April 15, 2020. The research trap was unused during the 2020 fish count season, as it was deemed non-essential due to safety measures put in place for the SARS-CoV-2 pandemic. SCIWC employees were restricted to one person on site, and they were initially only allowed to work in the SCIWC building and not enter the fishway.

Some last-minute teamwork between NB Power and SCIWC resulted in a Mobotix security camera being installed over the fishway, looking down on the whiteboard (Photo 15). This allowed the fish count to proceed for the 2020 season, with the count taking place via video feed. The video camera was connected to a computer in the SCIWC's building on site and the fish counted via video. The fish count was conducted with the same procedure used previously in the hourly "click" counts. Video footage was viewed every hour, on the hour, between 06:00 and 21:00, and the number of fish passing through the fishway over the whiteboard were counted for a ten-minute interval. This number was multiplied by 6 to give an estimate of fish for the hour. The use of video footage did offer the advantage of being slowed down during heavy runs for a more accurate count of fish. The video counts also require less time overall, as videos could be saved and viewed with interval counts being done in succession, without waiting for the next counting interval. The videos were recorded and stored on an external hard drive (Seagate Backup Slim Plus 2TB). The videos were saved for approximately two weeks, but due to the size of the files (approximately 50 gigabytes a day) were not stored permanently.

Photo 1: Camera and lights positioned over the whiteboard.

Photo 2: A still photo from the video overlooking the whiteboard.



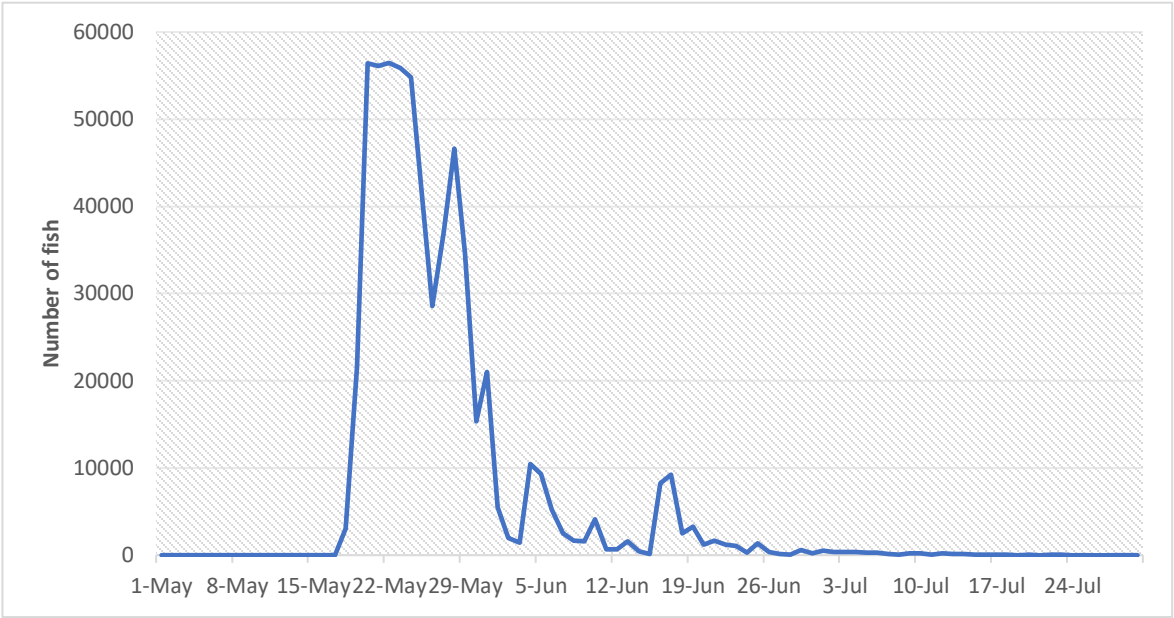
Results and Conclusions

A total of 611,907 fish were recorded at the Milltown trap in 2020, a 25.8% increase from the 486,500 fish counted in 2019. The ten-year average 175,863 (2011 – 2020).

Additionally, scale samples were collected 25 of the last 40 years, as a tool to identify repeat spawners, age, sex, and size of a sample population of the fish counted at the Milltown dam. Four other freshwater species were also counted going up the fishway . Twenty-nine American Shad (Alosa sapidissima) were seen during counts. No Atlantic Salmon were recorded in 2020.

The final numbers of fish species recorded are minimum counts for 2020, Due to limitations of interval counts it is assumed other species pass when counts are not actively being conducted.

Graph 1: Number of River Herring per Day 2020



Graph 2: Comparison of Total River Herring 2011 - 2020

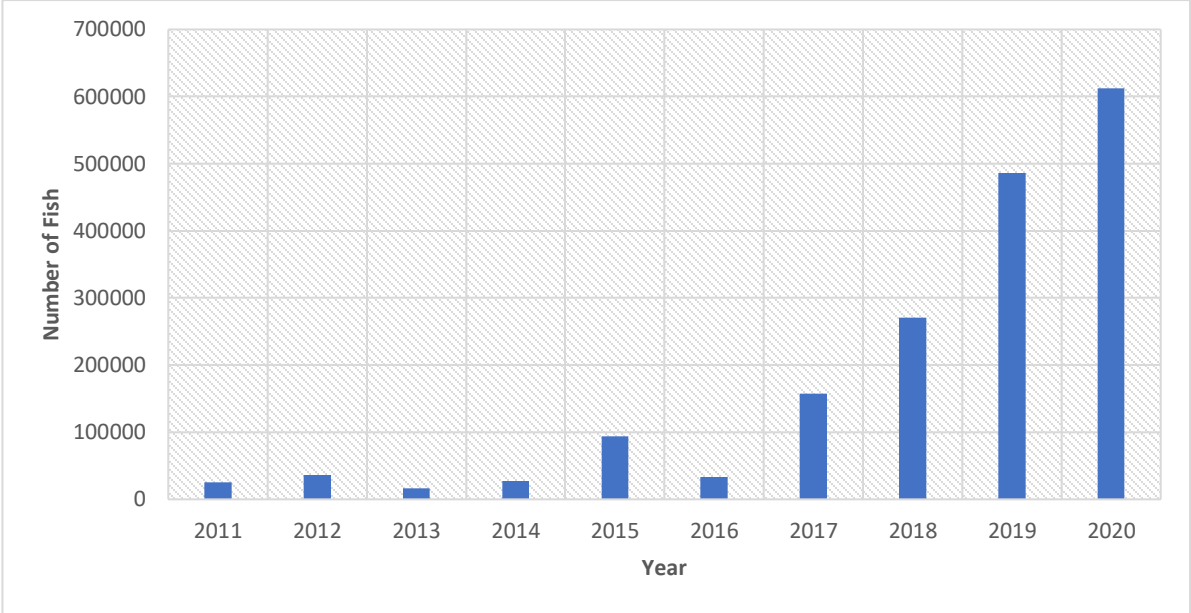


Table 4: 2020 Fish Species Identified

Species	2020 trap count
River herring/siqonomeq: alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*)	611, 907
White sucker/ (*Catostomus commersonii)*	1
Smallmouth bass *(Micropterus dolomieu)*	1
Brook trout/skuhtom *(Salvelinus fontinalis)*	0
Rainbow smelt/somelts (*Osmerus mordax*)	0
American shad/psam (*Alosa sapidissima*)	29
Lamprey/sakapsqehtomuk (*Petromyzon marinus)*	0
American Eel/kat (*Anguilla rostrata*)	10
Golden shiner/ (*Notemigonus crysoleucas)*	0
Common shiner (*Luxilus cornutus*)	0
Sunfish (*Lepomis auritus*)	0
Unknown fish	6

On May 13, after Covid 19 restrictions were relaxed in the province of New Brunswick, further access to the fishway was granted to the fish counter and the entrance of the fishway was checked for the first time. No fish were seen at the base of the fishway, nor were there any signs of cormorants fishing down river. The entrance of the fishway was checked daily thereafter. The first fish was recorded on May 18. However, on May 17, an otter was observed eating what could have been the 'first fish', a shad below the dam.

At 14h25 on the afternoon of May 18th a school of fish was seen staging below the dam for the first time this year, with a total of 3021 river herring eventually passing through that day. Water temperature at the time was 11.7C° and the water was flowing at 3870cfs (value provided by USGS Baring Maine).

Turbine 7, closest to the entrance of the fishway, was shut off at approximately 4 pm after the first fish arrived on May 18. NB Power continued to be shut off Turbine 7 during peak run times (8 am – 8 pm) each day, to ease passage for fish by preventing additional turbulence close the entrance of the fishway. On June 10 Turbine 7 was left on during the day to see if it would influence fish passage.

On May 22 lights were installed over the fishway, increasing visibility of the camera footage taken after dusk. Prior to this, between May 18-22, counts were being done in person with a headlamp during the evening hours.

After the run slowed down, on June 10th **Turbine 7** was left on during the day to see if it would influence fish passage. Water levels in the river were lower than usual and this is thought to have affected the migration of river herring in the St. Croix/Skutik. Because of this low water, on June 16 NB Power Staff adjusted the boards at the fishway exit to adjust flow in the fish ladder to see if a change would entice the fish. The water

line used for attraction at the entrance was also reduced. On June 29, the head pond levels were adjusted due to the low levels in the river. The attraction was turned back on to regular levels.

The **Gas Infusion System (GIS)** was running in the fishway again this year. It started running on June 1 and continued running continuously for the rest of the fish run. The GIS system was installed by NB Power and is designed to supersaturate water in the fishway with dissolved oxygen.

Water levels in the river were lower than usual and this is thought to have affected the migration of river herring in the St. Croix/Skutik. Because of this low water, on June 16 NB Power Staff adjusted the boards at the fishway exit to adjust flow in the fish ladder to see if a change would entice the fish. The water line used for attraction at the entrance was also reduced. On June 29th, the head pond levels were adjusted due to the low levels in the river. The attraction was turned back on to regular levels.

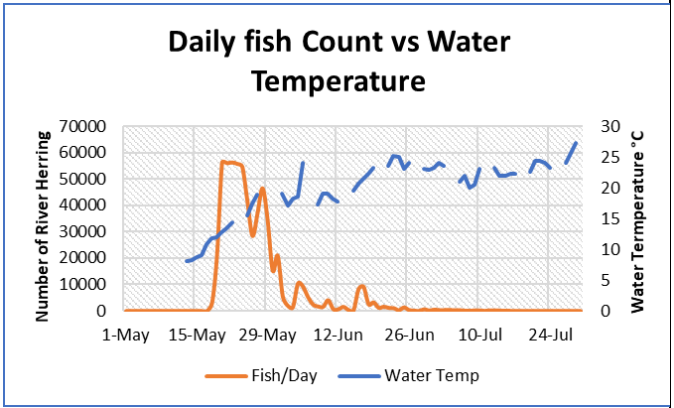
Problems with the video

The video camera recorded between 06h00 and 22h00 continuously from May 1 to July 30 with few exceptions. The video camera failed to record on May 20 and May 21. Because of this, there is no data for May 20 between 06h00 – 12h00 and May 21 between 06h00 – 12h00.

After the fish run was concluded on July 30, NB Power assumed operation of the fishway as specified by DFO, without fish counts, until mid-November.

The 2020 run of 611907 river herring was the highest recorded since 1996, which had a count of 645,978. See Table 9 for a summary of river herring returns to the St. Croix/Skutik River from 1981 to 2020.

Graph 3: Daily Water Temperature 2020



Graph 4: Daily Water Temperature 2020

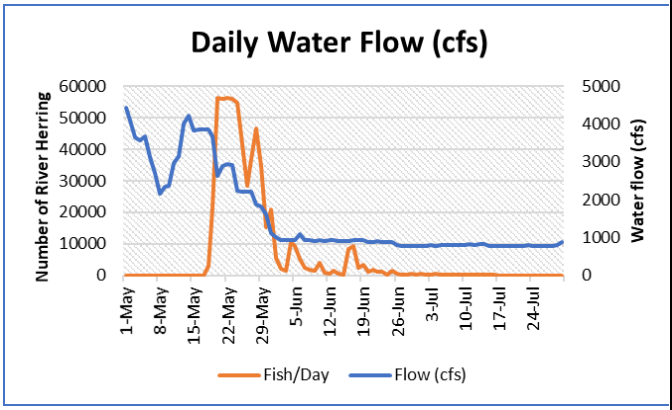


Table 5 Summary of Fish Count by Decade:

Year	Total Annual Count	Year	Total Annual Count	Year	Total Annual Count	Year	Total Annual Count
1981	169,620	**1991**	586,910	**2001**	5,202	**2011**	25,142
1982	233,102	**1992**	203,750	**2002**	900	**2012**	36,168
1983	151,952	**1993**	297,720	**2003**	7,901	**2013**	16,677
1984	152,900	**1994**	350,154	**2004**	1,299	**2014**	27,312
1985	368,900	**1995**	274,079	**2005**	11,632	**2015**	93,503
1986	1,984,720	**1996**	645,978	**2006**	11,829	**2016**	33,016
1987	2,624,700	**1997**	225,521	**2007**	1,294	**2017**	157,750
1988	2,590,750	**1998**	177,317	**2008**	12,261	**2018**	270,659
1989	1,164,860	**1999**	25,327	**2009**	10,450	**2019**	486,500
1990	1,531,250	**2000**	8,569	**2010**	59,145	**2020**	611,907
10-Yr Total	10,972,754		2,795,325		121,913		1,758,634
10-Yr Average	1,097,275		279,533		12,191		175,863
Variance from prior decade			-75%		-96%		1343%
Milltown Dam	Escapment Fish Count		15,196,526				
	Harvested Fish Count		452,100	1990-1991, 1993-1995			
	Total Fish Count		15,648,626				

Table 6: Milltown Dam Fish Count - Fish Count by Species 2017- 2020

			2017	2018	2019	2020
Common Name	**Indigenous Name**	**Scientific Name**	**Apr 26 – Jul 21**	**May 8 - Jul 16**	**May 1 – Jul 21**	**May 18 - Jul 30**
River herring: alewife & blueback	siqonomeq	Alosa pseudoharengus &	157,750	270,659	480,500	611,907
American Eel	kat	Anguilla rostrata	5		4	10
American shad	psam	Alosa sapidissima	56	255	29	29
Brook trout	skuhtom	Salvelinus fontinalis	2	3	5	-
Common shiner		Luxilus cornutus	2	1	-	-
Fallfish		Semotilus corporalis		2	1	-
Golden shiner		Notemigonus crysoleu	3			-
Lamprey		Petromyzon marinus	8			-
Pumpkinseed sunfish		Lepomis gibbosus			1	-
Rainbow smelt	somelts	Osmerus mordax	1			-
Smallmouth bass		Micropterus dolomieu	45	23	6	1
Sunfish		Lepomis auratus	1			-
White sucker		Catostomus commersc	94	87	43	1
Unidentified Fish						6
Total (2017 - 2020)		**33,016**	**157,967**	**271,030**	**480,589**	**611,952**
Increase / Decrease from prior year			**124,951**	**113,063**	**209,559**	**131,363**
% Increase from prior year			**378.5%**	**71.6%**	**77.3%**	**27.3%**

Other Species

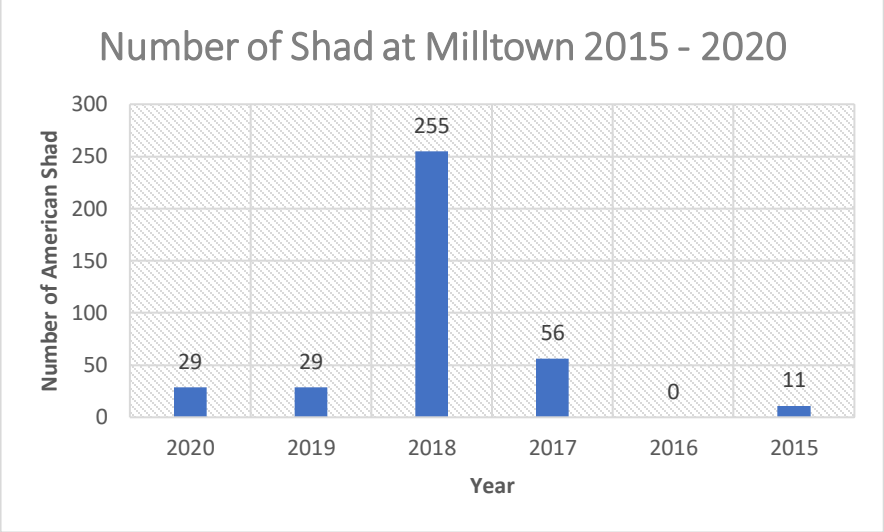
Other fish species seen on the video passing through the fishway were counted. Determining other species was more difficult in 2020 due to the count being conducted via video, with video footage of only the dorsal side of the fish. It should be noted that this difficulty also exists during the in-person interval counts which were done in previous years. Much of the data for other species comes from the use of the research trap, and which fish are found in the trap during slower periods of the migration.

In 2020, four other fish species were recorded in small numbers. Except for shad and small eels, these fish are all assumed to have passed over the dam spillway or through open gates and returned up the fish ladder after encountering brackish water.

American shad/psam

Twenty-nine American shad (*Alosa sapidissima*) were observed in 2020. Only shad that were directly observed passing through the fishway during a counting interval were recorded, making it possible that more than twenty-nine shad passed through the fishway in 2020. There were Twenty-nine American shad counted at the fishway in 2019. This is down from 255 shad counted in 2018, and 56 shad in 2017. No shad were recorded in 2016. In 2015 eleven shad were recorded in the fish trap after appearing in the St. Croix/Skutik for the first time since 1999.

Graph 5: Number of American shad counted at Milltown 2015 – 2020.



American eel/kat

The St. Croix/Skutik supports an active American eel (*Anguilla rostrata*) population and significant commercial fishery for juvenile eels on the Maine shore. Ten American eels (approximately 6 inches in length) were recorded passing through the fishway in 2020.

Sea Lamprey/sakapsqehtom

No lampreys were recorded during the 2020 fish count. Lampreys are usually seen attached to alewife/blueback herring and are easier to detect when hand counting fish from the fish trap, as opposed to click counting/video counts.

Atlantic salmon/polam

Wild Atlantic salmon (*Salmo salar*) have not been recorded at the Milltown trap since 2006

Additional studies

Fish Health Testing

Fish health testing was not conducted in 2020.

River Herring Tracking Studies

No tagging or tracking studies were performed this year.

Scale Aging

Fifty-six river herring were sampled by SCIWC staff for the purpose of scale aging by Maine DMR. Of these, 54 were alewife/blueback herring, and two were American shad. All fish were released alive in the fishway, except for one American shad which was sampled after it was found deceased near the exit of the fishway.

Scale collection was delayed until May 26, after access to the fishway was once again possible due to Covid-19 restrictions being relaxed.

Results of the scale collection were sent to Maine DMR for analysis. Results will be added to this report once available.

Additionally, scale samples were collected 25 of the last 40 years, as a tool to identify repeat spawners, age, sex, and size of a sample population of the fish counted at the Milltown dam.

Note: the total length, fork length, weight and sex details were not collected in 2020

Table 7: Milltown Dam Fish Count - ***Scale Sample Results 2020***

Sample No	Date	Species	Scale Age	Repeat Spawner	Remarks
1	26 May 20	BBH	4		
2	26 May 20	BBH	4	1	
3	26 May 20	ALW	4		
4	26 May 20	BBH	4	1	
5	26 May 20	ALW	5	1	
6	26 May 20	ALW	5	1	
7	26 May 20	ALW	5	1	
8	26 May 20	ALW	4	1	
9	26 May 20	ALW	4		
10	26 May 20	ALW	5	1	
11	26 May 20	ALW	5		
12	27 May 20	ALW	5		
13	27 May 20	ALW	4		
14	27 May 20	ALW	4		
15	27 May 20	ALW	4		
16	27 May 20	BBH	3		
17	27 May 20	ALW	4		
18	27 May 20	ALW	4		
19	27 May 20	ALW	5	1	
20	27 May 20	ALW	4		
21	5 Jun 20	BBH	3		
22	5 Jun 20	ALW	4		
23	5 Jun 20	ALW	4		
24	5 Jun 20	ALW	4		
25	5 Jun 20	ALW	4		
26	5 Jun 20	ALW	4		
27	5 Jun 20	ALW	3		
28	5 Jun 20	ALW	3		
29	5 Jun 20	ALW	4		
30	5 Jun 20	ALW	4		
31	16 Jun 20	ALW	4		
32	16 Jun 20	ALW	4		
33	16 Jun 20	ALW	4		
34	16 Jun 20	ALW	4		
35	16 Jun 20	ALW	3		
36	16 Jun 20	ALW	4		
37	16 Jun 20	ALW	4		
38	16 Jun 20	ALW	4		
39	16 Jun 20	ALW	5	1	
40	16 Jun 20	ALW	5	1	
41	16 Jun 20	ALW	3		
42	16 Jun 20	ALW	4		
43	16 Jun 20	ALW	3		
44	16 Jun 20	ALW	4		
45	16 Jun 20	ALW	3		
46	16 Jun 20	ALW	4		
47	16 Jun 20	ALW	5	1	
48	16 Jun 20	ALW	3		
49	16 Jun 20	ALW	4		
50	16 Jun 20	ALW	4		
51	29 Jun 20	ALW	4		
52	29 Jun 20	ALW	4		
53	2 Jul 20	ALW	4		
54	6 Jul 20	ALW	3		
55	9 Jul 20	ALW	4		
56	9 Jul 20	ALW	3		
101	16 Jun 20	Shad	4		
102	18 Jun 20	Shad	7	2	Ripe eggs; deceased and decaying

Executive Director's Closing Comments

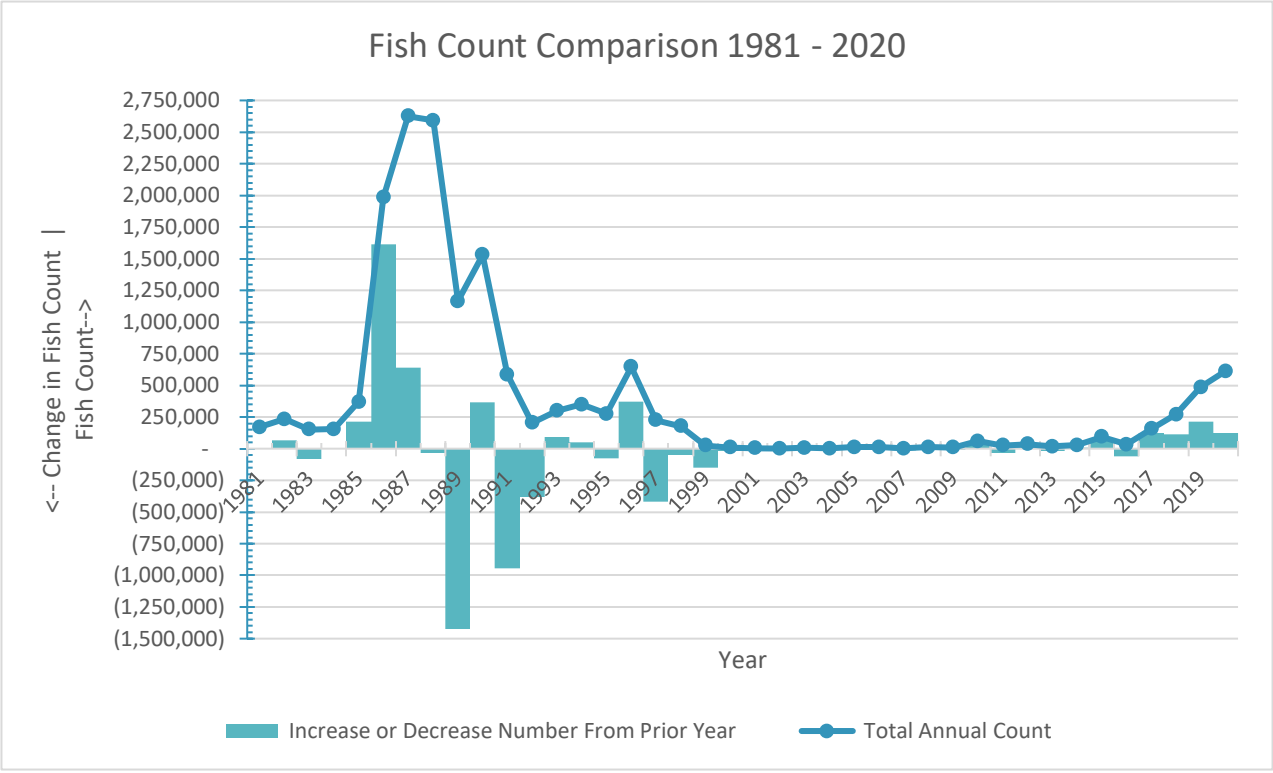
The 2020 fish count provided an opportunity to assess the process to develop and adapt to the restrictions imposed by the Covid-19 pandemic state of emergency. New methods of counting were tried, proved successful, and will be incorporated in future counts.

As a member of the NB Power Community Liaison Committee, it has allowed the SCIWC to build stronger relationships and connections with our partners at the Milltown Dam, DFO, Peskotomuhkati and Passamaquoddy Nations, and local enterprises. Understanding the process of decommissioning the dam has permitted us to prepare and adapt for the 2021-2023 fish counts, which are likely to be the final opportunity to do so.

The fish count was successful due to the dedication and hard work of the Lead Biologist, Rebecca Goreham. She alone managed the entire fish count on site at the dam. The process would not have been possible without her efforts and commitment.

2021 we hope to have the opportunity to allow student employees access to the fish count to learn and develop their skills.

Graph 6: Illustration of fish count 1981 2020



Records for the fish count include up to 14 weekly periods / year in which the fish count has been conducted since 1981.

By calculating the total number of fish counted per period over the course of the 40-year study, the peak periods can be identified as those periods in which 30% of the total fish are counted. Based on this calculation, it can be concluded that Periods 4 7, May 17 – June 13 are the peak periods. Based on this observation,

Table 8: Fish Count Periods by Week

Period	Dates
Period 1	Apr 30–May 2
Period 2	May 3 - 9
Period 3	May 10 - 16
Period 4	May 17 - 23
Period 5	May 24 - 30
Period 6	May 31 - Jun 6
Period 7	Jun 7 - 13
Period 8	Jun 14 - 20
Period 9	Jun 21 - 27
Period 10	Jun 28 - Jul 4
Period 11	Jul 5 - 11
Period 12	Jul 12 - 18
Period 13	Jul 19 - 25
Period 14	Jul 26 - Later

Table 9: Identification of Peak Period

Week	Period	Total 40-Year Period Total	# Weeks Fish Observed During Per Period	40-Year % of Total Fish Observation Per Period	Estimated Annual Observation Per Period
Apr 30–May 2	Period 1	5,460	4	10.0%	1.6%
May 3 - 9	Period 2	88,280	12	30.0%	4.7%
May 10 - 16	Period 3	1,228,690	25	62.5%	9.7%
May 17 - 23	Period 4	3,697,685	30	75.0%	11.7%
May 24 - 30	Period 5	4,970,336	31	77.5%	12.1%
May 31-Jun 6	Period 6	3,551,855	30	75.0%	11.7%
Jun 7 - 13	Period 7	1,358,523	30	75.0%	11.7%
Jun 14 - 20	Period 8	259,193	25	62.5%	9.7%
Jun 21 - 27	Period 9	23,465	19	47.5%	7.4%
Jun 28-Jul 4	Period 10	9,359	16	40.0%	6.2%
Jul 5 - 11	Period 11	2,607	14	35.0%	5.4%
Jul 12 - 18	Period 12	908	10	25.0%	3.9%
Jul 19 - 25	Period 13	146	5	12.5%	1.9%
Jul 26-Later	Period 14	19	6	15.0%	2.3%
Total	40	15,196,526	257		100.0%

Table 10: 40 Year Fish Count by Period (Not Incl Harvest)

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Period 13	Period 14	
Year	Apr 30 – May 2	May 3 - 9	May 10 - 16	May 17 - 23	May 24 - 30	May 31 - Jun 6	Jun 7 - 13	Jun 14 - 20	Jun 21 - 27	Jun 28 - Jul 4	Jul 5 - 11	Jul 12 - 18	Jul 19 - 25	Jul 26- Later	Annual Total **
1981			7,510	47,450	47,770	48,310	16,000	1,760	790	30					169,620
1982			32,160	64,120	74,800	56,930	4,610	250	210	20	1	1			233,102
1983			16,970	44,050	33,760	20,770	35,650	620			130		2		151,952
1984			6,000	40,300	67,100	26,200	13,300								152,900
1985				70,000	149,890	96,740	26,900	21,040	1,060	3,270					368,900
1986	5460	16,410	75,150	429,400	772,800	628,300	57,200								1,984,720
1987		9,400	171,500	559,500	674,700	645,300	480,400	83,900							2,624,700
1988		24,410	468,750	760,280	764,990	370,750	187,800	13,770							2,590,750
1989				200,610	464,390	424,550	63,940	11,370							1,164,860
1990		29,690	305,370	319,380	411,090	141,490	132,030								1,339,050
1991		170	14,740	133,820	154,560	51,110	4,010								358,410
1992			8,910	74,120	45,520	24,780	50,420								203,750
1993				12,000	146,600	102,800	2,260	26,060							289,720
1994				94,304	99,150	125,900	15,400								334,754
1995			5,898	109,388	99,847	50,946									266,079
1996		2,814	11,178	202,188	188,538	231,870	9,390								645,978
1997				122,478	93,000	4,091	5,951							1	225,521
1998			77,394	25,705	71,534	2,684									177,317
1999			195	5,933	13,615	5,476	108								25,327
2000		3,966	142	2,011	377	2,067	6								8,569
2001			160	505	2,625	1,735	123	54							5,202
2002		2	6	23	325	494	35	15							900
2003			3	603	2,115	3,163	999	1,018							7,901
2004							951	108	79	150	11				1,299
2005				2	20	5,277	6,220	113							11,632
2006		18	577	3,111	3,155	2,540	1,096	1,227	105						11,829
2007					2		1,225	66	1						1,294
2008			4	33	119	11,797	61	23	221	3					12,261
2009			1	12	3,740	42	2	6,627	26						10,450
2010			9,748	17,731	17,008	8,520	4,700	1,126	255	45	9	3			59,145
2011			1,657	13,053	1,227	7,750	1,387	50	10	7	1				25,142
2012		993	343	22,260	11,190	1,175	197	10							36,168
2013		342	362	178	10,542	5,107	37	83	23	3					16,677
2014			7	16	29	19,971	6,775	95	143	267	9				27,312
2015			16	126	32,637	16,875	27,150	11,871	3,817	816	161	34			93,503
2016			125	269	14,304	12,781	3,038	2,000	471	27	1				33,016
2017			369	29,946	44,110	42,406	27,681	8,790	3,787	571	69	21			157,750
2018		5	13,028	43,260	130,538	43,657	29,292	7,804	2,163	821	86	5			270,659
2019		60	417	13	63,941	252,631	129,387	34,221	4,220	809	743	58			486,500
2020				249,507	258,678	54,870	12,792	25,122	6,084	2,520	1,386	786	144	18	611,907
40-Yr Avg	**5,460**	**6,791**	**39,635**	**97,308**	**127,445**	**93,470**	**35,751**	**9,257**	**1,304**	**624**	**217**	**130**	**73**	**10**	**379,913**

Note: Items in Red indicate Peak Count that Period ** Annual Total items in Green are above average and Items in Red are below average

Table 11: Annual Summary

YEARS >>>	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
Apr 30 May 2		0	0	0	0	5,460	0	0	0	0
May 3 May 9		0	0	0	0	16,410	9,400	24,410	0	29,690
May 10 May 16	7,510	32,160	16,970	6,000	0	75,150	171,500	468,750	0	305,370
May 17 May 23	47,450	64,120	**44,050**	40,300	70,000	429,400	559,500	760,280	200,610	319,380
May 24 May 30	47,770	**74,800**	33,760	**67,100**	**149,890**	**772,800**	**674,700**	**764,990**	**464,390**	**411,090**
May 31 Jun 6	**48,310**	56,930	20,770	26,200	96,740	628,300	645,300	370,750	424,550	141,490
Jun 7 Jun 13	16,000	4,610	35,650	13,300	26,900	57,200	480,400	187,800	63,940	132,030
Jun 14 Jun 20	1,760	250	620	0	21,040	0	83,900	13,770	11,370	0
Jun 21 Jun 27	790	210	0	0	1,060	0	0	0	0	0
Jun 28 Jul 4	30	20	0	0	3,270	0	0	0	0	0
Jul 5 Jul 11	0	1	130	0	0	0	0	0	0	0
Jul 12 Jul 18	0	1	0	0	0	0	0	0	0	0
Jul 19 Jul 25	0	0	2	0	0	0	0	0	0	0
Jul 26 later			0	0	0	0	0	0	0	0
Escapement	169,620	233,102	151,952	152,900	368,900	1,984,720	2,624,700	2,590,750	1,164,860	1,339,050
Harvest	0	0	0	0	0	0	0	0	0	192,200
Total	**169,620**	**233,102**	**151,952**	**152,900**	**368,900**	**1,984,720**	**2,624,700**	**2,590,750**	**1,164,860**	**1,531,250**

YEARS >>>	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Apr 30 May 2	0	0	0	0	0	0	0	0	0	0
May 3 May 9	170	0	0	0	0	2,814	0	0	0	**3,966**
May 10 May 16	14,740	8,910	0	0	5,898	11,178	0	**77,394**	195	142
May 17 May 23	133,820	**74,120**	12,000	94,304	**109,388**	202,188	**122,478**	25,705	5,933	2,011
May 24 May 30	**154,560**	45,520	**146,600**	99,150	99,847	188,538	93,000	71,534	**13,615**	377
May 31 Jun 6	51,110	24,780	102,800	**125,900**	50,946	**231,870**	4,091	2,684	5,476	2,067
Jun 7 Jun 13	4,010	50,420	2,260	15,400	0	9,390	5,951	0	108	6
Jun 14 Jun 20	0	0	26,060	0	0	0	0	0	0	0
Jun 21 Jun 27	0	0	0	0	0	0	0	0	0	0
Jun 28 Jul 4	0	0	0	0	0	0	0	0	0	0
Jul 5 Jul 11	0	0	0	0	0	0	0	0	0	0
Jul 12 Jul 18	0	0	0	0	0	0	0	0	0	0
Jul 19 Jul 25	0	0	0	0	0	0	0	0	0	0
Jul 26 later	0	0	0	0	0	0	1	0	0	0
Escapement	358,410	203,750	289,720	334,754	266,079	645,978	225,521	177,317	25,327	8,569
Harvest	228,500	0	8,000	15,400	8,000	0	0	0	0	0
Total	**586,910**	**203,750**	**297,720**	**350,154**	**274,079**	**645,978**	**225,521**	**177,317**	**25,327**	**8,569**

YEARS >>>	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Apr 30 May 2	0	0	0	0	0	0				
May 3 May 9	0	2	0	0	0	18	0	0	0	0
May 10 May 16	160	6	3	0	0	577	0	4	1	9,748
May 17 May 23	505	23	603	0	2	3,111	0	33	12	**17,731**
May 24 May 30	**2,625**	325	2,115	0	20	**3,155**	2	119	3,740	17,008
May 31 Jun 6	1,735	**494**	**3,163**	0	5,277	2,540	0	**11,797**	42	8,520
Jun 7 Jun 13	123	35	999	**951**	**6,220**	1,096	**1,225**	61	2	4,700
Jun 14 Jun 20	54	15	1,018	108	113	1,227	66	23	**6,627**	1,126
Jun 21 Jun 27	0	0	0	79	0	105	1	221	26	255
Jun 28 Jul 4	0	0		150				3	0	45
Jul 5 Jul 11	0	0		11						9
Jul 12 Jul 18	0	0		0						3
Jul 19 Jul 25	0	0		0						
Jul 26 later	0	0		0						
Escapement	5,202	900	7,901	1,299	11,632	11,829	1,294	12,261	10,450	59,145
Harvest	0	0	0	0	0	0	0	0	0	0
Total	**5,202**	**900**	**7,901**	**1,299**	**11,632**	**11,829**	**1,294**	**12,261**	**10,450**	**59,145**

YEARS >>>	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Apr 30 May 2					0	0	0	0		0
May 3 May 9	0	993	342	0	0	0	0	5	60	0
May 10 May 16	1,657	343	362	7	16	125	369	13,028	417	0
May 17 May 23	**13,053**	**22,260**	178	16	126	269	29,946	43,260	13	249,507
May 24 May 30	1,227	11,190	**10,542**	29	**32,637**	**14,304**	**44,110**	**130,538**	63,941	258,678
May 31 Jun 6	7,750	1,175	5,107	**19,971**	16,875	12,781	42,406	43,657	252,631	54,870
Jun 7 Jun 13	1,387	197	37	6,775	27,150	3,038	27,681	29,292	129,387	12,792
Jun 14 Jun 20	50	10	83	95	11,871	2,000	8,790	7,804	34,221	25,122
Jun 21 Jun 27	10	0	23	143	3,817	471	3,787	2,163	4,220	6,084
Jun 28 Jul 4	7		3	267	816	27	571	821	809	2,520
Jul 5 Jul 11	1			9	161	1	69	86	743	1,386
Jul 12 Jul 18					34		21	5	58	786
Jul 19 Jul 25							0	0	0	144
Jul 26 later										18
Escapement	25,142	36,168	16,677	27,312	93,503	33,016	157,750	270,659	486,500	611,907
Harvest	0	0	0	0	0	0	0	0	0	0
Total	**25,142**	**36,168**	**16,677**	**27,312**	**93,503**	**33,016**	**157,750**	**270,659**	**486,500**	**611,907**

Note 1.	**Sources:** Fisheries & Oceans Canada (1981 1990), Atlantic Salmon Federation (2012 2014), St. Croix International Waterway Commission (1991 2011, 2015 present).
Note 2.	**Items in bold = 7-day peak.**
Note 3.	**Upstream passage.** Beginning in 1995, the State of Maine blocked the upstream fishways at Woodland and Grand Falls to spawning river herring. In 2001, Fisheries & Oceans Canada began to truck a portion of the spawning run from Milltown to Woodland Flowage. Number of river herring transported to Woodland: 2001 (3756), 2002 (807), 2003 (6805), 2004 (392), 2005 (7100), 2006 (6653), 2007 (1169). In 2008, Maine removed the Woodland fishway barrier, allowing river herring direct access to Woodland Flowage, and Fisheries & Oceans discontinued its trucking operation. In 2013, Maine removed the Grand Falls fishway barrier, allowing river herring access the upper watershed.
Note 4.	**Duration of count.** Monitoring was discontinued on June 27 in 2006, 2007 and 2012; on July 3 in 2008; July 4 in 2009 and 2013; July 8 in 2014; July 11 in 2011 and 2016; July 18 in 2015 and July 19 in 2010 at the presumed end of each year's run. Any fish entering the river after these dates were not recorded
Note 5.	**Correction of 1994, 1995 and 2010 counts**. In 2016, errors in the day counts for these three years was discovered and corrected. This increased earlier reported totals for 1995 and 2010 and decreased 1994.

Youth Engagement Program

Partners

Additional Partners

- Washington County Community College: Outdoor Adventure Center (S. McCormick)
- St. Stephen Elementary School (Principal, C. Winchester)
- Milltown Elementary School (Vice Principal, K. Chambers, C. Parsons)
- Campobello Islands Consolidated School (Principal, D. Carten)
- Passamaquoddy and Peskotomuhkati Nations (M. Soctomah, Chief H. Akagi)
- KAIROS Canada Organization (A. Barahona)
- Town of St. Stephen (K. Sumner)
- Future St. Stephen (K. Kadatz)

St. Croix International Waterway Commission

- Elizabeth Hyslop, BBA, FCIP, Executive Director
- Gloria Tinker, Program Coordinator
- Greg Rickard, Program Technical Support
- Rhonda Sage, Community Engagement Coordinator

Executive Summary

It is a component of the SCIWC purpose to interact with the community and to provide opportunities for instruction on the educational use of the watershed, recognizing the historic and current economic importance of the forest resource including its management and commercial utilization. The development of an outdoor education plan facilities bringing this instruction to local school children.

Introduction

SCIWC and Commissioners are very interested in developing a Youth Engagement Program that can be provided to the middle school students in Charlotte County, like the programs in Calais for all grade 5 students. In 2019, we worked with The Washington County Community College and former teacher, Donna Muir, to discuss the project and have identified staff hires and an initial process to develop the program. The program would introduce students to various aspects of the St. Croix River, including water quality sampling, outdoor adventures, and events like a nature scavenger hunt.

The goal for the Outdoor Education Program is to work collaboratively with the St. Stephen Elementary and Milltown Elementary schools and teachers, Peskotomuhkati elders, municipality and local organizations and businesses to facilitate the delivery of the proposed curriculum to each of the Grade 5 students in the St. Stephen community. Through these educational programs, a developed sense of stewardship for the St. Croix River watershed and the environment; a sense of place, and a collaborative community will inspire the desired attributes to mentor our youth into innovative, compassionate leaders in our province and world.

Financial Summary

Additional costs will be incurred in 2021 as the program is delivered to the grade 5 students in St. Stephen. We will apply for summer youth employment funding for these costs.

Table 12: Youth Engagement Program Financial Summary

Account Name		Revenue		Expense
TWSE - CND Temporary Wage Subsidy	$	43.25		
CEWS - CND Emergency Wage Subsidy	$	1,874.70		
IJC - IWI Grant	$	11,115.00		
Office & Miscellaneous			$	408.04
US CBP Employee I-94 Fees			$	7.65
Travel - Meals and Accommodations			$	80.96
Wages - Canadian Employees			$	9,385.62
Wages - US Employees			$	784.30
Vacation Earned			$	396.27
CPP Expense			$	464.28
EI Expense			$	244.91
WHSCC Expense			$	99.01
SOCSEC - FED Social Security			$	43.80
FED Medicare - Employer US			$	10.25
	$	13,032.95	$	11,925.09
REVENUE minus EXPENSE	$	1,107.86		

Methods and Observations

The 5 Grade curriculum to deliver to St. Stephen Elementary School and Milltown Elementary School was completed and accepted by the school board.

This is a 5-day curriculum to coincide with the classroom curriculum and collaborate. There are different sessions that are available to offer such as:

- **Story and Place: Indigenous and Settler Relations** - The program will use activities that seek to illustrate different ways of viewing 'natural resources', the cultural impacts of trade, and the importance of oral history.
- **Snowshoe Adventure and Winter Survival** where students will develop competency in a variety of movement concepts and skills in a diverse range of activities and environments. Understanding life systems, heat, and energy in the earth and space systems.
- **St. Croix Raindrop Adventure** was developed to understand water systems and movements of water in the water cycle. How the sun determines how water molecules moves around the world and use equipment to understand the water quality and the importance.
- **Tree Detectives and Caron Sinks** to learn observation skills to identify trees and the importance of trees to our planet's health. Learn the importance of trees in global warming and greenhouse gases.
- **Orienteering: Map and Compass and Shelter Building** is a physical outdoor experience and to understand navigation and map reading along with how to regulate body temperature in an emergency. Ensure students come prepared for the outdoors.

Students from St. Stephen Elementary School will walk to Elm Street Park where the session of choice will then be delivered. The Milltown Elementary students will be taken to Dover Hill Park to have their sessions delivered there. There are about 120 Grade 5 students all together that will be remain in their student bubble. Because of the student bubbles it will allow for 16 students at a time with a week to develop one session to each student bubble.

The sessions were due to be delivered beginning December 2020, but due to COVID 19 it was postponed until Spring 2021.

Program Test Run: Outdoor Education – Nature Day Camps – August 2020

In August of 2020, SCIWC did a trial run of Nature Day Camps to gain information on whether there was interest for outdoor activities. It started out slow, but quickly became a hit with the interest in our area. Each day camp had between 5-7 registrants ages 8-12. Cost was $35 per child with $20 per each additional sibling. The $430 collected from the day camps was used to pay for the program supplies.

The camp was held each Thursday in August from am 4 pm AST. These Nature Day Camps demonstrated there is an interest in the community for outdoor educational activities. The camp themes were as follows:

WEEK #1 (August 6) **Surviving and Thriving**

This week is all about surviving and thriving with nature! Campers will explore the basics of wilderness survival and be immersed in various survival activities, including fire building, shelter building, wayfinding, camouflage and more. Campers will have fun playing outdoor survival games, bushcraft skills, and enjoying cooking our lunch over a campfire. Campers are asked to bring their own hot dogs and marshmallows in their lunch for roasting and some surprises from the leaders will be provided.

WEEK #2 (August 13) **Zombie Apocalypse Survival**

Train to become ready for any Emergency. It is rumored that a zombie like virus has been released in a neighboring community and we are looking for brave recruits to protect us. Learn how to prepare for an all-wide national emergency and protect your community from the potential invading Zombies. An outbreak is threatening our community and through teamwork, a solution is possible to the outbreak! Create a bug out bag, stalking/sneaking, cook outdoors and defend the camp for from the zombies. This will be an action-packed week of thrilling adventure.

WEEK #3 (August 20) **Wings and Things**

From birds to bats to bugs, explore the world outside from the perspective of things with wings! We will delve into the flying world and learn how they have adapted to their surroundings how it all works and how it has influenced the human world. Each day we will explore with our binoculars and magnify glasses of various types of creatures in water to air habitats. We will explore ponds, under logs, in the air, build birdhouses, play games, and make crafts. Through this exploratory adventure, we will be rewarded with discovering how interconnected our world is today.

WEEK #4 (August 27) **Nature's Canvas**

Calling all artists (no experience necessary). Nature has inspired talented artists since the beginning of mankind. At this week of camp, campers will get their creative juices flowing as they use inspiration from nature to create beautiful pieces of artwork. Natural materials such as wood, clay leaves, sticks and natural

paint, twine will be sued to design natural masterpieces. Children will make natural wind chimes, ornaments, and more to take home and share with family.

Photo 3: Shelter building. Photo by G. Tinker

Photo 4: Fire Starting. Photo by Gloria Tinker

Photo 5: Insect identification & drawing. Photo by R Sage

Photo 6: A trail hike to ID trees Photo by R. Sage

Photo 7: Campers listening to instruction from camp leader R. Sage.

Program Safety & Curriculum Development

The important components of the Youth Engagement Program were the development of a handbook and curriculum. Below is a summary of each and the full documents are included in the Appendix.

Information and Policy Handbook

To ensure the program was successful, enjoyed by the participants and complied with all the relevant safety protocols, a handbook was developed and provided to each parent and covered the following topic:

- Description
  - Hours Of Operation
  - Location
  - What To Bring
  - Daily Schedule
- Contacting Us
- Safety And Protection
- During A Pandemic
- Policies And Procedures
  - Ratio
  - Participant Sign-In/Sign-Out Procedure
  - Late Policy
  - Payment Policy
- Behaviour Policy
- Litter-Less Lunches

- Heath Protocols
- Supplies
- Control Measures

- Food/Allergy Policy
- Medications
- Participant Withdrawal Policy
- Illness Policy

Program Curriculum

The curriculum consists of five (5) day long activities that bring the participants closer to and interact with the natural environment around them. The curriculum outline is as follows:

Session 1: *Trade and Consequences*

Curriculum Expectations
Activity: Trade and Consequences
Round 1: Thriving in Solitude
Round 2: First Encounter
Round 3: Pleasure Doing Business Despite You
Additional First Nation Peoples and Voyageur Activities

Session 2*: Snowshoe Winter Survival*

Curriculum Expectations
Activities: : Snowshoe Winter Survival
Rabbit/Fox Wagon Wheel Game
Play Capture the Firewood
Winter Survival
Fire Building
Background on Transfer of Heat on Earth

Session 3: St. Croix Raindrop Adventure

Curriculum Expectations:
Activities: St. Croix Raindrop Adventure
Water Study
Water Study Worksheet
The Incredible Journey

Session 4: Tree Detectives and Carbon Sinks

Curriculum Expectations:
Activities: Tree Detectives and Carbon Sinks
Make a Clinometer.
Trees and Carbon Sinks
Tree Worksheet
Carbon Storage Estimation Chart
Climate Change

Session 5: Orienteering: Map and Compass and Emergency Preparedness

Curriculum Expectations
Activities: Map and Compass
Practice Compass Bearings Activity
Orienteering by Map and Compass
Activities: Emergency Preparedness
Will you Survive? - A Simulation Game adapted
Survival Card

Next Steps

The outdoor education program will be launched in the local schools beginning on May 6 and May 13, 2021, starting at the Campobello Islands Consolidated School. Once the program has been tested in 2021, the curriculum will be updated and professionally edited before printing. Additionally, in 2021 we will be

developing an activity book for children 12 and under that will be focused on the content of the developed curriculum.

Executive Director's Closing Comments

The Youth Engagement Program was an exciting and vibrant project that sparked the imagination of the various staff involved in its development. We look forward to running the program in 2021 and hearing the feedback from schools, parents and the children. This feedback will permit the finetuning of the curriculum for other groups, families or schools to use. 2020 demonstrated the importance of being outside and enjoying the natural beauty around us. The skills and experience that Rhonda Sage brought to the table were extremely valuable in developing this program.

PROGRAM REPORT: MAP AND LIBRARY CATALOGUING

Additional Partners

- David Blair, Local Resident and Historian
- Southwest New Brunswick Service Commission, (X. Gopen)
- Province of New Brunswick, ERD, (L. Wesley)
- ECO Canada – Youth Employment Program

St. Croix International Waterway Commission

- Greg Rickard, Program Technical Support
- Dylan Eggleton, Program Technical Support
- Lee Sochasky, Former Executive Director

Executive Summary

As noted with the Youth Engagement Program, a purpose of the SCIWC purpose to interact with the community and to provide opportunities for instruction on the educational use of the watershed, recognizing the historic and current economic importance of the forest resource including its management and commercial utilization. With a library of documents, maps, reports, studies, and more, providing this library to the public further supports the management of the waterway, community engagement, and education.

Introduction

The SCIWC has collected a large selection of historical reports, studies, books, and other documents related to the region and the waterway. The original Executive Director, Lee Sochasky, collected, sorted and protected this library during her term from 1986 – 2011. The goal of this project is to document the library in a manner that allows public access.

The SCIWC also has in its possession a large variety of maps collected by George Pacific (GP) during their ownership of 60 River Road, St. Croix, NB as their Canadian Headquarters. Initially, the estimated number of maps was 600 but once complied and catalogued, there were a total of 723. We believe these maps, left behind in the early 1990's and dating back to the 1940's, provide a historical look at various counties in New Brunswick and from a natural resource position. Our goal with the collection of maps is to have them labeled, scanned, and provide access to the public.

Methods and Observations

The project was undertaken in four phases:

1. Confirm if there is an interest in the library.
2. Identify a cataloguing system and move entire collection central location for processing and preservation.
3. Sort, scan and catalogue the map collection.

4. Sort and catalogue the items in the library.

Phase 1: Confirm if there is an interest in the library.

In 2019 we undertook to ascertain if there would be interest in the collection of maps and documents. With respect to the maps, we invited D. Blair, a local historian, a professional archivist, and X. Goguen, of the Southwest New Brunswick Service Commission to review the collection and provide their feedback. Although all acknowledged that the monetary value of the maps was negatable, there was a consensus that the information was valuable.

Throughout 2019 and into 2020, we conducted an informal survey within the scope of our contacts. A verbal summary of the contents of the library and maps was described, and we then asked if they would consider these items worthy of protection. Overall, it was thought the library and maps have the potential to provide some historical environmental context, especially as it relates to forestry, and worthwhile to protect.

Based on these initial assessments and discussions, the SCIWC submitted the proposal to the IJC-IWI in 2020 to permit the hiring of staff that would undertake the process of identifying a platform to store the library and map data, and then complete the data entry. we have been advised that the maps and library, although may have little monetary value,

Phase 2: Identify a cataloguing system and move entire collection central location.

To assess the value of the contents of our library and map collection, we must first catalogue the 1000+ items in SCIWC library and 723 maps, with the end goal of making these documents available to the public. It was decided that the Integrated Library System (ILS) for managing its library online that we would use will be 'Librarika'. This allows the maps and library to be entered into a catalogue, shared with the public, and has a process for tracking items loaned. With less than 2000 entries, the service is free to use. The SCIWC Library has been posted on our website and can be viewed at https://SCIWC.librarika.com, with the items entered to date. To date, the 723 maps have been scanned and catalogued, and 1/3 of the library has been catalogued.

The maps were all sorted and arranged at the St. Croix Outdoor Centre, as it had the space to review and sort. The library was moved to the administration office, first in Calais and then in St. Stephen, in preparation for the data entry.

Phase 3: Sort, scan and catalogue the map collection.

This was a labour intensive process and took a substantial amount of time. The maps had been sorted in general categories in 2019 and in 2020 the maps were further sorted into subcategories and duplicates identified. The dimensions were taken on each individual map, and pertinent data was collected to be entered into Librarika. This data included the map name, author or creator, date created, scale, description, and then each map was given a unique ID number.

Once the map data was collected, each map was scanned. The Southwest New Brunswick Service Commission provided access to their map plotter and each map was scanned and attached to the data. All the information was then entered into the ILS database for each map individually with all the corresponding information. This will allow the public to view a snapshot of the map and check-out the map if needed.

Phase 1 – 3 were completed in 2019 and 2020.

Phase 4: Sort and catalogue the items in the library.

The process of cataloguing the library had been started in the fall of 2020 but was put on hold due to the outbreak of Covid-19 in Washington County, New Brunswick moving from Yellow to Orange Phase state of emergency, and the continued closure of the US-Canada border. The administration office in Calais was closed indefinitely on October 1, 2020, the employee was laid off, and the project put on hold. In February 2021, a new administration office was opened in St. Stephen and Greg Rickard was hired to work on the library catalogue.

Each item has the details entered directly into Librarika and a photo of the cover is taken. Details include title, author(s), editor, date, subject, category (format), ISBN, and description. The description is developed based on a summary review of the item. The documents include reports, thesis, project results, and books.

To date, April 2021, 723 maps and 337 items from the library have been entered into the Librarika.

For each item input into Librarika, the data collected, where available, includes:

Cover Photo of Library Item or Scanned Image of Map
Identification Number – Unique to each item
Title
Authors
Co-authors
Editors
Illustrators
Publisher
Edition
Year
Volume
ISBN
ISBN13
ISSN
Call No – Utilizing the Call No that Lee Sochasky created.
Category – Maps or SCIWC Library
Subject
Type – Format, such as book, thesis, report, etc.
Description
Tags
Series – A Heritage – A Future

Table 13: Library Project - Sample Map Catalogue Details

Title	Author	Year	Subject	Description
Village of McAdam	New Brunswick Department of Highways-Municipal Engineering Division	1970	Municipal	1 inch = 800 ft. 1.69 inch x 1.29 inch McAdam, York County, New Brunswick, Canada No Paper Map of streets, key buildings, trails, lakes and railway system
I-24 Parts of Magaguadavic,	New Brunswick Department of	1950	Forestry	Revision Author: K.H.D Revised for: Georgia Pacific Corp. Revision Date: 1977

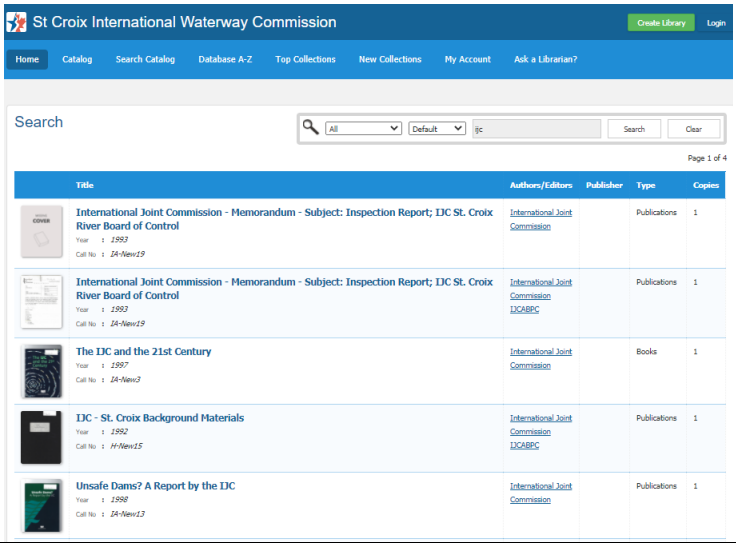
Kilburn and Duck Lakes 1	Lands and Mines			Scale: 1 inch = 3/4 mile Dimensions: 30 inches x 42 inches Location: Magaguadavic, Kilburn and Duck Lakes Legend: No Paper Type: Paper Description: Map of Georgia Pacific Corp. Management Zones I-24 Parts of Magaguadavic, Kilburn and Duck Lakes
St. Croix River Watershed Satellite Imagery	United States Environmental Protection Agency New England		Satellite Imagery	St. Croix River Watershed No Paper Topographic map of St. Croix Watershed (Sheet 2 of 10) map shows topographic features and shorelines of the St Croix River Watershed near St. Stephen New Brunswick and Calais Maine Coloured Imagery
St. Croix River Watershed	United States Environmental Protection Agency New England		Basemap	St. Croix River Watershed No Paper Basemap of the St. Croix International Watershed and surrounding area. Map shows tributaries, largely populated areas, sub watersheds and tribal areas along the watershed
Matrix Plot Bathymetric	Michael Goguen and Crew	1987	Hydrology	Scale: 1:1,000 Dimensions: 33 inches x 43 inches Location: Unknown Legend: No Paper: Paper Description: Map of water depths along an unknown body of water. Map is labeled as Chart Number 188. This map was drafted for the Sand Point project. All measurements are taken at 9.7 meters elevation.
No. 134 Grant Reference Plan	New Brunswick Department of Natural Resources	1976	Land Use	Revised for: New Brunswick Department of Natural Resources Revision Date: 1979 Scale: 1 inch= 1 miles Dimensions: 17 inches x 22 inches Location: North Lake, New Brunswick, Canada Legend: Yes Paper Description: No. 134 Grant Reference Plan showing parcel ownership and titles Working Map

Table 14: Library Project - Sample Library Data

Title	Author	Year	Subject	Description
1604-2004 Acadie: First Dialogues - The Meeting of Two Worlds - Commemoration of the 400th Anniversary of Acadie and the First Settlement in North America - Saint Croix Island International Historic Site Bayside, New Brunswick	Government Services Canada	2004	400th Anniversary of Samuel de Champlain's arrival on St. Croix Island	A pamphlet produced by the Government of Canada to commemorate the 400th anniversary of Samuel de Champlain's arrival at St. Croix Island in 1604. The pamphlet focuses on Acadian History, St. Croix Island History, and Indigenous History. The pamphlet is written in English and French languages.
1983-1984 Activities Report - International Joint Commission - Canada-United States	IJC	1984	International Joint Commission's Annual Activities Report	This document is an activity report on the International Joint Commission for the years of 1983-1984. Topics Include: - Brief review of the history of the International Joint Commission and the Boundary Waters Treaty - Featured piece on the Skagit River in British Columbia - The Great Lakes (Consumptive uses, Niagara River Ice

				Boom, Lake Superior Regulation, St. Mary's Rapids Fisheries) - Meetings and Workshops (Transboundary monitoring, Ecological effects of In Situ Sediment) - Great Lakes Water Quality Agreement
2001 State of the Ocean: Physical Oceanographic Conditions on the Scotian Shelf, Bay of Fundy and Gulf of Maine	FOC	2003	Oceanographic conditions in the Bay of Fundy and Gulf of Maine	This document appears to be a portion of an Environment Canada / Fisheries and Oceans 2003 / 002 Ecosystem Status Report. The document addresses the following topics: - Average conditions - Long term trends - Conditions in 2001
A Coastal Areas Protection Policy for New Brunswick	New Brunswick Department of the Environment and Local Government	2002	New Brunswick Policies for Coastal Areas Protection	This document is an information booklet produced by The Sustainable Planning Branch of the New Brunswick Department of the Environment and Local Government. The topic being associated policies of Coastal Areas Protection and Development. Topics Include: - The Importance of our Coastal Areas - Issues Affecting our Approach to Coastal Areas - Identifying Sensitive Coastal Areas - A Provincial and Local Approach - The Establishment of Protection Zones - Implementation and Legislation - Activities requiring formal environmental review - Activities Not requiring formal environmental review
A County Checklist of the Mosses of New Brunswick	Bruce A. Bagnell	1995	Moss species in varying counties of New Brunswick	This document is a publication of the New Brunswick Museum and focuses on the examination of Moss presence in different counties across New Brunswick. The document lists several different mosses, and using a charting system, indicates in which counties these mosses have been found. Presumably for the purposes of the St. Croix International Waterway Commission, the column labelled Charlotte County has been highlighted on most pages for quick reference.
A Field Guide to Laws Pertaining to Timber Harvesting in Organized Areas of Maine	DOEP; ME	1996	Forestry Practices in Maine	This document is a small informational booklet produced by The Department of Environmental Protection in Maine about forestry practices and laws. Topics Include: - Protection and Improvement of Waters - Natural Resources Protection Act (NRPA) - Shoreland Zoning - Forest Practices Act

Figure 1: Library Project - Sample View of Librarika Search



Executive Director's Closing Comments

Upon finding the library collected and preserved by former Executive Director, Lee Sochasky, and the multitude of maps left untouched in St. Croix, it was a mission to have these valuable historical assets catalogued. This process allows for the review of the library and maps, and to develop a method of sharing them.

Librarika is embedded into our website, allowing public to access. We will continue to catalogue the library and to add to it. Overall, we believe it is a valuable resource and are pleased with the platform chosen to share information. The following tables provide a snapshot of the data manually collected and entered in the catalogue.

PROVINCE OF NEW BRUNSWICK ENVIRONMENTAL TRUST FUND

In 2020, the Environmental Trust Fund supported the Commission in two (2) projects:

1. Benthic Invertebrate Sampling on the St. Croix River – In Progress
2. Water Quality Monitoring in the St. Croix Watershed – Completed

Benthic Invertebrate Sampling on the St. Croix River

Project No:	200169	**Project Term:**	April 1, 2019 – March 31, 2020

Partners

Regional Governmental Agencies

Province of New Brunswick

- Department of Natural Resources and Energy Development (K. Kinney, L. Wilbur)
- Dept of Energy and Local Government, Environmental Trust Fund (L. Theriault)
- Office of the Premier (L. Leger)

State of Maine

- Maine Dept. of Agriculture, Conservation & Forestry (A. Cutco)
- Bureau of Parks & Lands) M. Deroche)
  Maine State Legislature, District 6 (Senator M. Moore)

Benthic Invertebrate Sample Partners

- **Kim Reader, MSc,** Independent Consultant, for the Peskotomuhkati Nation 'Development and Production of Integrated Watershed Management Planning' and Rural Action and Voices on the Environment (RAVEN). Ms. Reader has co-authored publications related to climate change and governance. She achieved a Master of Applied Science, Environmental Management at University of New Brunswick, and her Forest Technologist at Maritime Forest Ranger School.
- **Claire Goodwin, Ph.D**., Research Scientist at Atlantic Reference Centre, specializing in biodiversity and taxonomy, and curator of the Atlantic Reference Centre (ARC). Dr. Goodwin achieved her Doctor of Philosophy (biology, ecology and conservation of lamprey in Norther Ireland), is an experienced marine benthic taxonomist, with over 15 years of experience covering the North Atlantic, Arctic, Antarctic, and sub-Antarctic faunas.
- **Emma Garden, MSc** Training Coordinator, Canadian Aquatic Biomonitoring Network. Ms. Garden achieved a MSc., Water Resources Engineering from University of Guelph, and her BSc from Saint Mary's University.

St. Croix International Waterway Commission

- Elizabeth Hyslop, BBA, FCIP, Executive Director
- Gloria Tinker, Program Coordinator
- Rebecca Goreham, BSc., Lead Biologist
- Lauren Mahon Hodgins, BSc., Field Biologist

Introduction

This project was new to us this year and provided an opportunity for collaboration with Environment and Climate Change Canada (ECCC), Huntsman Marine Science Centre, and ACAP. Through consultations with Emma Garden, CABIN Training Coordinator, Water Science and Technology Directorate of Environment and Climate Change Canada (ECCC), the sampling locations were identified. There were 6 sites selected to assess the impact of the Billy Weston Brook that runs into the Dennis Stream. Billy Weston Brook runs directly through the Town of St Stephen while the Dennis Stream run on the outer limits of St Stephen.

The equipment required to conduct the samples was borrowed from ACAP Saint John, thereby saving the time and cost associated with the equipment purchase.

Each sample was collected in accordance with the CABIN (Canadian Aquatic Biomonitoring Network) protocols and utilizing the Field Manual Wadable Streams 2012. These sites were selected for their depth,

width, location, and comparable habitat/substrate features. Kim Reeder, MSc, supervised the collections. And Claire Goodwin, PH.D. analyzed each sample.

Methods and Observations

Benthic Invertebrate sampling is used to assess water quality, as the invertebrate are diverse, sedentary, respond to environmental alterations, and good indicators of ecosystem productivity and health.

There were months of pre-planning before this project was able to get underway. There was numerous consultations and collaborations to be made beforehand. There was numerous surveying of the site including individual rock measurement, gathering of the invertebrates, information on the site such as, terrain, weather, and then the analyzing.

To comply with the CABIN specifications and regulations, the SCIWC collaborated with a CABIN certified community member, K. Reeder, MSc., to supervise the CABIN sample collection.

Step 1: Site Observations Sheets

At each site, an Observations Sheet was completed and included:

- Geographical description (forest, mining, logging etc.)
- Locations Data (GPS points, elevation)
- Site location map drawing (hand drawn to mimic site)
- Photos (field sheet, upstream, downstream, across site, etc.)
- Reach data (habitat type, canopy coverage, macrophyte coverage, streamside vegetation, dominant vegetation, periphyton coverage)
- Benthic Invertebrate Data (person sampling, sampling time, number of sample jars, depth in kick area)
- Water chemistry data (time, air temperature, water temperature, pH, conductivity, dissolved oxygen, turbidity)
- Channel data (upstream and downstream - top hairline, mid hairline, bottom hairline, distance, change in height, slope)
- Widths and Depth (bank full width, wetted stream width, bank full-wetted depth)
- Velocity and Depth (Velocity head rod)
- Substrate Data (100 pebble count)
- Site Inspection requiring safety questionnaire.

Step 2: Sample Collection

Once this sheet was completed, the kick net was put in place and the samples gathered.

Step 3: Sample Analysis

The samples were then sent to Claire Goodman at Huntsman Marine Science Centre to analyze the samples.

Step 4: CABIN Project Data Entry

That information was then given to Emma Garden, CABIN Training Coordinator, Water Science and Technology Directorate of Environment and Climate Change Canada (ECCC) to enter in the CABIN database.

The name of our CABIN project is “NB-St. Croix River Benthic Invertebrate Sampling.” The information can be accessed through the CABIN database, but only if you are CABIN trained in data entry. Below is a snapshot of what it would look like.

Results and Conclusions

In total there was six sites where sampling was collected from. Samples were sorted using a marchant box. Debris was sorted until a minimum of 300 organisms were obtained or at least five marchant box cells were counted. Organisms were identified by Claire Goodwin. All identifications were checked by Bill Hogans. Organisms were identified to at least family level. Some groups were identified to genus level. Nomenclature corresponds to ITIS.

The analyzing chart below, states what invertebrate was found, at which site, and how many of each genus were found per sample.

Map 1: Benthic Invertebrate Sample Sites

200169 Benthic Invertebrate Sampling on the St. Croix River

Benthic Invertebrate Sample Sites 2020

- SC-DS001 Dennis Stream
- SC-DS002 Dennis Stream
- SC-DS003 Dennis Stream
- SC-DS004 Dennis Stream
- SC-BW001 Billy Weston Brook
- SC-SB001 Scott Brook
- 200169

200189 Water Quality Sites Near Benthic Invertebrate Sites

- SC-BILL1A Billy Weston Brook
- SC-BILL1B Billy Weston Brook
- SC-BILL1C Billy Weston Brook
- SC-DEN1 Dennis Stream
- SC-DEN2 Dennis Stream
- SC-DEN Elm St Nature Trail
- SC-WHARF St. Stephen Wharf
- SC-TAN2 Tan House

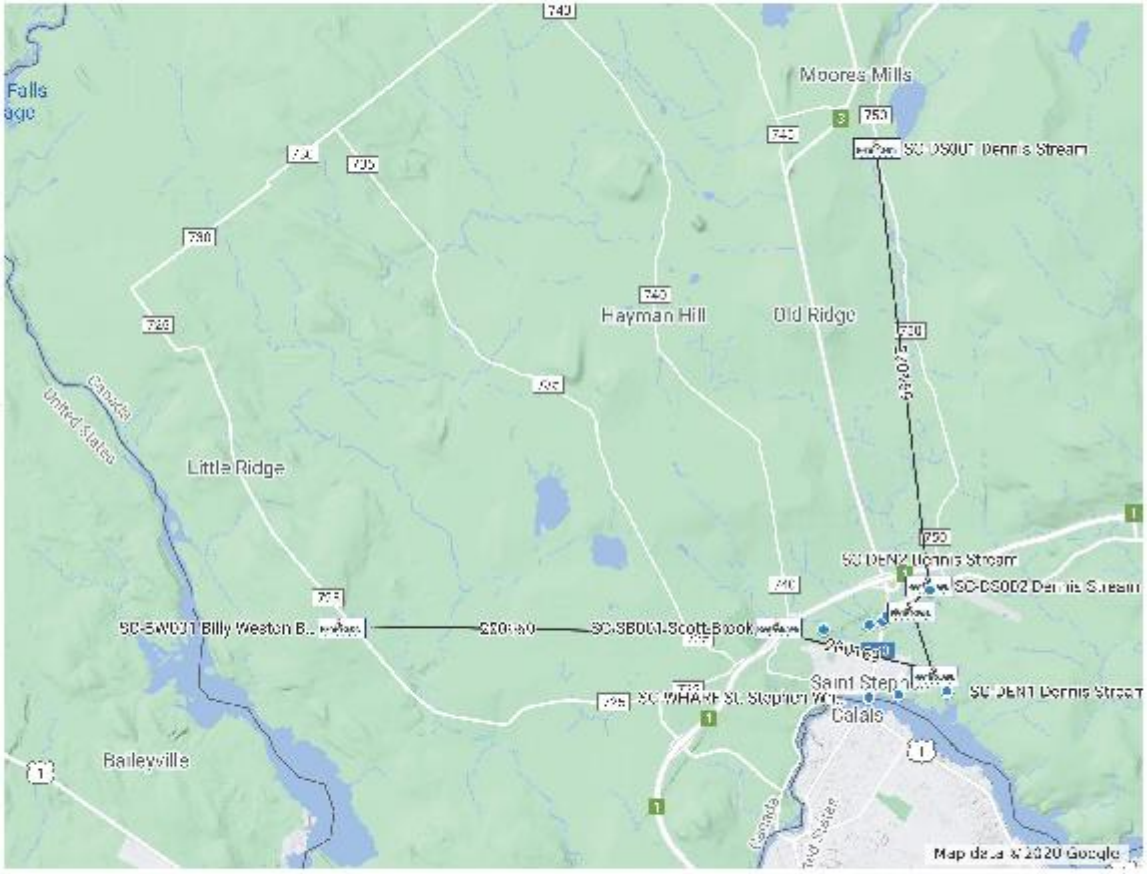


Table 15: Benthic Invertebrate Sample Results

Phylum	Class	Order	Family	Notes	SC-DS004	SC-BW001	SC-DS001	SC-SB001	SC-DS002	SC-DS003
					313	307	440	311	447	366
					5	17	5	34	5	5
Annelida					65	69	4	13	9	77
Arthropoda	Insecta	Basommatophora	Physidae		3					
Arthropoda	Insecta	Coleoptera	Elmidae		1	8				19
Arthropoda	Insecta	Coleoptera	Elmidae	Juvenile	1				23	
Arthropoda	Insecta	Coleoptera	Elmidae						1	
Arthropoda	Insecta	Coleoptera	Elmidae			1		1	6	2
Arthropoda	Insecta	Coleoptera	Elmidae				5		4	7
Arthropoda	Insecta	Coleoptera	Gyrinidae					2		
Arthropoda	Insecta	Coleoptera	Psephenidae				3			
Arthropoda	Insecta	Coleoptera	Psephenidae				3		5	
Arthropoda	Insecta	Coleoptera		Juvenile			7		1	
Arthropoda	Insecta	Diptera	Chironomidae		222	152	355	78	269	232
Arthropoda	Insecta	Ephemeroptera	Ameletidae				5			
Arthropoda	Insecta	Ephemeroptera	Baetidae		14	27	3	50	4	
Arthropoda	Insecta	Ephemeroptera	Baetidae			1		1		
Arthropoda	Insecta	Ephemeroptera	Caenidae		1	1				10
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae			6				
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Damaged /juvenile			5	23	7	
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae							1
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Damaged /juvenile		3	3	21	24	
Arthropoda	Insecta	Ephemeroptera	Heptageniidae				12			
Arthropoda	Insecta	Ephemeroptera	Heptageniidae					20	2	
Arthropoda	Insecta	Ephemeroptera	Isonychiidae			1		7		
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae		1					
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae			1				
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae					28		

Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae			14				
Arthropoda	Insecta	Ephemeroptera	Polymitarcyidae			1				
Arthropoda	Insecta	Ephemeroptera		Damaged /juvenile			1	11	11	5
Arthropoda	Insecta	Megaloptera	Corydalidae					1	2	
Arthropoda	Insecta	Odonata	Calopterygidae			1				
Arthropoda	Insecta	Odonata	Lestidae						1	1
Arthropoda	Insecta	Odonata	Coenagrionidae		1					
Arthropoda	Insecta	Odonata	Gomphidae	Juvenile				1		
Arthropoda	Insecta	Odonata	Gomphidae					5		
Arthropoda	Insecta	Odonata	Libellulidae	Juvenile				1		
Arthropoda	Insecta	Plecoptera	Perlidae					1		
Arthropoda	Insecta	Plecoptera	Perlidae						1	
Arthropoda	Insecta	Plecoptera	Perlidae				1			
Arthropoda	Insecta	Plecoptera	Perlodidae			2				
Arthropoda	Insecta	Plecoptera		Juvenile		1		6		
Arthropoda	Insecta	Trichoptera	Polycentropodidae					1		
Arthropoda	Insecta	Trichoptera	Polycentropodidae		1					1
Arthropoda	Insecta	Trichoptera		Damaged /juvenile		1			2	1
Arthropoda	Insecta	Trichoptera	Brachycentridae		1					
Arthropoda	Insecta	Trichoptera	Helicopsychidae						1	
Arthropoda	Insecta	Trichoptera	Hydropsychidae				9		8	
Arthropoda	Insecta	Trichoptera	Hydropsychidae				4			
Arthropoda	Insecta	Trichoptera	Hydroptilidae			2		19		
Arthropoda	Insecta	Trichoptera	Hydroptilidae	Juvenile				2		
Arthropoda	Insecta	Trichoptera	Hydroptilidae			1		4	3	1
Arthropoda	Insecta	Trichoptera	Hydroptilidae				1			
Arthropoda	Insecta	Trichoptera	Lepidostomatidae					1		
Arthropoda	Insecta	Trichoptera	Lepidostomatidae		1	1				
Arthropoda	Insecta	Trichoptera	Leptoceridae			1			3	1
Arthropoda	Insecta	Trichoptera	Leptoceridae							1

Arthropoda	Insecta	Trichoptera	Leptoceridae						2	
Arthropoda	Insecta	Trichoptera	Phryganeidae			1				
Arthropoda	Insecta	Trichoptera	Psychomyiidae				2			
Arthropoda	Insecta	Trichoptera	Sericostomatidae			5		2	1	
Arthropoda	Eucheliceratа	Trombidiformes	Aturidae					1	10	
Arthropoda	Eucheliceratа	Trombidiformes	Halacaridae						1	
Arthropoda	Eucheliceratа	Trombidiformes	Hygrobatidae				1		2	
Arthropoda	Eucheliceratа	Trombidiformes	Torrenticolidae						25	
Arthropoda	Eucheliceratа	Trombidiformes	Torrenticolidae							1
Mollusca	Bivalvia	Veneroida	Pisidiidae			1	9	11		2
Mollusca	Gastropoda	Basommatophora	Physidae		3					1
Mollusca	Gastropoda	Basommatophora	Planorbidae							1
Mollusca	Gastropoda	Basommatophora	Planorbidae			5				
Mollusca	Gastropoda	Heterostropha	Valvatidae				7		8	2
Mollusca	Gastropoda	Neotaenioglossa	Amnicolidae		1				11	

Water Quality Monitoring in the St. Croix Watershed

Partners

Regional Governmental Agencies

Province of New Brunswick

- Dept of Energy and Local Government, Environmental Trust Fund (L. Theriault)

St. Croix International Waterway Commission

- Elizabeth Hyslop, BBA, FCIP, Executive Director
- Gloria Tinker, Program Coordinator
- Rebecca Goreham, BSc., Lead Biologist
- Lauren Mahon Hodgins, BSc., Field Biologist

Executive Summary

Water quality monitoring is an important process that aligns with our purpose plan jointly for the management and protection of the international waterway of the St. Croix River (Brennan & Hatfield, 1986, p. 1) and the Province of New Brunswick, Environment and Local Government Environmental Trust Fund Priority Area Measure – Protecting the Environment (Government of New Brunswick, 2020, p. 1)**Error! Reference source not found.**.

The boundaries for the St. Croix Waterway lay between the international boundaries between Canada and the United States, so that it faces unique legislative, environmental, and economic management challenges. Water quality within the St. Croix Watershed can be affected by several factors, including natural events such as leaching of minerals from rocks and soil and surface runoff. Surface water quality can also be affected by residential, industrial, agricultural, and atmospheric runoff from development in the watershed.

Of the 41 locations sampled, the data collected in 2020 illustrated that the river is **GOOD** to **EXCELLENT** in 29 (71%) sites, **FAIR** to **Marginal** in 7 (17%) sites, and **POOR** in 5 (12%) of the sites.

The water temperature and dissolved oxygen concentrations could support fish and other aquatic live. Water levels were dramatically depleted in several areas along the river, including Vanceboro and Canoose Flowage (See Photos Photo 8: Canoose Outflow Conditions Observed Oct 2, 2020).

E. coli, nutrient, and metal concentrations varied between samples, dates, and locations. Blue Green algae was not observed, and the river users should review the data to confirm is it safe for their purposes.

Introduction

The St. Croix River runs from the Atlantic Ocean, from St. Andrews to North Lake, approximately 185 km / 115 miles, and includes three Provincial Parks and four dams. The St. Croix River is one of three rivers recognized Canadian Heritage River, for the natural, cultural, and recreation heritage (Government of Canada and the Parks Canada Agency , 2020),

In 2017 the Saint Croix International Waterway Commission (SCIWC) began to monitor water quality throughout the St. Croix watershed. Regular water quality analysis will allow for a timely detection of contaminants, measurable comparisons of historical to current water quality, and will contribute to longstanding data records. The most recent assessment of the watershed prior to this study was completed in 2000.

The SCIWC collected samples from 52 sites, with two new sites added to the list from the "Future Water Quality in the St Croix Watershed: A proposal for preliminary surface water classification under New Brunswick's Clean Water Act" (TBA, 2000). These locations are selected as sites of significance due to level of human activity, industry, and previous sample results. Water quality sampling sites in Maine are being monitored by the Sipayik Environmental Department (SED) and Indian Township Environmental Department (ITED).

Each sample was analyzed by the New Brunswick's provincial research organization located in Fredericton, Research Productivity Council (RPC) (https://rpc.ca/english/). Each analysis was based on identified key matrix for surface water chemistry and metals, total suspended solids, and E. coli. A Field Observation Sheet was completed for each sample site that identified information such as weather conditions; water levels and clarity' presence in the water of algae, oil, film, foam, or garbage; presence of fish and aquatic insects; bank erosion and vegetation; and human utilization of the land for purposes such as ATV crossings, fishing, swimming, or construction. Additionally, at each site temperature, dissolved oxygen, conductivity, and pH measurements were taken using a YSI loaned to the Commission through the Atlantic Water Network Equipment Loaning Program managed by ACAP Saint John (www.acapsj.org). The samples, Field Observation Sheet and Sample Submission Form (Chain of Custody Record) were sent by courier to RPC for analysis. We continued to work with the Atlantic Water Network and uploaded the sample results DataStream Water Quality Monitoring Online Tool (https://atlanticdatastream.ca/). This program was funded by the Province of New Brunswick Environmental Trust Fund.

Included in the 52 samples, were 2 (two) additional sites (SC CAN2C and SC CAN2D) that were tested on October 7th after numerous fish, a bird, snails, and other small species were found dead in the Canoose Flowage. The happenings where first discovered by individuals in the area, and they reported it. Rebecca Goreham was informed of this situation by a fellow colleague and immediately went to the site alongside Kim Reeder, who has assisted SCIWC in our Benthic Invertebrate project. Water quality samples were collected as this was the extent that SCIWC could assist with this situation. There was an investigation conducted by several Environmental agencies such as Department of Fisheries and Oceans Canada (DFO), Department of Natural Resources (DNR), and Department of Environmental and Local Government (DELG).

Photo 8: Canoose Outflow Conditions Observed Oct 2, 2020

Methods Water Quality Monitoring

The selected sites were sampled between June to October 2020. The sites to be sampled were predetermined by the Province of New Brunswick with approximate coordinates, and water quality field numbers were assigned (17/20/14000 14999). Location descriptions, site codes, GPS coordinates ca, field numbers and RPC sample numbers can be found in *Table 19: 2020 Sample Site GPS, Dates, Codes, Field No.*

Sampling included testing each predetermined site with a YSI Professional Plus Multiparameter meter, provided by the *Atlantic Water Network* equipment bank, which yielded readings for pH, salinity, conductivity, temperature, and dissolved oxygen (DO).

The water samples are analyzed for surface water chemistry, surface water metals, total suspended solids, and Escherichia coli. At the end of the season, the 2020 data was uploaded into the Atlantic DataStream website for public view. The site allows users to review and sort data according to their specific needs, and to generate various graphs to represent the data reviewed.

Water samples were sent to RPC in Fredericton, New Brunswick, for analysis Monday to Thursday within 24 hours of collection. Results for surface water chemistry, surface water metals, and *E. coli* testing were emailed to the SCIWC after analysis. Several of the sites sampled showed elevated levels of metals, chemicals, and *E. coli* when compared to the standards listed in description of the CCME Water Quality Index Ratings. Sites with values which exceed recommended guidelines have been identified in red.

Chemical Parameters

Sampling was conducted in accordance with the "Guidelines for River Sample Collection and Lab Submission for Watershed Groups in New Brunswick. May 2019". A **Field Observation Form** was completed with each **RPC Sample Submission Form.** Water samples were collected in sample jars provided by RPC. The samples were kept on ice in a cooler and shipped by courier to RPC in Fredericton to be analyzed for E. coli and surface water chemistry and metals.

Field Parameters

Water temperature (°C), dissolved oxygen (mg/L and %), pH, and conductivity (µs/cm), turbidity of the surface waters, and water clarity were determined at surface level with the use of the Professional Plus (Pro Plus) Multiparameter Instrument (YSI Inc. / Xylem Inc., 2021)borrowed for the season from ACAP Saint John. The YSI was returned to ACAP Saint John approximately every 10 14 days to be calibrated following manufactory methods.

At each of the sample sites, a Field Observation Sheet was completed, as overviewed in (Canadian Council of Ministers of the Environment (CCME), 2011). Each Field Observation Sheet was to include the information above, as well as document visual inspections of each site were, weather, nearby vegetation, algae, pollution sources, insects, and fish were recorded. The presence of any pollen, oil, or foam on the surface of the water was also recorded in the field notes. There is an observation sheet with all stated information that is sent to PNB Environment and Local Government, Environmental Trust Fund representatives with RPC results for record keeping.

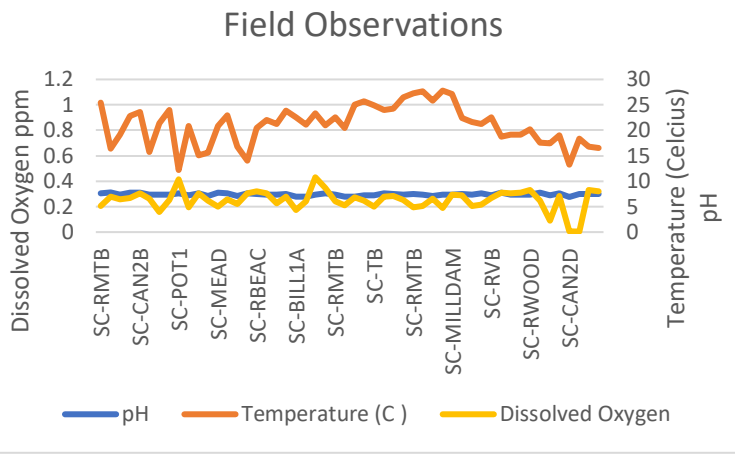
Results and Conclusions

In the sections to follow, the main results are represented with additional date related to previous water quality sampling.

Water Quality Monitoring

Water quality monitoring was conducted at 52 sampling sites along the St. Croix Waterway, from St. Andrews to Monument Brook, nearly 100 km / 61 miles as the crow flies. All water quality data is available online at https://atlanticdatastream.ca/, our website www.stcroix.org, by email at director@stcroix.org (See Appendix 3: Lab data collected from water quality 2020).

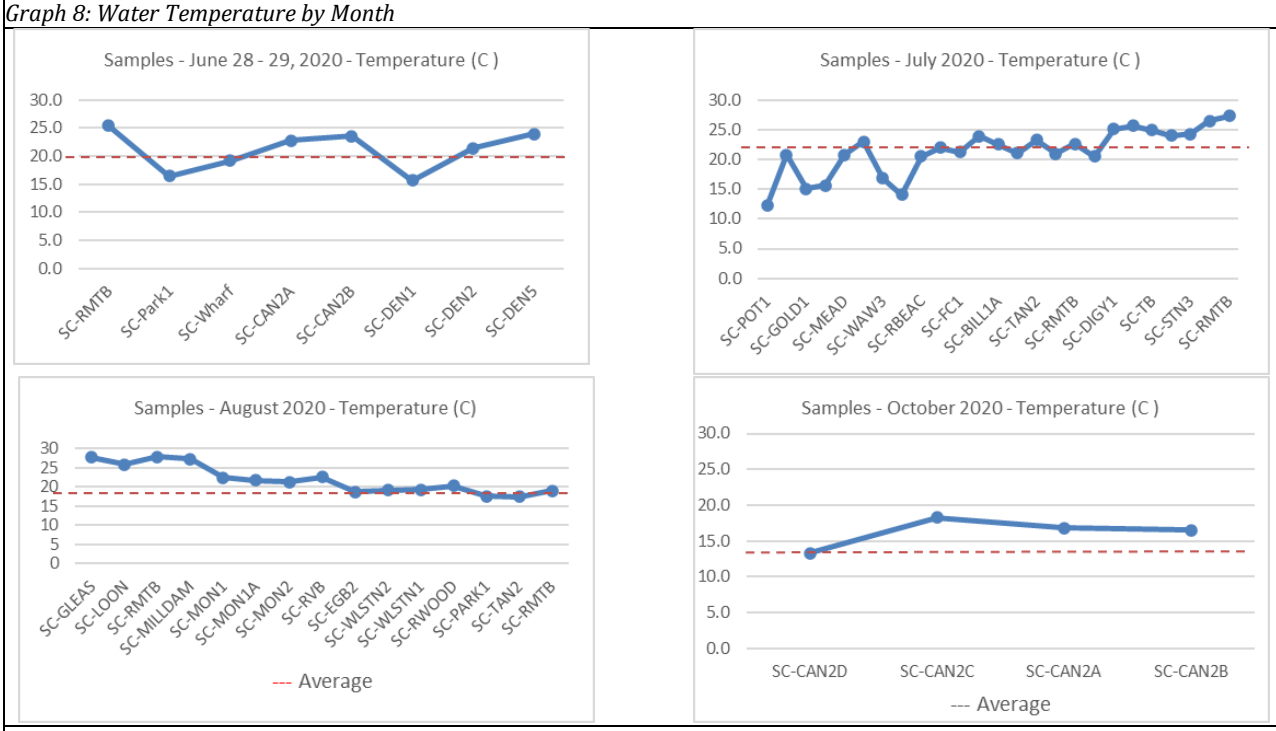
Graph 7: Summary of Field Observations:



Water Temperature

Water temperature was taken at each location and recorded in the Field Observation Sheets. The average temperature for June was 21.1 C, July 21.4 C, August 21.8 C, and October 16.2 C, as indicated in Average in chart below.

Graph 8: Water Temperature by Month



Dissolved Oxygen As with the temperature, Dissolved Oxygen data was collected on site and recorded in the Field Observations Sheets. CCME parameters for Oxygen, dissolved (DO) are 4 – 10 ppm. Of the 52 samples, four samples were below 4 ppm and two were higher than 10 ppm but below 11 ppm.

Table 16: Dissolved Oxygen Above or Below Parameters

Date Sampled:	Client Sample/Station ID:	Dissolved Oxygen
29 Jun 20	SC DEN2	3.96
6 Jul 20	SC POT1	10.38
15 Jul 20	SC TAN2	10.77
31 Aug 20	SC TAN2	2.30
7 Oct 20	SC CAN2D	0.16
7 Oct 20	SC CAN2C	0.10

pH of the 52 site samples, 51 included pH measurements. CCME parameters are 4 9 with 6.0 7.5 being the most common in this region, and the pH of the sample sites ranged from 6.90 to 7.80.

E. coli **ESCHERICHIA COLI** guideline for recreational bodies of water is an average of 200 MPN/100 ml over five samples or 400 MPN/100 ml in a single sample ((Her Majesty the Queen in Right of Canada, represented by the Minister of Health, 2012, bl. 10). Of the samples collected, there were six sites with E.coli levels above 400 MPN/100 ml, two of which had limits over 1000 MPN/100 ml.

Table 17: Locations with E. coli limits over 400 MPN/1 ml

Location	Station ID	ETF Sample ID	Date	2020 Results MPN/100 mL	2019 Results MPN/100 mL	Date
Forest City	SC FC1	17/20/14018	8 Jul 20	1203.3	5.2	16 Sep 19
Tan House	SC TAN2	17/20/14023	15 Jul 20	1046.2	2419.6	12 Jun 19
Loon Bay	SC LOON	17/20/14034	10 Aug 20	648.8	n/a	
Canoose Stream	SC CAN2C	17/20/14049	7 Oct 20	478.6	n/a	
Dennis Stream	SC DEN1	17/20/14005	29 Jun 20	461.1	52.0	16 Jul 19
St Stephen Wharf	SC WHARF	17/20/14002	29 Jun 20	410.6	9.8	16 Oct 19

Nutrients *& Metals*

The analytes tested in the **SURFACE WATER CHEMISTRY ANALYSIS** are sodium, potassium, **calcium**, magnesium, alkalinity (as CaCO3), chloride, fluoride, sulfate, bromine, ammonia (as N), Kjeldahl nitrogen, nitrate + nitrite, nitrite, nitrate, phosphorus, dissolved organic carbon, colour, conductivity, pH, turbidity, bicarbonate, carbonate, hardness, nitrogen (total), total dissolved solids, saturation pH, and the Langelier Index.

Metals The analytes tested in the **SURFACE WATER METALS ANALYSIS** are aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, rubidium, selenium, silver, sodium, strontium, tellurium, thallium, tin, uranium, vanadium, and zinc.

Water Quality Index (WQI)

The sample results were compared to the standards Test Parameters noted in the Future Water Quality in the St. Croix Watershed: A Proposal. These guidelines were taken from Canadian Environmental Quality Guidelines for the Protection of Aquatic Life. The results were also processed in accordance with the Canadian Council of Ministers of the Environment (CCME) Water Quality Index Calculator, a free software that compares water data parameters and determines the quality of the water on a scale of excellent to poor.

The following data for each sample was entered into the WQI Calculator and an Index Rating by location was calculated:

- Temperature
- pH
- Dissolved Oxygen
- Electrical Conductivity
- Total Dissolved Solids
- Turbidity
- E. coli

Table 18: 2020 Water Quality Index Rating by Location

Station	Location	WQI Category
SC BILL1A	Billy Weston Brook	GOOD
SC BILL1B	Billy Weston Brook	GOOD
SC BILL1C	Billy Weston Brook	GOOD
SC BILLELM	Elm Street Nature Park	GOOD
SC CAN2A	Canoose Stream	MARGINAL
SC CAN2B	Canoose Stream	MARGINAL
SC DEN1	Dennis Stream	GOOD
SC DEN2	Dennis Stream	GOOD
SC DEN5	Dennis Stream	GOOD
SC DIG1	Diggity Stream	EXCELLENT
SC EGB2	East Grand Border Bridge	EXCELLENT
SC FC1	Forrest City	MARGINAL
SC GLEAS	Gleason's Point	EXCELLENT
SC GOLD1	Goldsmith Brook	EXCELLENT
SC GOLDA1	Goldsmith Stream	POOR
SC HAYS	Hays Brook	EXCELLENT
SC MEAD	Meadow Brook	GOOD
SC MILLS	Upper Mills Road	EXCELLENT
SC MOH1	Mohanne's Stream	GOOD
SC MON1	Monument Brook	EXCELLENT
SC MON1A	Monument Brook	EXCELLENT
SC MON2	Monument Brook	EXCELLENT

Station	Location	WQI Category
SC MUD	Mud Lake Falls	EXCELLENT
SC PARK1	Oak Bay Campground (salt water)	POOR
SC POT1	Pottery Brook	EXCELLENT
SC POUT	Pout Brook	GOOD
SC RBEAC	Scott Brook	FAIR
SC RMTB	Milltown Boat Launch	GOOD
SC MILLDAM	Milltown Dam	GOOD
SC LOON	Loon Bay	EXCELLENT
SC RVB	Vanceboro Dam	EXCELLENT
SC RWOOD	Woodland Dam	MARGINAL
SC STN1	East Grand Lake	FAIR
SC STN3	East Grand Lake	FAIR
SC TAN2	Tanhouse	POOR
SC TODD	Todd's Point (salt water)	POOR
SC TROUT	Trout Brook	EXCELLENT
SC WAW3	Waweig	GOOD
SC WHARF	St Stephen Wharf	POOR
SC WLSTN1	Woodland Flowage	EXCELLENT
SC WLSTN2	Woodland Flowage	EXCELLENT

Table 19: 2020 Sample Site GPS, Dates, Codes, Field No.

Name	Site Code	Latitude	Longitude	Date	Field Number	RPC ID
Below Milltown Dam	SC MILLDAM	45.1769777	67.2942249	12 Aug 20	17/20/14036	363785
Billy Weston Brook 1A	SC BILL1A	45.20336	67.27588	15 Jul 20	17/20/14019	360111
Billy Weston Brook 1B	SC BILL1B	45.204	67.27301	15 Jul 20	17/20/14020	360111
Billy Weston Brook 1C	SC BILL1C	45.20488	67.27175	19 Jul 20	17/20/14021	360538
Canoose Downstream	SC CAN2D	45.397372	67.344871	8 Oct 20	17/20/14048	371178
Canoose Stream	SC CAN2A	45.3749397	67.3876322	29 Jun 20	17/20/14003	358272
Canoose Stream	SC CAN2A	45.3749397	67.3876322	8 Oct 20	17/20/14050	371178
Canoose Upstream	SC CAN2C	45.397459	67.344793	8 Oct 20	17/20/14049	371178
Dennis Stream	SC DEN1	45.1927	67.25813	29 Jun 20	17/20/14005	358272
Dennis Stream 2	SC DEN2	45.20901	67.26204	29 Jun 20	17/20/14006	358272
Dennis Stream 3	SC DEN5	45.29275	67.27201	29 Jun 20	17/20/14007	358272
Diggity Stream	SC DIGY1	45.6175	67.42683	19 Jul 20	17/20/14026	360538
East Grand Border Bridge	SC EGB2	45.816389	67.780439	29 Jul 20	17/20/14031	362098
East Grand Border Bridge	SC EGB2	45.816389	67.780439	31 Aug 20	17/20/14041	366304
East Grand Lake	SC STN1	45.7151446	67.8040143	29 Jul 20	17/20/14029	362098
East Grand Stn. 3	SC STN3	45.6808782	67.784802	29 Jul 20	17/20/14030	362098
Elm Street Nature Trail	SC BILLELM	45.20267	67.28635	15 Jul 20	17/20/14024	360111
Forest City	SC FC1	45.66575	67.73325	8 Jul 20	17/20/14018	359272
Gleason's Point	SC GLEAS	45.339793	67.433502	10 Aug 20	17/20/14033	363378
Goldsmith Brook	SC GOLD1A	45.20316	67.12258	6 Jul 20	17/20/14009	358874
Goldsmith Stream 1	SC GOLD1	45.20525	67.1393	6 Jul 20	17/20/14010	358875
Hays Brook	SC HAYS	45.8362641	67.7296105	22 Jul 20	17/20/14027	361098
Loon Bay	SC LOON	45.4037484	67.4405173	10 Aug 20	17/20/14034	363378
Meadow Brook	SC MEAD	45.18699	67.20426	6 Jul 20	17/20/14012	358877
Milltown Boat Launch	SC RMTB	45.1697808	67.2989091	28 Jun 20	17/20/14000	357996
Milltown Boat Launch	SC RMTB	45.1687808	67.2989091	15 Jul 20	17/20/14025	360111
Milltown Boat Launch	SC RMTB	45.1687808	67.2989091	29 Jul 20	17/20/14032	362098
Milltown Boat Launch	SC RMTB	45.1687808	67.2989091	12 Aug 20	17/20/14035	363785
Milltown Boat Launch	SC RMTB	45.1687808	67.2989091	31 Aug 20	17/20/14046	366304
Mohanne's Stream	SC MOH1	45.1598	67.33851	6 Jul 20	17/20/14013	358878
Monument Brook 1A	SC MON1A	45.851790	67.78936	20 Aug 20	17/20/14038	364821
Monument Brook 2	SC MON2	45.86461	67.78998	20 Aug 20	17/20/14039	364821
Mouth of Monument Brook	SC MON1	45.83331	67.76533	20 Aug 20	17/20/14037	364821
Mud Lake Falls	SC MUD	45.6878	67.72672	8 Jul 20	17/20/14017	359272
New Canoose Site	SC CAN2B	45.37406	67.35906	29 Jun 20	17/20/14004	358272
New Canoose Site	SC CAN2B	45.37406	67.35906	8 Oct 20	17/20/14051	371178
Oak Bay Campground	SC PARK1	45.2279325	67.1881298	29 Jun 20	17/20/14001	357996
Oak Bay Campground	SC PARK1	45.2279325	67.1881298	31 Aug 20	17/20/14044	366304
Pottery Creek	SC POT1	45.0786929	67.0696791	6 Jul 20	17/20/14008	358873
Pout Brook	SC POUT2	45.24425	67.15408	6 Jul 20	17/20/14011	358876
Scott Brook	SC RBEAC	45.48986	67.50251	8 Jul 20	17/20/14016	359272
St. Stephen Wharf	SC WHARF	45.1917994	67.2775507	29 Jun 20	17/20/14002	357996
Tan House	SC TAN2	45.19216	67.26926	15 Jul 20	17/20/14023	360111
Tan House	SC TAN2	45.19216	67.26926	31 Aug 20	17/20/14045	366304
Todd's Point	SC TODD	45.17269	67.16133	8 Jul 20	17/20/14015	359272
Trout Brook	SC TB	45.83117	67.72563	22 Jul 20	17/20/14028	361098
Upper Mills Road	SC MILLS	45.13366	67.32258	15 Jul 20	17/20/14022	360111
Vanceboro Dam/Bridge	SC RVB	45.56844	67.42872	20 Aug 20	17/20/14040	364821
Waweig	SC WAW3	45.24985	67.1331	8 Jul 20	17/20/14014	359272
Woodland	SC WLSTN1	45.1629	67.40578	31 Aug 20	17/20/14047	366304
Woodland 2	SC WLSTN2	45.16678	67.40494	31 Aug 20	17/20/14042	366304
Woodland Dam	SC RWOOD	45.15482	67.39282	31 Aug 20	17/20/14043	366304
Total					**52**	

Table 20: Samples by Collection Date (Jun 28 29, 2020)

RPC Sample ID:	357996 1	357996 2	357996 3
Client Sample/Station ID:	SC RMTB	SC Park1	SC Wharf
ETF Field No.	17/20/14000	17/20/14001	17/20/14002
Analysis of Surface Water Chemistry			
Analytes / Date Sampled:	28 Jun 20	29 Jun 20	29 Jun 20
Alkalinity (as $CaCO_3$)	20	91	31
Ammonia (as N)	< 0.05	< 0.05	< 0.05
Bromine	0.04	61.4	8.1
Calcium	4.48	379	53.4
Carbon Total Organic	7.6	2	6.8
Chloride	9.6	16800	2360
Colour	44	< 5	30
Conductivity	103	92400	8100
Fluoride	0.13	1.67	0.48
Magnesium	0.72	1210	160
Nitrate (as N)	0.08	< 0.05	< 0.05
Nitrate + Nitrite (as N)	0.08	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05
Nitrogen Total	0.6	0.3	0.6
pH	7.6	7.8	7.3
Phosphorus Total	0.045	0.03	0.04
Potassium	1.52	360	49.3
Sodium	13.4	9520	1300
Sulfate	12	2250	330
Turbidity	2.9	1.5	2.3
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001
Calculated Parameters			
Bicarbonate (as $CaCO_3$)	19.9	90.4	30.9
Carbonate (as $CaCO_3$)	0.074	0.536	0.058
Hardness (as $CaCO_3$)	14.2	5930	792
TDS (calc)	62	30600	4280
Saturation pH (20°C)	9.4	6.9	8.5
Langelier Index (20°C)	1.76	0.91	1.16
Analysis of Surface Water Metals			
Aluminum	0.101	< 0.05	0.11
Antimony	< 0.0001	< 0.005	< 0.001
Arsenic	< 0.001	< 0.05	< 0.01
Barium	0.009	< 0.05	< 0.01
Beryllium	< 0.0001	< 0.005	< 0.001
Bismuth	< 0.001	< 0.05	< 0.01
Boron	0.005	4.14	0.55
Cadmium	0.00006	< 0.0005	< 0.0001
Calcium	4.48	379	53.4
Chromium	< 0.001	< 0.05	< 0.01
Cobalt	< 0.0001	< 0.005	< 0.001
Copper	< 0.001	< 0.05	< 0.01
Iron	0.19	< 1	0.2
Lead	0.0003	< 0.005	< 0.001
Lithium	0.0004	0.154	0.021
Magnesium	0.72	1210	160
Manganese	0.09	< 0.05	0.08
Molybdenum	0.0002	0.011	0.001
Nickel	< 0.001	< 0.05	< 0.01
Potassium	1.52	360	49.3
Rubidium	0.0039	0.106	0.018
Selenium	< 0.001	< 0.05	< 0.01
Silver	< 0.0001	< 0.005	< 0.001
Sodium	13.4	9520	1300
Strontium	0.023	6.82	0.91
Tellurium	< 0.0001	< 0.005	< 0.001
Thallium	< 0.0001	< 0.005	< 0.001
Tin	< 0.0001	< 0.005	< 0.001
Uranium	< 0.0001	< 0.005	< 0.001
Vanadium	< 0.001	< 0.05	< 0.01
Zinc	0.004	< 0.05	< 0.01
Analysis of Water Chemistry			
Solids Total Suspended	< 5	< 5	< 5
Microbiological Examination of WQ			
Analytes			
E.coli	65.7	31.8	410.6
Field Observations			
Temperature (C)	25.4	16.4	19.2
Dissolved Oxygen	5.09	6.94	6.41

Indicates Analyte Over Parameter	Over
Analyte Within Parameter	Within
Analyte Under Parameter	Under

Table 21: Samples by Collection Date (Jun 29, 2020)

RPC Sample ID:	358272 1	358272 2	358272 3	358272 4	358272 5
Client Sample/Station ID:	SC CAN2A	SC CAN2B	SC DEN1	SC DEN2	SC DEN5
ETF Field No.	17/20/14003	17/20/14004	17/20/14005	17/20/14006	17/20/14007
Analysis of Surface Water Chemistry					
Analytes / Date Sampled:	29 Jun 20	29 Jun 20	29 Jun 20	29 Jun 20	29 Jun 20
Alkalinity (as $CaCO_3$)	40	37	26	16	9
Ammonia (as N)	< 0.05	< 0.05	0.14	< 0.05	< 0.05
Bromine	0.02	0.02	3.47	0.02	0.02
Calcium	13.2	11.3	27.2	5.58	3.56
Carbon Total Organic	9.7	11.2	6.9	6.3	9.5
Chloride	2.8	2.9	979	7.1	5.6
Colour	55	74	28	39	73
Conductivity	97	84	3500	67	44
Fluoride	0.15	0.14	0.36	0.13	0.12
Magnesium	2.27	1.94	59.3	1.02	0.76
Nitrate (as N)	< 0.05	< 0.05	0.46	0.19	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05	0.46	0.19	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	0.5	0.6	1	0.5	0.5
pH	7.7	7.7	7.4	7.4	7.3
Phosphorus Total	0.015	0.102	0.081	0.1	0.028
Potassium	0.55	0.34	22.3	0.69	0.22
Sodium	2.13	2.19	521	4.64	3.47
Sulfate	< 1	< 1	130	3	2
Turbidity	1.4	1.6	2.6	0.9	1.3
Un ionized @ 20ºC	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	39.8	36.8	25.9	15.9	9
Carbonate (as $CaCO_3$)	0.188	0.173	0.061	0.038	0.017
Hardness (as $CaCO_3$)	42.3	36.2	312	18.1	12
TDS (calc)	55	53	1760	39	31
Saturation pH (20°C)	8.6	8.7	8.7	9.4	9.8
Langelier Index (20°C)	0.9	1	1.33	1.95	2.48
Analysis of Surface Water Metals					
Aluminum	0.028	0.047	0.102	0.041	0.053
Antimony	< 0.0001	0.0002	0.0002	0.0002	0.0003
Arsenic	0.001	0.001	0.002	0.002	0.003
Barium	0.003	0.003	0.005	0.002	0.002
Beryllium	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Boron	0.004	0.004	0.267	0.004	0.003
Cadmium	0.00004	< 0.00001	0.00002	0.00002	< 0.00001
Calcium	13.2	11.3	27.2	5.58	3.56
Chromium	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001	0.0002	0.0002	0.0002
Copper	< 0.001	< 0.001	< 0.002	0.001	< 0.001
Iron	0.15	0.19	0.33	0.2	0.2
Lead	< 0.0001	0.0001	< 0.0002	0.0001	0.0002
Lithium	0.0002	0.0002	0.0111	0.0006	0.0006
Magnesium	2.27	1.94	59.3	1.02	0.76
Manganese	0.033	0.07	0.062	0.057	0.059
Molybdenum	0.0002	0.0002	0.0009	0.0001	< 0.0001
Nickel	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Potassium	0.55	0.34	22.3	0.69	0.22
Rubidium	0.0012	0.0009	0.0084	0.0016	0.0008
Selenium	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Sodium	2.13	2.19	521	4.64	3.47
Strontium	0.062	0.054	0.387	0.027	0.019
Tellurium	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Zinc	0.002	0.002	0.002	0.004	0.001
Analysis of Water Chemistry					
Solids Total Suspended	< 5	< 5	< 5	< 5	< 5
Microbiological Examination of WQ					
Analytes					
E.coli	31.3	78.5	461.1	88	7.3
Field Observations					
Temperature (C)	22.8	23.6	15.7	21.4	24
Dissolved Oxygen	6.75	7.61	6.61	3.96	6.31

Table 22: Samples by Collection Date (Jul 6, 2020)

RPC Sample ID:	358873 1	358873 2	358873 3	358873 4	358873 5	358873 6
Client Sample/Station ID:	SC POT1	SC GOLD1A	SC GOLD1	SC POUT2	SC MEAD	SC MOH1
ETF Field No.	17/20/14008	17/20/14009	17/20/14010	17/20/14011	17/20/14012	17/20/14013
Analysis of Surface Water Chemistry						
Analytes / Date Sampled:	6 Jul 20	6 Jul 20	6 Jul 20	6 Jul 20	6 Jul 20	6 Jul 20
Alkalinity (as $CaCO_3$)	74	11	48	22	77	19
Ammonia (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromine	0.2	0.02	29	0.04	0.04	0.02
Calcium	32.2	3.99	176	6.23	26.3	5.23
Carbon Total Organic	3	5.2	4.3	6.4	5.5	8.8
Chloride	79.2	8.2	7000	3.4	28.6	3.2
Colour	6	19	13	34	30	81
Conductivity	459	58	21700	65	276	8
Fluoride	0.11	0.12	0.78	0.11	0.15	0.15
Magnesium	5.13	0.68	523	1.11	4.39	1.19
Nitrate (as N)	0.31	< 0.05	< 0.05	0.06	0.1	< 0.05
Nitrate + Nitrite (as N)	0.31	< 0.05	< 0.05	0.06	0.1	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	0.7	0.4	0.4	0.5	0.5	0.5
pH	7.6	7.2	7.6	7.1	7.7	7.6
Phosphorus Total	0.015	0.012	0.02	0.034	0.023	0.028
Potassium	1.85	0.28	162	0.8	0.67	0.3
Sodium	37.9	4.79	3,620	4.11	16.6	2.68
Sulfate	10	< 1	1100	3	5	2
Turbidity	1.6	1.1	2.2	2	4.6	2.5
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calculated Parameters						
Bicarbonate (as $CaCO_3$)	73.7	11	47.8	22	76.6	18.9
Carbonate (as $CaCO_3$)	0.276	0.016	0.179	0.026	0.361	0.071
Hardness (as $CaCO_3$)	102	12.8	2590	20.1	83.7	18
TDS (calc)	216	30	12600	40	136	36
Saturation pH (20°C)	8	9.6	7.8	9.2	8.1	9.3
Langelier Index (20°C)	0.42	2.45	0.17	2.06	0.36	1.7
Analysis of Surface Water Metals						
Aluminum	0.026	0.022	0.07	0.088	0.025	0.052
Antimony	0.0002	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Arsenic	0.001	< 0.001	< 0.02	0.002	0.002	0.003
Barium	0.095	0.002	< 0.02	0.004	0.004	0.001
Beryllium	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.02	< 0.001	< 0.001	< 0.001
Boron	0.017	0.004	1.92	0.005	0.01	0.004
Cadmium	< 0.00001	< 0.00001	< 0.0002	0.00002	< 0.00001	< 0.00001
Calcium	32.2	3.99	176	6.23	26.3	5.23
Chromium	< 0.001	< 0.001	< 0.02	< 0.001	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001	< 0.002	0.0007	0.0002	0.0002
Copper	0.003	< 0.001	< 0.02	< 0.001	< 0.001	< 0.001
Iron	0.06	0.2	0.5	0.7	0.74	0.7
Lead	< 0.0001	< 0.0001	< 0.002	0.0002	< 0.0001	0.0002
Lithium	0.0036	0.0007	0.067	0.0006	0.0011	0.0005
Magnesium	5.13	0.68	523	1.11	4.39	1.19
Manganese	0.031	0.058	0.05	0.372	0.269	0.045
Molybdenum	0.0002	0.0004	0.005	0.0002	0.0002	0.0001
Nickel	< 0.001	< 0.001	< 0.02	0.001	< 0.001	< 0.001
Potassium	1.85	0.28	162	0.8	0.67	0.3
Rubidium	0.0016	0.001	0.05	0.0021	0.0013	0.0009
Selenium	< 0.001	< 0.001	< 0.02	< 0.001	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Sodium	37.9	4.79	3620	4.11	16.6	2.68
Strontium	0.196	0.013	3.22	0.039	0.119	0.028
Tellurium	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.002	< 0.0001	< 0.0001	< 0.0001
Uranium	0.0014	< 0.0001	< 0.002	< 0.0001	0.0001	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.02	< 0.001	< 0.001	< 0.001
Zinc	< 0.001	< 0.001	< 0.02	0.002	< 0.001	0.001
Analysis of Water Chemistry						
Solids Total Suspended	< 5	< 5	< 5	< 5	< 5	< 5
Microbiological Examination of WQ						
Analytes						
E.coli	66.3	73.3	3	80.1	122.3	12.1
Field Observations						
Temperature (C)	12.2	20.8	15.1	15.6	20.8	23
Dissolved Oxygen	10.38	4.85	7.6	6.15	5	6.44

Table 23: Samples by Collection Date (Jul 8, 2020)

RPC Sample ID:	359272 1	359272 2	359272 3	359272 4	359272 5
Client Sample/Station ID:	SC WAW3	SC TODD	SC RBEAC	SC MUD	SC FC1
ETF Field No.	17/20/14014	17/20/14015	17/20/14016	17/20/14017	17/20/14018
Analysis of Surface Water Chemistry					
Analytes / Date Sampled:	359272 1	8 Jul 20	8 Jul 20	8 Jul 20	8 Jul 20
Alkalinity (as $CaCO_3$)	19	88	7	12	11
Ammonia (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromine	0.04	64.3	< 0.01	< 0.01	< 0.01
Calcium	5.21	298	2.43	3.76	4.8
Carbon Total Organic	5.1	3.4	4.7	4	3.9
Chloride	6	16000	2	2.3	2.3
Colour	28	< 5	18	10	9
Conductivity	64	52300	25	36	36
Fluoride	0.07	1.49	< 0.05	< 0.05	< 0.05
Magnesium	0.89	1,120	0.39	0.58	0.81
Nitrate (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	0.3	0.4	0.2	0.2	0.2
pH	7.1	7.6	7.5	7.4	7.4
Phosphorus Total	0.028	0.141	0.009	0.006	0.014
Potassium	0.4	366	0.24	0.23	0.38
Sodium	4.46	9,460	1.07	1.43	1.45
Sulfate	< 1	2520	< 1	< 1	2
Turbidity	1.3	14.9	0.6	0.3	1
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calculated Parameters					
Bicarbonate (as $CaCO_3$)	19	87.7	7	12	11
Carbonate (as $CaCO_3$)	0.022	0.328	0.021	0.028	0.026
Hardness (as $CaCO_3$)	16.7	5360	7.7	11.8	15.3
TDS (calc)	34	29800	15	20	23
Saturation pH (20°C)	9.3	7	10	9.6	9.6
Langelier Index (20°C)	2.2	0.58	2.55	2.23	2.16
Analysis of Surface Water Metals					
Aluminum	0.071	0.92	0.47	0.013	1.27
Antimony	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Arsenic	0.003	< 0.05	< 0.001	< 0.001	< 0.001
Barium	0.003	< 0.05	0.004	0.002	0.017
Beryllium	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001
Boron	0.005	4.37	0.002	0.002	0.003
Cadmium	0.00002	< 0.0005	< 0.00001	< 0.00001	0.00007
Calcium	5.21	298	2.43	3.76	4.8
Chromium	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001
Cobalt	0.0006	< 0.005	0.0002	< 0.0001	0.0011
Copper	< 0.001	< 0.05	< 0.001	< 0.001	0.003
Iron	0.58	2	0.15	0.02	0.88
Lead	0.0002	< 0.005	0.0005	< 0.0001	0.0032
Lithium	0.0008	0.161	0.0003	0.0002	0.0018
Magnesium	0.89	1120	0.39	0.58	0.81
Manganese	0.178	0.16	0.045	0.007	0.208
Molybdenum	0.0001	0.009	< 0.0001	< 0.0001	< 0.0001
Nickel	< 0.001	< 0.05	< 0.001	< 0.001	0.002
Potassium	0.4	366	0.24	0.23	0.38
Rubidium	0.0018	0.112	0.0008	0.0005	0.0015
Selenium	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001
Silver	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Sodium	4.46	9460	1.07	1.43	1.45
Strontium	0.033	7.56	0.014	0.023	0.029
Tellurium	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.005	< 0.0001	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.005	0.0001	< 0.0001	0.0001
Vanadium	< 0.001	< 0.05	< 0.001	< 0.001	0.002
Zinc	0.002	< 0.05	0.002	< 0.001	0.012
Analysis of Water Chemistry					
Solids Total Suspended	11	56	< 5	< 5	9
Microbiological Examination of WQ					
Analytes					
E.coli	140.1	47.4	152.9	11	1203.3
Field Observations					
Temperature (C)	16.8	14.1	20.5	22	21.3
Dissolved Oxygen	5.54	7.68	7.95	7.6	5.67

Table 24: Samples by Collection Date (Jul 15, 2020)

RPC Sample ID:	360111 1	360111 2	360111 3	360111 4	360111 5	360111 6
Client Sample/Station ID:	SC MILLS	SC BILL1A	SC BILL1B	SC TAN2	SC BILLELM	SC RMTB
ETF Field No.	17/20/14022	17/20/14019	17/20/14020	17/20/14023	17/20/14024	17/20/14025
Analysis of Surface Water Chemistry						
Analytes / Date Sampled:	15 Jul 20	15 Jul 20	15 Jul 20	15 Jul 20	15 Jul 20	15 Jul 20
Alkalinity (as $CaCO_3$)	14	46	47	130	31	20
Ammonia (as N)	< 0.05	< 0.05	< 0.05	0.4	< 0.05	< 0.05
Bromine	0.02	0.04	0.04	7.7	0.04	0.04
Calcium	3.73	14.3	15.8	80.2	9.94	5.65
Carbon Total Organic	7.3	12.6	9.1	6.2	7.5	8.3
Chloride	6.8	45.7	61	2330	28.7	14.8
Colour	35	55	45	14	59	42
Conductivity	70	254	316	9600	168	120
Fluoride	0.07	0.09	0.09	0.48	0.08	0.08
Magnesium	0.62	3.93	4.41	162	3.36	0.88
Nitrate (as N)	< 0.05	< 0.05	< 0.05	0.05	0.09	0.13
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	0.1	0.09	0.13
Nitrite (as N)	< 0.05	< 0.05	< 0.05	0.05	< 0.05	< 0.05
Nitrogen Total	0.3	1.4	0.6	1.6	0.4	0.4
pH	7.5	7	7	7.4	7.6	7.4
Phosphorus Total	0.04	0.269	0.114	0.172	0.016	0.043
Potassium	0.82	2.33	1.37	49.9	0.9	1.38
Sodium	7.21	23.6	34.1	1340	15.6	14.3
Sulfate	7	8	9	300	7	13
Turbidity	2.5	18.1	4.1	6.4	2.2	1.2
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001
Calculated Parameters						
Bicarbonate (as $CaCO_3$)	13.9	46	47	130	30.9	19.9
Carbonate (as $CaCO_3$)	0.041	0.043	0.044	0.306	0.116	0.047
Hardness (as $CaCO_3$)	11.9	51.9	57.6	867	38.7	17.7
TDS (calc)	42	142	165	4350	93	71
Saturation pH (20°C)	9.6	8.5	8.5	7.7	8.8	9.3
Langelier Index (20°C)	2.08	1.54	1.5	0.26	1.25	1.87
Analysis of Surface Water Metals						
Aluminum	0.095	0.074	0.052	0.05	0.069	0.109
Antimony	< 0.0001	0.0002	< 0.0001	< 0.001	< 0.0001	< 0.0001
Arsenic	< 0.001	0.004	0.002	< 0.01	0.001	< 0.001
Barium	0.007	0.01	0.006	0.02	0.003	0.012
Beryllium	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.001	< 0.01	< 0.001	< 0.001
Boron	0.004	0.009	0.009	0.66	0.007	0.005
Cadmium	0.00003	0.00004	< 0.00001	< 0.0001	< 0.00001	0.00005
Calcium	3.73	14.3	15.8	80.2	9.94	5.65
Chromium	< 0.001	< 0.001	< 0.001	< 0.01	< 0.001	< 0.001
Cobalt	< 0.0001	0.0031	0.0005	< 0.001	0.0003	< 0.0001
Copper	< 0.001	0.002	0.002	< 0.01	< 0.001	< 0.001
Iron	0.24	2.07	1.03	1.1	0.77	0.19
Lead	0.0002	0.0004	0.0002	< 0.001	0.0002	0.0002
Lithium	0.0003	0.0006	0.0006	0.02	0.0003	0.0004
Magnesium	0.62	3.93	4.41	162	3.36	0.88
Manganese	0.086	1.09	0.288	0.58	0.065	0.082
Molybdenum	0.0001	0.0003	0.0003	0.001	0.0001	0.0002
Nickel	< 0.001	0.007	0.005	< 0.01	0.007	< 0.001
Potassium	0.82	2.33	1.37	49.9	0.9	1.38
Rubidium	0.0022	0.0045	0.0032	0.017	0.002	0.0037
Selenium	< 0.001	< 0.001	< 0.001	< 0.01	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Sodium	7.21	23.6	34.1	1340	15.6	14.3
Strontium	0.02	0.07	0.078	1.07	0.042	0.028
Tellurium	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.001	< 0.01	< 0.001	< 0.001
Zinc	0.003	0.02	0.001	< 0.01	0.001	0.004
Analysis of Water Chemistry						
Solids Total Suspended	8	94	31	7	< 5	< 5
Microbiological Examination of WQ						
Analytes						
E.coli	68.3	125.9	122.3	1046.2	261.3	39.9
Field Observations						
Temperature (C)	23.9	22.5	21.1	23.3	21	22.6
Dissolved Oxygen	7	4.34	6.01	10.77	8.67	6.01

Table 25: Samples by Collection Date (Jul 19 & 22, 2020)

RPC Sample ID:	360538 1	360538 2
Client Sample/Station ID:	SC BILL1C	SC DIGY1
ETF Field No.	17/20/14021	17/20/14026
Analysis of Surface Water Chemistry		
Analytes / Date Sampled:	19 Jul 20	19 Jul 20
Alkalinity (as $CaCO_3$)	44	4
Ammonia (as N)	< 0.05	< 0.05
Bromine	0.04	< 0.01
Calcium	15.6	1.75
Carbon Total Organic	7.6	6.7
Chloride	57.8	2.2
Colour	37	36
Conductivity	283	21
Fluoride	0.14	0.12
Magnesium	4.04	0.3
Nitrate (as N)	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05
Nitrogen Total	0.4	0.3
pH	7	7
Phosphorus Total	0.061	0.019
Potassium	1.42	0.5
Sodium	29.8	3.24
Sulfate	8	5
Turbidity	1.7	0.3
Un ionized @ 20ºC	< 0.001	< 0.001
Calculated Parameters		
Bicarbonate (as $CaCO_3$)	44	4
Carbonate (as $CaCO_3$)	0.041	0.004
Hardness (as $CaCO_3$)	55.6	5.6
TDS (calc)	152	22
Saturation pH (20°C)	8.5	10.4
Langelier Index (20°C)	1.53	3.44
Analysis of Surface Water Metals		
Aluminum	0.05	0.054
Antimony	0.0003	< 0.0001
Arsenic	0.002	< 0.001
Barium	0.005	0.001
Beryllium	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001
Boron	0.009	0.003
Cadmium	0.00002	< 0.00001
Calcium	15.6	1.75
Chromium	< 0.001	< 0.001
Cobalt	0.0004	< 0.0001
Copper	0.002	< 0.001
Iron	0.88	0.08
Lead	0.0003	< 0.0001
Lithium	0.0006	0.0006
Magnesium	4.04	0.3
Manganese	0.298	0.032
Molybdenum	0.0003	0.0003
Nickel	0.004	< 0.001
Potassium	1.42	0.5
Rubidium	0.0031	0.0012
Selenium	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001
Sodium	29.8	3.24
Strontium	0.073	0.008
Tellurium	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001
Uranium	< 0.0001	0.0001
Vanadium	< 0.001	< 0.001
Zinc	0.01	0.004
Analysis of Water Chemistry		
Solids Total Suspended	< 5	< 5
Microbiological Examination of WQ		
Analytes		
E.coli	204.6	9.7
Field Observations		
Temperature (C)	20.5	25.1
Dissolved Oxygen	5.28	6.8

RPC Sample ID:	361096 1	361096 2
Client Sample/Station ID:	SC HAYS	SC TB
ETF Field No.	17/20/14027	17/20/14028
Analysis of Surface Water Chemistry		
Analytes / Date Sampled:	22 Jul 20	22 Jul 20
Alkalinity (as $CaCO_3$)	14	14
Ammonia (as N)	< 0.05	< 0.05
Bromine	< 0.01	< 0.01
Calcium	5.21	4.89
Carbon Total Organic	5.7	6.6
Chloride	2.1	2.3
Colour	26	29
Conductivity	39	38
Fluoride	0.05	0.06
Magnesium	0.7	0.66
Nitrate (as N)	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05
Nitrogen Total	0.3	0.4
pH	7.2	7.2
Phosphorus Total	0.013	0.015
Potassium	0.23	0.9
Sodium	1.47	1.68
Sulfate	1	1
Turbidity	0.4	0.7
Un ionized @ 20ºC	< 0.001	< 0.001
Calculated Parameters		
Bicarbonate (as $CaCO_3$)	14	14
Carbonate (as $CaCO_3$)	0.021	0.021
Hardness (as $CaCO_3$)	15.9	14.9
TDS (calc)	25	27
Saturation pH (20°C)	9.4	9.5
Langelier Index (20°C)	2.22	2.25
Analysis of Surface Water Metals		
Aluminum	0.019	0.022
Antimony	< 0.0001	0.0002
Arsenic	< 0.001	< 0.001
Barium	0.002	0.002
Beryllium	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001
Boron	0.002	0.002
Cadmium	< 0.00001	< 0.00001
Calcium	5.21	4.89
Chromium	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001
Copper	< 0.001	0.002
Iron	0.04	0.07
Lead	< 0.0001	< 0.0001
Lithium	0.0001	0.0002
Magnesium	0.7	0.66
Manganese	0.016	0.018
Molybdenum	< 0.0001	< 0.0001
Nickel	< 0.001	< 0.001
Potassium	0.23	0.9
Rubidium	0.0004	0.0009
Selenium	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001
Sodium	1.47	1.68
Strontium	0.028	0.027
Tellurium	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001
Zinc	< 0.001	0.005
Analysis of Water Chemistry		
Solids Total Suspended	< 5	< 5
Microbiological Examination of WQ		
Analytes		
E.coli	39.7	23.5
Field Observations		
Temperature (C)	25.7	24.9
Dissolved Oxygen	6.21	4.94

Table 26: Samples by Collection Date (Jul 29, 2020 & Aug 10, 2020)

RPC Sample ID:	362098 1	362098 2	362098 3	362098 4
Client Sample/Station ID:	SC STN1	SC STN3	SC EGB2	SC RMTB
ETF Field No.	17/20/14029	17/20/14030	17/20/14031	17/20/14032
Analysis of Surface Water Chemistry				
Analytes / Date Sampled:	29 Jul 20	29 Jul 20	29 Jul 20	29 Jul 20
Alkalinity (as $CaCO_3$)	13	13	14	23
Ammonia (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Bromine	< 0.01	< 0.01	< 0.01	0.04
Calcium	4.2	4.06	4.54	5.44
Carbon Total Organic	3.5	3.4	4.5	7.4
Chloride	2.1	2.1	2.1	13.3
Colour	6	7	15	46
Conductivity	35	35	37	116
Fluoride	< 0.05	< 0.05	< 0.05	0.06
Magnesium	0.56	0.55	0.61	0.79
Nitrate (as N)	< 0.05	< 0.05	< 0.05	0.1
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	0.1
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	< 0.2	0.2	0.2	0.4
pH	7.6	7.5	7.4	7.5
Phosphorus Total	0.007	0.007	0.011	0.045
Potassium	0.25	0.22	0.29	1.62
Sodium	1.45	1.32	1.73	14.6
Sulfate	< 1	< 1	< 1	11
Turbidity	0.2	0.2	0.5	1.2
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001	< 0.001
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	12.9	12.9	14	22.9
Carbonate (as $CaCO_3$)	0.048	0.038	0.033	0.068
Hardness (as $CaCO_3$)	12.8	12.4	13.8	16.8
TDS (calc)	20	20	22	69
Saturation pH (20°C)	9.6	9.6	9.5	9.2
Langelier Index (20°C)	1.95	2.06	2.08	1.72
Analysis of Surface Water Metals				
Aluminum	0.007	0.007	0.013	0.081
Antimony	< 0.0001	< 0.0001	0.0002	< 0.0001
Arsenic	< 0.001	< 0.001	< 0.001	< 0.001
Barium	0.002	0.002	0.002	0.011
Beryllium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.001	< 0.001
Boron	0.003	0.002	0.003	0.005
Cadmium	< 0.00001	< 0.00001	< 0.00001	0.00006
Calcium	4.2	4.06	4.54	5.44
Chromium	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper	< 0.001	< 0.001	< 0.001	< 0.001
Iron	< 0.02	< 0.02	0.03	0.12
Lead	< 0.0001	< 0.0001	< 0.0001	0.0001
Lithium	0.0001	0.0001	0.0001	0.0004
Magnesium	0.56	0.55	0.61	0.79
Manganese	0.003	0.002	0.02	0.073
Molybdenum	< 0.0001	< 0.0001	< 0.0001	0.0001
Nickel	< 0.001	< 0.001	< 0.001	< 0.001
Potassium	0.25	0.22	0.29	1.62
Rubidium	0.0004	0.0004	0.0004	0.0041
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	1.45	1.32	1.73	14.6
Strontium	0.021	0.021	0.025	0.027
Tellurium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	0.005	< 0.001	0.035	0.054
Analysis of Water Chemistry				
Solids Total Suspended	< 5	< 5	< 5	< 5
Microbiological Examination of WQ				
Analytes				
E.coli	<1.0	<1.0	21.6	25.6
Field Observations				
Temperature (C)	24	24.3	26.5	27.3
Dissolved Oxygen	6.97	7.08	6.29	4.85

RPC Sample ID:	363378 1	363378 2
Client Sample/Station ID:	SC GLEAS	SC LOON
ETF Field No.	17/20/14033	17/20/14034
Analysis of Surface Water Chemistry		
Analytes / Date Sampled:	10 Aug 20	10 Aug 20
Alkalinity (as $CaCO_3$)	7	7
Ammonia (as N)	< 0.05	< 0.05
Bromine	< 0.01	< 0.01
Calcium	2.87	2.85
Carbon Total Organic	4.8	5.3
Chloride	1.6	1.5
Colour	14	22
Conductivity	26	26
Fluoride	< 0.05	< 0.05
Magnesium	0.42	0.42
Nitrate (as N)	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05
Nitrogen Total	0.3	0.3
pH	7.3	7.1
Phosphorus Total	0.007	0.008
Potassium	0.32	0.29
Sodium	1.2	1.16
Sulfate	2	2
Turbidity	0.4	0.5
Un ionized @ 20ºC	< 0.001	< 0.001
Calculated Parameters		
Bicarbonate (as $CaCO_3$)	7	7
Carbonate (as $CaCO_3$)	0.013	0.008
Hardness (as $CaCO_3$)	8.9	8.8
TDS (calc)	18	18
Saturation pH (20°C)	10	10
Langelier Index (20°C)	2.67	2.87
Analysis of Surface Water Metals		
Aluminum	0.029	0.027
Antimony	< 0.0001	< 0.0001
Arsenic	< 0.001	< 0.001
Barium	0.002	0.002
Beryllium	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001
Boron	0.003	0.003
Cadmium	< 0.00001	< 0.00001
Calcium	2.87	2.85
Chromium	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001
Copper	< 0.001	< 0.001
Iron	0.04	0.05
Lead	< 0.0001	< 0.0001
Lithium	0.0003	0.0003
Magnesium	0.42	0.42
Manganese	0.016	0.021
Molybdenum	0.0001	0.0001
Nickel	< 0.001	< 0.001
Potassium	0.32	0.29
Rubidium	0.0008	0.0008
Selenium	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001
Sodium	1.2	1.16
Strontium	0.014	0.014
Tellurium	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001
Zinc	0.007	0.003
Analysis of Water Chemistry		
Solids Total Suspended	< 5	< 5
Microbiological Examination of WQ		
Analytes		
E.coli	14.6	648.8
Field Observations		
Temperature (C)	27.6	25.8
Dissolved Oxygen	5.11	6.63

Table 27: Samples by Collection Date (Aug 12 & 20, 2020)

RPC Sample ID:	363785 1	363785 2
Client Sample/Station ID:	SC RMTB	SC MILLDAM
ETF Field No.	17/20/14035	17/20/14036
Analysis of Surface Water Chemistry		
Analytes / Date Sampled:	12 Aug 20	12 Aug 20
Alkalinity (as $CaCO_3$)	18	18
Ammonia (as N)	< 0.05	< 0.05
Bromine	0.04	0.04
Calcium	4.99	5.51
Carbon Total Organic	7.9	8.1
Chloride	12	13
Colour	38	38
Conductivity	112	115
Fluoride	0.08	0.09
Magnesium	0.74	0.79
Nitrate (as N)	0.06	0.08
Nitrate + Nitrite (as N)	0.06	0.08
Nitrite (as N)	< 0.05	< 0.05
Nitrogen Total	0.5	0.5
pH	7.4	7.4
Phosphorus Total	0.054	0.06
Potassium	1.55	1.57
Sodium	13.4	14
Sulfate	14	15
Turbidity	1	1
Un ionized @ 20ºC	< 0.001	< 0.001
Calculated Parameters		
Bicarbonate (as $CaCO_3$)	17.9	17.9
Carbonate (as $CaCO_3$)	0.042	0.042
Hardness (as $CaCO_3$)	15.5	17
TDS (calc)	66	70
Saturation pH (20°C)	9.4	9.3
Langelier Index (20°C)	1.97	1.92
Analysis of Surface Water Metals		
Aluminum	0.082	0.173
Antimony	< 0.0001	< 0.0001
Arsenic	< 0.001	< 0.001
Barium	0.011	0.018
Beryllium	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001
Boron	0.005	0.006
Cadmium	0.00006	0.00008
Calcium	4.99	5.51
Chromium	< 0.001	< 0.001
Cobalt	< 0.0001	0.0002
Copper	< 0.001	0.002
Iron	0.15	0.35
Lead	0.0003	0.0008
Lithium	0.0004	0.0005
Magnesium	0.74	0.79
Manganese	0.081	0.479
Molybdenum	0.0002	0.0002
Nickel	< 0.001	< 0.001
Potassium	1.55	1.57
Rubidium	0.0043	0.0043
Selenium	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001
Sodium	13.4	14
Strontium	0.026	0.029
Tellurium	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001
Zinc	0.004	0.012
Analysis of Water Chemistry		
Solids Total Suspended	13	< 5
Microbiological Examination of WQ		
Analytes		
E.coli	17.5	35.5
Field Observations		
Temperature (C)	27.8	27.2
Dissolved Oxygen	4.7	7.34

RPC Sample ID:	364821 1	364821 2	364821 3	364821 4
Client Sample/Station ID:	SC MON1	SC MON1A	SC MON2	SC RVB
ETF Field No.	17/20/14037	17/20/14038	17/20/14039	17/20/14040
Analysis of Surface Water Chemistry				
Analytes / Date Sampled:	20 Aug 20	20 Aug 20	20 Aug 20	20 Aug 20
Alkalinity (as $CaCO_3$)	16	45	50	10
Ammonia (as N)	< 0.05	< 0.05	0.21	< 0.05
Bromine	< 0.01	0.02	0.02	< 0.01
Calcium	5.29	15	17.1	2.73
Carbon Total Organic	5.8	10.5	11.5	5
Chloride	2	4.3	4.9	1.6
Colour	19	28	30	12
Conductivity	41	104	115	29
Fluoride	0.05	0.11	0.11	0.06
Magnesium	0.72	1.97	2.13	0.41
Nitrate (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	< 0.2	0.5	0.5	< 0.2
pH	7.5	7.4	7.6	7.2
Phosphorus Total	0.011	0.016	0.018	0.007
Potassium	0.22	0.38	0.17	0.23
Sodium	1.48	2.92	3.16	1.13
Sulfate	< 1	< 1	< 1	< 1
Turbidity	0.6	0.8	1.1	0.6
Un ionized @ 20ºC	< 0.001	< 0.001	0.003	< 0.001
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	15.9	44.9	49.8	10
Carbonate (as $CaCO_3$)	0.047	0.106	0.186	0.015
Hardness (as $CaCO_3$)	16.2	45.6	51.5	8.5
TDS (calc)	25	63	70	17
Saturation pH (20°C)	9.4	8.5	8.4	9.8
Langelier Index (20°C)	1.86	1.1	0.8	2.64
Analysis of Surface Water Metals				
Aluminum	0.012	0.008	0.01	0.017
Antimony	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Arsenic	< 0.001	0.001	0.001	< 0.001
Barium	0.002	0.004	0.004	0.002
Beryllium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.001	< 0.001
Boron	0.002	0.004	0.004	0.002
Cadmium	< 0.00001	0.00002	0.00002	< 0.00001
Calcium	5.29	15	17.1	2.73
Chromium	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper	< 0.001	< 0.001	< 0.001	< 0.001
Iron	0.03	0.1	0.14	0.02
Lead	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Lithium	0.0001	0.0002	0.0002	0.0003
Magnesium	0.72	1.97	2.13	0.41
Manganese	0.022	0.089	0.148	0.014
Molybdenum	< 0.0001	< 0.0001	0.0001	< 0.0001
Nickel	< 0.001	< 0.001	< 0.001	< 0.001
Potassium	0.22	0.38	0.17	0.23
Rubidium	0.0004	0.0004	0.0003	0.0007
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	1.48	2.92	3.16	1.13
Strontium	0.031	0.102	0.113	0.014
Tellurium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	< 0.001	0.003	< 0.001	< 0.001
Analysis of Water Chemistry				
Solids Total Suspended	< 5	< 5	5	< 5
Microbiological Examination of WQ				
Analytes				
E.coli	7.4	8.5	13.4	3
Field Observations				
Temperature (C)	22.4	21.7	21.3	22.5
Dissolved Oxygen	7.28	5.13	5.4	6.71

Table 28: Samples by Collection Date (Aug 31, 2020)

RPC Sample ID:	366304 1	366304 2	366304 3	366304 4	366304 5	366304 6	366304 7
Client Sample/Station ID:	SC EGB2	SC WLSTN2	SC WLSTN1	SC RWOOD	SC PARK1	SC TAN2	SC RMTB
ETF Field No.	17/20/14041	17/20/14042	17/20/14047	17/20/14043	17/20/14044	17/20/14045	17/20/14046
Analysis of Surface Water Chemistry							
Analytes / Date Sampled:	31 Aug 20	31 Aug 20	31 Aug 20	31 Aug 20	31 Aug 20	31 Aug 20	31 Aug 20
Alkalinity (as $CaCO_3$)	12	8	8	8	110	93	16
Ammonia (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.3	< 0.05
Bromine	< 0.01	< 0.01	< 0.01	< 0.01	62	29.6	0.04
Calcium	4.28	2.45	2.55	2.53	379	197	4.64
Carbon Total Organic	4.3	4.4	4.3	4.5	2.1	4	6.3
Chloride	2.1	1.5	1.5	1.7	16300	9330	10.3
Colour	9	13	13	15	< 5	8	30
Conductivity	37	26	25	26	57900	38400	87
Fluoride	0.05	0.06	0.05	0.06	1.66	1.11	0.09
Magnesium	0.63	0.5	0.51	0.51	1220	574	0.73
Nitrate (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.08
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.08
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	0.3	0.3	0.3	0.3	0.3	0.6	0.5
pH	7.7	7.4	7.3	7.3	7.7	7.2	7.6
Phosphorus Total	0.004	0.006	0.009	0.018	0.048	0.084	0.033
Potassium	0.25	0.26	0.27	0.29	381	181	1.07
Sodium	1.46	1.35	1.5	1.38	9,420	4740	10.4
Sulfate	2	2	2	2	2400	1270	10
Turbidity	0.4	0.5	4.1	0.9	0.7	0.9	0.9
Un ionized @ 20ºC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Calculated Parameters							
Bicarbonate (as $CaCO_3$)	11.9	8	8	8	109	92.9	15.9
Carbonate (as $CaCO_3$)	0.056	0.019	0.015	0.015	0.516	0.138	0.06
Hardness (as $CaCO_3$)	13.3	8.2	8.5	8.4	5970	2860	14.6
TDS (calc)	22	17	18	18	30200	16400	54
Saturation pH (20°C)	9.6	10	10	10	6.8	7.4	9.4
Langelier Index (20°C)	1.88	2.58	2.67	2.67	0.89	0.2	1.84
Analysis of Surface Water Metals							
Aluminum	0.01	0.019	0.025	0.034	< 0.1	0.08	0.071
Antimony	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Arsenic	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Barium	0.002	0.001	0.002	0.002	< 0.1	< 0.05	0.009
Beryllium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Boron	0.003	0.003	0.003	0.003	4.2	2.02	0.004
Cadmium	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.0005	0.00004
Calcium	4.28	2.45	2.55	2.53	379	197	4.64
Chromium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Cobalt	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Copper	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Iron	< 0.02	0.08	0.1	0.18	< 2	< 1	0.13
Lead	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.01	< 0.005	0.0001
Lithium	0.0001	0.0003	0.0003	0.0003	0.16	0.072	0.0003
Magnesium	0.63	0.5	0.51	0.51	1220	574	0.73
Manganese	0.012	0.015	0.018	0.038	< 0.1	0.21	0.044
Molybdenum	< 0.0001	0.0001	0.0001	0.0001	0.01	< 0.005	0.0001
Nickel	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Potassium	0.25	0.26	0.27	0.29	381	181	1.07
Rubidium	0.0004	0.0007	0.0008	0.0008	0.11	0.055	0.0028
Selenium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Sodium	1.46	1.35	1.5	1.38	9420	4740	10.4
Strontium	0.025	0.015	0.015	0.015	7.5	3.61	0.023
Tellurium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Uranium	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.01	< 0.005	< 0.0001
Vanadium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	< 0.05	< 0.001
Zinc	< 0.001	< 0.001	0.001	0.001	< 0.1	< 0.05	0.003
Analysis of Water Chemistry							
Solids Total Suspended	< 5	< 5	5	< 5	< 5	7	< 5
Microbiological Examination of WQ							
Analytes							
E.coli	3	6.3	2	56.3	387.3	12.1	1
Field Observations							
Temperature (C)	18.7	19.1	19.2	20.2	17.6	17.4	19
Dissolved Oxygen	7.7	7.63	7.69	8.27	6.2	2.3	7.03

Table 29: Samples by Collection Date (Oct 7, 2020)

RPC Sample ID:	371178 1	371178 2	371178 3	371178 4
Client Sample/Station ID:	SC CAN2D	SC CAN2C	SC CAN2A	SC CAN2B
ETF Field No.	17/20/14048	17/20/14049	17/20/14050	17/20/14051
Analysis of Surface Water Chemistry				
Analytes / Date Sampled:	7 Oct 20	7 Oct 20	7 Oct 20	7 Oct 20
Alkalinity (as $CaCO_3$)	82	80	25	40
Ammonia (as N)	7.4	7.6	< 0.05	< 0.05
Bromine	0.05	0.05	0.03	0.02
Calcium	15.4	16.1	8.84	13.3
Carbon Total Organic	10.5	11.1	15.7	11.6
Chloride	3.7	3.7	5.1	3.8
Colour	32	35	50	36
Conductivity	170	167	69	90
Fluoride	0.07	0.05	0.08	0.07
Magnesium	2.82	2.83	1.67	2.4
Nitrate (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate + Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite (as N)	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen Total	8.5	9	0.8	0.6
pH	6.9	7.5	7.5	7.5
Phosphorus Total	0.3	0.52	0.032	0.013
Potassium	0.95	1.18	0.36	0.5
Sodium	3.22	3.27	3.17	2.83
Sulfate	2	2	2	2
Turbidity	26.2	49.9	2.8	0.7
Un ionized @ 20ºC	0.023	0.094	< 0.001	< 0.001
Calculated Parameters				
Bicarbonate (as $CaCO_3$)	81.9	79.7	24.9	39.9
Carbonate (as $CaCO_3$)	0.061	0.237	0.074	0.119
Hardness (as $CaCO_3$)	50.1	51.9	29	43.1
TDS (calc)	90	91	37	50
Saturation pH (20°C)	8.2	8.2	9	8.6
Langelier Index (20°C)	1.34	0.74	1.46	1.1
Analysis of Surface Water Metals				
Aluminum	0.164	0.443	0.022	0.039
Antimony	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Arsenic	0.002	0.002	< 0.001	< 0.001
Barium	0.016	0.021	0.003	0.004
Beryllium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Bismuth	< 0.001	< 0.001	< 0.001	< 0.001
Boron	0.005	0.005	0.006	0.005
Cadmium	0.00002	0.00008	< 0.00001	0.00002
Calcium	15.4	16.1	8.84	13.3
Chromium	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	0.0005	0.0007	< 0.0001	0.0002
Copper	< 0.001	0.002	< 0.001	< 0.001
Iron	1.23	2.5	0.11	0.15
Lead	0.0009	0.0023	< 0.0001	0.0002
Lithium	0.0002	0.0003	0.0002	0.0002
Magnesium	2.82	2.83	1.67	2.4
Manganese	1.44	1.05	0.075	0.139
Molybdenum	0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	< 0.001	0.001	< 0.001	< 0.001
Potassium	0.95	1.18	0.36	0.5
Rubidium	0.0031	0.0037	0.0008	0.0012
Selenium	< 0.001	< 0.001	< 0.001	< 0.001
Silver	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	3.22	3.27	3.17	2.83
Strontium	0.075	0.082	0.042	0.061
Tellurium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tin	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Uranium	0.0001	0.0003	< 0.0001	< 0.0001
Vanadium	< 0.001	0.002	< 0.001	< 0.001
Zinc	0.002	0.008	0.001	0.002
Analysis of Water Chemistry				
Solids Total Suspended	89	55	< 5	< 5
Microbiological Examination of WQ				
Analytes				
E.coli	145.5	478.6	75.4	7.2
Field Observations				
Temperature (C)	13.3	18.3	16.8	16.5
Dissolved Oxygen	0.16	0.1	8.25	7.95

Appendix 1: Youth Engagement Program Information & Policy Handbook

DESCRIPTION

St. Croix International Waterway Commission (SCIWC) Nature Explorers Summer Day Adventures provide hands on outdoor experiences that promote respect for the natural world, local history, and each other. Participants spend all day outside exploring the natural environment, discovering natural mysteries and through observing nature, playing games, crafting, and learning about various science concepts in a fun way. Each week will have a different theme for the day and are used to offer unique experiences for family and children to learn skills and the world around them.

HOURS OF OPERATION

Our camps are held every Thursday in August, from 9:00 am – 4:00 pm, for children ages 8-12.

LOCATION

SCIWC Nature Explorers Summer Day Adventures are held at **Spednic Provincial Park on Highway 630, McAdam.** There is a sign on Hwy 630 and the meeting place will be at the open space behind the kiosk as you come into the park. This wonderful property offers lots of woods and trails to explore, a portable fire pit, outhouse, and open space for playing.

WHAT TO BRING

Each day your child attends, please ensure to send clothes that can stand up to adventure (they will be getting dirty in the mud and water), and still be comfortable to wear. Please bring the following listed items to ensure they are prepared. Please label all your child's belongings.

WHAT TO BRING	ADDITIONAL RECOMMENDED ITEMS
✓ Backpack	✓ Rain Gear (waterproof boots, pants, jacket)
✓ Full lunch and 2 snacks	✓ Full extra change of clothes
✓ Reusable water bottle (with water)	✓ Running shoes (please no open toe)
✓ Sun hat	✓ Sunscreen (keep labelled bottle in backpack)
✓ FACE MASK	✓ Bug spray (optional – keep in backpack)

WHAT NOT TO BRING

Electronics Watch Cell phone Toys	The day is a time to unplug so that full participation and focus is on our wonderful program in nature. We would not want any of these items to be lost or damaged, and respectfully request that they are not brought to the program.

Note: Depending on the daily theme, some days we ask participants to dress-up or bring additional items (i.e. packing hot dogs/marshmallows for campfire). Reminders will be sent out to parents in advance for these days.

We will have a functioning radio to communicate with our administration office, Outdoor Centre, and field staff.

DAILY SCHEDULE

Each day of camp is packed with a variety of activities that follow the daily theme, free time, and snack breaks. Children will spend all day outside. The general outline of your child's day at camp will be as follows:

9:00 am	–	Sign-In & Opening Circle
9:30 am	–	Morning Snack Break
10:00 am	–	Block 1 Activities
12:00 pm	–	Lunch Break & Free Play
1:00 pm	–	Block 2 Activities
3:00 pm	–	Afternoon Snack Break
3:30 pm	–	Clean Up, Pack Up, & Closing Circle

4:00 pm – Sign-Out & Pick-Up

CONTACTING US

If you need to contact us for any reason while your child is at the program, or to discuss matters before or after your child's day, please contact:

- Program Coordinator: Gloria at 207-952-9088 or email gtinker@stcroix.org
- Executive Director: Elizabeth Hyslop at 506-921-0150 or email director@stcroix.org

On-site Radio Access: SCIWC staff are provided with a Motorola APX4000 field radio that provides access in remote areas, has a direct link with 911 services, and allows the SCIWC administration to contact the Program staff while in the park.

SAFETY AND PROTECTION

A child be released to an individual that is not listed on registration as someone who can pick up child or if contacted by parent/guardian. It is our duty to ensure the safety and protection of all children attending programs, will always use our best judgement and act in the best interest of the child.

SCIWC has a legal obligation under Section 30(1) of the Family Services Act makes it mandatory for professionals to report suspected cases of child abuse and neglect to any child in our care. If a staff member has reasonable grounds to suspect abuse and/or neglect of a child, they will immediately make a report to the Child Protection Services at 1-888-99-ABUSE (1-888-992-2873)/in province calls only or After-Hours Emergency Services 1-800-442-9799. Staff have been educated to know and identify the indicators of abuse and neglect and the steps to be taken when a child needs protection. Each staff member and volunteer are required to complete and submit a police check (Vulnerable Sector)to SCIWC prior to participating in any programs.

Supervision and safety are important for the safety of all staff and participants. To ensure everyone is safe, the following is to be followed.

- Identify the go-to person. Even adult groups need to have one person who will take charge in case of an emergency.
- Always have enough competent, trained leaders for the number of children or youth being supervised. The adult to child ratio for ages 6-12 is 1:15. As a rule, the number of leaders required increases proportionally with the risk of the activity and the lower the age of the participants.
- At least one adult member of your group should be trained in first aid and CPR.
- Use the buddy system for all activities. Always do activities with another adult or within eyesight of another adult. An adult should never be alone with a child nor communicate use social media to personally communicate with a child.
- Do a periodic roll call or head count to ensure no one has wandered from the group.
- The SCIWC employs the "Do No Harm" strategy outlined in the document "Keeping Children and Youth Safe from Harm in New Brunswick."
- Make sure participants and their parents or guardians fully understand the nature of all scheduled activities.
- When supervising youth activities, always provide thorough instruction on safety rules corresponding to the specific activity. Virtually any activity has the potential to cause an injury.

Safety During A Pandemic

References:

- Government of Canada, Public Health Department Public Health Services Coronavirus
- Province of New Brunswick, Office of the Chief Medical Officer of Health - GNB Coronavirus

The SCIWC has implemented extra procedures to protect our staff and families enrolled in our programs. Each family is required to conduct a daily self-assessment based on the PNB questionnaire provided (ATTACHED). If you answer yes to any of the two questions, we ask that you stay home and contact 811 or your physician. 100% of your program fee will be reimbursed.

SCIWC Nature Explorers Summer Day Adventure staff will be sanitizing all surfaces and high touch items before each program and providing hand sanitizer to each participant prior to starting our program. Regular hand washing and personal hygiene will be discussed and demonstrated.

Heath Protocols

1. Required daily pre-screening of all participants, staff, and their households. This is our most important protocol and is the personal responsibility of each family unit to uphold this for the safety of the whole group.

   Daily Pre-screening before arriving at the program:
   - Please check temperatures before coming to the program
   - Please go through the pre-screening procedure attached.

   When to stay home
   - When you or anyone in your family is feeling ill, or has symptoms listed in the daily screening.
2. We have pre-program and post-program surface cleaning of high touch surfaces such as equipment and tabletops and knobs.
3. All participants and staff, adults, and children, will be asked to wash hands with soap and water or with hand sanitizer upon arrival and before and after eating.
4. Health Canada recommends using 70% hand sanitizer if there is not access to soap and water, and if their hands are not visibly soiled. Children are to be supervised when using these sanitizers. Hand sanitizer products must not be ingested and must always be kept out of reach of children.

   To wash your hands properly with alcohol-based hand sanitizers, follow these steps:
   a. Apply hand sanitizer.
   b. Rub into the front and back of hands, between fingers, around nails (especially cuticles), thumbs and wrists.
   c. Rub until dry.
5. We will remind all participants to practice coughing/sneezing etiquette (into the elbow or tissue and disposing immediately)
6. Temperatures of participants will be conducted up arrival and every 5 hours. This will be recorded in the daily log.

SUPPLIES

SCIWC Nature Explorers Summer Day Adventures will ensure they have all the necessary disinfecting supplies and staff personal protection equipment. Parents are required to provide masks for their children.

CONTROL MEASURES

Control measures as guided by Public Health if an outbreak is detected.

A suspect case is defined as:

• *a child/staff that has 2 or more of the following symptoms: fever or signs of fever, new cough or worsening chronic cough, runny nose, headache, sore throat, new onset of fatigue, new onset of muscle pain, diarrhea or loss of taste or smell.*

OR

• *a child displaying purple fingers or toes even as the only symptom Note: Children or staff who have been identified as having seasonal allergies or who suffer from chronic runny nose/nasal congestion would not be considered a suspect case.*

***If* a suspected case is detected at camp the following procedure will be followed:**

1) Temperatures will be required to be taken prior to the day and every 5 hours afterward.
2) The symptomatic child/staff will be immediately separated from the others in a supervised area until they can go home. The staff providing care should maintain a 2-meter distance.
3) The symptomatic child/staff will be requested to wear a mask along with the staff providing care.
4) Parents of the child will be contacted to pick up child all cleaning and disinfection of the isolation area will be conducted once the ill child/staff has left the facility.
5) The public Health will be notified, and parents will need to follow the guidance of the Regional Health Authority Public Health Nurse.
6) If there is a confirmed case the Public Health may request the camp to post appropriate notices for parents/guardians at all entrances to the facility to ensure that disease information is available for staff and parents/guardians or may be ordered to close.

POLICIES AND PROCEDURES

RATIO

Following the Childcare ratio guidelines of 8-12-year-old 1:15 of staff to children with a maximum of 30 in one group. Parents are welcome to stay and participate.

During the pandemic, a maximum group number is 15 and larger groups can be split into smaller groups provided ratio is maintained.

PARTICIPANT SIGN-IN/SIGN-OUT PROCEDURE

Start time is at 9:00 am and end time is at 4:00 pm. All persons will be required to sign the sign-in/out sheet for your child on the attendance sheet. *We will request to see your ID on the first day at pick-up*.

During a pandemic, we encourage **one family member** be allocated for drop off/pick up of the child(ren). Should another family member or friend pick up your child, please inform our staff ahead of time. *Identification will be required when someone new is picking up your child.*

LATE POLICY

Unless otherwise noted, all children are to be picked up at 4:00 pm. If you know you are going to be early or late picking up your child, the camp coordinator must be notified as soon as possible. A $5 fee for each block of 15 minutes early/late will be charged. Children cannot be dropped off until 8:45 a.m., and all children MUST be picked-up before 4:30 p.m.

PAYMENT POLICY

The cost of camp is $35/day/child, Payment *in full* is due with registration prior to attending. Payment can be made via credit card or e-transfer by contacting Gloria at St. Croix International Waterway Commission. (*No debit cards can be accepted at this time).*

BEHAVIOUR POLICY

SCIWC's goal is for ALL participants to have the opportunity to discover their strengths and have fun. To do this, it is crucial that all our participants feel safe.

All participants must:

1. Behave in a manner which respects the rights and safety of others, including human, animal and plant life.
2. Participants that physically or emotionally harass, intimidate, bully or abuse another participant, staff, or others; animals or the plant life; or deliberately damage property of the SCIWC, participants or others, while Nature Explorers Summer Day Adventures will be dismissed from camp immediately, with no refund.

3. **No exceptions to this policy will be allowed.**

All participants must understand and agree to our **"Participant Code of Conduct"** to help create a positive camp atmosphere for everyone. Participants and their parents must sign that they understand our "Participant Code of Conduct" and submit the form prior to their attending events. The Participant Code of Conduct was included in the registration package.

LITTER-LESS LUNCHES

The SCIWC follows the Leave No Trace © (https://lnt.org/) practice in all our camp facilities and do not provide garbage cans or trash removal.

We strive to reduce the amount of waste that is produced at our camp. Therefore, we encourage participants to pack a litter-less lunch or pack their garbage back into their lunch kits to take home. Please also ensure your child brings a reusable water bottle that can be refilled, opposed to plastic disposable bottles. Water will be provided for refilling.

FOOD/ALLERGY POLICY

We want to ensure the safety and accessibility of all participants, and therefore ask that no nut products be sent to camp. Soy and seed butters are a possible alternative. Please be sure to inform our staff of any allergies your child has and to discuss appropriate precautionary measures to ensure their protection.

As well, there will be times where food and/or beverage are provided as part of the summer camp program theme (i.e. campfire s'mores, crackers, fruit etc.). Please inform our Community Engagement & Education Coordinator prior to camp if your child is not to have a food/beverage item. In these instances, you may pack your child an acceptable replacement treats if you wish, so they do not feel left out!

MEDICATIONS

Participants and staff under the age of 18 who take medication are to give medications to the Community Engagement & Education Coordinator. The Coordinator will oversee the individual dispensing and taking of medication at the allocated time. Staff are not permitted to give participants any medications including over the counter, without written permission from the parent/guardians.

PARTICIPANT WITHDRAWAL POLICY

If you need to withdrawal your child for any reason, the following refund policy applies:

Two weeks or more (+14 days) notice before adventure day – 100% refund.

Due to COVID-19 Related illness – 100% refund

One week (7 days) notice before adventure day – 50% refund.

Less than a week notice before adventure day, or a no-show – NO REFUND.

ILLNESS POLICY

We ask that when children are sick, they stay home from camp for at least 24 hours after the disappearance of the following symptoms: temperature over (101 F, 38.3 ºC), vomiting, diarrhea, unidentified rash.

In the case that a child becomes sick while at camp, the parents or alternative contact will be contacted and asked to pick up the child from camp.

CANCELLATION AND REFUND POLICY

Low Enrollment

A one-week advanced notice will be provided to all parents/guardians if an adventure day did not meet enrollment numbers. A minimum of 10 children must be enrolled each day to run the daily camp. A maximum of 15 children are permitted.

Inclement Weather

As these events are solely outdoors with no indoor shelter available, adventure days where heavy rain, winds, hail, thunderstorms, or extreme heat are forecasted may be cancelled. Notice will be provided to parents/guardians of the cancellation 24 hours beforehand based on the forecast. The Coordinator will closely monitor the weather before and during adventure days to make informed choices regarding camp activities and child safety.

ACCIDENT AND EMERGENCY POLICY

In the case of a serious accident or emergency, SCIWC staff will:

1. Determine the nature and degree of the emergency. The Coordinator will take the responsibility of responding to and administering first aid.
2. Organize the other children and be sure they are in a safe space. Assess the environment for any hazards that could be present.
3. Ask another adult (educator, volunteer) to call 911 while lead educator preforms first aid. The person calling 911 will need to answer the following questions:
    a. Nature and degree of emergency
    b. Details of the injured: age, gender, medical info
    c. Location of forest school
    d. First aid that has been administered.
4. Once 911 has been called, have that same adult meet emergencies services at the front and direct them to the injured (if you are away from the building/classroom and other children are safe and secure)
5. Inform parents or guardians of the emergency. If you cannot reach parents or guardians, call alternate contact indicated in records.
6. Inform SCIWC Executive Director of emergency.
7. Remain in contact with Emergency Services until emergency is over.
8. Make written report of the emergency using the Incident and Accident Report form. Submit to the Executive Director of SCIWC.

LOST CHILD POLICY

Prevention is always the first line of defense. When a child is not visible to the leaders, either the child or the leader will yell “HEY YOU WHERE ARE YOU?” where the children are instructed to respond with “HEY YOU HERE WE ARE!” while waving their hands for easy visuality.

- If a child does not respond and is out of view of the group:
- Check the attendance to ensure the child is present.
- Obtain a description of the lost/missing person including what they were wearing, gender, name, apparel, age, race, hair colour, where last seen.
- Record the time.
- full shut down of the facility and a staff/volunteer with go to the exit and keep watch for anyone coming in or out.
- one staff with stay with the other children while the other one goes ahead and looks in the last place the child was seen and then where the child might have gone.
- If the child is not found within 5 minutes
- All available staff will then start a search with the Head Lead in charge
- If the child is not found within 10 minutes, 911 is called along with the executive Director and parents.
- Available staff will continue search.
- If someone finds the child, they are to report back to the Head Lead and behavior management will take place along with a report.
- Determine how the person became missing, identify any corrective action that needs to be taken and provide follow up and support if necessary. This may include communication with participants and family.
- Fill out an incident report.

SPECIAL ASSISTANCE POLICY

Parents are asked to provide staff with information regarding any special needs or medical information of their child prior to adventure day, to ensure the camp experience is as successful as possible. SCIWC reserves the right to decline registration if staff determine that adequate support cannot be provided.

Basic Risk assessment

SCIWC has protocols in place to mitigate risk and help keep everyone safe. However, it is impossible to make a rule for every possible situation. Staff are required to make their best judgment to make informed decisions on how to handle hazards and mitigate risk. The following strategy will be used:

Risk assessment strategy:

1) Identify Hazard
2) Assess likelihood vs severity (red light/green light model)
3) Decide if risk can be lessened through management (rules, altering activity etc.)
4) Communicate with other staff throughout the assessment process.

Environmental Hazards: examples wasps, trees, bodies of water, poisonous plants, wild animals, feces, water-borne illnesses, fires, sticks, topography, etc.

Human Factor Hazards: examples, fatigue, distraction, conflict, peer pressure, stress, risk homeostat\sis (getting use to the risk) and differing perception of risk.

RED LIGHT/GREEN LIGHT MODEL For judgment-based risk management	Low Likelihood	High likelihood
High Severity	Yellow Light	Red Light
Low Severity	Green Light	Yellow Light

Red Light

High likelihood + High Severity – These risks have a high likelihood of serious injury or death. Do not participate in these activities at camp. Examples include lightening, fast running water, extreme heights, etc.

Yellow Light

Low Likelihood + High severity

High Likelihood Low severity

A hazard is present, but the risk is worth the benefit. Special rules may be put in place to mitigate risk. Many of our activities are yellow light, including carving, blindfold activities, tree climbing and fire. Be aware of the hazards and possible consequences and what you are doing to limit them.

Green Light

Low likelihood+ Low Severity

A hazard is present, but it is easy to manage. Staff can be aware of the hard and watch for a change in hazard or ask participants questions so they can become aware of the situation and any adjustments they may have to make.

Environmental Risk Protocol

Lightening: There is no indoor facility to take shelter from lightening. Weather will be monitored by staff and if required camp will be cancelled. If a storm arrives while at camp, parents will be notified to pick up participants.

In a case of caught in a lightning storm, do the following:

- Get into a vehicle if possible.

- Seek a low spot on the landscape (come down from hills) away from tall trees, metal structures of any other tall structure.
- Assume the lightening position (crouched on feet with head down and arms wrapped around legs).
- Spread out participants so they are visible and in voice contact but as far apart as possible from one another.
- Never sit or lean against a tree trunk.

If someone gets struck, seek medical help immediately and begin CPR if necessary.

TICKS

The deer tick (or black-legged tick) is prevalent in Charlotte County and is a known carrier of Lyme disease. All parents/guardians will be provided an information brochure from the Health Unit on the first day of camp. Staff will be on the lookout for ticks on participants daily on exposed parts of the body. If a tick is found, it will be carefully removed and put into a vial for parents. **It is important that parents/guardians follow the recommendations in the brochure, including conducting a thorough tick check on their child at the end of camp each day.**

WASPS

Wasps can make nests in trees, logs or in the ground. Stings can be painful or life threatening to someone allergic.

Ensure known allergies are documented on registration and staff are aware of allergies. Know the degree of severity.

If a wasp nest is found, move everyone calmly and quickly away from the area.

If someone gets stung, move them away from the area first then administer first aid. Continue to monitor for swelling and adverse effects.

Activity Risk Protocols

CAMPFIRES

Having a campfire is common in our program and encouraged. To keep the safety of the participants and the environment around us, these are the safety rules to follow:

- Check the weather before building a fire. Are there any bans?
- Use a pit provided or a mobile fire pit.
- Keep the fire manageable and not too big.
- Have a bucket of water or a water source to always extinguish the fire.
- Never leave a fire unattended
- Make sure the fire is out before leaving.
- Maintain the fire pit and use the “Leave No Trace” protocol.

Safety around the fire:

- Give the fire safety guidelines to participants when using a fire. A good reminder of proper safety steps around a fire
- No running or horseplay around the inner circle of the fire area. Play can occur outside the fire area (ring of seats)
- No jumping over the fire
- If using roasting sticks, always use in a kneeling position, hold the fork up and by the handle.
- Instruct the fire pit is hot, including the metal, stones, end of sticks, roasting sticks.
- Anything that goes in the fire, stays in the fire.

CARVING AND KNIVES

Knife safety is taught every time a knife is used. Returning participants can participate in the knife safety skills. Staff should make sure knives are sharp as a dull knife is more dangerous.

The ratio of carving participants to staff can vary with skill level. An inexperienced Participant may need 1:1 supervision and assistance, while advanced participants might have a 1:5 ration.

Protocol:

1) **Ask permission**. Participants must ask to use their knife every time so the adults can supervise.
2) **Check your blood bubble/safety circle**. The person carving must have an arm-length clearance around them. DO NOT use your knife to check your blood bubble. The carver is responsible for their blood bubble. If someone approaches you blood bubble, stop carving and kindly let them know.
3) **Be Seated when carving**. Sit where you can be supervised but not in a high traffic area (such as a fire circle)
4) **Carve away from your body**. This includes fingers, toes, thighs, faces etc. Be aware of the "triangle of death" – the femoral arteries in the thighs.
5) **Do not carve into the ground**. Carve into a piece of bark or wood if you need to . Hitting the earth with a knife dulls the blade.
6) **Pay attention**. Keep your eyes on your knife and do not engage in conversations while carving. Never gesture with a knife or scratch at or itch while holding a knife.
7) **The knife goes in the sheath when not carving**. Never stick a knife in the ground or leave a knife unsheathed. Knives left lying around will be taken by staff.
8) **Return the knife to your backpack when done carving.** Knives left lying around will be taken by staff.
9) **Axes, hatches and saws** are permitted when appropriate. Each Participant must have a lesson with a staff member on proper use first.
10) **Violence is never acceptable. Even joking threats will result in the knife being taken away.**

Knife use is a privilege and a responsibility. Participants must learn knife safety before using a knife and must be able to demonstrate and recite the knife safety rules.

If a knife safety rules are not being followed:

a) For a forgetful moment, remind the Participant of the rule.
b) For many instances of forgetting or moderate negligence, a sit-down conversation on knife safety may be had.
c) Knives may be taken away for the activity, the day, or the week depending on the situation.

Behaviour Management Policy

SCIWC Nature Explorers Summer Day Adventures, we strive to make rich learning environments for all the children participating in the program. It is vital that every child feels safe and supported, so that they can learn and grow to their highest potential. In order fulfill this goal, we will:

- observe the child's developmental level.
- implement developmentally appropriate activities.
- engage in respectful and responsive relationships with the children and their families.
- foster self-regulation, resilience, and positive decision making.
- be consistent in our approach to managing behaviour.
- help children learn and achieve constructive behaviour strategies.
- consult with parents and caregivers to get advice, recommendations and feedback of
- successful behaviour approaches for their child.
- notify parents and caregivers of any concerns or issues that develop.

Inappropriate behaviour is defined as using actions or words that make others (child or staff) feel uncomfortable or unsafe. Unsafe behaviour is defined as any behaviour that puts another (child or staff) at risk. This includes, but is not limited to, not responding when called, running away, hiding, taking risks without notifying or consulting staff, and not following community standards and expectations established by the group.

SCIWC reserves the right to suspend or dismiss participants from the program if their behaviour is consistently inappropriate or unsafe for themselves, others, and the environment. We will strive to take every measure to ensure all participants have a safe and rewarding experience while attending programs with parents and caregivers being a vital part of the process. When a situation or event occurs, the behavior management policy will be implemented to provide a consistent guideline and basis for interventions in all situations for all children who attend our programs. This enables staff to record situations and events and coach a child into maintaining a healthy behavioral standard.

This is done through verbal conversations with the child(ren) involved to work through an issue or problem in a manner that is supportive and constructive of their situation and development and growth.

Step One:

- Isolate the issue and those involved.
- Gather information relating to the incident from individuals involved.
- Compare information with staff/volunteers and witnesses.
- Assess the situation in a constructive manner with all children. Maintain a civil and constructive.
- conversation always
- Identify triggers, underlying situations in family that may have instigated the event.
- Walk the child through the event for understanding on everyone's part.
- Help the child to plan on how to avoid incident in the future.
- Write up a report.

Step Two: If situation persists, isn't resolved, escalates or is repetitive.

- remove the child(ren) from the situation and activities.
- allow time to cool down, may need a safe quiet spot.
- assist the child(ren) to come up with a solution.
- communicate the situation with a parent.

Step Three:

- When the situation persists, and staff is no longer about to meet the needs of a child.
- parents will be called and depending on the nature of the event, the parent will be.
- asked to pick up their child.
- reassessment of the child(ren)'s attendance in the program. If the child(ren) will return
- the next day, they will be given that opportunity.
- If it is not deemed possible for the return of the child(ren), the parent will be asked to
- withdraw their child from the program. The regular refund policy as outlined in the
- policy will go into effect.

INCLUSION AND ACCESSIBILITY

At SCIWC, we believe that every child needs and deserves to have nature connection in their everyday lives. This is the driving force that fuels our passion to develop high quality programs for our community. We understand that there are barriers for some families to participate in programing, and these barriers may be well beyond their control. We will take steps to uncover and dismantle these barriers (within our control) to make our programs accessible to all families in our community. Any suggestions or recommendations to help us achieve this goal are welcomed and appreciated.

COMMUNICATION STRATEGY

General Communication

Although much of the communication between staff and parents will happen during pick up and drop off times, we also rely on email to get information out to parents, as well as notification of closures. If at any time a parent/caregiver needs to contact SCIWC staff during program hours, a telephone number will be provided (at registration) for them to call. Parents/caregivers are to notify Forest School staff, via email, text, or phone, if a child will be late or absent from the program.

Emergency Communication

In the case of an emergency, parents/caregivers will be contacted by telephone once emergency services (if needed) have been called. If the parent(s) cannot be reached, the emergency contact provided in the registration form will be called.

Grievance Policy/Procedure

It is important to us that all participants and their families feel comfortable and satisfied with the programs being delivered by SCIWC. If you have any concerns with something arising from our programming, please voice these issues and concerns with the staff, either in person or through email or phone. If the issue cannot be resolved directly with staff, please contact the Program Coordinator, Gloria Tinker. If the issue still cannot be resolved with the Executive Director, further a letter can be sent to the SCIWC Board of Directors.

If you have any questions regarding the above information or your child's time at camp, please contact our Gloria Tinker at gtinker@stcroix.org 207-952-9088. We look forward to a wonderful time at camp this summer.

Appendix 2: Youth Engagement Program – Outdoor Education Curriculum

Introduction

The St. Croix International Waterway Commission (SCIWC) is an international, non-profit organization that manages natural habitats; offers exceptional back-country camping experiences; and celebrates our shared, cross-boundary cultural heritage between Maine & New Brunswick.

The SCIWC is responsible for overseeing the implementation of a long-term management plan for the St. Croix river corridor in the following areas:

a. International Heritage Waterway
b. Environmental Setting
c. Human Heritage
d. Natural Heritage
e. Recreational Heritage
f. Economic Development
g. Waterway Management

In June 2020, SCIWC hired Rhonda Sage, B.Sc., to develop a program for Grade 5 students in the St. Stephen community, comparable to the "In Your Backyard" program developed collaborating with Washington County Community College. Ms. Sage holds a Bachelor of Science in Agriculture: Environmental Biology and specialized in Aquatic Biology from the University of Guelph, certification in the Master Naturalist Program from Lakehead University, is part of the Art of Mentoring movement in Ontario and trained in the Coyote Mentoring philosophy and outdoor nature connection. She brings over 25 years of experience running her own business in nature immersion programs and working for various schools and outdoor facilities to deliver engaging nature-based, inquiry learning experiences. She has developed homeschool programs for ages 6-15, a girl only club to learn outdoor skills and summer day camps.

The program was developed to allow facilitators to mentor youth and connecting them to nature, to themselves and to community. Through understanding the world around us and developing a sense of place, youth will innately develop respect, confidence, self-esteem, questioning and innovation in on ever changing and unpredictable future.

This summer, the SCIWC developed and facilitated day camps for the month of August. Due to COVID-19, the decision to pilot a small program was spontaneous and quickly delivered to the St. Stephen and surrounding community. The all-day camp was held at the Spednic Provincial Park with themes of Zombie Apocalypse, Wings and Things, Nature's Canvas and Thriving is Surviving. The camp attendance had 5-8 participants a day and ran with two leaders. The feedback was positive with the youth expressing their connection with the staff and enjoying the program. Most of the youth were repeating campers which illustrates the camp was engaging and successful.

For each season, there will be a block of dates allocated to deliver the programs. Teachers will pick two dates to participate in the program; one date will be the desired date and the second will be the rain date. This will allow SCIWC to ensure equipment rented/borrowed is available through its various sources.

The goal is to work collaboratively with the schools, teachers, Peskotomuhkati elders, municipality and local organizations and businesses to facilitate the delivery of the attached proposed curriculum to each of the Grade 5 students in the St. Stephen community. Through these educational programs, a developed sense of stewardship for the St. Croix River watershed and the environment; a sense of place, and a collaborative community will inspire the desired attributes to mentor our youth into innovative, compassionate leaders in our province and world.

In addition to the Youth Engagement Program, the IJC-IWI also provides financial support for the fish counting project "Supporting Alewife Restoration in the St. Croix River Watershed – Anadromous Fish Counts at Milltown Dam" and our "Map and Document Library". This program was funded with the support of the International Joint Commission – International Watershed Initiative (IJC-IWI). The IJC is a collaboration between the United States and Canada upon recognizing each country is affected by the other's actions in lake and river systems along the border. The two countries cooperate to manage the bordering waters and to protect them for the benefit of both citizens and future generations.

Supporting Alewife Restoration in the St. Croix River Watershed – Anadromous Fish Counts at Milltown Dam

The 'Supporting Alewife Restoration in the St. Croix River Watershed' project facilitated enumeration of all anadromous fish entering the St. Croix River at the lowermost dam, the NB Power Milltown Hydro Dam. The project forms the basis for measuring progress of current international efforts to restore sea-run Alewife, Blueback herring and American shad to the watershed, as well as plays an important role in supporting and validating recent alewife population dynamics models developed to support alewife restoration planning. The project provided counts and other biological data to agencies, legislators, and involved parties to support evolving restoration plans.

Data Bank of Historical Documents and Maps

After the evaluation by local historians, professional archivist and local service commission, the contents of our collection of 1000+ historical studies and texts, 723 maps and other documents are in the process of being catalogued. The end goal is to make the documents available to the public. Based on their initial assessment, the maps, although they have little monetary value, they have the potential to provide some historical environmental context, especially as it relates to forestry.

The SCIWC collection of historical studies and documents has been sequestered since our inception in 1986. This includes an original hard cover copy of the IJC 1918 Annual Report and various other studies, texts, and reports. Additionally, we have over 723 maps that have been in storage at our St. Croix office that represent the period from the 1950's – 1990's and for various counties in New Brunswick.

Project Description

To deliver the programs at no cost and to eliminate the issue with bussing during the pandemic protocols, using natural spaces within walking distance are being used for the Youth Engagement Program. We have received

permission from the Town of St. Stephen to use Elm Street Nature Park, 56 Elm Street, St. Stephen, NB for St. Stephen Elementary School location. The location for Milltown Elementary School is currently in discussion with a private property owner at 154 Pleasant Street, St. Stephen, NB.

We have received permission to use Elm Park Nature Park from the Town of St. Stephen. We will provide an outline of our COVID Policy and Procedures which will correspond with the public school system. We will also provide the dates we will be using the park, so the municipality is aware when a program is running. There is no fee for the use of the park which reduce the expenses of the program. The park is within walking distance for the St. Stephen Elementary School, but bussing will have to be provided for the Milltown Elementary School.

We have received funding from the IJC-IWI that has provided resources for a staff to develop the program during the summer of 2020 and deliver the program to students in St. Stephen in the 2021 school year. Further program funding will be applied to cover expenses of supplies and busing. Grants could be applied for will include organizations such as TD Friends of the Environment, International Joint Commission, Irving Oil Company, New Brunswick Wildlife Trust Fund and Canadian Tire Jump Start charities.

Maximize Impact of the program will be through providing extension and information that participants can utilize further either with their school, families or in their community. For example, using a local park in the community could inspire further stewardship and ownership of the area and more families will use the park. Another example is participants may take what they have learned and utilize it into opportunities to provide advocacy to live in harmony with the earth, the community and each other.

The importance and need for such a program are to educate and connect the community to the St. Croix River watershed. The St. Croix river is the largest freshwater river along the US/Canada border. The river covers 4221 square kilometers and is the largest watershed in New Brunswick. The river originates in the Chiputneticook Lakes and extends down into the Passamaquoddy Bay. The watershed contains a high percentage of forested land, wetlands and water features and the river contains 36 species of fish. These include longnose sucker, rainbow trout, alewife, smallmouth bass, fall fish, chain pickerel, yellow perch, common shiner, pumpkinseed, rainbow smelt, burbot, lake trout, brown bullhead, landlock salmon and white sucker. St. Stephen is situated at the transition of freshwater to salt water with impressive 20-foot tides and waterfalls. The St. Croix River provides many resources and recreation to the town of St. Stephen that is important in the economy and environmental health of the area.

The program will connect youth to various unique characteristics of the watershed. Not only are these engaging hands-on experiences for the youth, but they are also in their own back yards and can be accessed at any time. The program address subjects like climate change, outdoor skills, reconciliation, and history of the area along with outdoor activities like hiking and snowshoeing. These experiences provide outdoor physical activities along with fun and engaging lessons. The program setting in the outdoors also promotes known benefits of being in nature like relief from stress, students managing ADHD, emotional and mental disorders, increased sense of place, community building and comradery.

The Youth Engagement Program will offer another means to deliver curriculum to students and build connections to the environment and community. There is also opportunity to offer similar programs to the remaining primary, elementary, junior, and senior grades. These programs are not available anywhere else in the St. Stephen community.

Future Program Opportunities

SCIWC could offer a full day program with hands-on outdoor skills and cultural teachings, guest instructors from various communities to share their knowledge and culture. There will be a participant fee which will be determined with each workshop/program. A bursary fund can be set up to raise funds for families who may not be able to afford to take the programs. This fund would allow us to incorporate the "leave no child behind" philosophy and increase accessibility to the programs.

Proposed 2020-2021 Dates and Schedule				
Date	School	Class Bubble	Location	Program
November 9-13	SSES	5a, 5b, 5c, 5d	Elm Street Nature park	Trade and Consequences (F,W,S)
November 16-20	MES	4/5, 5	154 Pleasant Road	Trade and Consequences (F,W,S)
December 7-12	SSES	5a, 5b, 5c, 5d	Elm Street Nature park	Orienteering: Map and Compass and Emergency Preparedness (F,W,S)
Dec 14-18	MES	4/5, 5	154 Pleasant Road	Orienteering: Map and Compass and Emergency Preparedness (F,W, S)
February 1-5	SSES	5a, 5b, 5c, 5d	Elm Street Nature Park	Snowshoe Winter Survival (W)
February 8-9	MES	4/5, 5	154 Pleasant Road	Snowshoe Winter Survival (W)
April 12-16	SSES	5a, 5b, 5c, 5d	Elm Street Nature park	Tree Detectives and Carbon Sinks (F,W,S)
April 19-23	MES	4/5, 5	154 Pleasant Road	Tree Detectives and Carbon Sinks (F,W,S)
May 3-7	SSES	5a, 5b, 5c, 5d	Elm Street Nature Park	St. Croix Raindrop Adventure (F,S)
June 7-11	MEC	4/5, 5	154 Pleasant Road	St. Croix Raindrop Adventure (F,S)

SSEC-St. Stephen Elementary School, MEC-Milltown Elementary School, F-Fall, S-Spring, W-Winter

SSEC-Total Students 63/MES-Total Students 40

Sample Budget

The YOUTH ENGAGEMENT program, as with all SCIWC programs, would be a community and stakeholder collaborative venture that is funded through appropriate grants. We would undertake the grant process and have estimated the costs as follows.

Note: as we had intended to start the first session in December, several of the supplies have been purchased and would be available for use.

Potential Revenue Sources

International Joint Commission
TD Friends of the Environment
Environmental Trust Fund
Irving Oil Company: Community Giving Program
Canadian Tire: jump Start
NB Wildlife Trust Fund

Estimated Expenses

Wages	Program Lead 300 hrs x $18/hr + MERC	$	6,210
	Assistant Lead 240 hrs x $15/hr + MERC	$	4,130
Port-A-Potty	Hannan Portable Toilets $175/week for 2 units on site.	$	1,006
Materials	Session 1	$	1,425
	Session 2	$	815
	Session 3	$	2,230
	Session 4	$	915
	Session 5	$	180
Indirect Costs		$	1,690
Total Estimated Expenses		$	18,601

Curriculum

Session 1: Trade and Consequences - Exploring Our Indigenous History

Purpose: To offer a hands-on simulation experience of the history of the early settlers' relationship with the First Nations and Inuit communities.			
Delivery - offered fall, winter, spring)			
Desired Learning Outcome	Understanding the interaction of the early British and French settlers with the First Nations and Inuit communities and what later became Atlantic Canada. (This Game can be played in one day or split into 3 days over the course of the year. Splitting it may allow for deeper discussions and further extension opportunities.)		
Classroom Preparation	Talk about why the first settlers came to Canada		
Roles & Responsibilities	No.	Roles	Responsibilities
SCIWC Staff	2	Explain the activities and schedule of the day	Ensure all materials and equipment is ready for the activity. Represent honourably the First Nations
School Staff	1-2	Supervise/Role Play	Role Play in the game and supervise students. Ensure students come prepared. Supervise the students. Help where needed
Volunteers/Parents	1-2	Assist/Role Play	Role play and supervise students. Help where needed. Be engaged in the day and students
Documentation Required			
Materials Required:	Round 1,2,3 worksheets Signs for Game, trading cards, store, natural resource station Items to demonstrate/illustrate the era/store. Pylons, markers/stamps/orientation punches Clip boards, pencils		
Materials Provided by:	Booklets will be emailed to the school where they will print off appropriate amount for each group in the class (1:3) Signs and items for the store, bank provided by SCIWC		
Participation Fees (if any)	FREE		

Proposed Budget Session 1: Trade and Consequences

Expenses	Wages	Program Lead 48 hours	$ 959
		Assistant Lead 48 hours	$ 826
	Materials	Paper and printing	$ 100
		Laminating sheets	$ 50
		Pencils	$ 20
		Poker Chips	$ 25
		Clipboards	$ 50
		Ferrocerium Magnesium/Striker	$ 150
		Furs	$ 1,000
		Cast Iron pan	$ 30
Total Estimated Expenses			$ 3,210

Agenda

Times may change to accommodate school schedules.

8:30 am School leaves for Elm Street Nature Park (56 Elm Street, St. Stephen)

9:00 am Arrive at Elm Street Nature Park speak with teachers to debrief about students (concerns, schedule, etc.). Also set up who the Natural Resource Stations and Trading Post persons will be and explain their roles.

9:15 am Welcome Circle, Introductions

9:30 am Why they are there and explain what they will be doing and how the game is played. Also go over safety, rules and call back.

10:00 am Play the game.

11:45 pm Wrap-up

12:00 pm Lunch and free time

1:00 pm First Nation Peoples training games have 4 stations (Leg wrestling, target practice, Tappe la Galette and last 15 minutes have a tug of war (15-minute interval)

2:00 pm Debrief, harvest stories.

2:15 pm Head back to school

2:45 pm Arrive at school.

Curriculum Expectations

<table>
<tr><td colspan="2">Activity: Native Studies</td></tr>
<tr><td>Set up</td><td>Cards placed ahead of time according to map.
Natural Resource Station, Store
Examples of animal furs
Clipboards, booklets, pencils, pen
Company Store and Items for Sale (cards)
Worksheets for all rounds</td></tr>
<tr><td>10 min</td><td>Debrief with the teacher over expectations, behaviours, allergies while the students explore a nature table full of artifacts, nature items etc. Will need a few teachers/parents to act as a banker, store merchant and some volunteers to represent fur traders.

Gather students together Give gratitude and go over expectations, call back call.</td></tr>
<tr><td>30 min</td><td>Intro the players to the game.
Students take on the role of living in the manner of Indigenous communities during three phases of contact.
You also must create a relationship with the local first nations group and if you are successful, they may teach you how to survive or trade with you.
Your goals are:
To explore the new world and gather enough provisions to survive the coming Canadian winter.
Avoid conflict while creating a relationship with the local first nations groups of the area.
Go over how to read a map.
SEE ATTACHED HOW TO PLAY THE GAME: Simulation of the Fur Trade</td></tr>
<tr><td colspan="2">5.1.1 Demonstrate an understanding of how we learn about the past.
5.2.1 Explain how environment influenced the development of an ancient society.
5.4.1 Demonstrate an understanding of the diverse societies of First Nations and Inuit in what later became Canada.
5.4.2 Examine decision-making practices in First Nations and Inuit societies in what later became Atlantic Canada Unit Five: Interactions
5.5.1 Examine interactions between British and French and First Nations and Inuit in what later became Atlantic Canada Unit Six: My Society
5.6.1 Illustrate the similarities and differences of past societies and your society</td></tr>
<tr><td>Nature Connections:
Build awareness of local mammals through research.</td><td>Safety/Hazards</td></tr>
</table>

Explore the local habitat while locating mammal cards. Learn about First Nations Peoples and their connection to the land. Watershed connection Learn about the history of First Nations Peoples connection to the St. Croix River Watershed	Stay on the trails. There is no stealing at this point in history so play with integrity. Always stay within "High-Five" distance with your group (no one is left alone). Anyone found not abiding by the "High-Five" rule will be sent to the merchant store. Come back to the store at the designated signal. Station teacher/volunteer at the Stations

Activity: Trade and Consequences (Anderson, 2019)

Requirements

- Playing Space
    - This game is best played outdoors in a large area with clear boundaries. However, it can be successfully played in a gym or similar space.
- 23+ Natural Resource station cards, mounted.
    - The station cards will be distributed over the playing area. They may be secured to trees, poles, outdoor play equipment, chairs, pylons, use your creativity to meet your needs.
- Punches or Alternatives
    - Orienteering punches or other method for students to prove they have visited a station.
    - Could be stamp or coloured marker attached to the station.
- Tracking sheets for students – 3 sets for whole game (1 per round)
- Trading Resource Cards
    - These cards are displayed in the 'store' so students can decide what they want to trade.
- Cheat Sheet and Tally Sheet for teacher managing the 'store'.
    - Let them know what trades are available.
    - Sheets and items for staff person(s) – shopping list of things available per round – with pictures and space for markers for students to use – (markers, crayons, or orienteering punches)
- Big Safe place on a map with defined locations of stops and boundaries.

Introduction:

This activity is intended to demonstrate the relationship between humans and their environment as Indigenous peoples before and after European contact. The environment at the time is in balance with the harvest made by Indigenous groups – human and natural systems worked in harmony to support and sustain each other. The carrying capacity of the space was not exceeded and the natural elements were a part of the human community.

Method:

- Students take on the role of living in the manner of Indigenous communities during three phases of contact: Pre-European Contact, Initial Contact and Colonialism.
- Students must fulfill all their needs in five categories using the different resources available in each phase (Food, Technology, Transportation, Clothing and Way of Life).
- They do this by visiting stations that represent resources and/or skills that fulfill those needs and punching the appropriate space in their books, or by later trading with adults who represent European traders.
- At the end of each round, it is hoped that each group has what they need to successful in fulfilling their physical needs and enjoying the Way of Life of the culture

Sources: The Sources for all the information provided are from wisdom and learnings from the Indigenous team of the Simcoe County District School Board, Springwater Provincial Park Education Team and from the following websites: https://www.canada.ca/en/crown-indigenous-relations-northern-affairs.htm (Crown-Indigenous Relations and Northern Affairs Canada, 2020) and the Ojibwe people's dictionary https://ojibwe.lib.umn.edu. (Ojibwe People's

Dictionary, 2019), https://www.gonaskamkuk.com (Peskotomuhkati Nation, 2020) and the Passamaquoddy-Maliseet language Portal https://pmportal.org/browse-dictionary/p?page=24 (Passamaquoddy-Maliseet Language Portal, 2020)

Always check your sources and ask your local elders for your points to clarify.

Activity Set up:

Once you determine the playing area, set up your stations with your habitat.

- They could be taped to landmarks or pylons or chairs, or tied, if punching holes in lamination ensure that the elements cannot contact paper so the game pieces can last.
- Group together the stations that will be removed in Round Three as they will dramatically show what was lost as the Europeans settle and take a prime location as their own. (i.e., one section of school yard, on hard top or identifiable area of forest easy to block off.
- Proof being there could be shown by using crayons, orienteering punches, markers – whatever you have or are willing to invest in.

Provide a base map of area or ensure students know the area well.

Be sure that boundaries are clearly defined and understood.

Comments from Elders: (this to be revised once we have guidance from elders)

Why two styles of housing?

The choice of the 2 swellings is to reflect two of the people groups who are in the Simcoe Country District School: Anishinnaabemowin and Wyandot. As the various groups over time in this area had different styles of dwellings these two are chosen to show during the game.

Remember the importance of Hunting and Gathering.

Hunting and gathering are inherent rights of Indigenous peoples and these continued practices help to maintain the cultures and lifestyles today as well as honouring the past.

Activity Rules

- Stay together as a group.
- Find all resources necessary to maintain quality of life – fulfil the needs for food, technology, transportation, clothing, and way of life each round.
- At the end of each round, if a group is successful fulfilling their needs, the group can stay together. If not successful, they can either split up and join other groups or during debriefing ask other teams for assistance with gathering tips.

Activity Roles for Teachers/Facilitators – The Store

Round One – Thriving in Solitude

In round one, time can be taken to share how to run the store with whoever you are facilitating with (parent/teacher/co-worker). There is no store in Round One as there was no store then.

Round Two – First Encounter

The store in round two is the first chance the group can have to see what the Europeans have brought with them to trade. This is all about building the trade relationship.

Student groups bring their sheets in to make trades.

- When they have decided what they want to take and what they want to give, you will record the changes in their sheets.
- Visually negate their mark showing hey have visited a Natural Resource Station. Highlight or liquid paper out marker crayon or stamps if they need the items they need to go back and get it again for themselves.
- Write on their sheets what they are receiving, use a noticeably different system to make this than in the Natural Resource Markers
- Students cannot retain the Natural Resource that they trade away to use for their own benefit. A beaver pelt that is traded away, cannot be used for clothing.

Alternately, students can create individual records of visits to the Natural Resource stations using a separate piece of scrap paper for each visit.

- Students can write the Maliseet-Peskotomuhkati name on a piece of scrap paper to hand in to give to store and punch or mark it to indicate they were at the station.
- You can retain the slips of paper to keep a count of how many items were brought in for trade and the impact that has on the environment – the resource impact is a great talking point.

Please ensure entire group is together and knows what they have and what they want before they come up to trade. If they are not ready, send them to the end of the line or coach them to ensure they have all the things they need for their quality of living.

Round Three – Pleasuring Doing Business Despite You

This is where the trading is more mercenary on the part of the store – you are not taking in the same things and the benefits are less for the Indigenous People. Still keep track of what items come in on tally sheet or retaining the slips of paper.

Be prepared for student groups trying to get the same trades that were available in Round 2 and being frustrated that fewer items are accepted in trade and the trades are less generous. Example is once you learn the language in round 2, you do not need to learn it again in round 3, you know it already so no trade.

Round 1: Thriving in Solitude

Time

1 period or 40 minutes including debrief of the round. Time is flexible depending on the size of area used and your constraints.

Procedure

Students may only use the punches/markers at the Natural Resource Stations to fill the squares in their needs page. They will need to be able to survive on their own with each category.

This round represents Indigenous groups living according to their cultures, as rich civilizations operating purposefully within the natural carrying capacity of the land.

At Round Conclusion

Discuss the ease of survival as the class works as a community and provide tips for those who need help in future rounds.

If a group or groups of students are not successful, interventions to improve are a community responsibility:

- Groups may be tutored by others.
- Groups with surplus may donate some of their resources.
- Groups may be split up and be added to other groups.

Debrief Questions

- Was it easy or hard to meet your needs?
- How does each item or skill meet your needs?
- How do these differ from how we met our needs today?
- Are your personal needs different from the needs of Indigenous people living before Settlers arrived?

Round 2: First Encounter

Time

1 period or 40 minutes including debrief of the round, middle part of the day.

Procedure

- Students may use the station punches/markers to fill their squares or may trade with a Settler who will cross out the traded item or knowledge and sign/stamp/punch for the items given in return.
- Trade
    - One Beaver = 4 Trade Items
    - One Language = 3 Trade Items
    - One Technology = 2 Trade Items
    - One other Animal = 2 Trade Items

Round Conclusion

- Consequences for successful surviving- earn extra items or early start time or gather new group members to help you out.
- Consequences for not being successful – tutored by successful group or time delay in next round or split up and added to other groups.

Debrief Questions – for students

- What did you get- items of what you gathered and what you were giving by trading?
- What did you give up having these things?
- How did it feel to get the new items – was it a need or a want?
- How does this reflect what happened in history?
- What feelings do you have about this – where could there be a repeat in history?
- Where do you think the game will go next? Could others have foreseen this turn of events?

Debrief Questions – for the Storekeeper

- What did the store get lots of?
- How easy was it to build a relationship with the indigenous people?
- Are you satisfied with the level of trade?
- Does this help your business mandate of establishing trade relations?

Round 3: Pleasure Doing Business Despite You

Time

1 period or 40 minutes including debrief of the round, last part of the day.

Procedure

- Played as round 2 was, with the following changes:
- A large part of the playing area is cut off as the Settlers have claimed as their own and Indigenous people are not allowed to live there.
- You may use ropes to block off and area.
- You may remove the Natural Resource station signs in the area claimed by the Settlers and replace with signs saying, "Claimed Territory".
- Some of the fur bearing animal stations are removed – including/2 of the Beaver. Those animals have been extirpated because of overharvest.
- The trades being offered by settlers in trades are much less generous.
- Some Technology stations are removed as those skills have been lost when use of Settler technology made them less important.
- Trades
    - One Beaver = 2 Trade Items
    - One Language = 0 Trade Items
    - One Technology = 0 Trade Items
    - One Other Animal = 1 Trade Item

Debrief Questions - for students

- What did you get – discuss the items of what you have and what you were given?
- What did you give up having these things?
- How did you feel about losing places to play in to get what you needed?
- What other items should be here from the start in the Indigenous perspective?
- What items do you think are missing from the European Explorers and Traders?
- How would you change the game?
- How did the loss of territory make you feel? Did you're hunting and gathering habits change as you are denied access to things you once had?
- Who could you talk to for learning the significance of all your different stations?
- Why are some of the Technology stations removed from the game in this round? (Bow Drill, Flint Tools)
- Why were some of the food stations removed from the game in this round? (strawberries, Wild Rice, Corn, Beans and Squash, Fish)

Debrief Questions – for store

- What level of intake did the store bring in after you set your territory and took the real estate that you did as yours?
- How did the attitude of the store and the indigenous people change from last round to this one – or did it?

Debrief Questions – for both

- What would happen if we added another round – what could be done on both sides of the play area.

If Time – Stations

Additional <u>First</u> Nation Peoples and Voyageur Activities

Leg Wrestling: Two kids lie down on their back beside each other facing in the opposite directions. They count to three, lifting their inside leg for each count. On three, they lock legs and try to flip their opponent over.

Tappe la Galette: With a partner, stand face to face. Position your feet so they are in line, toe to heel. Hold out one hand each like they are going to shake. One person then tries to hit the other's hand to cause them to lose their

balance, while the other person tries to move their hand out of the way. This game is played to improve balancing skills needed in a canoe.

Target Practice: Lay out targets and have each member throw 3 bean bags, lawn darts or other weighted items. Have each person keep track of how many they get in. After each member has thrown, add up the number of darts that went in. The team with the most points will win the game.

Tug of War: a traditional test of strength. Make two groups (maybe adults against the students).

Wrap Up

- Discuss what it would be like to be a settler back then trying to meet and communicate with the First Nations Peoples.
- How has the relationship changed since then and what can they do to reconcile with the First Nation community here in New Brunswick?

After School Extensions

- Have an Elder or someone from the First Nation community come in and speak about the culture, the history or even what the relationship is now with the Canadian people and what they are doing about it.

Session 2: Snowshoe Winter Survival

Purpose: To offer an opportunity for students to get active outdoors with an outdoor activity (snowshoe) and to learn how to survive in the winter by maintaining body heat.			
Delivery: Offered in winter			
Desired Learning Outcome	Students will develop competency in a variety of movement concepts and skills in a diverse range of activities and environments. Understanding life systems and heat and energy in the earth and space systems.		
Classroom Preparation	Talk about how the body and animals keep warm in the winter, how do we keep our houses warm.		
Roles & Responsibilities	No.	Roles	Responsibilities
SCIWC Staff	1-2	Leader	Provide instruction and guidance to the students in the activities
School Staff	1-2	Supervise	• Ensure students come prepared. • Supervise the students. • Help where needed
Volunteers/Parents	1-2	Assist	• Help where needed. • Be engaged in the day and students
Documentation Required			
Materials Required:	• Snowshoes • Tarp • Rope • Thermometer • Ferro Rods • Bow Drill/matches/flint and steel, lighters		
Materials Provided by:	• Snowshoes to be rented from OAC. • All other materials provided by SCIWC		
Participation Fees (if any)	FREE		

Proposed Budget Session 2: Snowshoe Winter Survival

Expenses			
Wages	Program Lead - 48 hours	$ 959	
	Asistant Lead - 48 hours	$ 826	
Materials	Printing	$ 100	
	Plastic Tarp 10x26	$ 100	
	Thermometers	$ 195	
	Matches and Lighters	$ 20	
	Snowshoes (30 students)	$ 500	
Total Estimated Expenses		$ 2,700	

Agenda

Times may change to accommodate school schedules.

8:30 am School leaves for Elm Street Nature Park (56 Elm Street, St. Stephen)

9:00 am – arrive at Elm Street Nature Park, speak with teachers to debrief about students (concerns, schedule etc.).

9:15 am – Welcome Circle, Introductions

9:30 am – Explain the different types of snowshoes.

10:00 am- Go for a snowshoe: while hiking look for tracks and animal adaptations

Games: Fox and rabbit with snowshoes, capture the flag

11:00 am- Play Capture the Firewood (snowshoes can be taken off)

12:00 pm– Lunch and free time

1:00 pm - Shelter building and fire building

2:00 pm - Debrief, harvest stories.

2:15 pm – Head back to school

2:45 pm - Arrive at school.

Curriculum Expectations

Snowshoe Adventure and Winter Survival	
Set up	**Snowshoe** • Display various types of snowshoes. • Have one snowshoe with a boot in it to demonstrate how to put shoes on. • Get snowshoes out and ready to allocate to the students/teachers and volunteers. **Winter Survival** Ensure equipment is ready for the next activity: tarp, rope, thermometer, pencils, clipboard, worksheet
10 min	Debrief with the teacher over expectations, behaviours, allergies while the students explore a nature table full of artifacts, nature items etc. Gather students together Give gratitude and go over expectations, call back call.
60 min	**Snowshoe** Go over the various types of snowshoes and their uses. Ask who has snowshoed before and show how to put snowshoes on. When everyone has snowshoes on, demonstrate and allow the students to practice how to walk, turn, go downhill/uphill, over objects, how to get back up and safety. Ensure you tell students to give each other room and do not give each other a "flat tire" (step on the back of their snowshoe). Go for a hike and play games along the way. Also look for tracks, animal signs and adaptations. Explain the ways a body regulates body temperature (sweating, shivering, radiate heat) the way the sun heats up the planet and how animals utilize these systems: radiation, convection, conduction) Give the challenge that they are to build a shelter and raise the temperature inside.
30 min	Play Capture the Firewood
60-90 min	**Winter Survival** Then they will learn how to build a fire from the items they collected in the morning. Goal is to get a 5-minute fire burning (small fires).
Snowshoe a. refine movement concepts with a variety of movement activity. 1.2 apply movement principles related to balance on a variety of steady surfaces, unsteady surfaces, and curriculum.	

2.1 select appropriate tactics in a variety of games and activities. apply physical fitness concepts and principles to construct personal wellness plans.

SC0 1.2 apply movement principles related to balance on a variety of steady surfaces, unsteady surfaces and moving objects, as well as movement sequences.

SCO 3.1 apply movement principles related to balance on a variety of steady surfaces, unsteady surfaces and moving objects, as well as movement sequences.

SCO 3.2 apply physical fitness concepts and principles to construct personal wellness plans.

Winter Survival

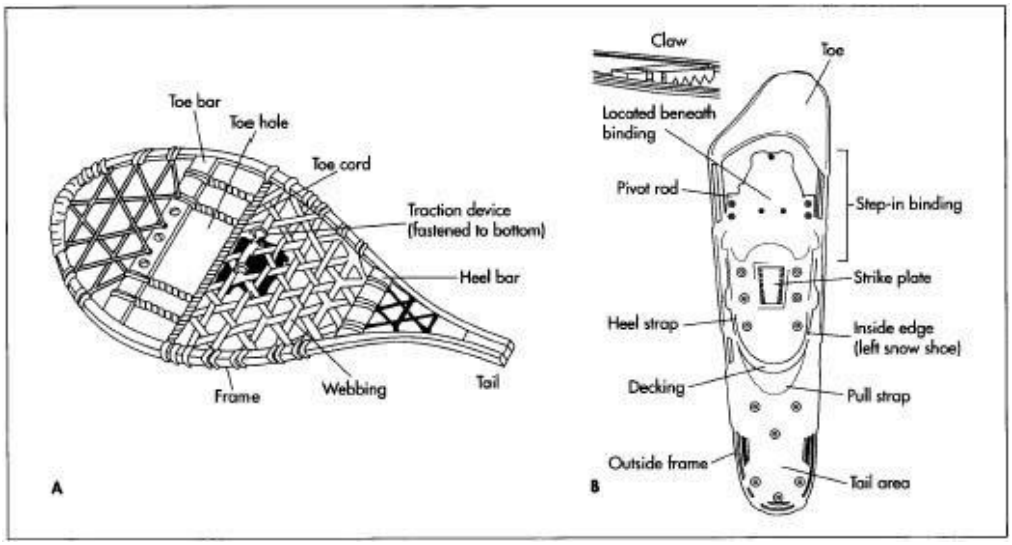
107-5 provide examples of how science and technology have been used to solve problems in their community and region.
107-8 describe examples of technologies that have been developed to improve their living conditions.
204-5 identify and control major variables in investigations.
204-7 plan steps to solve a practical problem and carry out a fair test of a science-related idea.
205-3 follow a given set of procedures.
205-5 make observations and collect information that is relevant to a given question or problem.

- carry out procedures, making certain to control variables, when investigating the factors affecting breathing and heartbeat rate; compile and display data from these investigations in a graph (205-1, 206-2)

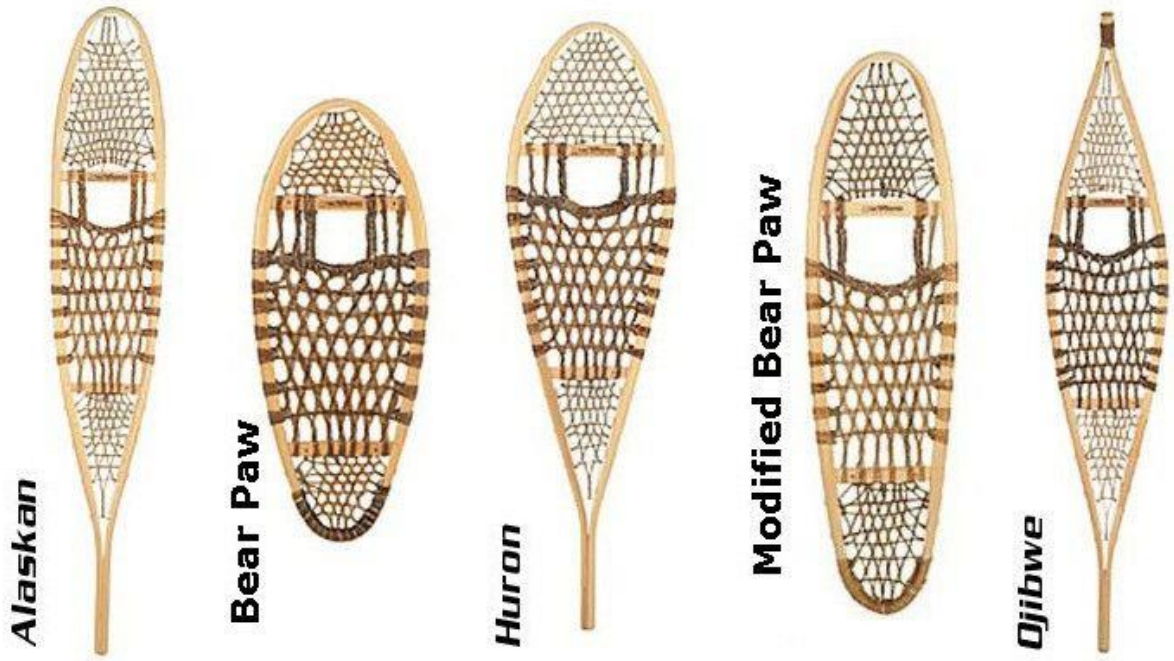
Nature Connections: • Adaptation of animals in winter • Movement • Insulation Wat*ershed connection* • Importance of winter precipitation to the watershed • Biodiversity increases the health of the watershed.	*Safety/Hazards* • Stay on the trails. • Come back to the designated location at the designated signal. • Station teacher/volunteer at the boundaries • Fire Safety • Risk Assessment

Snowshoeing

Parts of the snowshoe (Woodward, 2020)



Types of Snowshoes



Alaskan: This shoe is ideal for hiking long distances in deep powder and drifted snow. Great for opening trails and snow drifted country.

Bear Paw: This style of snowshoe makes turning easier. It is used for navigating the thick forests of Ontario and Quebec. Usually made by bending a stick into a circle and adding webbing.

Algonquin/Huron: Round toe of Ottertail for turning, but long tail for stability in deep snow. The tail also helps to knock snow off the shoe. This is a multipurpose snowshoe.

Otter Tail or Modified Bear Paw: Stretched to increase surface area. Round toe and round tail to allow quick overland travel in forests and over frozen lakes. Made of one piece of ash that has been steamed and bent.

Athabaskan/Ojibwe: Used in areas with deep snow and few to no trees (the prairies). The point tips help knock deep snow off the shoe. Tight turns are tricky with this style of snowshoe.

Show students how to put snowshoes on. There is a left and right aluminum snowshoe. The buckles always go on the outside of the foot. Pull up on the buckle to make it tighter like a racket. At the back of the foot, do up the clip then pull the nylon cord to tighten. To remove, pinch the buckle. Once everyone has a pair on, demonstrate how to walk so you do not give the person ahead of you a "flat tire", how to turn and how to get back up. Show how to properly climb over a log and how bridging can damage a snowshoe. Form a line and head out on the trail.

Activities: Snowshoe Winter Survival

Rabbit/Fox Wagon Wheel Game

Get the students to follow you in a single track to make a circle with crossbars inside (like a wagon wheel). Decide who will start as the fox. Everyone must stay on the trail, no jumping off trail or jumping from track to track. When the fox tags a rabbit, the rabbit becomes a fox and then the game continues until there is only one rabbit left. (Game developed by Laura Ehnes) (Ehnes, 2018)

Tracking

Divide into groups and give each group a tracking sheet. Allow them to explore and find tracks and signs of their animal. (see attached sheets)

Play Capture the Firewood

Divide into two teams. Make a boundary and halfway mark within the boundary. One team is on one side and the other team is on the other. Each team must collect wood on the opponent's side without being tagged and get it to a collection site on the other side. Once the team is back on their own side, they are safe. If someone is tagged, they are frozen until someone from their team comes and tags them to unfreeze them.

Winter Survival

Talk about survival and what is the most important action one must make in a survival situation. Talk about the law of 3s: 3 minutes without air, 3 hours without shelter, 3 days without water, 3 weeks without food. Talk about shelters we use today.

Fire Building

Go through the steps of building a fire with the wood they collected in the morning. Partner up and the goal is to build and light a fire for 5 minutes. No relighting. Will have a choice to use Flint/steel or matches. Talk about building a fire smallest to biggest saying you want to start with wisps, babies, toddlers, teens, parents then grandparent size sticks. For this exercise we will be only using up to parent size as the fire is only too last 5 minutes.

Background on Transfer of Heat on Earth

The heat from the sun is called thermal energy, which gives life on earth. Thermal energy is the total kinetic energy of all the particles a substance contains. Since energy is defined as the ability to do work, the more energy you have the more work gets done. An example of this would be a cup of hot chocolate. If you compared a large cup of hot chocolate to a small cup of hot chocolate, both cups would transfer heat to whatever cooler object it was subjected to. The big cup however would transfer more heat because it has more particles with energy. Hence the big cup of hot chocolate would heat your body more.

Thermal energy can be transferred in 3 ways: conduction, convection, and radiation.

Conduction is the only way heat can pass through solids. Heat will move from a high temperature to a low temperature. The heated molecules will speed up against the slower cool molecules causing them to speed up and transfer heat. Some materials used to insulate transfer of heat are used in animals, technology, housing, etc., are better than others: Styrofoam, air, wood, cotton, wool, body fat, fur.

Convection is a method of heat transfer where the mass motion of fluid is caused to move away from the heat source, carrying heat with it. An example of this is air. When air is heated the molecules move faster and move away from each other and causing it to be less dense (same with water). The warmer air rises, and the cold air then becomes denser and sinks (same with water).

Radiation is a transfer of heat from a heated surface and does not require movement of particles. The energy is part of the electromagnetic spectrum which includes light, radio waves, x-rays etc. It can also be called infrared radiation. Heat is emitted from the object. Heat from the sun is a great example. Radiant heat is partially controlled by colour where dark colours absorb and light repels. This knowledge is used in designs of cars, clothes, homes etc.

Like our house. How is the heat kept inside? How are all the floors heated? Why is the furnace always in the basement? What are in the walls to keep the heat inside? What about the doors and windows? You are hoping they understand the transfers and the laws of heat and energy are understood so that they can build their shelters and be successful. You are in a plane crash at the top of the mountain. It is cold and snow all around you and all you have are yourselves, the survivors, a tarp of some type, and a shovel. Working cooperatively decides how you will build your shelter while understanding how heat is transferred. By using only mother nature and the manmade items provided, build a shelter so that you can increase the inside temperature.

Keep in mind how buildings are built, animal shelters are built and what we discussed. PLEASE DO NOT MAKE HOLES IN THE TARPS Have each team make a shelter with items on the ground, do not use anything alive. Time will be given to construct the shelter. When the time is done, take the temperature outside the shelter. Then tell everyone to go into their shelters and do whatever they can to increase the temperature inside their shelter. Remembering that heat transfer can be applied to them as well as we are energy and produce energy as heat. While they are doing this, have them answer the sheet in appendix. Further investigation: If you were going to build a house, what type of energy would you use that would be efficient, cost effective and safe for the environment. What would you do to your house to ensure heat is not lost to the outdoors? What type of materials would you use? Construct your own house.

Session 3: St. Croix Raindrop Adventure

Purpose: To learn the importance of water quality of our water source, the St. Croix, and how humans and environmental factors impact the water cycle.			
Delivery: Fall, Spring			
Desired Learning Outcome	To understand water systems and movement of water in the water cycle. How the sun determines how water molecules moves around the world and use equipment to understand the water quality and the importance.		
Classroom Preparation	Ensure students are dressed for the weather, proper foot gear/rubber boots or water shoes. Change of socks and even clothes.		
Roles & Responsibilities	No.	Roles	Responsibilities
SCIWC Staff	1-2	Leader	• Do risk assessment and adjust as needed. • Explain the activities and ensure everyone is equipped for the day. • Ensure all equipment is available and inspected. • Deliver the program
School Staff	1-2	Supervise	• Ensure students come prepared. • Supervise the students. • Help where needed
Volunteers/Parents	1-2	Assist	• Help where needed. • Be engaged in the day and students
Documentation Required	ID sheets, fields guide		
Materials Required:	• Nets, bucket, benthic identification sheet, testing kit, recording booklet, pencil, measuring tape, meter stick, popsicle sticks/tennis ball, • Clipboards • Pencils		
Materials Provided by:	St. Croix International Waterway Commission Rhonda Sage		
Participation Fees (if any)	FREE		

Proposed Budget: Session 3 St. Croix Raindrop Adventure

Expenses			
Wages	Program Lead - 48 hours	$	959
	Assistant Lead - 48 hours	$	826
Materials	Printing and laminating	$	100
	Aquatic nets (15)	$	450
	Water Quality Test Kits (9 parameter x 100)	$	300
	Measuring Tape	$	150
	Meter Stick	$	80
	Popsicle Sticks	$	5
	Sampling Tray	$	30
	Pony Beads- 9 different colours	$	65
	String	$	10
	Bristol boards (10)	$	20
	Containers	$	20
Total Estimated Expenses		$	3,015

Agenda:

Times may change to accommodate school schedules.

8:30 am	School leaves for Elm Street Nature Park (56 Elm Street, St. Stephen)
9:00 am	Arrive at Elm Street Nature Park, speak with teachers to debrief about students (concerns schedule etc.)
9:15 am	Welcome Circle, Introductions
9:30 am	Why they are there and explain what they will be doing. Also go over safety, rules and call back.
10:00 am	Explain what a watershed is, the water cycle, threats, what they will be doing etc.
12:00 pm	Lunch and free time
1:00 pm	Explain the game – play game.
2:00 pm	Debrief, harvest stories.
2:15 pm	Head back to school
2:45 pm	Arrive at school.

Curriculum Expectations:

Activities: Water Study Water Cycle Game	
Set up	Water Study: • Ensure each group has all the equipment needed to do the water study: (hip waders/rubber boots, nets, bucket, benthic identification sheet, testing kit, recording booklet, pencil, measuring tape, meter stick, popsicle sticks/tennis ball). • Water test kit • Clipboards • Pencils **Afternoon activity:** set up game The Incredible Journey (Project WET)
10 min	Debrief with the teacher over expectations, behaviours, allergies while the students explore a nature table full of artifacts, nature items etc. Gather students together Give gratitude and go over expectations, call back call.
60 min	**Water Study** (See the attached worksheet)

	Find out what the class knows about watershed and ask for definition. Watershed is an area of land that collects precipitation and drains it through a network of streams and rivers to a common body of water. It is an area where small streams, springs flow into bigger rivers eventually draining to a common large body of water. Canada has 25 major watersheds of various shapes and sizes which consists of over 100 sub watersheds. Today you will be assessing the health of the Saint John-St. Croix Watershed. You will be looking at: • Water flow – volume of water • Water Quality – levels of certain chemical substances in the river • Fish – we will partake in the fish count the SCIWC runs every spring with the Biologist (If available) • Benthic Invertebrates – reveals the health of the river. Talk about Watershed Threats • Alternation of Flow • Climate Change • Pollution • Habitat Loss • Habitat Fragmentation • Overuse of Water • Invasive Species
60 Min	**Incredible Journey Game** (see attached Game write up) Students will become water molecules moving through the water cycle and they will create a bracelet and a map to keep track of their movements. Explain the nine stations: clouds, plants, animals, rivers, oceans, lakes, ground water, soil, and glaciers. Play the Game. An alternative Game that can be played is the Water Cycle Game. The Teacher can decide which one they would like to play.

Properties of Materials

classify materials as solids, liquids, or gases, and illustrate the classification in a chart showing the properties of each material (206-1, 300-9

- Physical Changes observe and identify physical changes that affect the form or size of the material in the object without producing any new materials (301-9, 205-5)
- identify and describe some physical changes that are reversible and some which are not (301-10)

Chemical Changes

- describe chemical changes that occur when materials interact with each other to form totally new materials, including those that result in the production of a gas (301-12, 301-11)
- identify and describe chemical changes to materials that are reversible and some which are not (301-10)
- work with team members to develop and carry out a plan to systematically distinguish a material based on its chemical properties (204-7, 207-3, 204-5)
- compile and display data that represents the results of chemical tests used to distinguish one material from another (206-2)

Sun's Energy Reaching the Earth

- relate the transfer of energy from the sun to weather conditions (303-21)
- identify and use appropriate tools and/or materials to measure the temperature of soil and water which have been exposed to light and draw conclusions about the temperature readings (204- 8, 205-4, 206-5)

Movement of Water relate the constant circulation of water on Earth to the processes of evaporation, condensation, and precipitation (301-13)	
Nature Connections: • Identify animals in the watershed. • Sense of place *Watershed connection* • Learn about local watershed. How humans impact watershed	Safety/Hazards • Do not go past knees in the water. • Wear water shoes or closed toed sandals, hip waders, or rubber boots (absolutely no flip-flops) • Walk slowly in the water. • No horseplay • Always have first aid kit • Always have radio/cell phone • Teacher/staff 1:8 ratio

Activities: St. Croix Raindrop Adventure

Water Study

Explain what each group will be doing.

- Measure with measuring tape the width of the stream at their designated location (each group will have a section of the stream)
- Measure the depth of the stream in three spots of their location (near bank, middle, far bank).
- Describe the riverbed substrate.
- Measure the speed of the stream: using a measuring tape, measure out 10 feet and have two students at each end. Upstream, have one student drop a popsicle stick into the water and the student at the end will count "steamboats" till it reaches the end of the measuring tape. They will do this 3 times and take the average.
- Use the water test kit to test Dissolved Oxygen, pH, Conductivity, Salinity, Temperature, Total Suspended Particles, Ammonia, Nitrate and Chloride).
- Benthic Invertebrate bug study – use kick nets to collect organisms in the water and ID them. This will take the bulk of the morning.

It is recommended the students do the measuring and testing before they move onto collecting and identifying organisms since the last step takes longer and students tend to get very engaged in this part of the activity.

Divide students into groups depending on the size of the class. Hand out group equipment for each group. Ensure they have water shoes or rubber boots on or else they will not be permitted into the stream. Go over the safety Rules for the water study. Have them fill out the worksheet.

Wrap UP

- Gather around together and go over findings. See what everyone found and make an assessment on what was found the health of the stream.
- Discuss why it is healthy/unhealthy and what can be done to keep the stream and the watershed healthy.

After School Extensions

- Have the class map out all the sections of the stream.
- Discuss how the stream contributes to the health of the watershed and to the St. Croix River

Water Study Worksheet

Date:	
Location:	
Stream Name:	
Names of Students in Group:	
Use the	

Instructions in your Water Quality Test Kits and record your findings in the chart below.			
Dissolved Oxygen	PH	BOD (Biochemical Oxygen Demand)	Turbidity
Phosphorus	Temperature	Coliform	Nitrate

Width of the River		
Speed of the River:	Reading 1	
	Reading 2	
	Reading 3	
	Average Speed (1+2+3)/3	
Depth of the River:	Near Bank	
	Middle of Stream	
	Far Bank	

Draw a picture of the River including the riverbed substrate:

The Incredible Journey

(Project Wet pg. 155)

Objectives:

Describe the movement of water within the water cycle and identify the states of water as it moves through the water cycle.

Materials:

- 9 large pieces of paper
- 9 playing cubes.
- String with a yellow bead tied to one end to represent the sun.
- 9 different colours of pony beads and in a container
- 9 station markers

Set Up:

- Place the 9 stations around in play area.
- Leave a container of single colour beads at each location.
- Give each student a bracelet and a single yellow bead. They assemble the initial bracelet themselves by tying a knot in one end and threading the yellow bead, or the bracelets can be preassembled before the activity. Ask students wheat the yellow bead might signify. Explain that the yellow bead is meant to represent the Sun, since energy from the sun helps drive the water cycle.
- Give each student a Water Journey map and pencil. Students will use this to record their journey through the water cycle. Tell students to draw arrows to each station they move to. Students should also record anytime they stay at a station. They may do this with a symbol of their choosing such as a star or a circle.
- Tell students they will be divided amongst the nine stations. Students can choose a station or bracelets can be pre-threaded with a second bead to assign students to specific station. Ask students to move to their first station. Each group share their work.
- Have students identify the different places water can go from their station in the water cycle. Discuss the conditions that cause the water to move. Explain that water movement depends on energy from the sun, electromagnetic energy, and gravity. Sometimes water will not go anywhere.
- After students have written their lists, have each group share their work. The cube for each station can be handed to that group, and they could check to see if they covered all places water can go. The Water Cycle Table provides an explanation of water movements from each station.
- Students should discuss that water moves from one location to another when in its liquid form. However, anytime water moves to the clouds, it is in the form of water vapor with molecules moving rapidly and apart from each other.
- In this game a roll of a cube determines where water will go. Students line up behind the cube at their station. Students roll the cube and go to the location indicated by the label facing up. If they roll “stay” they take a bead and move to the back of the line. When students arrive at the next station, they get in line. When they reach the front to the line, they roll the cube and move to the next station or proceed back to the end of the line if they roll a “Stay”.
- Students keep track of their movements by taking one bead from the station they arrive at and placing it on their string and noting their movement on the Water Journey Map. Students should take one bead for each turn, including stays.
- Tell the students the game will start and end at the sound of a whistle/call etc.

Wrap-Up

1. Have students use their bracelets and travel records to write stories about the places water has been. They should include a description of what conditions were necessary for water to move to each location and the state water was in as it moved. Discuss any cycling that took place (that is if any students returned to the same station) Especially when using the travel records, students should be able to clearly see the interconnected web of water.
2. Provide students with locations (i.e., parking lot, stream, glacier or one from the human body-bladder) and have them identify ways water can move to and from that site. Have them identify the states of the water.

After Program Extensions

1. Have students compare the movement of water during different seasons and at different locations around the globe. They can adapt the game to represent these different conditions or locations (i.e., change the faces of the cubes, add alternative stations)
2. Have the students investigate how water becomes polluted and is cleaned as it moves through the water cycle.
3. Visit a local water authority to find out more about water in the community.
4. Create a video or photo documentary of the local watershed that represents each aspect of the water cycle to print in the local or school newspaper or to post online to a blog or video site.

Session 4: Tree Detectives and Carbon Sinks

Purpose: To offer an opportunity for students to learn about the importance of trees in our environment as they pertain to global warming and greenhouse gases			
delivery: Fall, Winter, Spring			
Desired Learning Outcome	Learn observation skills to identify trees and the importance of trees to our planet's health. Learn the importance of trees in global warming and greenhouse gases		
Classroom Preparation	Ensure students, teachers and parents come prepared for all weather and to walk in the outdoors. Discuss global environmental issues and how to use a calculator. Classes could make their own clinometer to be used.		
Roles & Responsibilities	No.	Roles	Responsibilities
SCIWC Staff	1-2	Leader	• Do risk assessment before the day starts. • Ensure all items are prepared and in good working order for the day. • Be prepared to change with alternative if needed. • Provide instruction and guidance to the students in the activities
School Staff	1-2	Supervise	• Ensure Students/Parents come prepared for the outdoors. • Supervise the students. • Help where needed
Volunteers/Parents	1.2	Assist	• Help where needed. • Be engaged in the day and the students – if adults are engaged, students will be too.
Documentation Required	Field guides of trees		
Materials Required:	1 Clip boards, pencils/pens 2 Clinometer 3 measuring tape 4 calculator 5 Worksheets		
Materials Provided by:	SCIWC NBU: Faculty of Forestry and Environmental Management		
Participation Fees (if any)	FREE		

Proposed Budget Session 4: Tree Detective and Carbon Sinks

Expenses			
Wages	Program Lead - 48 hours	$ 959	
	Assistant Lead - 48 hours	$ 826	
Materials	Printing and Laminating	$ 100	
	Ping Pong balls 2bags of 144 balls	$ 20	
	Fabric	$ 100	
	Rubbermaid Bins (1 lg/2sm	$ 15	
	Green Mesh Bags	$ 30	
	DBH measuring tapes	$ 100	
	Calculators	$ 50	
	Clinometer	$ 500	
Total Estimated Expenses		$ 2,700	

Agenda:

Times may change to accommodate school schedules.

8:30 am School leaves for Elm Street Nature Park (56 Elm Street, St. Stephen)

9:00 am Arrive at Elm Street Nature Park, speak with teachers to debrief about students (concerns schedule etc.).

9:15 am Welcome Circle, Introductions

9:30 am Why they are there and explain what they will be doing.

9:45 am Send them on the Tree Detective Course to identify trees.

10:30 am Circle back up and go over the worksheet.

Go over the use of tools and hand out tools to do the sequestering worksheet.

11:45 am Go over the findings of the worksheet, discuss thoughts.

12:00 pm Lunch and free time

12:30 pm Talk about Climate Change, learning how the carbon sinks in the environment affects the planet.

1:00 pm Play the Climate Change Game

2:00 pm Debrief, harvest stories.

2:15 pm Head back to school

2:45 pm - Arrive at school.

Curriculum Expectations:

Activities: Tree Identification, Carbon Sequestering, Carbon Sink Game	
Set up	**Carbon Sink Activity and Game** • Flagging tape (to number the trees for the tree key) • Calipers and measuring tapes (or meters sticks) • Tree Key and Carbon Sink calculation sheets • Calculators and thermometers (one each group) • Climate Change game equipment
10 min	Debrief with the teacher over expectations, behaviours, allergies while the students explore a nature table full of artifacts, nature items etc.

	Gather students together Give gratitude and go over expectations, call back call.
60-90 min	**Carbon Sink Activity** Find out what the class knows about climate change and energy conservation Discuss climate change and the role of trees as carbon sinks. Explain that the trees in the forest have lost their names and it is their job to find them. Explain the scientific terminology of coniferous, deciduous, opposite branching, alternate branching. Flag 7 trees and a number 1-7. Students will be working in groups as detectives. They will use the tree key to help them identify each of the trees. Do the "Carbon Sequestering" Worksheet • Take the air temperature in full sun and under trees (forest). • Ask what is the cooling effect of the trees? • Explain the worksheet Groups will revisit the trees: • At each tree they will also measure the diameter and height of the tree using the instructions on the sheet. (Note: measure the diameter of the tree at height of 4'-6"). Using the calculations, they will calculate the total mass of carbon the tree absorbs from the atmosphere
105-1 identify examples of weather phenomena that are currently being studied. **106-4** describe instances in which scientific ideas and discoveries have led to new inventions and applications. Performing and Recording **108-1** identify positive and negative effects of technologies that affect weather and the environment. **205-4** select and use tools for measuring. **205-6** estimate measurements **205-7** record observations using single words, notes in point form, sentences, simple diagrams, and charts. **205-10** construct and use devices for a specific purpose.	
Nature Connections: • Students develop a sense of importance for Trees. • How our actions affect the world global warming? *Watershed connection* • The importance of trees in the watershed How other industries affects the watershed	Climate Change Game (while they are working on their tree worksheets, set up the game) Explain the game and go over the rules and safety/hazards. Establish a call back. *Safety/Hazards* • Stay on the trails. • Come back to the designated location at the designated signal. • Station teacher/volunteer at the boundaries

Activities: Tree Detectives and Carbon Sinks

Make a Clinometer. (Brain Chaser, 2013)

(this could be an activity that students do before they come out for the day)

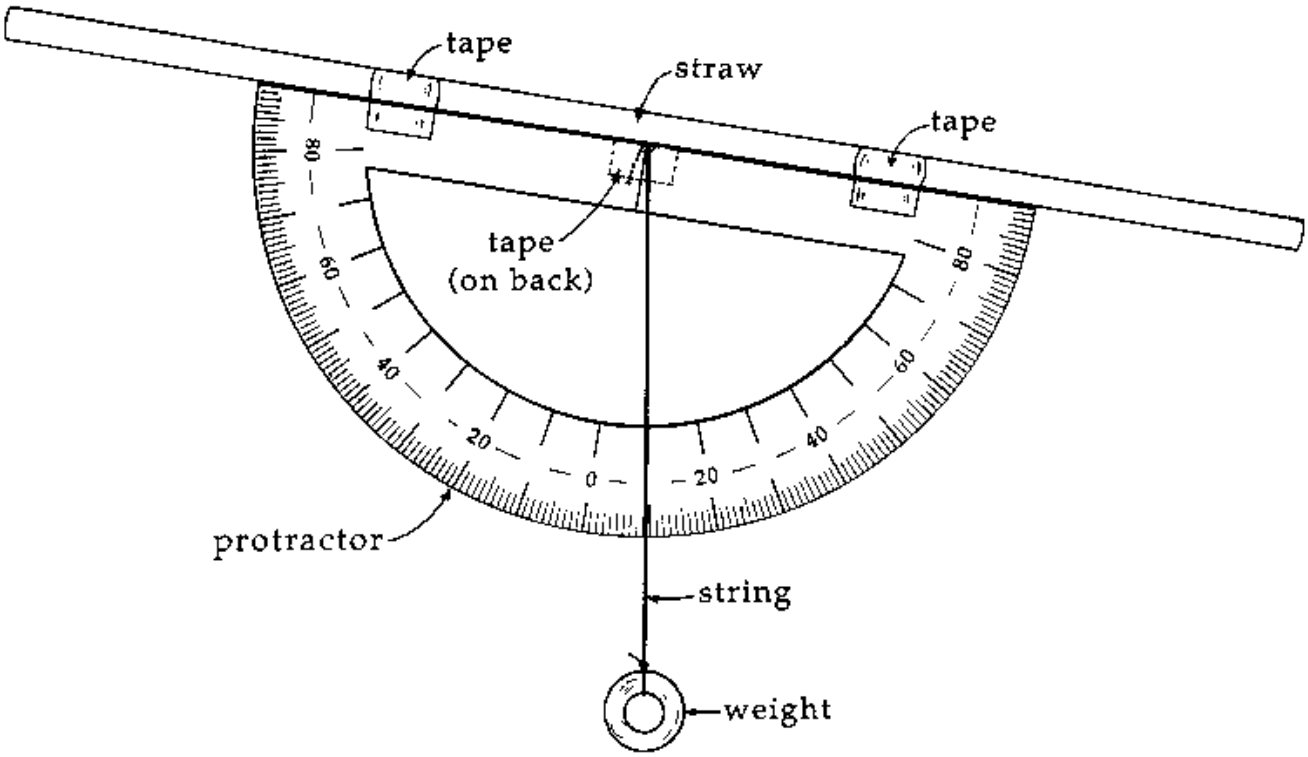
This is a device that also relies on trigonometry. A simple model can be made with a paper plate, a straw (or empty pen tube), some string and a weight (plasticine/washers).

Cut the plate in half and glue a straw or an empty pen tube along the cut edge. This is a sighting guide.

Exactly halfway along the cut plate edge stick a piece of string with a weight on the end so that it dangles beyond the edge of the plate.

Paper plate clinometer You now need to be able to find the line that is 45° to the straw.

A position exactly halfway between 0o and the cut edge of the plate is 45°. Alternatively use a protractor (in fact the clinometer can be made using a protractor to replace the paper plate).



Instructions:

- If printing off a protractor, strengthen it by gluing it to a piece of cardboard (cereal boxes work well), then cut the cardboard in the shape of the protractor. Or you can use a plastic protractor.
- Poke a small hole in your protractor in the middle of the flat edge, where indicated. Attach a piece of string about 8″ long.
- Attach a small weight to the other end of the string, like a small washer or screw.
- Tape a regular drink straw to the flat edge of your protractor.

Trees and Carbon Sinks

Trees are a very important aspect of life. They store carbon and exchange it for the oxygen we breath. Trees act as carbon sinks storing large amounts of carbon within their systems. Trees play an important role in mitigating climate change. So how much carbon does a tree hold? Let us find out!

- Pick your Tree.

Pick three of the marked trees that you wish to study today. These trees will be the trees you will use to complete this activity. Record the species name on your worksheet.

- Identify your Tree.

Use the identification key provided and the skills taught to identify the species of your tree! Record this value on your worksheet.

- How tall is your tree?

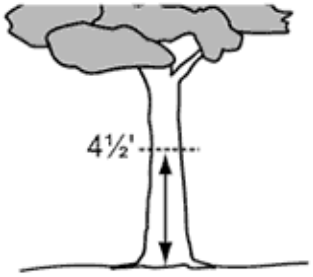
Using the clinometer provided to you, measure the height of your tree (in feet). Record the value on your worksheet. Look through the straw so that the treetop is visible. Walk backwards away from the tree keeping the top in the sights. Your partner will need to follow you and note when the weighted string lines up with the 45° line. Stop and measure the distance that you are from the tree. This distance is equal to the height of the tree plus your height.

Find out how tall you are, add this to the distance from the tree and you have an accurate measurement of the tree height.

This distance is equal to the height of the tree plus your height.

- Circumference of your Tree

Figure 80-4
Measuring Tree Size for Existing Trees



Using the measuring tape provided, measure the circumference of your tree (inches). Be sure to measure the circumference of the tree at least 1.3 meters above the ground! Record this a value on your worksheet.

Diameter of a Tree

With the measuring tape, measure 4.5 feet up the trunk of the tree from the ground. Use a thumb tack to mark the height on the tree. Measure around the tree at 4.5 feet

- Determine the Diameter of your Tree.

Using the value from the calculation above determine the diameter of your tree using the following formula (Diameter = Circumference (inches) /3.14). Record this on your worksheet.

- How old is your tree?

To determine the age of you tree use the table below to find the appropriate growth factor! To get an estimate of tree age you will multiply the diameter of the tree by the appropriate growth factor. Record on worksheet.

Species	**Growth Factor**
White Birch	5
Yellow Birch	3.5
White Ash	5
Eastern Hemlock	4
White Pine	5.0
Sugar Maple	5.0
American Beech	4.5

- How much carbon is stored in your tree?

Determining the correct amount of carbon that is stored in your tree can be difficult and a lengthy process. But! There is a way to estimate the amount of carbon stored in your tree. Using two simple pieces of information you collected already you can provide a rough estimate of how many pounds of carbon is stored within your selected tree! How cool!

Use the table attached to this form to determine the carbon content in your tree!

Be sure to record this information on your worksheet.

- Okay that is cool! But on average how much carbon do you think is stored in that tree each year as it grows larger and larger?

Simply, take your answer from above and divide that by the estimated tree age to get the estimated amount of carbon stored in the tree per year.

Tree Worksheet

Date		Location	
Participants			
Leaders			

Tree #	Species	Height (ft.)	Circum - ference (in)	Diameter (in)	Estimated Age (yrs.)	Growth Factor	LBS / CO_2	LBS / CO_2 / Year

Carbon Storage Estimation Chart

Height (feet)

DBH (inches)	5	10	15	20	25	30	35	40	45	50	55	60
8	127.5	254.9	382.4	509.9	637.4	764.8	892.3	1019.8	1147.3	1274.7	1402.2	1529.7
10	199.2	398.4	597.5	796.7	995.9	1195.1	1394.2	1593.4	1792.6	1991.8	2190.9	2390.1
12	172.088	344.175	516.263	688.351	860.439	1032.53	1204.61	1376.702	1548.79	1720.877	1892.965	2065.0529
14	234.231	468.461	702.692	936.922	1171.15	1405.38	1639.61	1873.844	2108.075	2342.305	2576.536	2810.7664
16	305.934	611.868	917.801	1223.74	1529.67	1835.6	2141.54	2447.47	2753.404	3059.338	3365.271	3671.2051
18	387.197	774.395	1161.59	1548.79	1935.99	2323.18	2710.38	3097.579	3484.777	3871.974	4259.172	4646.369
20	478.022	956.043	1434.06	1912.09	2390.11	2868.13	3346.15	3824.172	4302.194	4780.215	5258.237	5736.258
22	578.406	1156.81	1735.22	2313.62	2892.03	3470.44	4048.84	4627.248	5205.654	5784.06	6362.466	6940.8722
24	688.351	1376.7	2065.05	2753.4	3441.75	4130.11	4818.46	5506.808	6195.159	6883.51	7571.861	8260.2115
26	807.856	1615.71	2423.57	3231.43	4039.28	4847.14	5654.99	6462.851	7270.707	8078.563	8886.42	9694.276
28	936.922	1873.84	2810.77	3747.69	4684.61	5621.53	6558.45	7495.377	8432.299	9369.221	10306.14	11243.066
30	1075.55	2151.1	3226.65	4302.19	5377.74	6453.29	7528.84	8604.387	9679.935	10755.48	11831.03	12906.581
32	1223.74	2447.47	3671.21	4894.94	6118.68	7342.41	8566.15	9789.88	11013.62	12237.35	13461.09	14684.82
34	1381.48	2762.96	4144.45	5525.93	6907.41	8288.89	9670.37	11051.86	12433.34	13814.82	15196.3	16577.786
36	1548.79	3097.58	4646.37	6195.16	7743.95	9292.74	10841.5	12390.32	13939.11	15487.9	17036.69	18585.476
38	1725.66	3451.32	5176.97	6902.63	8628.29	10353.9	12079.6	13805.26	15530.92	17256.58	18982.23	20707.891
40	1912.09	3824.17	5736.26	7648.34	9560.43	11472.5	13384.6	15296.69	17208.77	19120.86	21032.95	22945.032
42	2108.07	4216.15	6324.22	8432.3	10540.4	12648.4	14756.5	16864.6	18972.67	21080.75	23188.82	25296.898
43	2209.65	4419.31	6628.96	8838.62	11048.3	13257.9	15467.6	17677.24	19886.89	22096.54	24306.2	26515.853
44	2313.62	4627.25	6940.87	9254.5	11568.1	13881.7	16195.4	18508.99	20822.62	23136.24	25449.86	27763.489
46	2528.73	5057.47	7586.2	10114.9	12643.7	15172.4	17701.1	20229.87	22758.6	25287.34	27816.07	30344.805
48	2753.4	5506.81	8260.21	11013.6	13767	16520.4	19273.8	22027.23	24780.63	27534.04	30287.44	33040.846
50	2987.63	5975.27	8962.9	11950.5	14938.2	17925.8	20913.4	23901.08	26888.71	29876.34	32863.98	35851.613

Table created by Dylan Eggleton.

Climate Change

Description:

This program explores climate change and the importance of global carbon sinks on the planet. The game will explore how care-taking actions can make a change and you will be challenged to reduce CO2 emissions and cool the earth. Time is running out.

Story: (borrowed from (Scientists, 2020)) (Union of Concerned Scientists, 2020)

On a bright sunny day in July, Joe went with his mother to the mall. They parked in the outdoor parking lot. Joe's mother locked the car doors and rolled up the windows. Joe forgot that he had left some candy in the back seat. He and his mother were in the mall for about an hour. When they returned, what do you think they felt when they opened the car doors? What do you think happened to Joe's candy? How could they prevent this from happening next time Joe's mother parks the car?

What happens inside the car is comparable to the greenhouse effect on earth- and to the way global warming occurs. Short wavelength rays of light can pass into the car through the windshield and windows. Just as sunlight passes through the glass of the greenhouse. When the rays strike the inside of the car, the seats, dashboard, and other parts absorb some of the energy, heat up and then radiate heat into the car. However, the heat inside the car consists of longer-wavelength infrared rays, which cannot pass through glass, so heat builds up and the temperature inside the car rises. Putting "sunglasses" (cardboard or reflective material sold just for this purpose) inside the windshield of the car will cut down on the amount of sunlight entering the car and cause less heating inside. Parking in the shade under a tree or inside a garage will also prevent heat from building up because not so much sunlight can enter the car. If the car must be parked in the sun, then all the windows should be left rolled down as far as is safe. This will let some of the heat escape and the temperature will not increase nearly as much as if the windows are all rolled up. Joe and his mother could also walk to the mall, take public transit, or ride a bike. Make connections with how these ideas relate to reducing global climate change.

Materials:

- A clear, dry bag thermometer represents the temperature of the earth. Bag is marked with cartoon faces representing changing temperatures. Symbol of Venus is at the top, a sweating face is 2/3 up and a smiley face is 1/3 from the bottom for just right.
- A blue Tupperware bin represents the ocean (a carbon sink – a natural feature of the planet that accumulates and stores greenhouse gases)
- 2-3 bins partially filled with ping pong balls: represent carbon dioxide molecules.
- Green bands and drawstring bags for trees
- Yellow and blue bands for the Guardians and the Once-lers. Once-lers represent the humans that use and dispose of resources after only one use. Once-lers are known for creating excessive waste and greenhouse gases.
- Golden pinecone

How to Play:

- Divide the group equally into two teams. Hand out yellow and blue bands. One team will be the Guardians (blue) and one team will be the Once-lers (yellow). Introduce the role of the Once-lers. Ask the students to come up with some examples of wasteful practices that increase greenhouse gasses. Introduce the role

of “Guardians”. The Guardians fight for the force of good. Ask the students to share examples of ways to conserve resources and reduce greenhouse gases.

- Set up the playing area by putting the thermometer at one end of the ocean at the other. Set the bin of carbon dioxide molecules in the middle of the playing area. The goal for the Guardians is to carry one ping pong ball at a time to the ocean so they can keep the temperature down to optimum (smiley face level or below)
- The goal of the Once-lets is to carry one ping pong ball at a time to the thermometer to increase the earth’s temperature to sweating and beyond.
- Guardians and Once-lers can take carbon dioxide molecules from the thermometer, the carbon dioxide bin, or the ocean at any time.
- The Guardians are also trying to find the golden pinecone that has been hidden in the playing area. Having possession of the pinecone will allow them to plant trees. Once they have the pinecone, they can choose 3-5 of their teammates to be trees (green bands). The trees can tag the Once-lers and cause them to be frozen. The trees take the Once-lers’ ping pong ball (if they are carrying one) and put it in their draw string bag (their carbon sink). A frozen Once-ler is “chill-axing” momentarily mesmerized by the cooling shade provided by the trees.
- If the Once-lers reach the “sweaty face” level on the thermometer, they unleash “Severe Storms”. One player becomes “Severe Storms” and is armed with soft balls. This player can tag Guardians and Trees and cause them to be frozen. If the temperature drops below sweating, “Severe Storms” returns to being the Once-ler without the raindrops. NOTE: a temporary severe storm may be unleashed before the Once-lers get to the sweaty face if the leader decides.
- Teammates unfreeze other teammates by crawling under their arms or legs.
- Play continues until all the Ping Pong Balls are either in the ocean or in the Thermometer.

Wrap UP

- What can you do to decrease carbon emissions locally at your school, your home your community, what about municipally or provincially, nationally, and globally?
- How can we use our resources more wisely?

After School Extensions

Encourage them to discuss how trees are important and calculate the carbon sink in their school yard or home. Discuss how this may offset the fuel emissions around the world or even in the town.

Session 5: Orienteering: Map and Compass and Emergency Preparedness

Purpose - To offer the experience to elaborate on compass understanding through hands-on special relationship of space through using a map and compass to navigate a course. Also, to understand life systems and earth and space systems in conserving energy.			
Season	Offered Fall, Winter, Spring		
Desired Learning Outcome	Physical outdoor experience and to understand navigation and map reading along with how to regulate body temperature in an emergency. Ensure Students/Parents come prepared for the outdoors		
Classroom Preparation	Understand the Cardinal directions and their intermediates		
Roles & Responsibilities	No.	Roles	Responsibilities
SCIWC Staff	1-2	Leader	• Do risk assessment before the day starts. • Ensure all items are prepared and in good working order for the day. • Be prepared to change with alternative if needed. • Provide instruction and guidance to the students in the activities
School Staff	1-2	Supervise	• Ensure Students/Parents come prepared for the outdoors. • Supervise Students • Help where needed
Volunteers/Parents	1-2	Assist Supervisor	• Help where needed. • Be engaged in the day and students
Documentation Required	• Survival cards for each group • Orientation Maps		
Materials Required:	• Tarps • Rope • Ferro rods and strikers • Compass • Pencils • Clipboards		
Materials Provided by:	SCIWC		
Participation Fees (if any)	FREE		

Proposed Budget Session 5: Orienteering: Map and Compass and Emergency Preparedness

Expenses			
Wages	Program Lead - 48 hours	$	959
	Assistant Lead - 48 hours	$	826
Materials	Printing and Laminating	$	100
	Compass (18)	$	60
	Compass teaching Example	$	20
Total Estimated Expenses		$	1,965

Agenda

Times may change to accommodate school schedules.

8:30 am School leaves for Elm Street Nature Park (56 Elm Street, St. Stephen)

9:00 am Arrive at Elm Street Nature Park, speak with teachers to debrief about students (concerns schedule etc.).

9:15 am Welcome Circle, Introductions

9:30 am Why they are there and explain what they will be doing. Also go over safety, rules and call back.

10:00 Explain parts of a map, how to read it.
Explain and demonstrate parts of a compass and how to use one.

10:30 am Do compass practice exercise.

11:00 am Give out maps and compasses to partners and do course.

12:00 pm Lunch and free time

1:00 pm Talk about the importance of shelters (rule of 3) and build shelters in groups.

2:00 pm Debrief, harvest stories.

2:15 pm Head back to school

2:45 pm Arrive at school.

Curriculum Expectations

Activities: Map and Compass and Emergency Preparedness	
Set up	• Set up orientation course with markers. • Put maps and booklet on clipboards. • Have enough compasses in working order? • Have rope for shelters (if using)
10 min	Debrief with the teacher over expectations, behaviours, allergies while the students explore a nature table full of artifacts, nature items etc. Gather students together Give gratitude and go over expectations, call back call.
60-90 min	**Map and Compass Orientation** • Find out what the class knows about maps. • Go over parts of the map and then how to read a map. Can do an exercise if class is unfamiliar with reading a map. Go over safety rules
Math N7 Demonstrate an understanding of fractions by using concrete and pictorial representations to: • create sets of equivalent fractions. • compare fractions with like and unlike denominators. SS2 Demonstrate an understanding of measuring length (mm and km) by: • selecting and justifying referents for the unit mm and km • modelling and describing the relationship between mm and cm units, and between mm and m units. • modelling and describing the relationship between m and km units. SCO: SS3: Demonstrate an understanding of volume by: • selecting and justifying referents for cm3 or m3 units • estimating volume by using referents for cm3 or m3 • measuring and recording volume (cm3 or m3)	

<table>
<tr><td colspan="2">constructing rectangle</td></tr>
<tr><td colspan="2">107-5 provide examples of how science and technology have been used to solve problems in their community and region. 107-8 describe examples of technologies that have been developed to improve their living conditions.
204-5 identify and control major variables in investigations.
204-7 plan steps to solve a practical problem and carry out a fair test of a science-related idea.
205-3 follow a given set of procedures.
205-5 make observations and collect information that is relevant to a given question or problem.
carry out procedures, making certain to control variables, when investigating the factors affecting breathing and heartbeat rate; compile and display data from these investigations in a graph (205-1, 206-2)
60 min</td></tr>
<tr><td><u>Nature Connections:</u>
• Being confident to navigate in the outdoors.
• How animals use shelters
<u>Watershed connection</u>
• Understanding the various trees in the area
• What animals use the watershed in their home</td><td><u>Safety/Hazards</u>
• Always stay within “high-five” distance apart
• Know the call back call/sound.
• Stay on the trails (no need to go off trail)
• Only use items on the ground (nothing alive)
• Nothing bigger than your circumference of your thigh
• No building shelters with someone in them</td></tr>
</table>

What is a map?

A map is a scaled representation of an area. It gives a flat, symbolic, bird’s eye view of an area on the earth. There are different types of maps and depending on what you are doing; will determine which kind of map you need. Ask students where they have seen maps before.

Early explorers relied on maps and maps making to take note of their surroundings in new uncharted lands. They used their detailed notes to make maps and guides for other settlers that followed them.

First Nation Peoples used many techniques to give directions and the early settlers and pioneers quickly learned and applied these techniques to their maps to mark portage points, trap areas, transportation routes, sources of food and water. They soon started to incorporate marking other locations of unusual landmarks, rock formations, animal trails, waterways that included rapids, waterfalls, forks, etc., and the different types of terrain they travelled.

Learning these skills can open job opportunities as many careers depend on mapping and charting skills. Some of the jobs include urban planning, northern development, and transportation. Not only do jobs require these skills but your life could depend on them as well. If you go hiking, camping, knowing how to find a location on a map, or how to navigate your trip is essential to a fun and safe adventure.

All maps have certain things to ensure you can read it and understand it. A map will show water, relief areas that includes mountains, cliffs, hills, valleys, etc., culture that include cities, towns, villages, buildings, railways, highways and land boundaries and vegetation that includes wooded areas, orchards, vineyards and cleared areas.

Colours are used to tell the difference between these areas.

Legend is a record on a map that tells you what symbols mean on the map.

Scale is used as you cannot put the whole world in your pocket, so the real world must be scaled down in proportional ratio so you will be able to calculate distance and direction.

Compass Rose is on every map to illustrate which way the map should be oriented to face North.

Title is always on a map, so you know what section of the world you are looking at.

Orienting a Map

Orienting a map means placing a map in correspondence in direction on the actual ground it represents. You can do this in two ways: (there is a third way but may be too confusing)

a. By a compass: which we will not do but will show easily by placing the compass in the North bearing and placing it onto the compass rose so that the arrow to North face the same way. Then you move the map and compass together until the needle points North. Now the map should be in position that represents the actual terrain you are on.
b. By Inspection: This is what we will use. First find where you are in real life and where you are represented on the map. Find an object represented on the map and in real life (parking lot, road, lake etc.). Turn your map so that the object in real life matches the direction it is represented on the map. If you take a line from yourself to the object, it would be in the same direction as you in real life and you and the object on the map.

Orientation of the Map by Inspection

When you look at your map, hold the picture the way it is represented in real life. Just like a picture, if you hold a picture upside down, you will still know what it is but will have a harder time understanding it. The map is the same, but North does not always have to be pointed to the top of the page. You also will not always be travelling North. If you have your map oriented correctly the following will be true:

a. What is in front of, to the right, or left of, or behind you on the ground is in the same position on the map.
b. The map corresponds with the ground as you look at it as the bird flies over.

Orienting a Map means turning the map so that the map directions and the objects correspond with the ground in real life. Orienting the map helps with a few things:

1. Makes it easier to relate the map to real life ground.
2. It helps you find your location or direction if you are in doubt of where you are.
3. It will keep you on track through your travels.

To orient your map, simply hold your map in front of you and turn it until the features on the map are in line with your own location as it is represented in real life.

How to carry your map:

1. When carrying the map, carry it in your non-dominant hand, leaving your other hand free for other tasks.
2. Map reading by thumb by placing your thumb on the last place you knew where you were. This will help you find your position quicker when you look at your map.
3. Do not try to navigate by staring at your map, keep your head up and look around, only refer to your map to remind yourself or to look forward to the next feature or area you need to go.
4. Once you have planned your route, decide on the techniques you will use to get to your destination.

By using the objects on the map, you should be able to navigate to the various areas just by using the map. However, using a compass will ensure you are going in the right direction. This exercise can be delivered with just map reading skills or with a compass with bearings to follow.

History of the Compass (Secrest, 1982)

By 500 B.C., it was known that lodestone, a naturally occurring form of iron oxide also known as magnetite, had the ability to attract iron. No one knows where or when it was first noticed that a freely moving piece of lodestone tended to align itself so that it was pointing North and South. Written records indicate that the Chinese used magnetic compasses by 1100 A.D., western Europeans, and Arabs by 1200 A.D., and Scandinavians by 1300 A.D.

Early compasses consisted of a piece of lodestone on a piece of wood, a cork, or a reed floating in a bowl of water. Somewhat later, a needle of lodestone was pivoted on a pin fixed to the bottom of a bowl of water. By the thirteenth century, a card marked with directions was added to the compass. By the middle of the sixteenth century, the bowl of water was suspended in gimbals, which allowed the compass to remain level while being used aboard a ship being tossed by the ocean.

In 1745, the English inventor Gowin Knight developed a method for magnetizing steel for long periods of time. This allowed needles of magnetized steel to replace needles of lodestone. During the early nineteenth century, iron and steel began to be used extensively in shipbuilding. This caused distortions in the operation of magnetic compasses. In 1837, the British Admiralty set up a special commission to study the problem. By 1840, a new compass design using four needles was so successful at overcoming this difficulty that it was soon adopted by navies around the world.

Until the middle of the nineteenth century, navigators used both dry-card compasses, in which the needle pivoted in air, and liquid compasses, in which the needle pivoted in water or another liquid. Dry-card compasses were easily disturbed by shocks and vibrations, while liquid compasses tended to leak and were difficult to repair. In 1862, improvements in the design of liquid compasses quickly made the dry card compass obsolete for naval use. By World War 1, the British Army used liquid compasses on land, and liquid compasses are still the standard for the best handheld magnetic compasses.

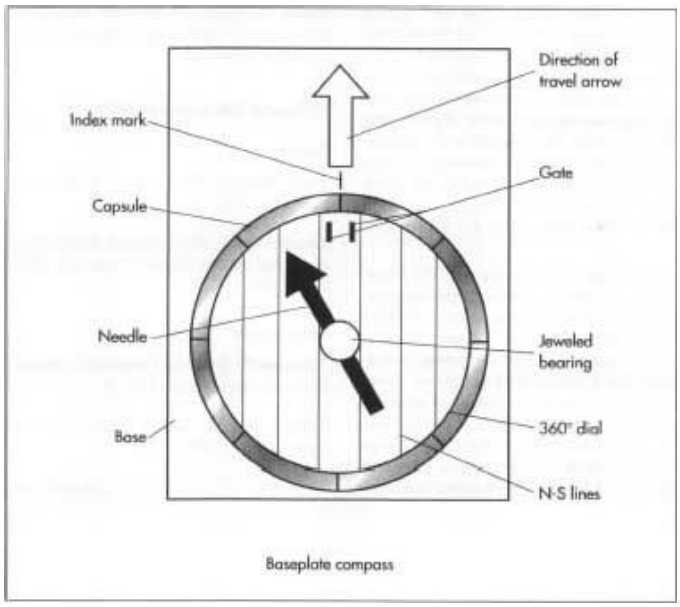
How a compass works

A compass is used in conjunction of good map reading skills. It is used to make precise measurements in direction and distance. A small error in calculation or measurement in a large excursion could equal a significant error in the field. We will be using magnetic navigation. The basic principles of how a compass works are:

1. Magnetic Needle: A small elongated and permanently magnetized needle is placed in a pivot in enclosed liquid so that it may rotate freely in the horizontal plane.
2. The earth's magnetic field is shaped like a field around a simple bar magnet, exerts forces on the compass needle causing it to rotate until it comes to a rest in the same horizontal direction as the magnetic field.
3. The earth has a north and a south magnetic pole.

The compass needle does not point to true north, instead it orients itself to the Earth's magnetic field which converges on the north magnetic pole. This magnetic pole is located off the northern tip of Bathurst Island in the Canadian Arctic which is 1300 km south of the north geographical pole.

Parts of a Compass (Secrest, 1982)



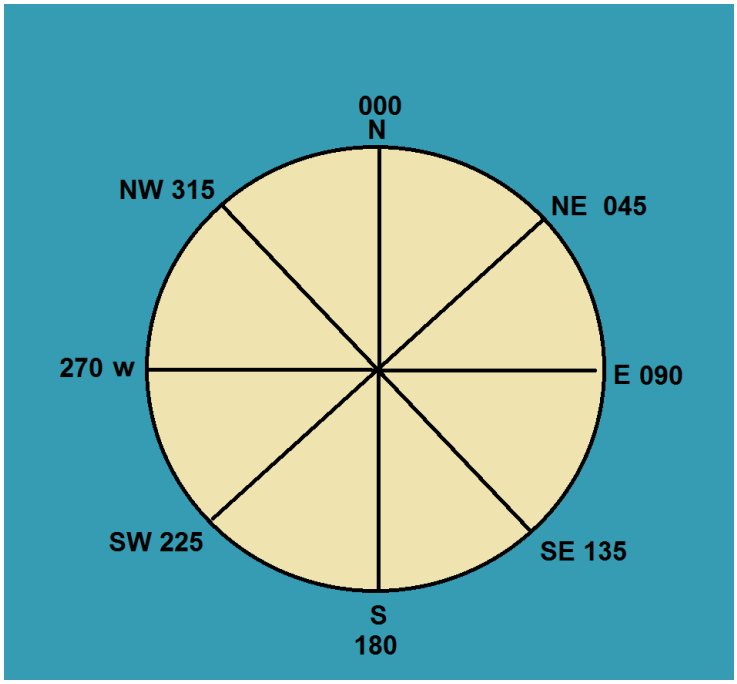
The Gate or the Shed is the red arrow on the housing, where you will see it always point to North. Since your needle always points North and is red, you will be putting the red part of the needle into the gate or the shed. I refer this to putting "RED IN THE SHED". Make sure that when you put "RED IN THE SHED", you are moving your whole body and not just the compass.

Points of a Compass

Points of a compass divide up a circle into degrees. A circle has 360° and they are read clockwise direction starting from North. North has two readings, 0° and 360°. Starting at North (0°), go around the compass to figure out what the degrees for the cardinal directions then the intermediate points.

North, South, East, and West are known as the Cardinal Points. Half a circle is equal to 180°, which is also South. A quarter of a circle is equal to 90° which is also East. To determine the value of West you would add 90° to half a circle. Intermediate points are then further divided to give you 4 more directions Northeast, Southeast, Southwest, and Northwest. They are located between the Cardinal Directions. These are at the 45° between the Cardinal Directions.

Points of a Compass Image (Boxing the Compass, 2020)



How to Hold a Compass

First put the lanyard around your neck so you will not lose your compass. Hold your compass so the direction arrow points out in front of you (does not point towards you). Hold it in front of you with your elbows "glued" to your sides. When you move to get your bearing, you move with your whole body including your feet till the needle points north (putting Red into the Shed). Do not move the compass, we do not walk on weird angles.

Taking a bearing.

Hold your compass properly. At your directional line at the top of the circular housing, place the number you wish to go, or the Cardinal direction. Remember, if it says to go SE, you would be putting the bearing on 135°. Set your "bearing"- the degree you wish to go on the directional line by moving the circular housing to that number you wish to go. Hold your compass in front of you and move your body until "RED IN THE SHED". Now raise your eyes in the direction where the arrow is pointing, find a landmark and walk straight to it. When you reach your landmark, check your bearing again, pick another landmark and go to it. Do this until you reach your destination.

When you reach your destination, there will be a letter. Record the letter and when you are done, unscramble the letters to find the answer to question.

Activities: Map and Compass

Practice Compass Bearings Activity

Partner up. One partner will stay at the starting point holding the string at the ground level and they will give directions and number of steps to take to the other partner. The other partner will take the string, take the bearing, and walk the number of steps in that direction. When they reach the end, they will put the popsicle stick in the ground and wrap the string around it. Then take the next bearing given by your partner and do the same until the end (should end up back to your partner).

Shape 1:

Bearing one: Go North 20 steps
Bearing two: Go East 20 steps
Bearing three: Go South 20 steps
Bearing four: Go West 20 steps

Shape 2:

Bearing one: Go 45° 20 steps
Bearing two: Go 135° 20 steps
Bearing three: Go 225° 20 steps

Shape 3

Bearing one: Go 90° 20 steps
Bearing two: Go 45° 20 steps
Bearing three: Go 360° 20 steps
Bearing four: Go 315° 20 steps
Bearing five: Go 270° 20 steps
Bearing six: Go 225° 20 steps
Bearing seven: Go 180° 20 steps
Bearing eight: 135° 20 steps

When they feel comfortable with the compass, send them out with their maps and compasses to find the clues to the question on their work sheet.

Orienteering by Map and Compass

Elm Park A: At each bearing, write down the letter and number. It is strongly recommended to follow the bearing to ensure you go to the correct bearing.

Standing at the edge of the log

- Go 10° _____
- Go 133° _____
- Go 338° _____
- Go 352° _____
- Go 188° _____
- Go 304° _____
- Go 274° _____
- Go 272° _____
- Go 140° _____
- Go 173° _____
- Go 140° _____
- Go 136° _____
- Go 198° _____

Who was the stream named after that runs through Elm park?

____ ____ ____ ____ ____

2 6 9 1 12

____ ____ ____ ____ ____ ____ ____ ____

4 11 3 7 10 5 8 13

Elm Park B: At each bearing, write down the letter and number. It is strongly recommended to follow the bearing to ensure you go to the correct bearing.

Standing at the edge of the log

1. Go 26° _____
2. Go 320° _____
3. Go 324° _____
4. Go 358° _____
5. Go 310° _____
6. Go 90° _____
7. Go 82° _____
8. Go 119° _____
9. Go 18° _____
10. Go 162° _____
11. Go 160° _____
12. Go 314° _____
13. Go 190° _____

Who was the stream named after that runs through Elm park?

____ ____ ____ ____ ____

2 6 9 1 12

____ ____ ____ ____ ____ ____ ____ ____

4 11 3 7 10 5 8 13

Activities: Emergency Preparedness

Can You Survive?

When an emergency occurs, the first thing to do is **STOP,** an acronym that can save your life.

STOP where you are! Do not panic. Many times, lost people waste valuable energy and get themselves into bigger trouble by panicking. They do this by running aimlessly, continuing to travel after dark, walking in circles and more.

THINK about immediate and future dangers and the factors involved in your situation. Consider the time of day, your physical condition, the last time you drank or eat. Try to list the options that are available to you.

OBSERVE your immediate surroundings, the weather, the environment, the terrain, resources available and how each of these affect your options. Look for a location for a shelter, for fresh drinking water and for clues to your location or the route you took to get where you are now (i.e., "I followed a stream until it went into a swamp, then I walked over a hill behind me.

PLAN your best course of action Include in your plan methods you will use to signal rescuers.

<u>Will you Survive? - A Simulation Game adapted</u> (Survival Simulation game, 2020)

You and your companions have just survived the crash of a small plane. Both the pilot and co-pilot were killed in the crash.

It is mid-January, and you are in Northern Canada. The daily temperature is 25 below zero, and the nighttime temperature is 40 below zero. There is snow on the ground, and the countryside is wooded with several creeks crisscrossing the area.

1. The nearest town is 20 miles away.
2. You are all dressed in city clothes appropriate for a business meeting.
3. Your group of survivors managed to salvage the following items:
    a. A ball of steel wool
    b. A small ax
    c. A loaded .45-caliber pistol
    d. Can of Crisco shortening
    e. Newspapers (one per person)
    f. Cigarette lighter (without fluid)
    g. Extra shirt and pants for each survivor
    h. 20 x 20 ft. piece of heavy-duty canvas
    i. A sectional air map made of plastic.
    j. One quart of 100-proof whiskey
    k. A Compass
    l. Family-size chocolate bars (one per person)

Your task as a group is to list the above 12 items in order of importance for your survival. List the uses for each. You MUST come to agreement as a group.

EXPLANATION FOR FACILITATOR (do not discuss with the class)

Mid-January is the coldest time of year in Northern Canada. The first problem the survivors face is the preservation of body heat and the protection against its loss. This problem can be solved by building a fire, minimizing movement and exertion, using as much insulation as possible, and constructing a shelter.

The participants have just crash-landed. Many individuals tend to overlook the enormous shock reaction this has on the human body, and the deaths of the pilot and co-pilot increases the shock. Decision-making under such circumstances is extremely difficult. Such a situation requires a strong emphasis on the use of reasoning for making decisions and for reducing fear and panic. Shock would be shown in the survivors by feelings of helplessness, loneliness, hopelessness, and fear. These feelings have brought about more fatalities than perhaps any other cause in survival situations. Certainly, the state of shock means the movement of the survivors should be at a minimum, and that an attempt to calm them should be made.

Before taking off, a pilot must file a flight plan which contains vital information such as the course, speed, estimated time of arrival, type of aircraft, and number of passengers. Search-and rescue operations begin shortly after the failure of a plane to appear at its destination at the estimated time of arrival.

The 20 mile walk to the nearest town is a long walk under even ideal conditions, particularly if one is not used to walking such distances. In this situation, the walk is even more difficult due to shock, snow, dress, and water barriers. It would mean almost certain death from freezing and exhaustion. At temperatures of minus 25 to minus 40, the loss of body heat through exertion is a very serious matter.

Once the survivors have found ways to keep warm, their next task is to attract the attention of search planes.

Thus, all the items the group has salvaged must be assessed for their value in signaling the group's whereabouts.

The ranking of the survivor's items was made by Mark Wanvig, a former instructor in survival training for the Reconnaissance School of the 101st Division of the U.S. Army. Mr. Wanvig currently conducts wilderness survival training programs in the Minneapolis, Minnesota area. This survival simulation game is used in military training classrooms.

How to score, each team should list its top 5 choices in order prior to seeing the answer sheet. To award points, look at the ranking numbers on this answer sheet. Award points to each team's top choices according to the numbers here. For example, the map would earn 12 points, while the steel wool would earn 2 points. Lowest score wins (and survives).

RANKINGS

1. Cigarette lighter (without fluid). The gravest danger facing the group is exposure to cold. The greatest need is for a source of warmth and the second greatest need is for signaling devices. This makes building a fire the first order of business. Without matches, something is needed to produce sparks, and even without fluid, a cigarette lighter can do that.
2. Ball of steel wool. To make a fire, the survivors need a means of catching the sparks made by the cigarette lighter. This is the best substance for catching a spark and supporting a flame, even if the steel wool is a little wet.
3. Extra shirt and pants for each survivor. Besides adding warmth to the body, clothes can also be used for shelter, signaling, bedding, bandages, string (when unraveled), and fuel for the fire.
4. Can of Crisco shortening. This has many uses. A mirror-like signaling device can be made from the lid. After shining the lid with steel wool, it will reflect sunlight and generate 5 to 7 million candlepower. This is bright enough to be seen beyond the horizon. While this could be limited somewhat by the trees, a member of the group could climb a tree and use the mirrored lid to signal search planes. If they had no other means of signaling than this, they would have a better than 80% chance of being rescued within the first day. There are other uses for this item. It can be rubbed on exposed skin for protection against the

cold. When melted into an oil, the shortening is helpful as fuel. When soaked into a piece of cloth, melted shortening will act like a candle. The empty can be useful in melting snow for drinking water. It is much safer to drink warmed water than to eat snow, since warm water will help retain body heat. Water is important because dehydration will affect decision-making. The can is also useful as a cup.

5. 20 x 20-foot piece of canvas. The cold makes shelter necessary, and canvas would protect against wind and snow (canvas is used in making tents). Spread on a frame made of trees, it could be used as a tent or a wind screen. It might also be used as a ground cover to keep the survivors dry. It is shape, when contrasted with the surrounding terrain, makes it a signaling device.
6. Small ax. Survivors need a constant supply of wood to maintain the fire. The ax could be used for this as well as for clearing a sheltered campsite, cutting tree branches for ground insulation, and constructing a frame for the canvas tent.
7. Family size chocolate bars (one per person). Chocolate will provide some food energy. Since it contains mostly carbohydrates, it supplies the energy without making digestive demands on the body.
8. Newspapers (one per person). These are useful in starting a fire. They can also be used as insulation under clothing when rolled up and placed around a person's arms and legs. A newspaper can also be used as a verbal signaling device when rolled up in a megaphone-shape. It could also provide reading material for recreation.
9. Loaded .45-caliber pistol. The pistol provides a sound-signaling device. (The international distress signal is 3 shots fired in rapid succession). There have been numerous cases of survivors going undetected because they were too weak to make a loud enough noise to attract attention. The butt of the pistol could be used as a hammer, and the powder from the shells will assist in fire building. By placing a small bit of cloth in a cartridge emptied of its bullet, one can start a fire by firing the gun at dry wood on the ground. The pistol also has some serious disadvantages. Anger, frustration, impatience, irritability, and lapses of rationality may increase as the group awaits rescue. The availability of a lethal weapon is a danger to the group under these conditions. Although a pistol could be used in hunting, it would take an expert marksman to kill an animal with it. Then the animal would have to be transported to the crash site, which could prove difficult to impossible depending on its size.
10. Quart of 100 proof whiskey. The only uses of whiskey are as an aid in fire building and as a fuel for a torch (made by soaking a piece of clothing in the whiskey and attaching it to a tree branch). The empty bottle could be used for storing water. The danger of whiskey is that someone might drink it, thinking it would bring warmth. Alcohol takes on the temperature it is exposed to, and a drink of minus 30 degrees' Fahrenheit whiskey would freeze a person's esophagus and stomach. Alcohol also dilates the blood vessels in the skin, resulting in chilled blood belong carried back to the heart, resulting in a rapid loss of body heat. Thus, a drunk person is more likely to get hypothermia than a sober person is.
11. Compass. Because a compass might encourage someone to try to walk to the nearest town, it is a dangerous item. It is only redeeming feature is that it could be used as a reflector of sunlight (due to its glass top).
12. Sectional air map made of plastic. This is also among the least desirable of the items because it will encourage individuals to try to walk to the nearest town. It is only useful feature is as a ground cover to keep someone dry.

Give the Survival Item Cards to each team. Allow them time to determine which order to put them in.

They must put in order of importance. Will take up as a group and discuss what each item may be used for.

Then give them their survival guide. Do not give too much guidance here, most of the instructions are already in the package. Each group must work together as a team to survive. Hand out Each Survival Scenario package and tell them they must allocate various roles to their team. They have one hour to fulfill the activity. Go over safety.

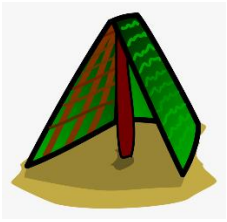
IMPORTANT: No one is to light a fire unless supervised by an adult.

Survival Score Card			
Diff	Act	Your	Item
			Cigarette Lighter
			Newspaper
			Family Sized Chocolate Bar
			Quart of 85 Proof Whiskey
			Can of Shortening
			Ball of Steel Wool
			Loaded .45-caliber pistol
			Extra Shirt and Pants
			Small Ax
			20 x 20-foot Piece of Canvas
			A Sectional Air Map Made of Plastic
			A Compass
			Total of difference
0-50:			All Survive
51-60:			Frostbite
61-70:			Three Live
71 and up:			Prepare for a new Life

WILL YOU SURVIVE?

Wilderness Survival Skills



Scenario: Your plane has crashed in a lake somewhere in Northern Canada. The plane has sunk but the five of you have made it to an uncharted island. The group has several injuries to deal with. One is a broken leg; another has a broken arm, and the third person has a head injury. You have two hours until nightfall, you are cold, and wet. All you have a is a garbage bag with a few items in it and this guide.

What should you do?

a) Assess and attend to injuries.
b) Designate someone to be the leader, perhaps someone with the most experience.
c) Pick a spot to set up camp.
d) Create some sort of SOS signal (flag, rock, sticks, fire, etc.) Visible from the air
e) Build a shelter for the night. It must be large enough to fit everyone in the group.
f) Start a fire: This is the campfire and the signal fire (WAIT UNTIL STAFF GIVES THE ok) You only have two matches or a flint and steel.
g) Get to work quickly. Working together as a group will save time and energy.

Rules:

1. NO live trees are to be cut or broken. NO live plants are to be pulled up, broken, or used in anyway.
2. Every member of the group must stay within their given area – no visiting other sites, no leaving to gather extra materials.
3. You will not receive any further instruction. Everything you need is in this guide. If you think there is a safety issue, contact staff immediately. If you are unsure about anything, ask.
4. Absolutely NO lighting fires unless the Instructor is present.

Evaluation:

After a period (1-1/2 hours) each group will visit each other's camp and each group will get a chance to explain what they did to try to survive. It is at this point that the group will be given two matches and the group leader will choose who gets to light the fire. Points will be awarded in the following categories: treated injuries, victim simulation, working together, rescue strategies, shelter building, fire building, proper use of materials new ideas. There is a potential to achieve 90 points.

DISCLAIMER: THE INFORMATION TO FOLLOW IS FOR THE PURPOSE OF THE ACTIVITY AND IS INTENDED ONLY TO FACILITATE THE ACTIVITY.

Sample First Aid Information

1. Broken bones: determine if the fracture is open or closed.

    a. Open means the bone has broken through the skin.
    b. Closed means the bone has not punctured the skin.

    Treatment: If there is an open fracture, tear the clothing away from the wound. Treat the wound before splinting. To splint the patient, improvise pieces of equipment. Pad the splint and place it so that it supports the joints above and below the fracture. You may have to immobilize a fractured leg by attaching it to an unfractured leg if no materials available. Elevate.

    Do not move patient unless necessary for safety. Do not handle injury. Do not give food or liquid.

2. Neck & Head: A head injury may involve one or more of the following:

    a) a cut or bruise of the scalp,
    b) a fracture of the skull,
    c) an injury of blood vessels of the scalp, skull or brain,
    d) an injury to the brain.

    Symptoms:

    1. A head injury may have the following symptoms, unconscious, and blood or fluid from ears or nose, headache, slow pulse, vomiting, convulsions, different sized pupils.
    2. A neck injury may have the following symptoms: head injury, stiff or painful neck, in ability to move arms or legs, or to move at all, or tingling sensation.

    Treatment: Immobilize head and neck avoiding movement of the head. Keep he patient comfortable, warm, and dry and handle gently. Give nothing by mouth (including medication), patient should be watched closely until help arrives. Keep patient lying down and treat for shock. To control any bleeding, place gauze compresses lightly over the injury.

3. How to prevent hypothermia:

    Treatments: Keep warm and dry
    Avoid over exertion.
    Protect head, face, and ears from wet and cold.
    Take frequent rest breaks.
    Carry a supply of high energy food and drink items (i.e., hot chocolate and candy bars)
    Avoid drinking cold liquids.

4. How to prevent heat emergencies

    Treatments: Avoid being outdoors during hottest part of the day
    Take frequent rest periods in a shaded or cool area.
    Dress for the weather, wear a hat and light coloured clothing.
    Drink plenty of fluids (Water is best) and avoid caffeine filled drinks like cola.

Priorities: Once your injuries have been treated, your most important goals are to stay warm and dry. To do this you need to establish the order of importance of the following, be prepared to explain:

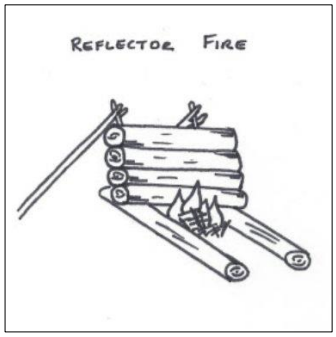
Fire, Food, Signal, Shelter, Water

❖ Fire Building:

To build a fire you need: Ferro rod and striker, dryer lint, kindling, fuel, patience and a little skill and luck.

1. Find a protected spot.
2. Gather tinder (dry paper, pitch, brittle twigs, etc.) that will quickly burn.
3. Break into small pieces
4. Protect from moisture, plastic bag, pocket, cover it, etc.
5. Gather a good supply of kindling and fuel wood before lighting the fire.
6. Build a small teepee over the paper, chips, leaves, pitch, etc.
7. Place the Ferro rod into the tinder bundle and strike until you get a flame.
8. You may gently blow the flame if it will help. Fire needs oxygen, fuel, and ignition
9. Fire climbs, so ad new kindling from your bundle of sticks
10. This is only to burn for 5 minutes so do not make it too big.

Note: a small fire with a reflector is better and gives more heat than a big fire. And uses less fuel.



❖ Shelter Building:

Where to locate a shelter:

- It should be safe from hazards (hang up limbs, wind, floods, poison ivy, pests)
- It should be near building material, fuel for fire and water.

What type of shelter to build? The type will depend on:

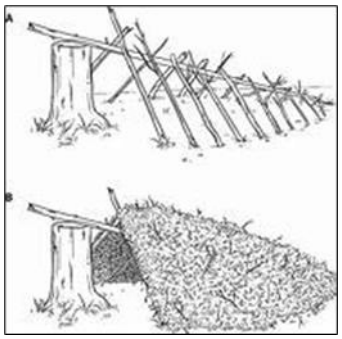
- Weather conditions
- The time of day (how much daylight is left).
- What nature can provide?
- What tools you have
- Your physical condition
- Your innovation

Other needs of the shelter:

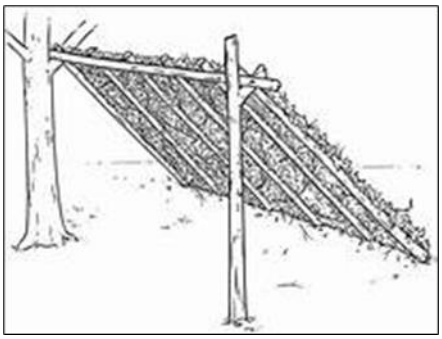
- Will it be strong enough?
- Will fire be used near it?
- Is it large enough for all of you to sleep in, put your gear in and fuel storage?

Shelter Types

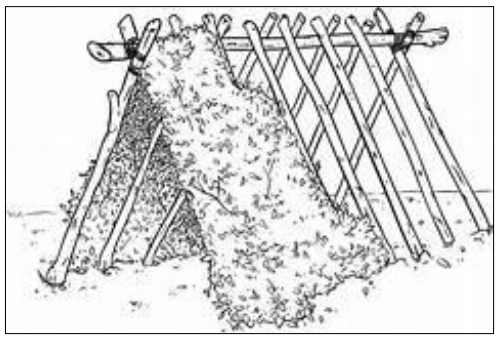
Debris Hut



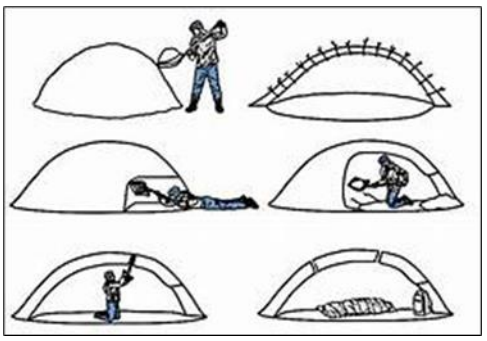
Lean to



Tent Style



Quinzhee



❖ Signals:

The purpose is to say “HELP, here I am” and “I’m OK” or “I’m Hurt”. It can also show the direction you travelled.

Signal types:

1. Battery powered radios, strobe lights, locator beacons and flashlights are all good but limited by the battery size, temperature, and age. Carry fresh batteries, protect them from the heat and cold and only use when necessary.
2. Fire and Smoke at night -the fire’s flame is a good signal – in the day, the fire’s smoke is most visible. To make the fire smoke, add green or damp plants and leaves.
3. Mound and trench these can be constructed out of brush, rocks, or branches or by stomping a giant letter or arrow or digging gin the snow.
4. Signal Mirror used to attract an aircraft.
5. Whistle great for short distance – 3 blasts
6. Cyalume a chemical light signaling device. The glow sticks you see in camping stores.

Ground Air Emergency codes and how to display them:

X	Require Medical Assistance	V	Require Assistance	Y	Yes – Affirmative	N	No – Negative	→	Going in this Direction

Use whatever you have on hand and around you. Try to provide the biggest colour contrast as possible between material used and background. Along with symbols, try to use the other signal types. For marine distress, use a flag with a round ball on it, or any ball shaped object raised over a vessel indicates distress. Make sure you space out your symbols 10 feet apart where possible and are 1-meter-wide by 6 meters long in an open field for easy visual from the air. If you are making a signal in the snow, ensure to stomp down the snow so a shadow appears to form the signals.

Acknowledgement from an Aircraft:

Message received and understood by rocking side to side or by flashing green flashes on a signal lamp

Message not understood by making a right-hand circle or by flashing red flashes on a signal lamp

❖ Water:

About 2/3 of your body is water. When there is a water shortage (dehydration), the body, and the mind do not function well.

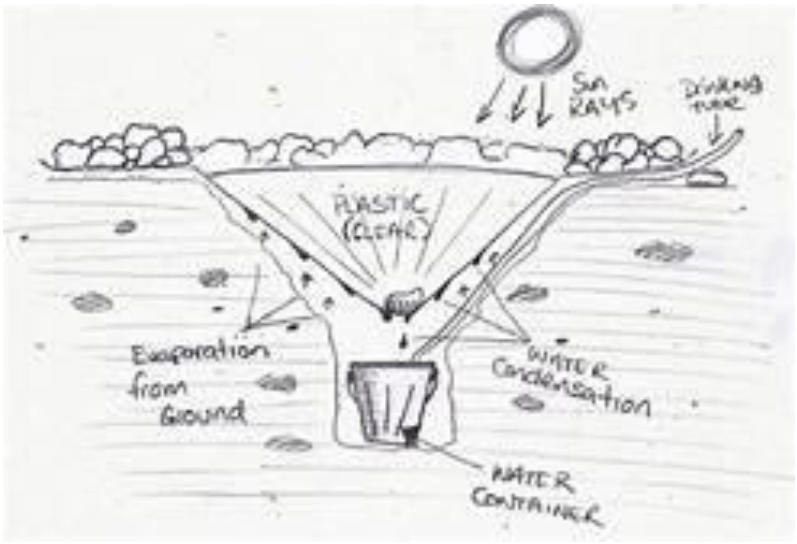
Cut down on water leaving he body by:

- Stay in the shade in warm or hot weather.
- Do not sit or lie on the hot ground. It can be as much as 15° cooler just about the ground.
- Keep your shirt on in hot weather – it will cut down on sweat leaving the body and increase body cooling.
- Eat less so that less water is needed to break down food.
- Do not use energy in a careless way.

Need for Water: 3-5 litres of water are needed each day for a grown person. All water should be boiled for at least 5 minutes or purified using tablets. Just because it looks clean does not mean it is. It can sometimes make you sick and increase dehydration.

Solar Still Construction:

- Build your still in the sun. Do this right away so while you are doing other things it can be working.
- The hole should be bowl shaped and mounded around the top edge.
- Place a container in the centre of the hole.
- Surround the container with plants and leaves.
- Place the plastic cover over the hole and seal it all around with rocks. Be sure to leave enough slack in the plastic to make a downward cone (make the plastic droop)
- Place a smooth rock in the centre of the plastic and adjust over the container. The rock should be heavy enough to pull the plastic tight but should not be allowed to touch the container or sides.



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