Evaluation, Restoration and Stewardship of the Coastal Ecosystems of the Shediac Bay

The Shediac Bay Watershed Association Inc.

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1 Introduction

The Shediac Bay Watershed Association (SBWA) was founded in 1999 as a result of growing concerns from local community residents over the ecological health of Shediac Bay. In order to establish a long-term water quality-monitoring program, a community-based association was formed. To address growing concerns on water quality in the Shediac Bay, the program "Evaluating the Health of the Shediac Bay" was initiated in 2016. The program aims to assess the health of coastal habitats and ecosystems, conduct ecological restoration initiatives, and launch education and awareness campaigns.

The eelgrass monitoring program began in 2016, to assess the state of the eelgrass habitats in the Shediac Bay, as they are facing the threats from the invasive green crab. Additionally, we've been able to use this data to assess the impacts of severe storms on these sensitive ecosystems. These transects are monitored once per year using the SeagrassNet protocol, to measure changes in density of the eelgrass beds over time. Monitoring of the invasive European Green Crab continued in conjunction with the eelgrass monitoring.

Smelt spawning surveys were undertaken for the first time in 2021. With matching funds from the U de M (from the New Brunswick Wildlife Trust Fund), and guidance and training from the Department of Fisheries and Oceans, watercourses have been evaluated from the Cocagne River to Baie Verte over the last 2 years.

Coastal restoration has been an area of great interest, and the SBWA has worked to increase its capacity for ecological restoration around sand dunes and in habitats along the coastline.

Public education and outreach activities are an integral part of all SBWA projects. A partnership with the Shediac Bay Yacht club has produced a boater awareness campaign, aiming to promote best environmental practices for boaters and the promotion of pumping station locations in Southeast NB. The Shediac Bay Yacht Club and Parlee Beach Provincial Park both received a Blue Flag certification in 2019. As a partner in this program, the SBWA helps deliver educational materials and resources.

The SBWA continues to develop public educational materials such as signage, interpretation panels, videos, handouts and social media postings. The Association has expanded its digital outreach on several social media platforms. The present report highlights the monitoring results and actions that have been undertaken in 2022.

1.1 Overview of the Shediac Bay Watershed

The Shediac Bay Watershed covers 420 km^2 of land area and stretches along 36 km of coastline, from Cap Bimet to Cap-de-Cocagne (Figure 1). The Shediac Bay Watershed is composed of two major river systems emptying into Shediac Bay: the Shediac River and the Scoudouc River. The Shediac and the Scoudouc Rivers are characterized by small tributaries covering watersheds of 201 km^2 and 143 km^2, respectively. The Shediac River is composed of two major water arms. The northern water arm is created by the convergence of the McQuade Brook, the Weisner and the Calhoun Brook. The southern water arm of the Shediac River is the continuation of the Batemans Brook.

Figure 1: Map of Shediac Bay watershed boundaries

2 Eelgrass Monitoring

Eelgrass (*Zostera marina*) is an important component in the ecosystem of the Shediac Bay. It is a marine plant that can grow up to two metres in deep waters. The leaves are supported by a rhizome (underground stem) on the seabed. It serves as shelter and food for a wide variety of fishes, crustaceans and shellfish. In addition, this marine plant helps filter the water column and stabilize sediment, thereby creating a buffer zone between land and water.

The *SeagrassNet* program is a global seagrass monitoring network that monitors the status of seagrass and the threats to these ecosystems. The program started in 2001, and now includes more than 126 sites in 33 countries. In 2015, the Southern Gulf of Saint Lawrence Coalition on Sustainability (Coalition-SGSL) implemented the SeagrassNet program in Atlantic Canada. In 2016, they provided equipment and training to the SBWA for the monitoring program to begin in the Shediac Bay. Since the dissolution of the Coalition-SGSL, the Ecology Action Centre in Halifax has taken the role of coordinating the eelgrass monitoring consortium for New Brunswick.

In fall 2019, hurricane Dorian caused extensive damages to the eelgrass beds. The eelgrass monitoring data, prior to the storm, will serve as a tool in monitoring of the recovery rate of the eelgrass beds. Continuing the monitoring of these habitats in 2023 will reveal the extent of the damages caused by hurricane Fiona in September 2022.

In addition, the invasive European green crab (*Carcinus maenas*) has been present in the Shediac Bay since 2010. The green crab is an invasive species originating from Europe and is capable of devastating our local eelgrass habitats (Therriault, Herborg, Locke, & McKindsey, 2008). The data collected from these annual surveys will serve to measure changes in eelgrass density and measure the ecological impacts of the green crab.

2.1 Eelgrass Scientific Consortium

The eelgrass scientific consortium is a group that is coordinated by the Southern Gulf of Saint-Lawrence Coalition, who meets to discuss the state of eelgrass habitats in the maritime provinces. The SGSL-Coalition also went through a transition in 2021; the departure of the executive director and the lack of a replacement has caused the dissolution of the Coalition.

Thankfully, the remaining assets and legacy projects have been transferred to the Ecology Action Centre (EAC) in Halifax. The EAC has taken the lead on the coordination of the eelgrass monitoring and scientific consortium for the NB organizations.

Although no official meeting was held in 2022, due to staff turnover at the EAC, the groups met on several occasions to prepare a multi-year funding proposal (2022-2024) that was submitted to

the DFO- Ocean Management Fund. The funding was approved in 2022 and will supplement the costs of the eelgrass and green crab monitoring projects in the Shediac Bay. This project will also support Blue Carbon sampling, to measure the capacity for carbon storage in eelgrass beds at multiple sites in New Brunswick and Nova Scotia.

2.2 Methods

At each assessment site, a line crossing the eelgrass bed is drawn perpendicular to the shoreline. Three transects, parallel to the shoreline, are then determined using the following criteria:

- Transect A: Shallow station (1m into the eelgrass bed from the landward edge with continuous presence of eelgrass)
- Transect B: Mid-depth station (between deep and shallow stations or at an interesting transition between species)
- Transect C: Deep station (1m into the eelgrass bed before the end of a continuous eelgrass presence)

All transects are marked with three permanent screw anchors. The anchors are placed at the distance of 0m, 25m and 50m. GPS coordinates are taken for each anchor.

During the eelgrass assessment, 12 $1m^2$ quadrants are measured on each transect. Quadrant locations are determined in advance by the SeagrassNet program. Fifty metres tapes are prepared in advance with the quadrants identified. The tapes are attached to the anchors at the established distances. The quadrants are then positioned on the tape at the identified distances.

A photo of each quadrant is taken and sent to SeagrassNet. Herbarium sheets of each seagrass species are prepared for the International Seagrass Herbarium and sent to SeagrassNet for verification.

Total cover of eelgrass and other seagrass is visually estimated as a percentage of each species in the quadrants. Canopy height is measured from an average height eelgrass in the quadrant. Any evidence of seagrass grazing is recorded.

2.3 Shediac River Site

The Shediac River Estuary site is located at Shediac Bridge just east of the Route 134 bridge (Table 1 & Figure 2). This site was established in August 2017. Access is possible from Route 134 across the riprap.

Table 1. Shediac River eelgrass monitoring site coordinates

Shediac River						
Transect	**Left**		**Center**		**Right**	
	Latitude	**Longitude**	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	N 46°16'15.63"	W 64°34'24.52"	N 46°16'15.78"	W 64°34'23.38"	N 46°16'15.92"	W 64°34'22.23"
B	N 46°16'16.49"	W 64°34'24.37"	N 46°16'16.57"	W 64°34'23.21"	N 46°16'16.69"	W 64°34'22.10"
C	N 46°16'17.25"	W 64°34'24.41"	N 46°16'17.29"	W 64°34'23.20"	N 46°16'17.30"	W 64°34'22.08"

Figure 2. Shediac River eelgrass monitoring sites

2.3.1 Results

The 2022 sampling took place on September 12th. This site was heavily impacted by Hurricane Dorian in fall 2019. The eelgrass bed was devastated by the strength of the winds and waves. Since 2019, there has been barely any eelgrass left in the study areas. Continued monitoring will be useful to measure the recovery of this eelgrass bed.

2.3.1.1 Average height of eelgrass

Plant height at the Shediac River site has had no significant change since 2020. The average height of eelgrass had been increasing in years prior to 2019 in all transects, however, Hurricane Dorian eliminated the Shediac River eelgrass bed almost entirely. No measure of height could be taken in 2022 due to the absence of eelgrass (Figure 3).

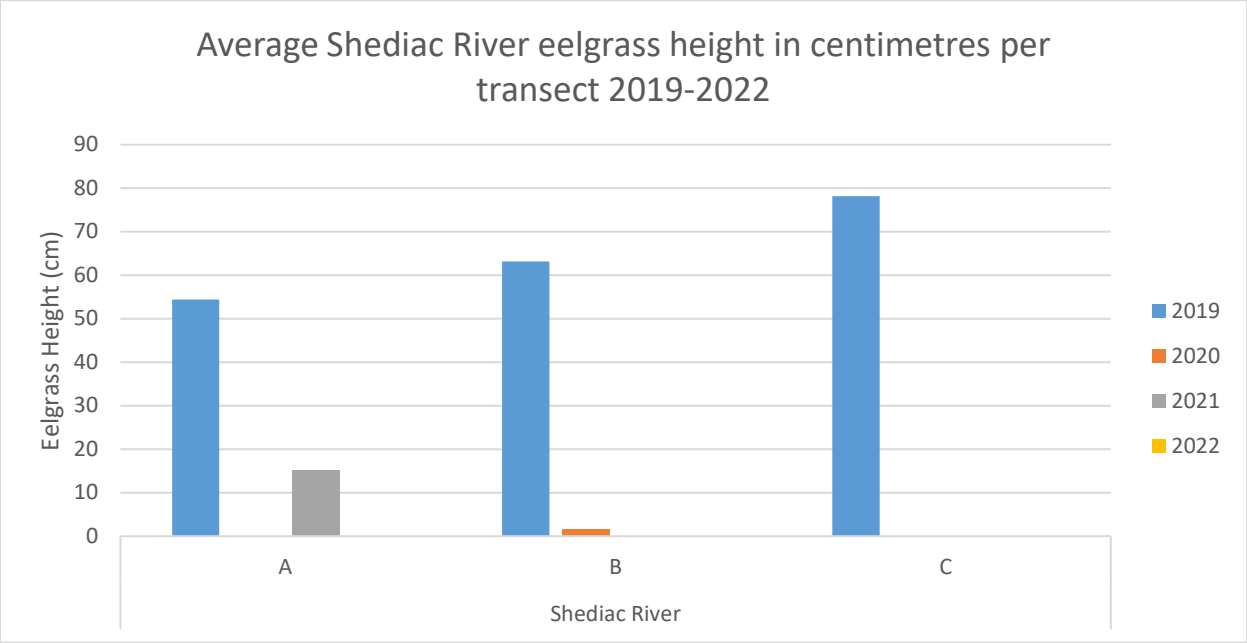


Figure 3: Average Shediac River eelgrass height in centimetres per transect 2019-2022

2.3.1.2 Average Percentage of Cover

The average percent cover also has had no significant change since 2022. Similar to the average height, the average percent cover of eelgrass had been increasing yearly prior to 2019. The Shediac River transects had no presence of eelgrass (*Appendix A – Shediac River Site*), therefore no average percent cover could be measured in 2022 (Figure 4).

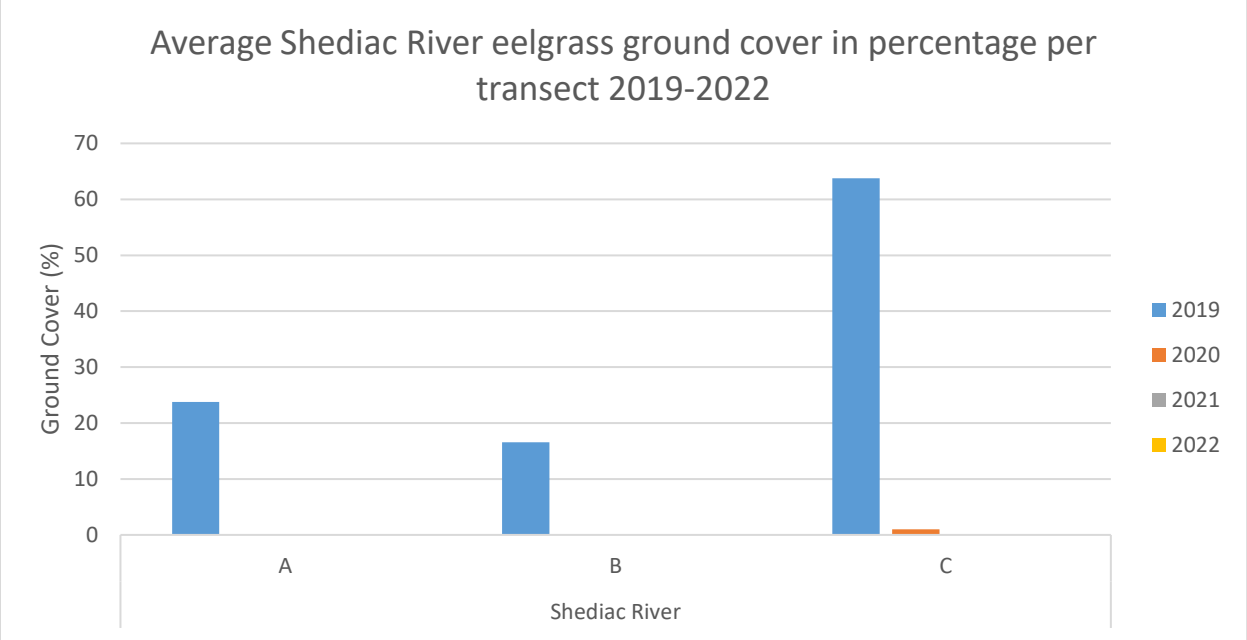


Figure 4: Average Shediac River eelgrass ground cover in percentage per transect 2019-2022

2.4 Scoudouc River Site

The site is located in the Scoudouc river estuary and is accessed from Heron Lane. The SBWA has received permission from the property owners to use the road and permission from the Greater Shediac Sewage Commission to park at their lift station for easy access to the beach (Figure 5). This site was established in 2016. In 2019, the site was re-established in an area slightly further north (Table 2). The nearshore (A) transect of the original site being too shallow for a proper assessment.

Table 2. Scoudouc river eelgrass monitoring site coordinates

Scoudouc River						
Transect	**Left**		**Center**		**Right**	
	Latitude	**Longitude**	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	N 46°13'37.37"	W 64°33'31.60"	N 46°13'36.54"	W 64°33'31.42"	N 46°13'35.84"	W 64°33'31.16"
B	N 46°13'37.64"	W 64°33'30.09"	N 46°13'36.84"	W 64°33'29.89"	N 46°13'36.00"	W 64°33'29.74"
C	N 46°13'37.89"	W 64°33'28.66"	N 46°13'37.12"	W 64°33'28.47"	N46°13'36.32"	W 64°33'28.25"

Figure 5. Scoudouc River eelgrass monitoring sites

2.4.1 Results

Sampling took place on August 12th, 2022. The Scoudouc River site was not completely eliminated by Hurricane Dorian but was still affected.

2.4.1.1 Average height of eelgrass

In both shallow (A) and mid-depth (B) transects, the average plant height has increased by 5 cm in 2022. These two transects are showing signs of recovery; however, they are still about half of what they were pre-Dorian (2019). The deep transect (C) was not as affected by hurricane Dorian. However, there has been a decrease of 12 cm in average eelgrass height for the deep transect in 2022 (Figure 6.).

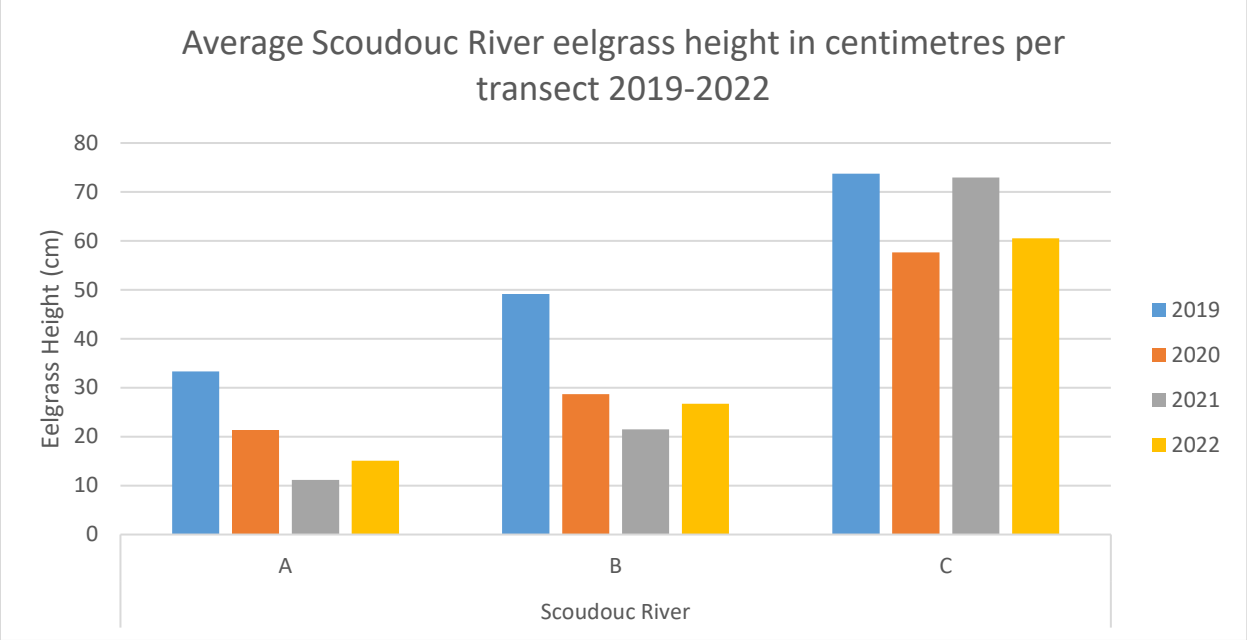


Figure 6: Average Scoudouc River eelgrass height in centimetres per transect 2019-2022

2.4.1.2 Average Percentage of Cover

The average percent cover of eelgrass showed the same trends as the average height. In both shallow and mid-depth transects there was an increase of 16% and 12% respectively in 2022. The offshore transect, however, has had a decrease of 7% (Figure 7).

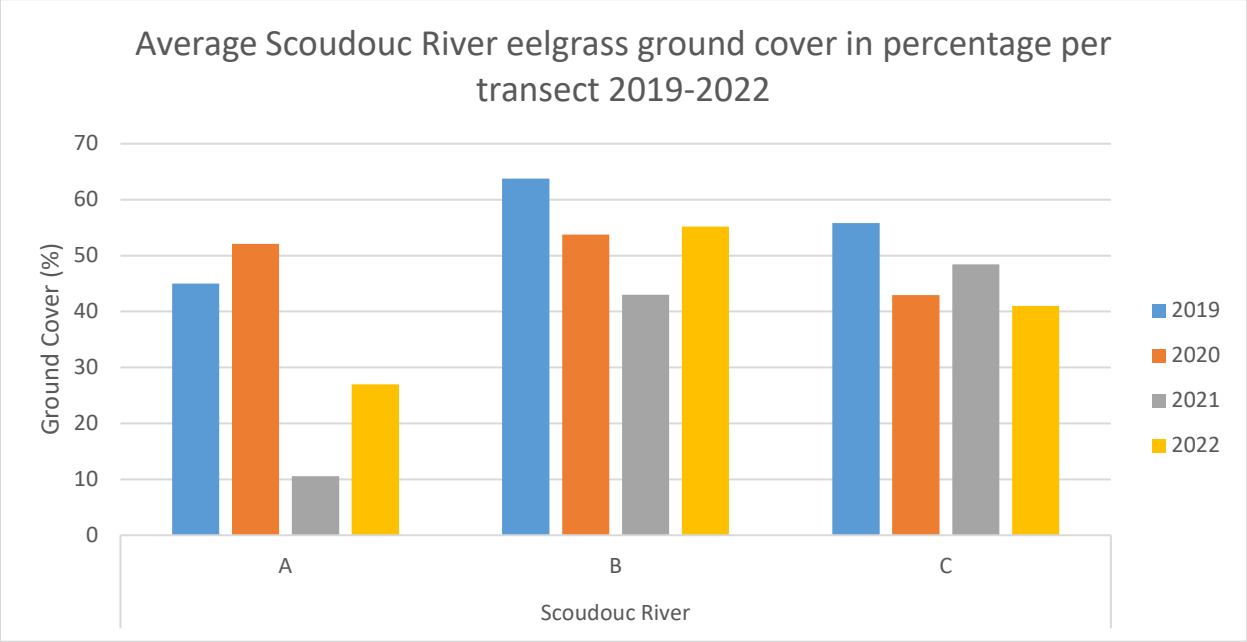


Figure 7: Average Scoudouc River eelgrass ground cover in percentage per transect 2019-2022

2.5 Pointe-du-Chêne Site

The Pointe-du-Chêne assessment site is located at the end of Stead Road (Table 3 & Figure 8).

Table 3. Pointe-du-Chêne river eelgrass monitoring site coordinates

Pointe-du-Chêne						
Transect	**Left**		**Center**		**Right**	
	Latitude	**Longitude**	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	N 46°13'51.21"	W 64°31'26.21"	N 46°13'51.68"	W 64°31'25.25"	N 46°13'52.13"	W 64°31'24.30"
B	N 46°13'53.39"	W 64°31'28.39"	N 46°13'53.90"	W 64°31'27.40"	N 46°13'54.34"	W 64°31'26.42"
C	N 46°13'55.32"	W 64°31'30.15"	N 46°13'55.71"	W 64°31'29.15"	N 46°13'56.18"	W 64°31'28.25"

Figure 8: Point-du-Chêne eelgrass monitoring sites

2.5.1 Results

This site was sampled on August 8th and 10th, 2022. This site was also affected by Hurricane Dorian; however, it is showing signs of recovery.

2.5.1.1 Average height of eelgrass

This is the first year since hurricane Dorian that the average height of eelgrass in all sites has increased. Compared to 2021, the shallow transect has increased 10 cm, mid-depth and deep transects have both increased 5 cm (Figure 9).

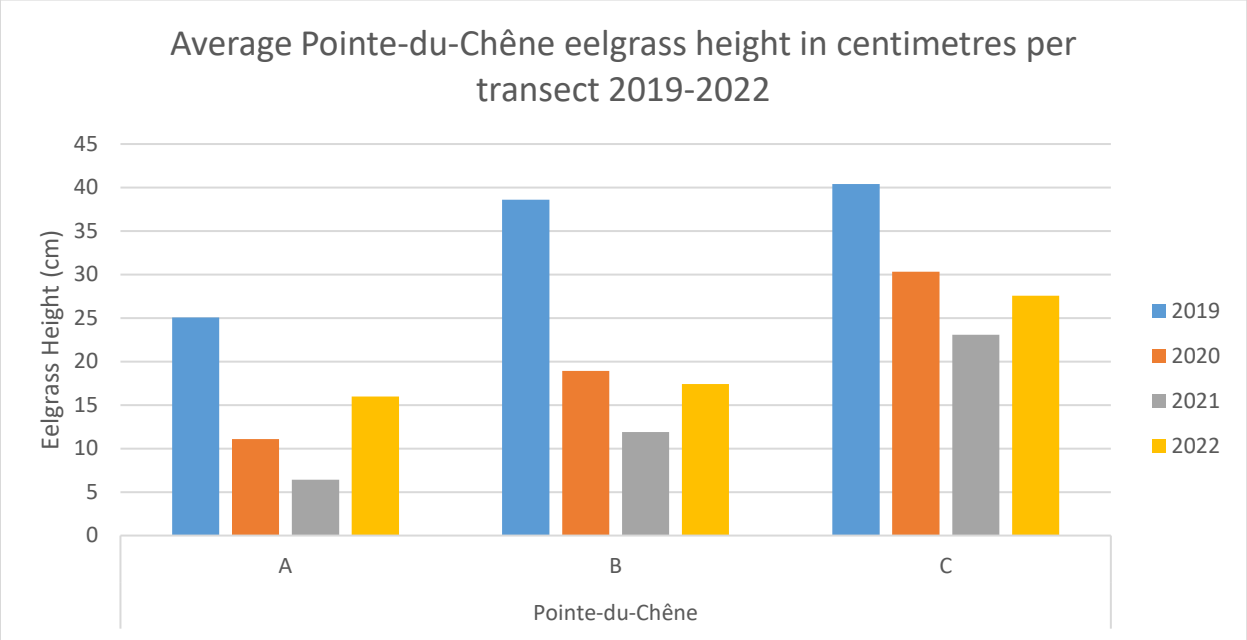


Figure 9: Average Pointe-du-Chêne eelgrass height in centimetres per transect 2019-2022

2.5.1.2 Average Percentage of Cover

The average percent cover has mostly decreased yearly since 2019. In 2022, all sites have had an increase in their plant cover. Mid-depth and deep transects both had an increased of 8%. The shallow transects had a slight increase of 3%(Figure 10).

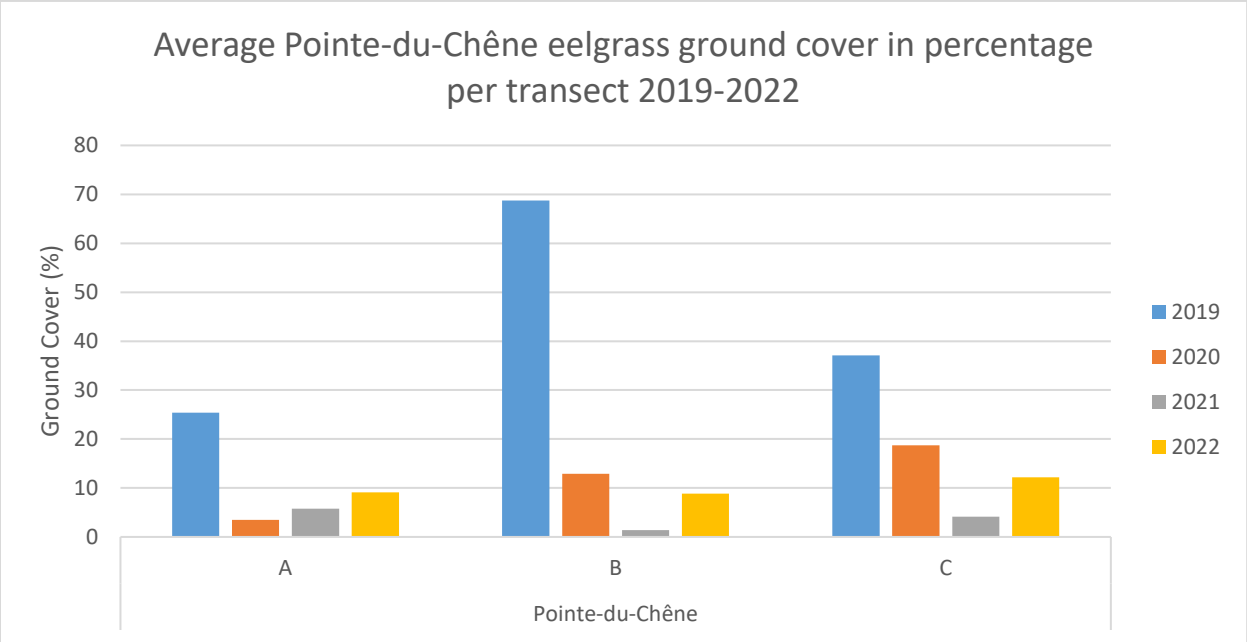


Figure 10: Average Pointe-du-Chêne eelgrass ground cover in percentage per transect 2019-2022

2.6 Grande-Digue Site

The Grande-Digue site was established near the Grande-Digue dune at the end of Allée des Faisans Road (Table 4 & Figure 11). Permission was obtained from the landowner for parking and access to the shore.

Table 4. Grande-Digue eelgrass monitoring site coordinates

Grande-Digue						
Transect	**Left**		**Center**		**Right**	
	Latitude	**Longitude**	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	N 46°18'35.36"	W 64°31'10.69"	N 46°18'34.71"	W 64°31'11.39"	N 46°18'34.04"	W 64°31'11.99"
B	N 46°18'34.31"	W 64°31'8.39"	N 46°18'33.67"	W 64°31'8.99"	N 46°18'32.94"	W 64°31'9.58"
C	N 46°18'33.32"	W 64°31'6.09"	N 46°18'32.66"	W 64°31'6.71"	N 46°18'31.95"	W 64°31'7.40"

Figure 11: Grande-Digue eelgrass monitoring sites

2.6.1 Results

The sampling took place on August 26th and September 6th. This site was slightly affected by hurricane Dorian, however, it has since mostly recovered.

2.6.1.1 Average height of eelgrass

The eelgrass in Grand-Digue has shown signs of excellent recovery and was the least affected by Hurricane Dorian. However, all sites have had a decrease in average eelgrass height in 2022. Shallow, mid-depth and deep transects had a 1 cm, 13 cm, and 6 cm decrease in average eelgrass height respectively (Figure 12).

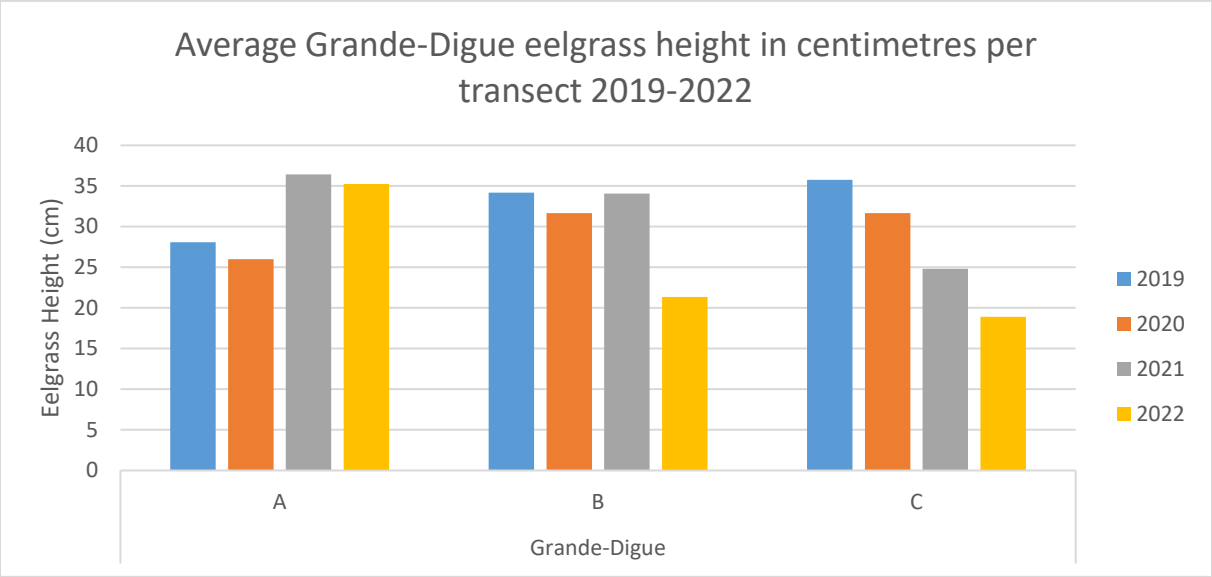


Figure 12: Average Grande-Digue eelgrass height in centimetres per transect 2019-2022

2.6.1.2 Average percentage of cover

The same trends were recorded in the average percent cover. The mid-depth and deep transects had a decrease of 7% and 30% respectively since 2020. The shallow transect, however, increased 17% (Figure 13).

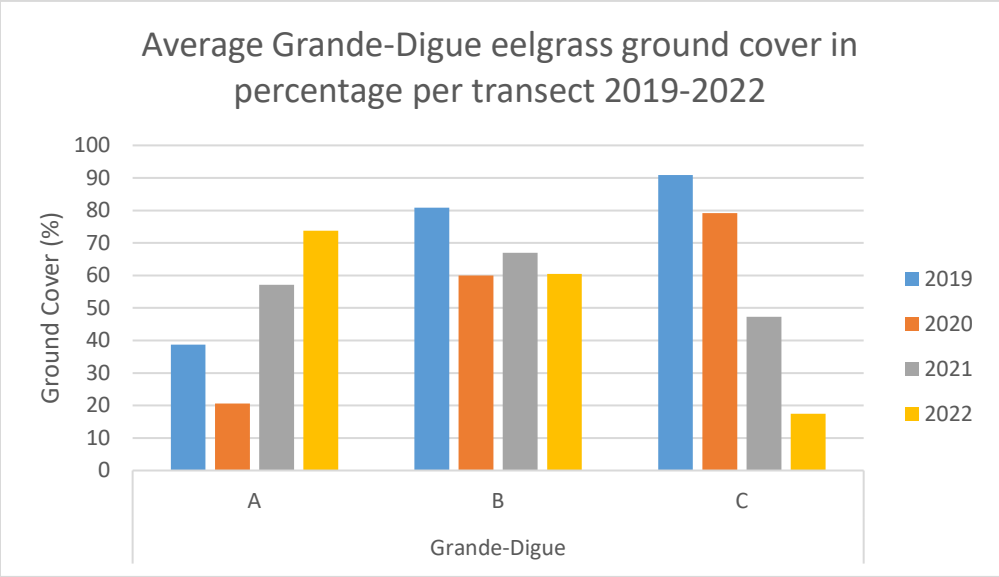


Figure 13: Average Grande-Digue eelgrass ground cover in percentage per transect 2019-2022

2.7 Summary of Results

The different parameters evaluated in eelgrass monitoring are percent cover, average number of plants, and total plant height. In this section, the parameters are compared across all eelgrass monitoring sites.

2.7.1 Average height of eelgrass

Looking at the maximum average plant height in each site, we see that the tallest plants on average are found in the deep transects of the Scoudouc River site (Figure 15). The plants at the Grande-Digue site are the least affected by Hurricane Dorian and in the shallow transect, plants have grown taller than pre-Dorian measurements (2019). The Point-du-Chêne site has had it's first increase in average plant height since 2019 across all transects. The Shediac river site is still suffering from the effects of Hurricane Dorian, no plants were available to record height (Figure 14).

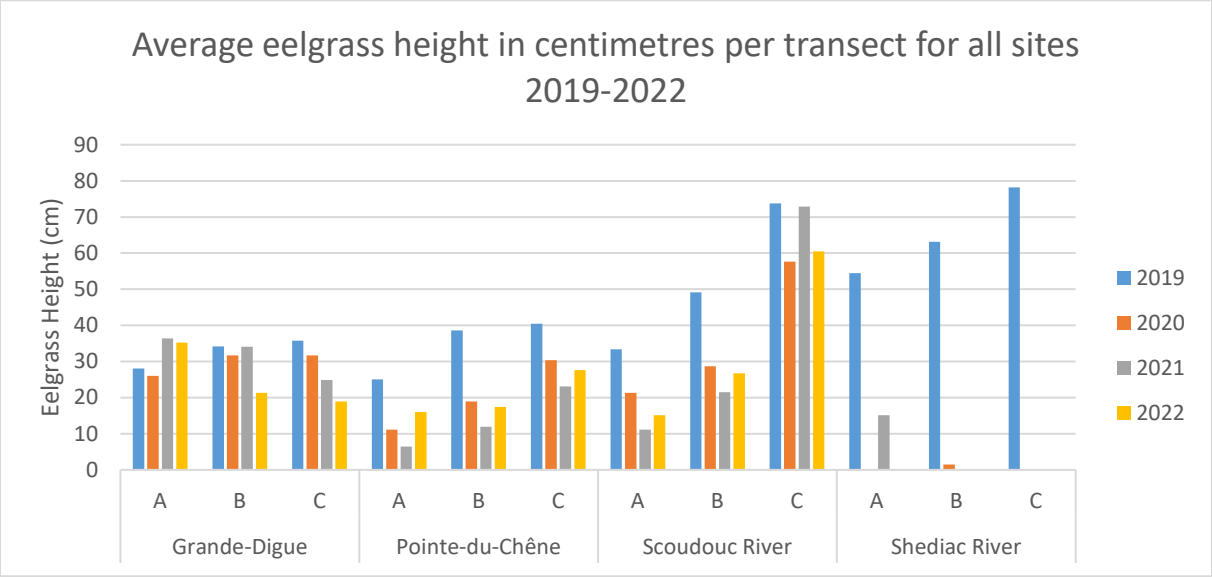


Figure 14: Average eelgrass height in centimetres per transect for all sites 2019-2022

2.7.2 Average percent cover

The Grande-Digue and Scoudouc River sites have the most percentage cover. They also show the best recovery from Hurricane Dorian. The Grande-Digue site is the only site to have a transect (Transect A) with a higher percentage cover post-Dorian. The Pointe-du-Chêne site was heavily affected by Dorian, however, for the first time since 2019, it is showing signs of recovery. Unlike the other sites, the Shediac River has not shown any signs of recovery since Hurricane Dorian. This hurricane caused a lot of damage to the coast and appears to have eliminated the eelgrass almost entirely (Figure 15).

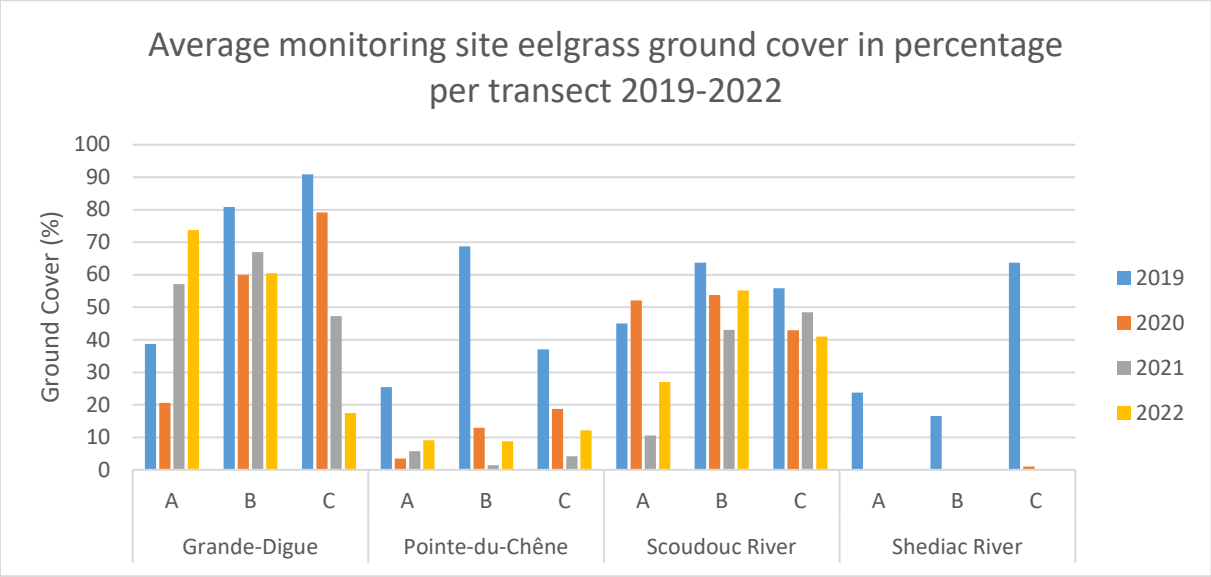


Figure 15: Average monitoring site eelgrass ground cover in percentage per transect 2019-2022

2.7.3 Average shoot density

In 2022, the Grande-Digue site had the highest plant density followed by Scoudouc River. Similar to the other parameters, the Grande-Digue and Scoudouc Rivers sites have had the greatest recovery following hurricane Dorian. The Pointe-de-Chêne site has shown some signs of recovery in 2022 (Figure 16).

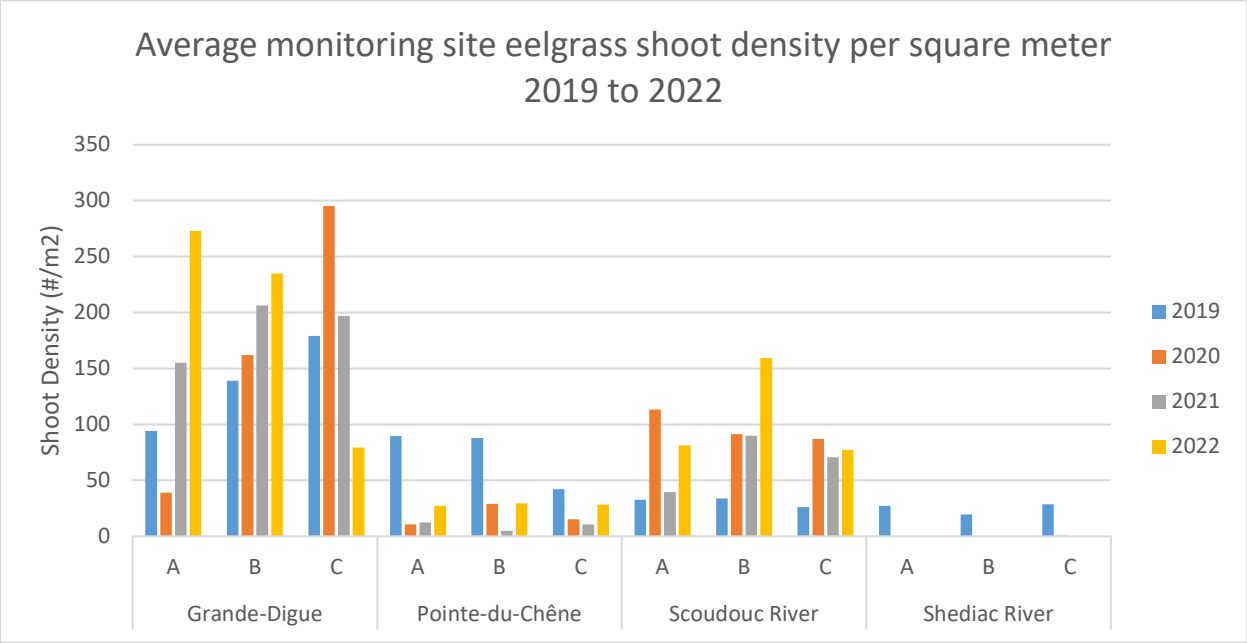


Figure 16: Average monitoring site eelgrass shoot density per square meter 2019 to 2022

3 Green Crab Monitoring

A native species in Europe and Northern Africa, the green crab has invaded the Atlantic and Pacific coasts of North America, South Africa, Australia, South America, and Asia. In North America, the distribution of green crabs now extends from Newfoundland to Virginia and from British Columbia to California (Klassen & Locke, 2007).

The green crab preys on a wide variety of marine organisms including commercially important species. Impacts on prey populations are greater in soft-bottom habitat and in environments sheltered from strong wave action. In the search for food, green crab has been documented to destroy eelgrass beds, a productive habitat for many juvenile fish species and crustaceans (Vercaener & Stephton, 2016). Destruction of this important habitat will have detrimental effects on the health of the Bay, as it has in other locations. The green crab also poses a serious threat to littoral communities, as it feeds on a variety of intertidal animals, including; fish, oysters, mussels, clams and juvenile crabs (Therriault, Herborg, Locke, & McKindsey, 2008)

In response to the discovery of the invasive European green crab in the Shediac Bay in 2010, the SBWA has been conducting a population monitoring program since 2013. After monitoring for nine consecutive years, both by sampling using Fukui traps and with the CAMP sampling program, valuable information has been gathered on their population trends and distribution in the Shediac Bay.

3.1 Methods

The green crab population monitoring will continue using the same protocol as previous years; ten Fukui crab traps are baited with sardines, attached to buoys, and placed throughout the Shediac Bay (Table 5 & Figure 17). The traps are placed for 24 hours, then are collected and emptied of their contents. The green crabs are counted, sexed and retained. All other species found in the traps are immediately released back into the water. The sampling is done from June to October, in the third or fourth week of the month depending on weather and tides.

Table 5. Green crab monitoring sites coordinates

site	Green Crab – Site details	Coordinates	
A	Pass Under the Bridge Chez Leo	46° 16' 17.52"	64° 34' 32.44"
B	Bridge Chez Leo, left of boat launch point	46° 16' 19.18"	64° 34' 329.01"
C	In front of CAMP site (Oak Point)	46° 16' 22.52"	64° 33' 48.07"
D	Shediac Island (middle) off line of oyster lease buoys	46° 15' 53.72"	64° 33' 00.20"
E	Yellow House, shore before Friars	46° 15' 15.87"	64° 34' 02.86"
F	flag St Martins in Woods Rd	46° 14' 06.84"	64° 33' 38.09"
G	Before crossing bridge Scoudouc River Lobster from Marina	46° 13' 10.98"	64° 33' 16.69"
H	After crossing bridge opposite Shediac Lobster inside next to channel	46° 13' 04.65"	64° 33' 11.76"
I	Outer Shediac marina opposite crane	46° 13' 34.70"	64° 33' 43.45"
J	Pointe-du-Chêne inner South Cove (eelgrass site)	46° 14' 06.62"	64° 31' 26.75"

Figure 17. Green crab monitoring sites

3.2 Results

Since 2013, the amount of green crabs caught has fluctuated. Year-to-year comparisons in the green crab monitoring program are made using Catch Per Unit Effort (CPUE) due to varying sampling period lengths. CPUE is a metric used in fisheries science to estimate the amount of fish caught per unit of fishing effort, such as the number of fish caught per hour of fishing. It is commonly used to monitor changes in fish populations over time and to evaluate the effectiveness of different fishing strategies. A higher CPUE generally indicates a higher abundance of fish in the area being fished (Moreno & Morato, 2017).

The largest fluctuation occurred from 2015 to 2016; the CPUE went from 0.6 crab/hour to 7.8 crab/hour. The CPUE decreased from 2016 to 2019, however, it has been increasing since 2019 (Figure 18.).

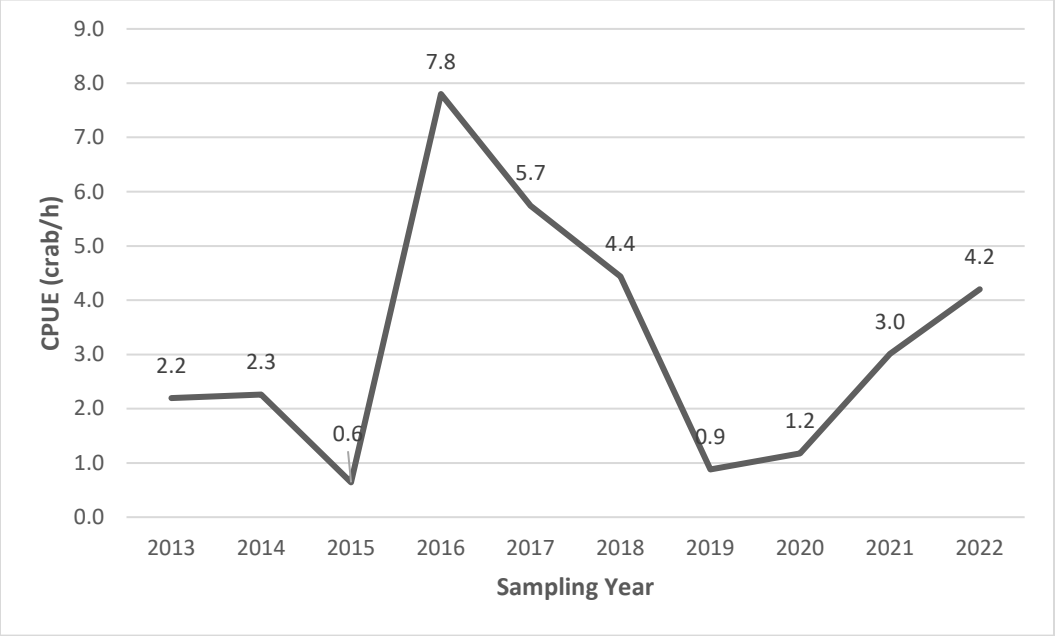


Figure 18: Total amount of green crab caught per year

The 2022 sampling was carried out from June to August and in October. Male crabs were the most abundant sex across all monitoring months. The month of August had the highest count of male to female ratio (Table 6). The highest counts of green crab were recorded in June at site C (Figure 19). Sampling sites experienced fluctuations of green crab populations throughout the monitoring period. High numbers of green crabs were caught at site B, C, F and I (Figure 19). These four sites are located in both the Shediac and Scoudouc River estuaries. The sites with the lowest amount of caught crabs through the 2022 monitoring period were sites E and J (Figure 19).

Table 6. Ratio of male to female caught per month for the 2022 sampling period

	June	July	August	October
Ratio (M to F)	2	3	9	5

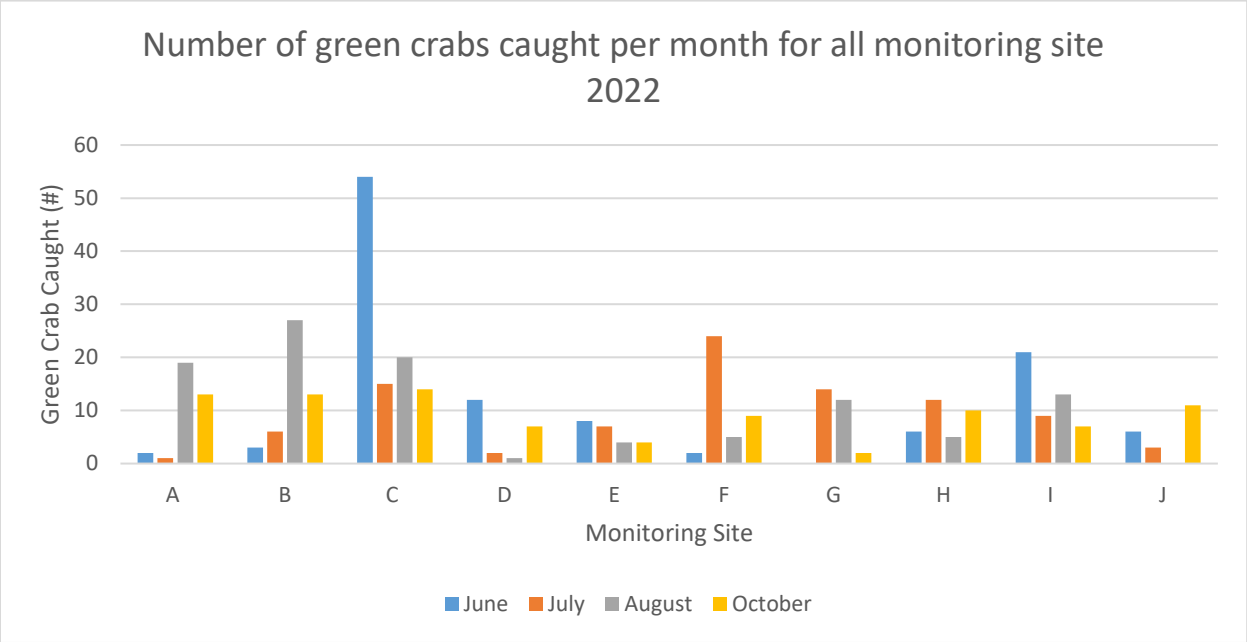


Figure 19: Number of green crabs caught per month for all monitoring site 2022

4 Rainbow Smelt Surveys

The rainbow smelt (*Osmerus mordax*) is an anadromous fish with a habitat distribution that spans across the North American east coast from Labrador to New Jersey (UNB, n.d.). This species is an important forage fish for many commercial and cultural significant species like the Atlantic cod (*Gadus morhua*), Atlantic salmon (*Salmo salar*), stripped bass (*Morone saxatilis*), and grey seal (*Halichoerus grypus*). The rainbow smelt are born in freshwater and spend most of their lives in saltwater. They only return to freshwater to spawn (Fuller, Maynard, Larson, Markled, & Bartos, 2022). Spawning of Rainbow Smelt occurs after ice-out in early spring. The eggs a very adhesive and stick to whatever they come in contact with. With a diameter of about 1mm, the eggs take two to three weeks to hatch (UNB, n.d.).

In partnership with the Université de Moncton, rainbow smelt surveys were carried out by the SBWA and other watershed groups in small streams and rivers in South Eastern New Brunswick, from Cocagne to Baie Verte. The surveys served to address the lack of data on rainbow smelt spawning areas along the Northumberland Strait.

4.1 Methods

The rainbow smelt surveys began in March 2022. The water temperature of a small local stream was checked daily to monitor for the start of spawning season. When water temperature approached 5^{o}C, surveying began. Potential watercourses containing smelt spawning habitat were identified beforehand. Surveys consisted of checking the stream substrate for smelt eggs. The data recorded include:

- GPS coordinates
- Habitat type (run, riffle, pool)
- Stream bed composition (Fine, sand, gravel, cobble, bolder)
- Presence of human and organic debris
- Presence of dead or live fish
- Substrate where eggs are found
- Proportion of dead eggs
- Proportion of submerged/exposed eggs
- Length of spawning sites

4.2 Results

A total of 51 watercourses were identified as potential rainbow smelt spawning habitat in the Shediac bay watershed. Due to lack of access and private property, only 23 watercourses could be surveyed (Appendix B). Of the 23 sites, four were found to contain smelt eggs (Figure 20, 21, & 22). In, addition five sites were found to have a barrier to upstream spawning. The largest spawning area was located in the Calhoun Brook, with an area of around 1105m^2.

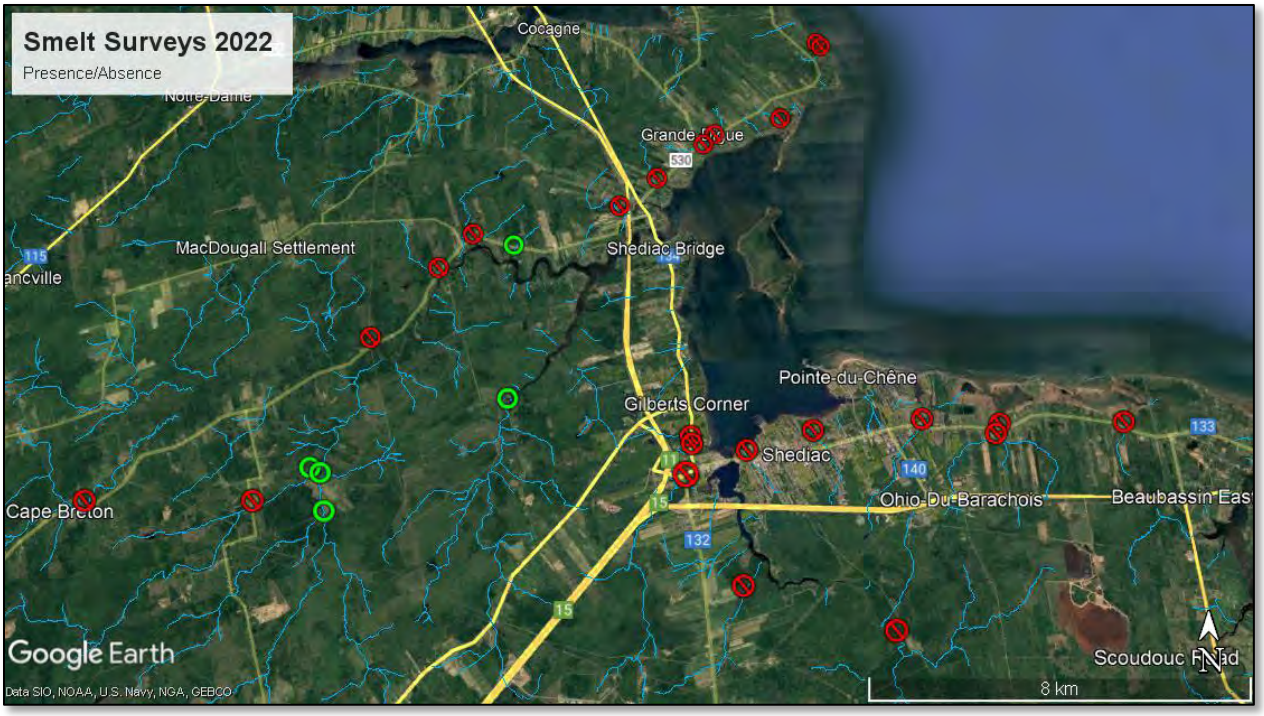


Figure 20: Smelt presence/absence survey results in the Shediac bay watershed

Figure 21: Smelt crowded in small stream in the Shediac bay watershed

Figure 22: Dead eggs (white dots) on stream substrate

5 Bank Swallow Surveys

The Bank Swallow is an aerial insectivorous bird that nests in colonies on vertical cliff faces or banks along waterbodies and human-made habitats. The causes of Bank Swallow population declines are unclear. Multiple factors likely have a cumulative impact on the species. The loss of natural nesting sites from erosion control measures and a reduction in prey availability as a result of climate change may create further pressure on the species (Environment and Climate Change Canada, 2021).

In 2022, a continuation of bank swallow surveys was undertaken by the SBWA. Surveys were carried out at Parlee Beach, Boudreau area, and Cap-de-Cocagne by summer students from mid-July to early August. The best time to record colony information is late May to mid July, however, the surveys were still carried out successfully. The surveyed sites were chosen based on past surveys. The summer students received training through Birds Canada's bank swallow videos.

5.1 Methods

The bank swallow surveys are based on visual observations. The field sheets used in the surveys were created by Birds Canada (Appendix C). The information recorded during the surveys is the following:

- Visit Details
    - Temperature
    - Wind
    - Cloud cover
    - Precipitation
    - # of birds
    - # of burrows
- Site and Habitat Details
    - Colony locations
    - Site description
    - Colony habitat type
- Additional Information
    - Colony history
    - Colony length
    - Breeding evidence
    - Stewardship indicator

5.2 Results

A total of eight colonies were identified during the bank swallow surveys. Only one was recorded as not active. Most colonies were found in coastal bluff areas (Table 7). All colonies are within a 100m distance of either a building, roads, and/or shoreline hardening.

Table 7: Bank swallow survey results overview

Colony Number	Location			Habitat Type	Colony Activity
	Area	Latitude	Longitude		
1	Parlee Beach	46.24166	64.51466	Dune	Yes
2	Parlee Beach	46.24122	64.51218	Dune	Yes
3	Boudreau	46.24121	64.51219	Coastal Bluff	Yes
4	Boudreau	46.23889	64.48975	Coastal Bluff	Yes
5	Cocagne	46.33324	64.59824	Coastal Bluff	Yes
6	Cocagne	46.33389	64.60004	Coastal Bluff	No
7	Cap-de-Cocagne	46.33285	64.59743	Coastal Bluff	Yes
8	Cap-de-Cocagne	46.36301	64.54882	Coastal Bluff	Yes

5.2.1 Parlee Beach

Two colonies were surveyed at Parlee Beach (Figure 23). These were the only colonies observed nesting in dunes. Both were active and had occupied nests with pairs of swallows. Bank swallows at colony 1 were observed carrying food and fecal sacs, both signs of an active and breeding colony. Due to the proximity to beach goers, the swallows were also observed having agitated behaviour including making anxiety calls. A total of 20 burrows and five swallows were counted at colony 1 (Figure 24). For colony 2, seven burrows and two swallows were counted (Appendix C).

Figure 23: Parlee Beach Provincial Park bank swallow colonies surveyed in 2022

Figure 24: Bank swallow burrows at Parlee beach

5.2.2 Boudreau Area

Two colonies were surveyed in the Boudreau area (Figure 25). These colonies are located in sandstone cliffs on private waterfront properties (Figure 26 & 27). Both colonies had occupied nests. Colony 3 had pairs of swallows sharing burrows and adults carrying fecal sac. Small groups of people (4-6) were seen in the vicinity of the colonies. These colonies are quite large with around 180 and 71 burrows for colonies 3 and 4 respectively (Appendix C).

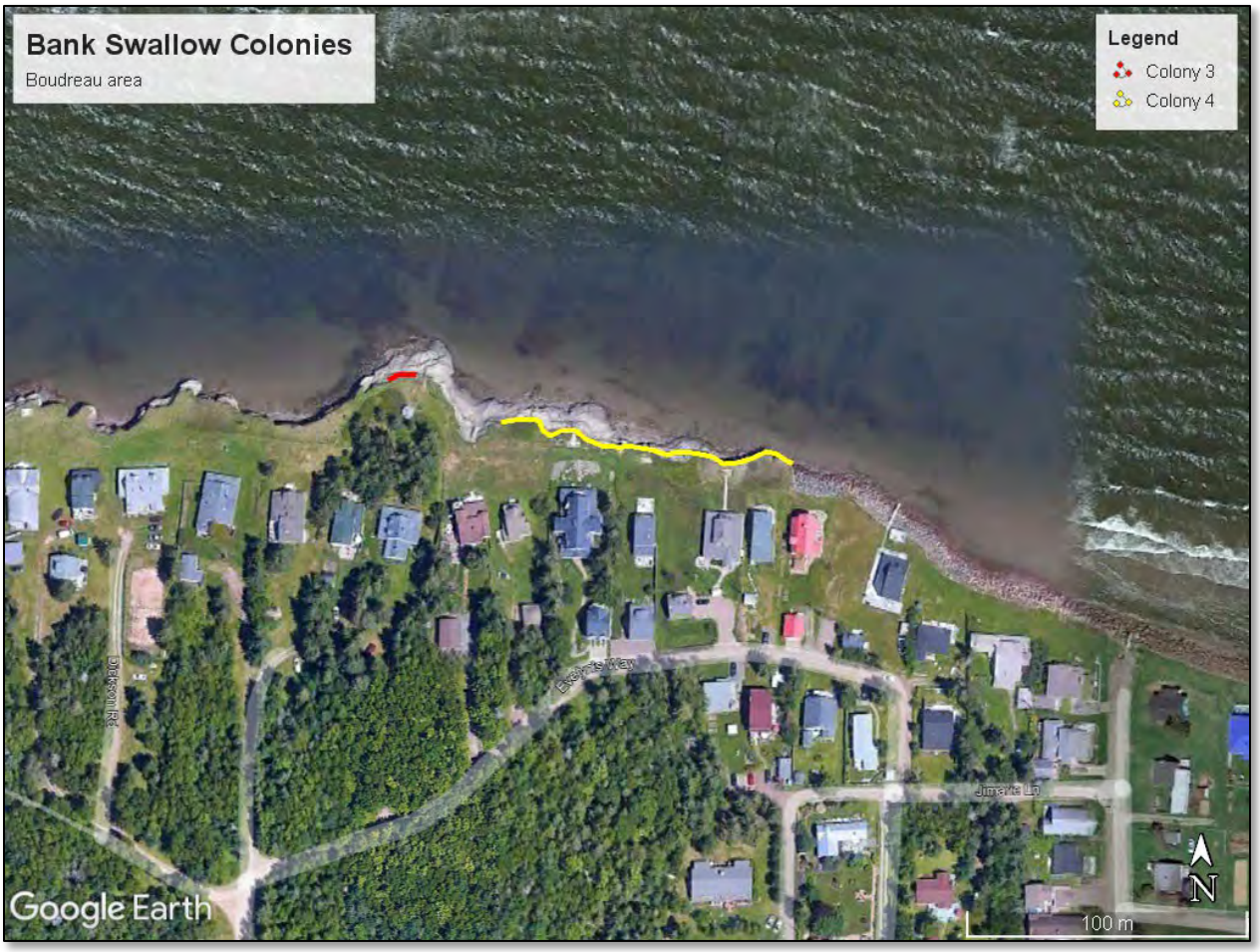


Figure 25: Boudreau area bank swallow colonies surveyed in 2022

Figure 26: Bank swallow burrows in the Boudreau area (1)

Figure 27: Bank swallow burrows in the Boudreau area (2)

5.2.3 Cocagne

Two colonies were surveyed in Cocagne (Figure 28). Similar to the Boudreau area colonies, these colonies are located in sandstone cliffs on private waterfront properties (Figure 29 & 30). A total of 116 burrows and 40 swallows were counted at colony 5. Colony 6 had seven burrows but had no swallow activity (Appendix C).

Figure 28: Cocagne bank swallow colonies surveyed in 2022

Figure 29: Bank swallow burrows in Cocagne (1)

Figure 30: Bank swallow burrows in Cocagne (2)

5.2.4 Cap-de-Cocagne

Two colonies were surveyed at the Cap-de-Cocagne (Figure 31). These colonies were also found in sandstone cliffs on private waterfront properties (Figure 32 & 33). Both were active and had occupied nests. A total of 46 burrows and two swallows were counted at colony 7. For colony 8, 28 burrows and three swallows were counted (Appendix C).

Figure 31: Cap-de-Cocagne bank swallow colonies surveyed in 2022

Figure 32: Bank swallow burrows in Cap-de-Cocagne (1)

Figure 33: Bank swallow burrows in Cap-de-Cocagne (2)

6 Environmental Restoration

6.1 Tait Brook Restoration

The Tait Brook underwent modifications as part of a flood protection plan; the area was cleared of trees so that the stream could be widened. This created a stormwater retention system to protect neighbouring infrastructure from flooding. New culverts were installed to protect roads from washouts. The restoration of the Tait Brook included the planting of native trees and shrubs, to reforest the new banks on an approximate 200m long section of the stream. The work took place between Donat and Clarence Street. Native vegetation was planted in order to recreate the natural ecosystem that was once present in that area.

The various native trees planted were sourced from the SBWA nursery. The placement of these trees is meant to mimic a natural forest patch. Due to a concern for the build up of organic debris in the downstream culvert, planting only occurred in the flat areas on the banks of the stormwater retention system. A total of 78 trees were planted:

- 23 Pine (*Pinus spp.*)
- 40 Spruce (*Picea spp.*)
- 15 Maple (*Acer spp.*)

Figure 34: Tait brook restoration area

Figure 35: Tait's brook planting arrangement

6.2 Dune Restoration and Protection

The SBWA was contacted by a citizen during the winter of 2021, with concerns about the degradation of the dune at Belliveau Beach in Pointe-du-Chêne. In 2022, a continuation of the dune fencing was undertaken by the SBWA. In an effort to fortify this local dune, about a half kilometre of dune fencing was installed at Belliveau beach. The fence started at the eastern limit of Parlee Beach and finished short of the canal. The length and surface area of this restoration project is 410 metres and 2, 756 square metres respectively.

Figure 36: Dune fencing at Belliveau beach

The fence was installed about five feet away from the dune as to allow for future growth of marram grass (*Ammophila spp.*). The fence keeps beach goers from getting too close to the dunes and allow for the establishment of marram grass. Marram grass is important as it helps lock the dunes in place thanks to their roots. This anchoring of the dunes plays an important role in preventing damage during high wind conditions. The root system can also encourage the colonization of other plants, which serve to further protect the dune.

The dune fencing is comprised of 50-foot-long segments of wooden snow fence. To secure the fence in place, they were attached to steel T-post using metal wire. The T-posts were imbedded into the sand at a depth of around three feet using a manual post driver. A portion of the fence was provided by the landowner.

Unfortunately, the entire dune fencing was destroyed by hurricane Fiona and the dune was severely damaged. The SBWA is planning on replacing the dune fencing and restoring the dune. Possible restoration actions include planting marram grass and using Christmas tree to capture windblown sand.

Figure 37: SBWA summer students installing dune fencing (left) and secured to t-post (right)

Figure 38: Dune fencing installed at Belliveau beach (Top & Bottom)

6.3 Japanese Knotweed Eradication

The Japanese knotweed (*Fallopia japonica*) is an invasive species originating from Asia that was introduced in the mid-1800s as an ornamental plant. Japanese knotweed thrives in various habitats, including riparian ecosystems and disturbed areas. It became a troublesome invader and considerable challenge to manage due to its efficient reproduction and dispersal. Native plant species are quite vulnerable to being outcompeted by a Japanese Knotweed. Growing up to heights of more than three metres, this invader can easily shade out other native plants. Native plants that are used for food and habitat by native insects, birds, and animals are replaced by this invader.

In 2022, two patches of invasive Japanese knotweed were targeted for eradication. The Japanese knotweed patches were discovered in the south cove marsh and on a private property in the town of Shediac. Both were approached with the same eradication measures. The eradication measures included the following:

1. Cut previous years' growth
2. Cover site with tarps to prevent new growth
3. Perform monthly cutting on new growth (May – October)

The tarps and regular cutting prevent the plants from performing adequate photosynthesis. This method does not produce immediate results, however, overtime the Japanese knotweed patches might be weakened enough that they are eliminated.

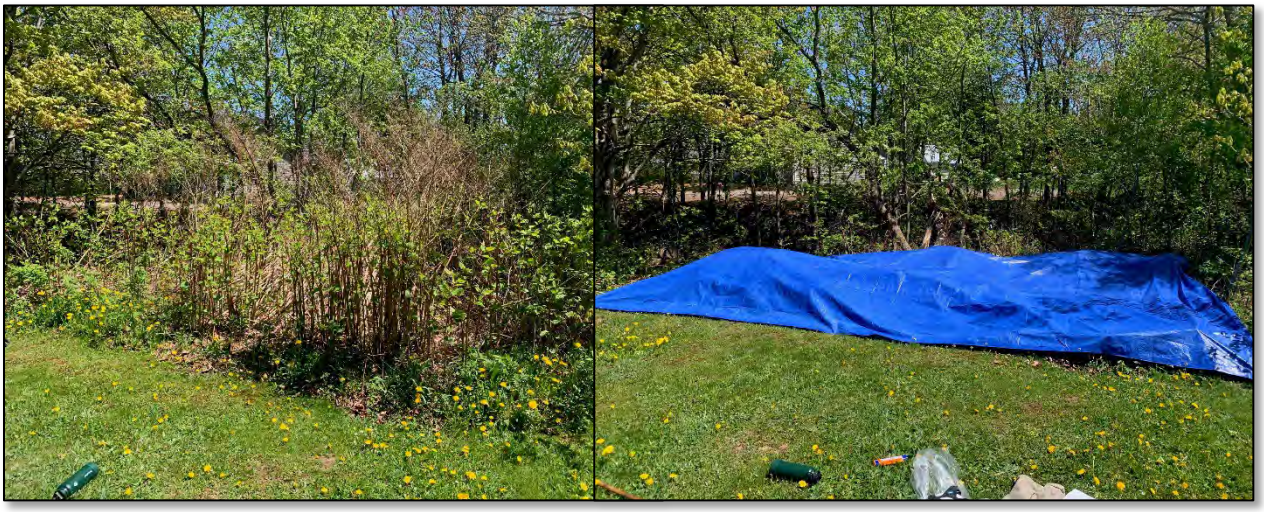


Figure 39: Japanese knotweed patch on private property before (left) and during (right) eradication methods

Figure 40: South Cove Japanese knotweed patch during eradication

7 ENVIRONMENTAL CLEANUP

7.1 Beach Sweep

In celebration of World's Oceans Day, a public beach sweep event is organized every year by the SBWA, in partnership with the Town of Shediac. This activity aims to combat marine litter, to raise awareness, and contribute to the protection and conservation of our marine environment in the Shediac Bay.

This year, the event was held on June 4th at the Pointe-du-Chêne community centre. Trash bags, gloves, hand sanitizer were provided to the volunteers. Door prizes provided by Gestion H2O in the Baie de Caraquet were handed out. We would like to thank the 24 volunteers who came to collect 54 bags of trash, to help keep our shoreline clean this year.

Figure 41:Beach Sweep 2022

8 Education

8.1 Blue Flag Certification – Shediac Bay Yacht Club

The Shediac Bay Marina (Shediac Bay Yacht Club) received their Blue Flag certification in 2019. The certification is described as the following on the Blue Flag website (Blue Flag, n.d.):

> *A world-renowned award trusted by millions around the globe, the Blue Flag programme is run by the Foundation for Environmental Education and is headquartered in Copenhagen, Denmark. In order to qualify for this prestigious award, a series of stringent environmental, educational, safety-related and access-related criteria must be met and maintained.*

The Blue Flag certification requires that marina's display information relating to local ecosystems and environmental elements. Environmental education and engagement activities are also encouraged.

As a privileged partner, the SBWA helps coordinate environmental awareness activities with the marina. In 2022, a trash cleanup was undertaken with the help of students from Louis J. Robichaud high school. The students were also given a presentation on the Blue Flag certification. This activity helps the marina reach their environmental and educational deliverables under the Blue Flag program.

Figure 42: L.J.R high school students picking up trash at the Shediac Marina

8.2 Blue Flag Certification – Parlee Beach

Parlee Beach Provincial Park also received their Blue Flag certification in 2019. The SBWA is proud to support the environmental education program at Parlee Beach, under the Blue Flag program.

Over the past few years, we have assisted with the facilitation of activities for school groups and the general public. Activities include on-site interpretation of the coastal ecosystem, such as the importance of sand dunes, the importance of salt marshes, and the various species of wildlife found at the beach (seabirds, fish, crabs, sand shrimp, etc.).

Other activities are often animated by the SBWA; treasure hunts, trash cleanups, fish sampling demonstrations, and various games from the Get Outside! NB and the Great Minds Think Outside Program. These games are science-based, designed to teach about nature while getting fresh air and exercise. The fish sampling, using a beach seine, offers the participants a first-hand view of some of the aquatic community species found in the saltwater ecosystem of the Shediac Bay.

In 2022, the SBWA assisted in the creation of three interpretation panels in partnership with CPAWS. The three themes are; the Shediac Bay, sand dunes and shallow-water species. Our role was the redaction of the panel texts, and the role of CPAWS is the design of the panels themselves. These panels will be ready for the 2023 beach season.

Figure 43: Parlee Beach Blue Flag Posters

8.3 Salt Marsh Field Trips

On June 3rd, a field trip was organized for a group of 10th grade students from the Polyvalent Louis-J.-Robichaud to the South Cove wetland in Pointe-du-Chêne.

The activities delivered come from the Ducks Unlimited Canada (DUC) Wetland Center of Excellence (WCE) program. Even though this salt marsh is not registered as a WCE, it is a great location that is full of biodiversity and is in close proximity to our local schools.

The field trip starts off with a presentation on wetlands in general, notions specific to salt marshes, and ecosystem services of coastal wetlands. A baited minnow trap is placed in the water and left alone until the end of the activities. The students then take a walk through the wetland, getting the opportunity to observe a variety of plant species as they head towards the pools of water within the marsh. The students get to do a critter dipping exercise; with the use of small dip nets, they get to sweep the muddy bed in search of saltwater invertebrates. The activity ends by checking the minnow trap and identifying anything caught before being released.

Figure 44: South Cove Wetland Field Trip with L.-J.-R. Students

8.4 Living Shoreline Workshop - Cocagne

The *Groupe de Développement Durable du Pays de Cocagne* (GDDPC) organized a series of coastal restoration and monitoring workshops, hosted by Rosmarie Lohnes of Helping Nature Heal (HNH).

The SBWA staff participated in these hands on workshops to learn the techniques of vegetating a rock wall (June 28 and August 23) and a coastal monitoring protocol using transects (August 24). Site visits were done in October with HNH, to evaluate the living shoreline projects in Cocagne, Shediac and Cap-Pelé post Fiona.

Figure 45: Vegetated rock wall workshop

Figure 46: Workshop on coastal monitoring transects

8.5 Increasing Capacity for Native Species Propagation- Workshop Series

In partnership with Vision H2O and the GDDPC, the SBWA helped organize two workshops to increase NGO's capacities to grow, propagate or purchase native species of plants, shrubs and trees. Increasing these capacities would allow environmental groups in New Brunswick for restoration projects at lower costs. The goal of these workshops are also to encourage a greater supply of native species in NB nurseries. For example, marram grass is in high demand for numerous NGO's for coastal restoration, yet no nurseries in NB have had it in stock this year.

On July 11, several groups attended the first workshop at Cornhill Nursery, hosted by Bob Osborne. This workshop focused on softwood cutting techniques for various species.

The next workshop will take place virtually, on March 16, titled "Increasing the availability of native plants in SENB".

Two surveys were developed and distributed through various channels prior to the workshop; one created for nurseries, the second for NGO's. The survey sent to nurseries is meant to collect information on the availability of native species, and to find out the barriers to increase their supply. The survey sent to NGO's aims to collect information on the species they often look for, and an estimated quantity needed per year. The results of the two surveys will help stimulate discussion during the workshop, as well as provide a perspective on the market that exists in NB for native species. The goal is for nurseries in New Brunswick to increase their supply to feed the demand. (Link for more information https://nben.ca/en/get-involved/events/all-events/678-improving-availability-of-native-plants-in-senb.html)

Figure 47: Cornhill workshop on softwood cuttings

9 Media Outreach

9.1 Media Appearance – Hurricane Fiona

Following the devastation caused by hurricane Fiona on September 24, multiple news outlets contacted the SBWA for interviews on the impacts on our coastal ecosystems. Several on-site interviews were given to show the damages caused to the shoreline and dune systems.

This was an opportunity to talk about these fragile ecosystems, and to discuss the importance of the natural ecosystem services along our shorelines and the importance of coastal restoration.

Interviews were given to Radio-Canada on September 28th, 29th and October 1st. An interview was given to CBC on October 2nd, to Global News on October 4th and to the Times & Transcript on October 5th.

Figure 48: Global News televised interview on Fiona damages to dune ecosystems

https://ici.radio-canada.ca/ohdio/premiere/emissions/la-matinale/segments/entrevue/427479/sapin-noel-erosion-cote-tempete

https://www.cbc.ca/news/canada/new-brunswick/nb-marram-grass-1.6603555

https://globalnews.ca/news/9178401/new-brunswick-sand-dunes-lost-fiona-storm/

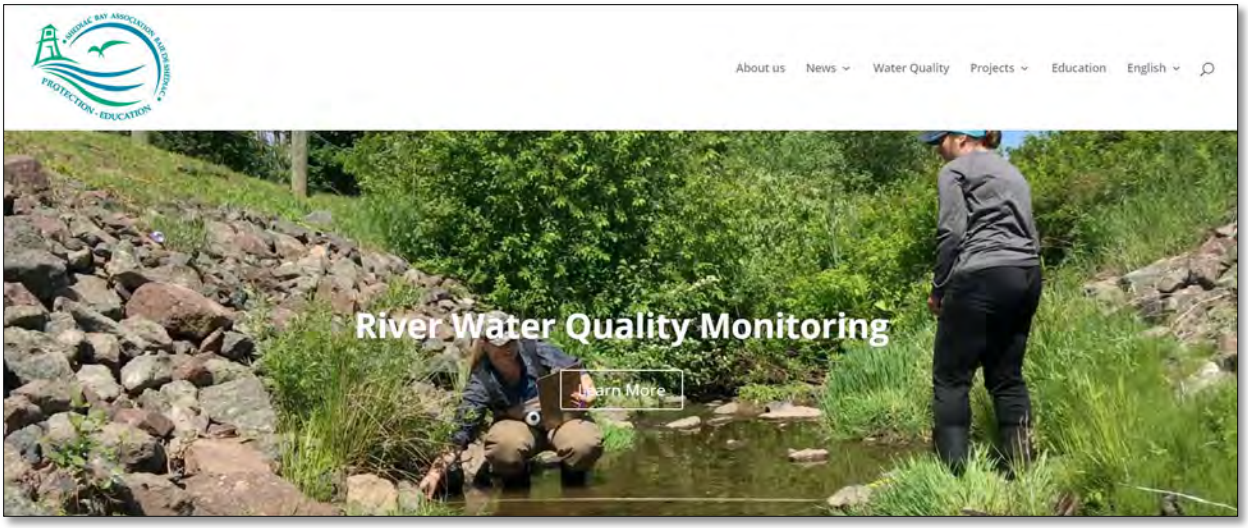
https://ici.radio-canada.ca/nouvelle/1921154/dominique-leblanc-fiona-dommages-forces-armees-canadiennes

9.2 Newsletter

During the 2022-2023 fiscal year, 2 bilingual newsletters were produced. One was published in the fall and the second will be released in March. The newsletters display information and photos on the various projects that the SBWA has been doing in the year. The newsletter is now distributed electronically by email list and is available on our website and Facebook page.

9.3 Socials Medias and Website

The SBWA is working to keep its website and social media up to date, posting photos and short description of activities and projects. The SBWA now has a dedicated employee who focuses on outreach and communications, and the design and production of educational materials.



www.shediacbayassociation.org
www.facebook.com/#!/shediacbaywatershedassociation
https://www.instagram.com/bvshediacwatershed/?hl=en
https://www.youtube.com/channel/UCT1bsN08OyOeIzqqwn9ZhlQ

10 Closing Comments

The evaluation, restoration and stewardship of the Shediac Bay program has had another successful year. The aim of the program is to identify areas and ecosystems that can benefit from restoration activities and gather data on the health of the various ecosystems and vulnerable species of the Shediac Bay.

The eelgrass monitoring program was continued and will be used to assess the evolution of eelgrass beds in Shediac Bay. Sites that have been sampled over several years are already showing changes. However, several more years of sampling are required to see trends. Participation in the Ecology Action Centre's eelgrass working group will enable comparisons between different bays in New Brunswick, Nova Scotia and Prince Edward Island.

Green crab catches increased in numbers in the summer of 2022. The total catch was 403 crabs, up only lightly from 393 in 2021. The highest total catch of 817 crabs was reached in 2016. The monitoring of eelgrass and green crabs will make it possible to establish the impact of the arrival of this invasive species in Shediac Bay. More details on the monitoring of green crabs are described in the report available on our website.

In the coming years, there will be sufficient data to establish conservation and restoration priorities. Meetings with the EAC eelgrass consortium and the Department of Fisheries and Oceans will determine if restoration activities are feasible and desirable. The SBWA wants the ecological integrity of Shediac Bay to be maintained in the face of invasive species and climate change.

A coastal restoration and protection committee was started with neighbouring environmental groups to help coordinate efforts along the coast of South Eastern New Brunswick. This group is involved in planning priorities for conservation of the coastal zone. Our groups are a part of a greater collective; the Healthy Coast partnership, coordinated by Nature NB. This larger collective increases our capacity for knowledge and skills to take our projects to the next level.

The work around dune restoration has captured the attention of our community and of news media outlets. After the devastation from hurricane Fiona, there was a significant increase of interest in coastal protection and restoration.

The Shediac Bay Watershed Association will continue the various educational campaigns around the health of the Shediac Bay. Stewardship activities with the public such as shoreline clean-ups and tree planting activities will resume as soon as public health regulations permit.

The partnerships with the local marinas will continue to promote best practices for boaters of Shediac Bay. Other partnerships such as the Beach Sweep with the Town of Shediac and Shediac Bay Marina will help increase awareness around the importance of a healthy environment.

The Shediac Bay Health Evaluation project has gathered a wide range of information since 2016. The project will continue to expand in the coming years with increasing partnerships. There is still more that can be done to advance our knowledge. As the project evolves, the Association will concentrate on more stewardship projects to help improve the environment around Shediac Bay.

Figure 49: Salt marsh in Grande-Digue

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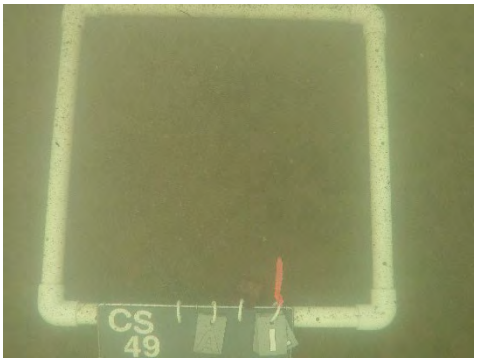
APPENDIX A – Eelgrass Transect Images



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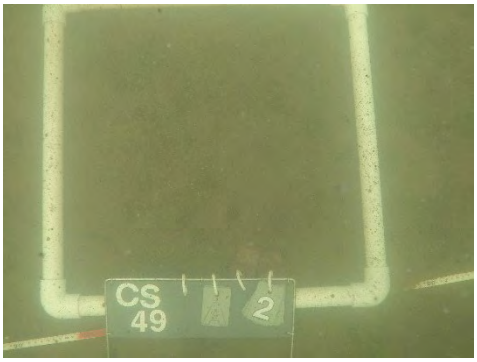

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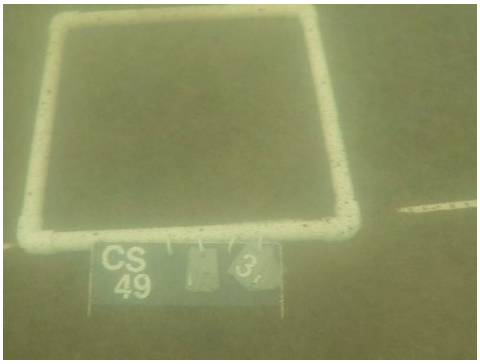

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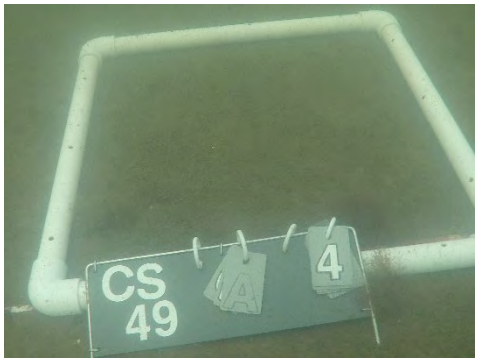

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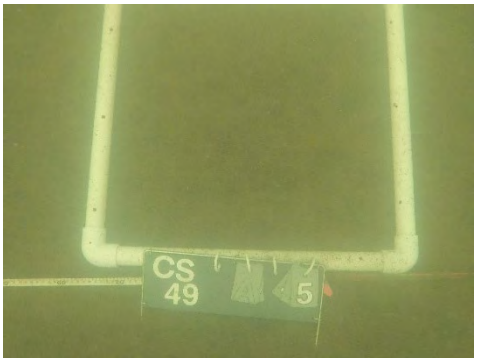

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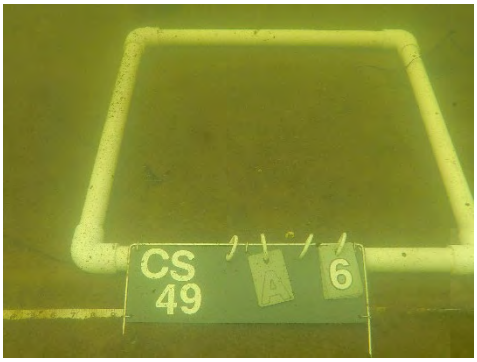

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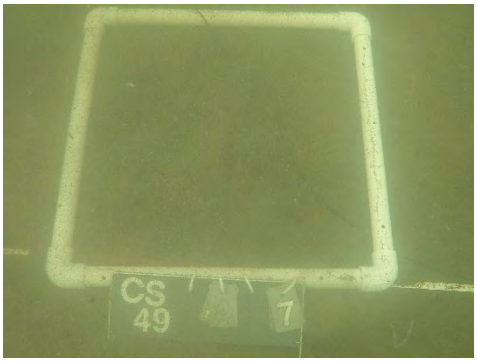
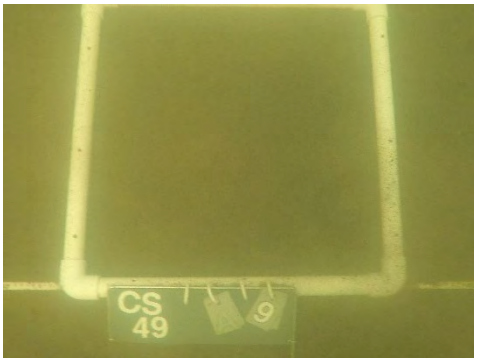
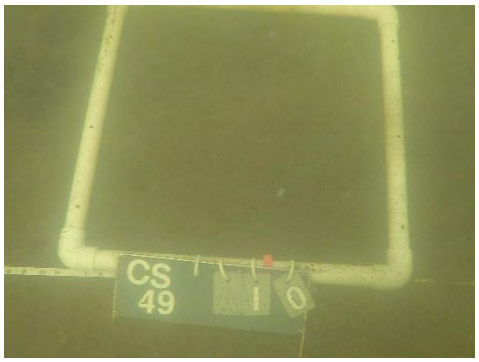


Shediac River A7

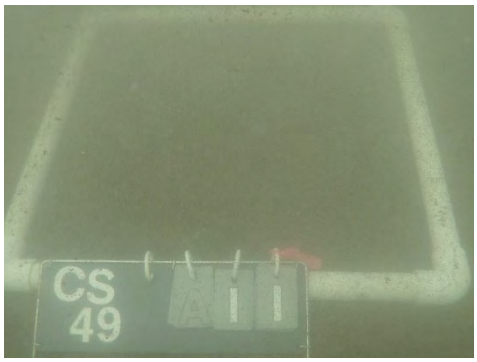
Shediac River A8



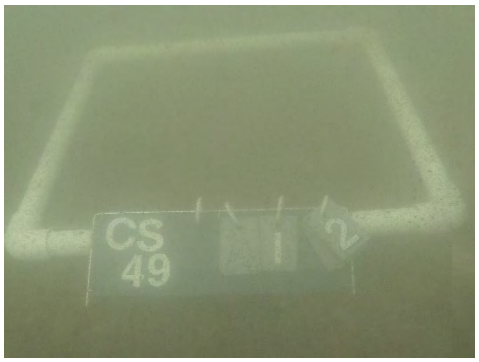
Shediac River A9



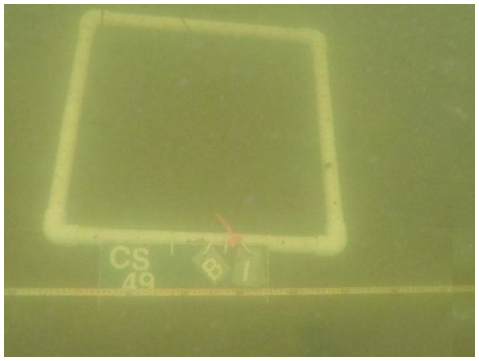
Shediac River A10



Shediac River A11

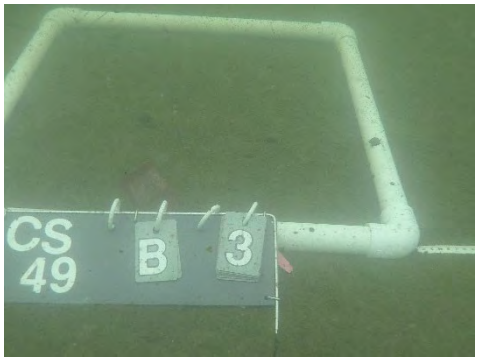


Shediac River A12



Shediac River B1

Shediac River B2



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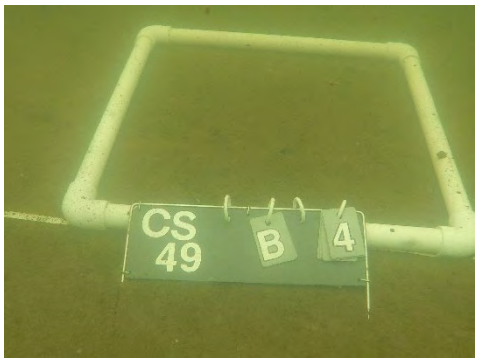

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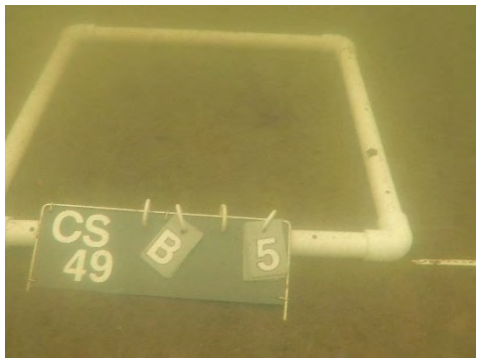

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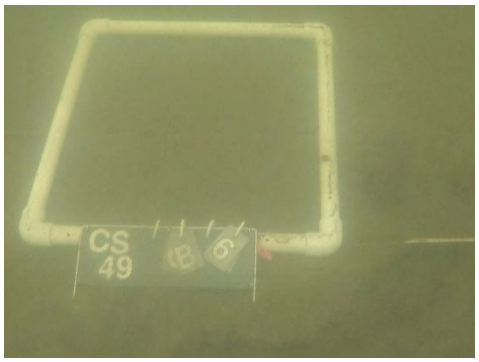

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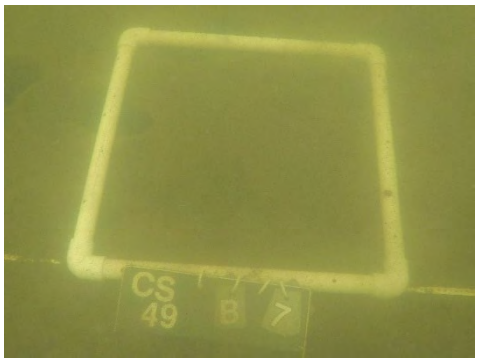
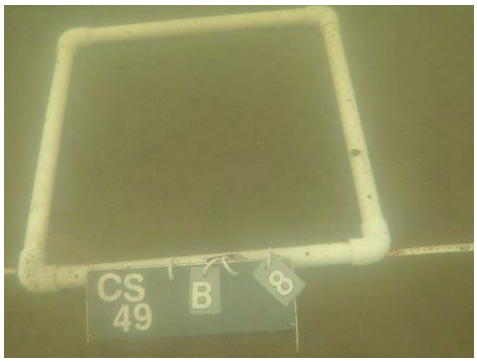
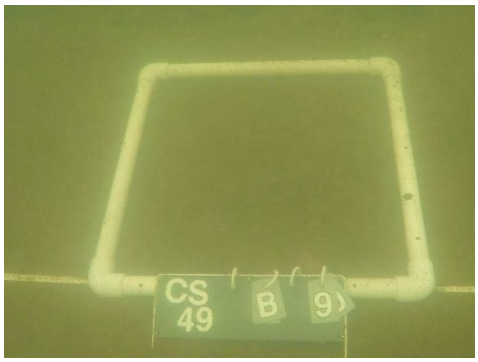


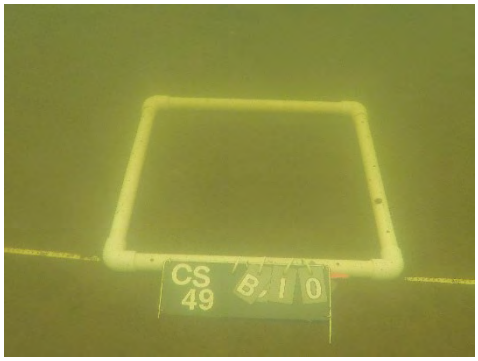
Shediac River B7



Shediac River B8

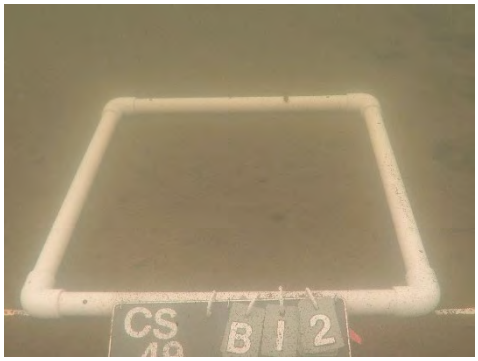


Shediac River B9



Shediac River B10

Shediac River B11

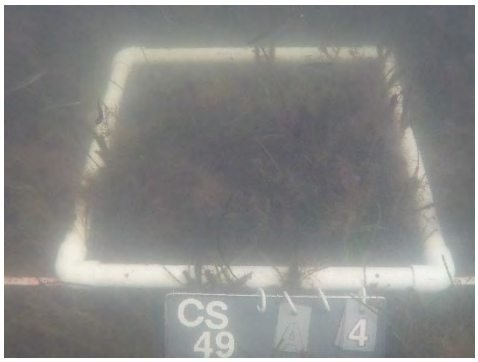


Shediac River B12

Scoudouc River A1

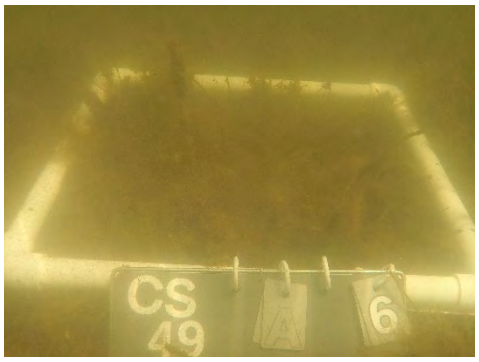
Scoudouc River A2

Scoudouc River A3



Scoudouc River A4

Scoudouc River A5

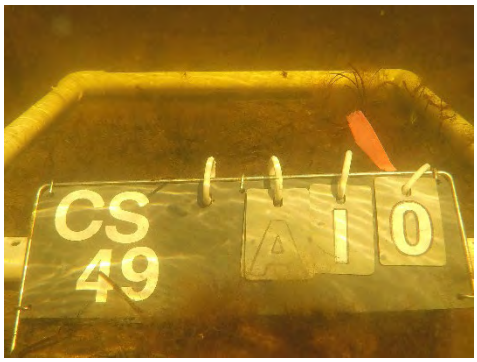


Scoudouc River A6

Scoudouc River A7

Scoudouc River A8

Scoudouc River A9



Scoudouc River A10

Scoudouc River A11

Scoudouc River A12

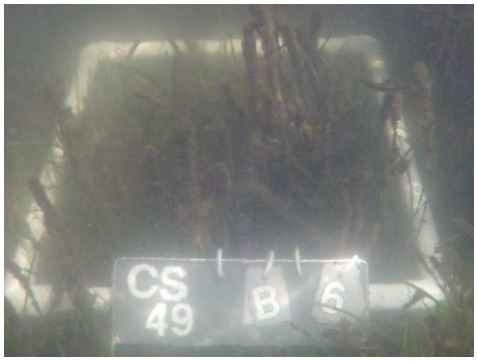
Scoudouc River B1

Scoudouc River B2

Scoudouc River B3

Scoudouc River B4

Scoudouc River B5



Scoudouc River B6

Scoudouc River B7

Scoudouc River B8

Scoudouc River B9

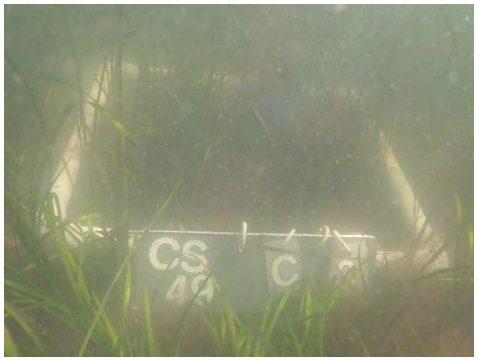
Scoudouc River B10

Scoudouc River B11

Scoudouc River B12

Scoudouc River C1

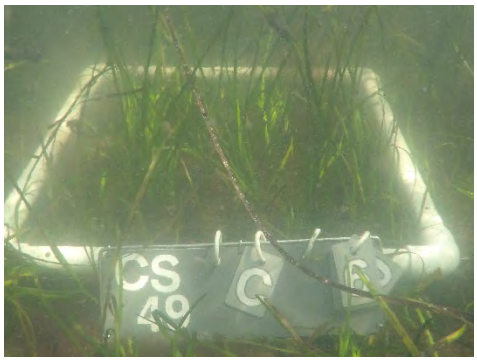
Scoudouc River C2



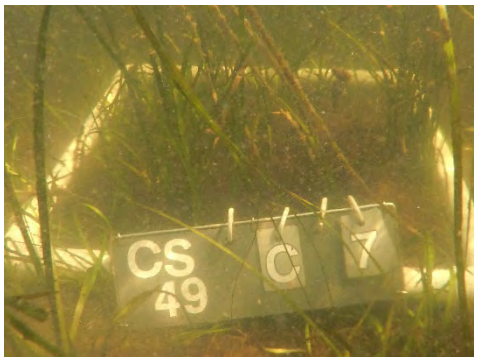
Scoudouc River C3

Scoudouc River C4

Scoudouc River C5

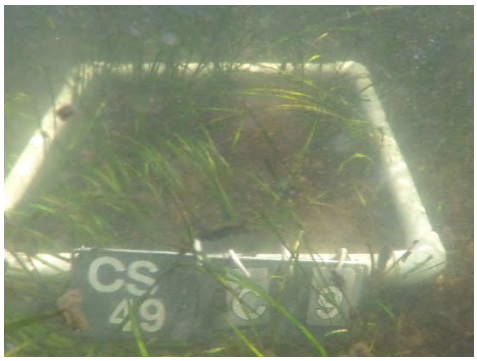


Scoudouc River C6



Scoudouc River C7

Scoudouc River C8

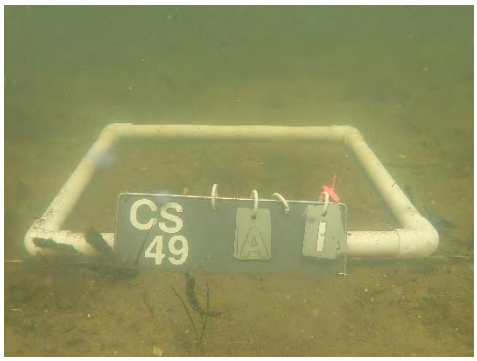


Scoudouc River C9

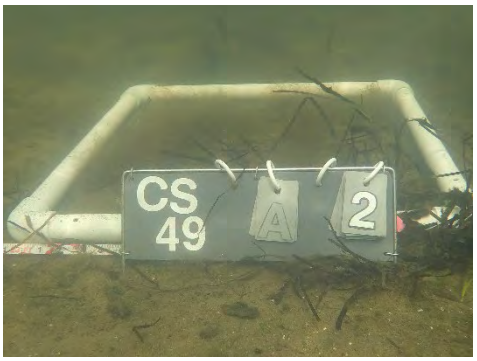
Scoudouc River C10

Scoudouc River C11

Scoudouc River C12



Pointe-du-Chêne A1



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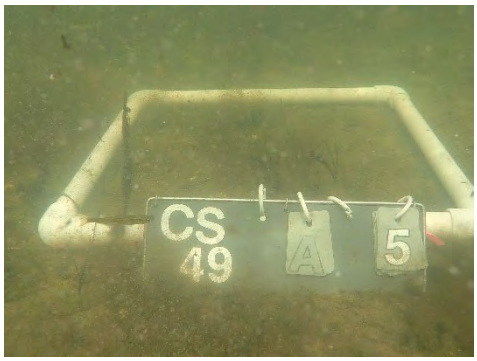
Pointe-du-Chêne A3

Pointe-du-Chêne A4

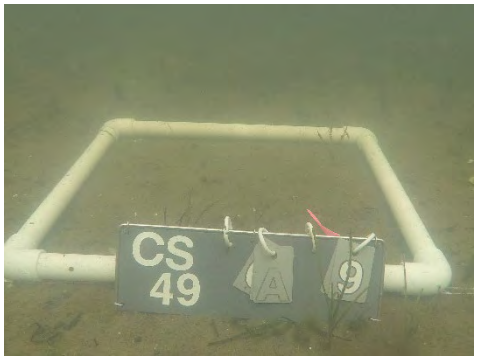


Pointe-du-Chêne A5

Pointe-du-Chêne A6

Pointe-du-Chêne A7

Pointe-du-Chêne A8

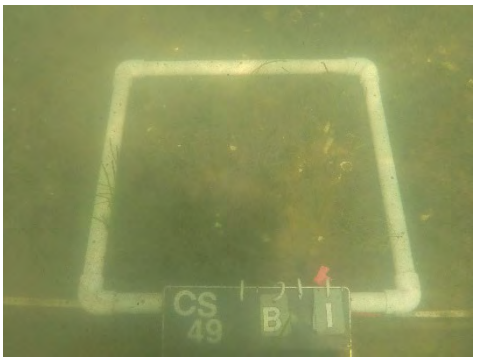


Pointe-du-Chêne A9

Pointe-du-Chêne A10

Pointe-du-Chêne A11

Pointe-du-Chêne A12



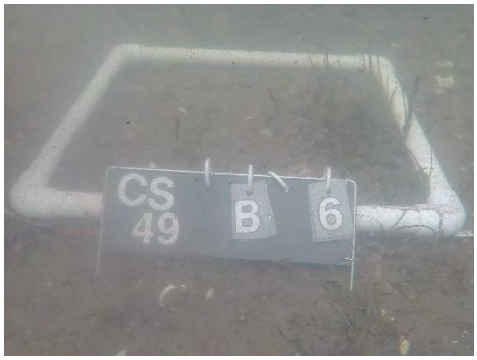
Pointe-du-Chêne B1

Pointe-du-Chêne B2

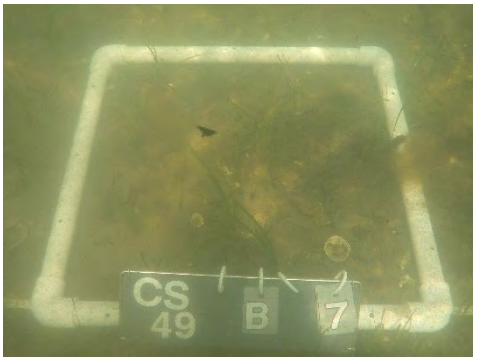
Pointe-du-Chêne B3

Pointe-du-Chêne B4

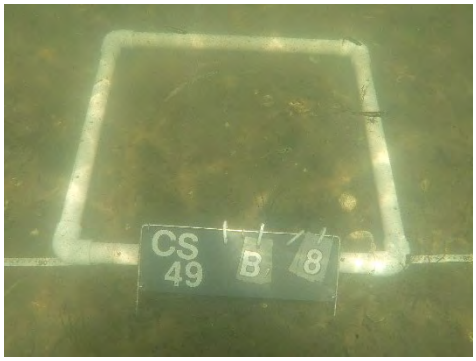
Pointe-du-Chêne B5



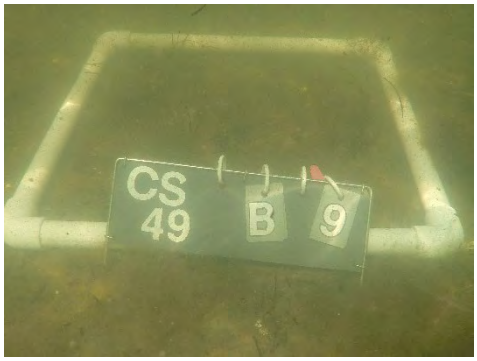
Pointe-du-Chêne B6



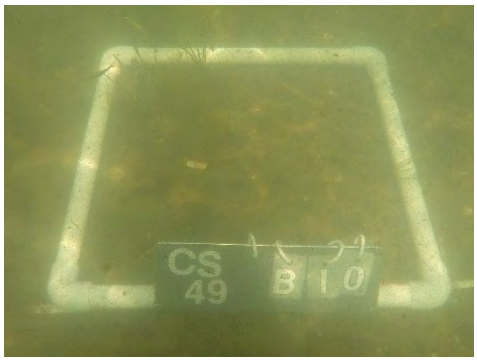
Pointe-du-Chêne B7



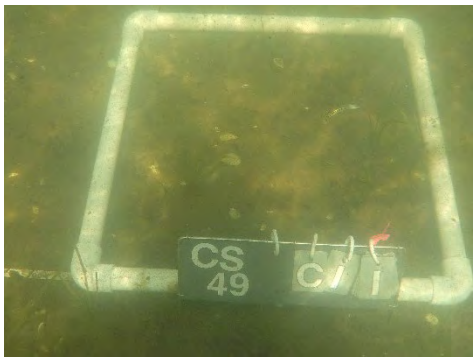
Pointe-du-Chêne B8



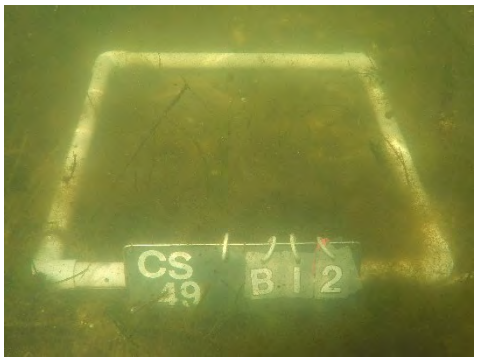
Pointe-du-Chêne B9



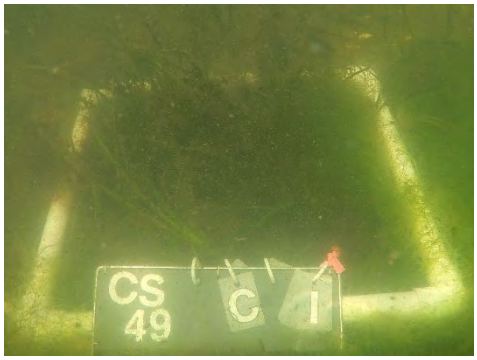
Pointe-du-Chêne B10



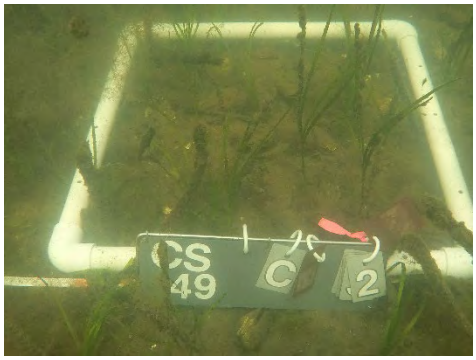
Pointe-du-Chêne B11



Pointe-du-Chêne B12



Pointe-du-Chêne C1

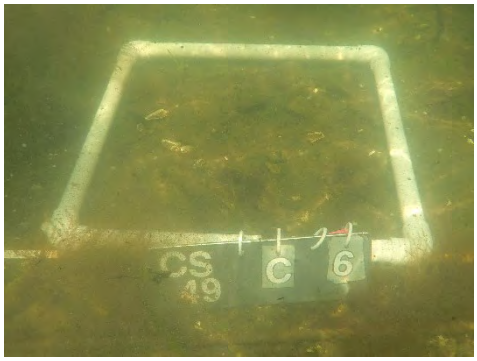


Pointe-du-Chêne C2

Pointe-du-Chêne C3

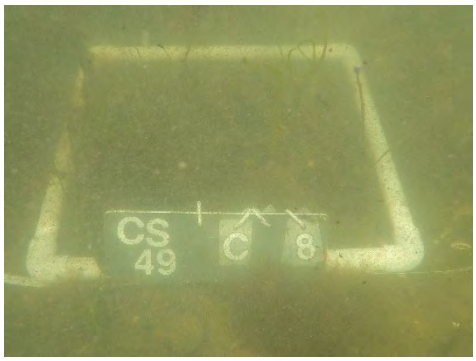
Pointe-du-Chêne C4

Pointe-du-Chêne C5

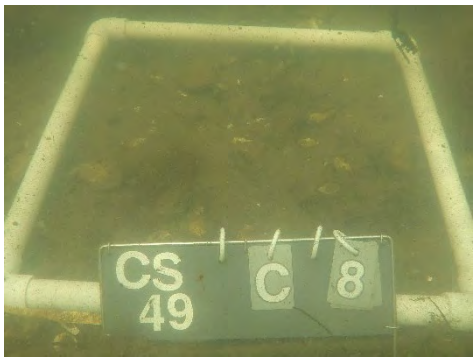


Pointe-du-Chêne C6

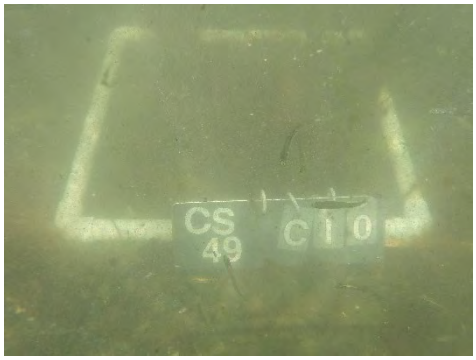
Pointe-du-Chêne C7



Pointe-du-Chêne C8



Pointe-du-Chêne C9



Point-du-Chêne C10

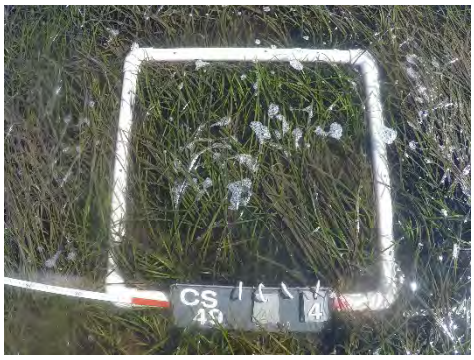
Pointe-du-Chêne C11

Pointe-du-Chêne C12

Grande-Digue A1

Grande-Digue A2

Grande-Digue A3



Grande-Digue A4

Grande-Digue A5

Grande-Digue A6

Grande-Digue A7

Grande-Digue A8

Grande-Digue A9

Grande-Digue A10

Grande-Digue A11

Grande-Digue A12

Grande-Digue B1

Grande-Digue B2

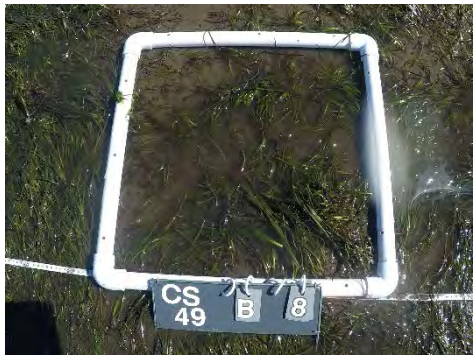
Grande-Digue B3

Grande-Digue B4

Grande-Digue B5

Grande-Digue B6

Grande-Digue B7



Grande-Digue B8

Grande-Digue B9

Grande-Digue B10

Grande-Digue B11

Grande-Digue B12

Grande-Digue C1

Grande-Digue C2

Grande-Digue C3

Grande-Digue C4

Grande-Digue C5

Grande-Digue C6

Grande-Digue C7

Grande-Digue C8

Grande-Digue C9

Grande-Digue C10

Grande-Digue C11

Grande-Digue C12

APPENDIX B – Smelt Data and Maps

Table B 1: Smelt survey site results

Watercourse Code	Eggs found	Stream barrier	Habitat type	Dead egg %	Eggs submerged %	Length of site
S2	No					
S3	No					
S5	No					
S6	No					
S7	No					
S8	No					
S9	No					
S10	Yes	Perched culvert	Riffle	5%	100%	5m
S11	No					
S12	No					
S13	No					
S14	No					
S24	Yes	Perched culvert	Run	1%	100%	150m
S24A	Yes		Riffle	50%	100%	5m
S28	Yes		Riffle/Run	5%	95%	50m
S31	No					
S32	No					
S33	No					
S37	No					
S38A	No					
S38B	No					
S38C	No					
S39	No					
S40	No					
S43	No	Perched culvert				
S45	No					
S46	No	Perched cu;vert				
S47	No					

Table B 2: Smelt survey stream bed composition

Watercourse Code	Substrate composition						
	Fines (<0.05mm)	Sand (0.06-2.5mm)	Gravel (2.6-53mm	Pebbles (54-460mm)	Algae	Organic debris	Human debris
S2							
S3							
S5							
S6							
S7							
S8							
S9							
S10		60%	10%	30%		x	
S11							
S12							
S13							
S14							
S24	10%	20%	10%	60%		x	x
S24A	10%	10%	20%	60%			
S28		20%		80%		x	
S31							
S32							
S33							
S37	20%	30%	20%	30%		x	x
S38A							
S38B							
S38C	0%	5%	25%	70%			
S39	5%	15%	30%	50%	x	x	X
S40	30%	10%	30%	30%		x	x
S43	5%	35%	20%	40%	x	x	X
S45	10%	20%	10%	50%	x	x	x
S46							
S47							

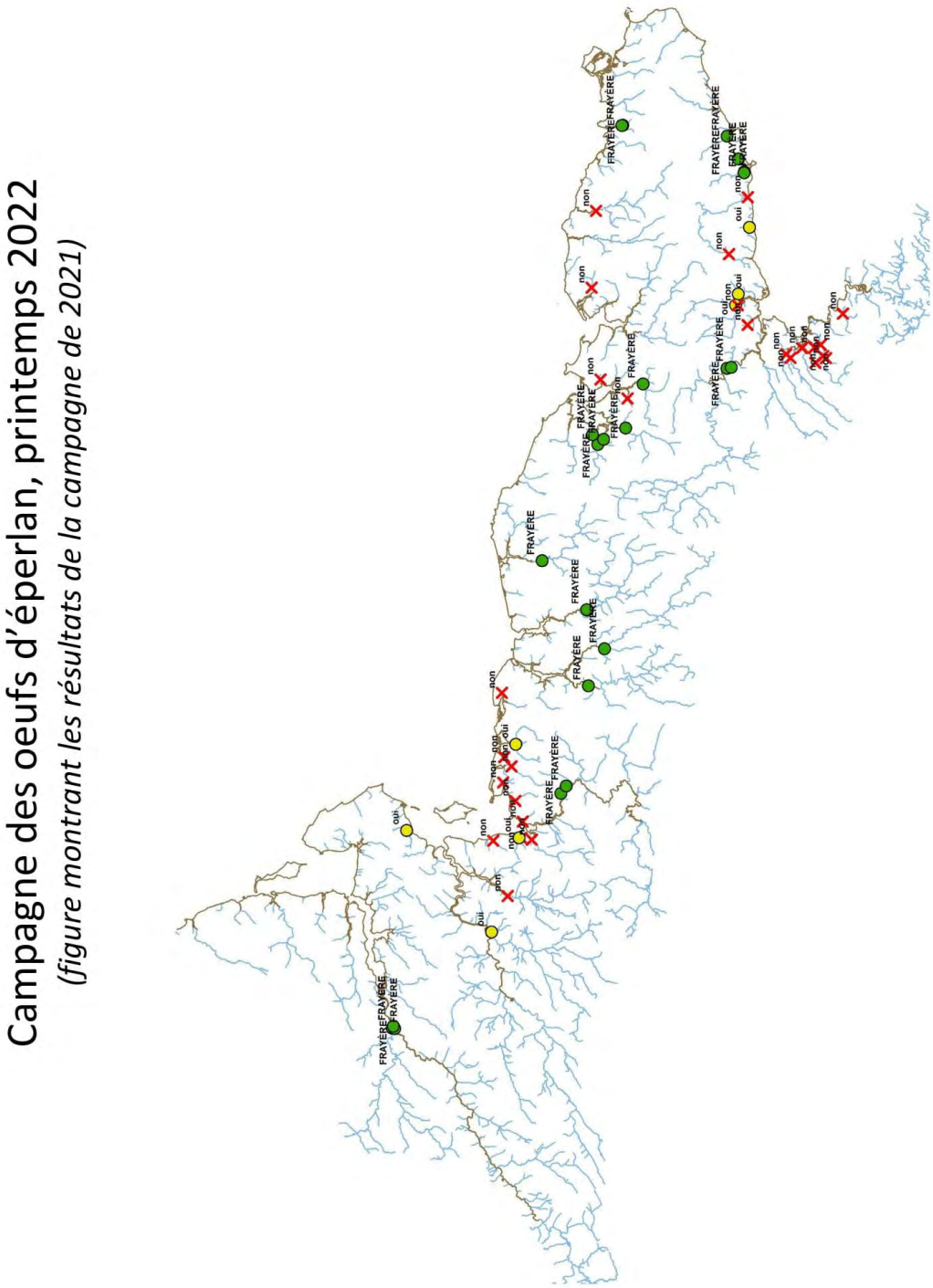


Figure B 1: Smelt egg campaign map 2022

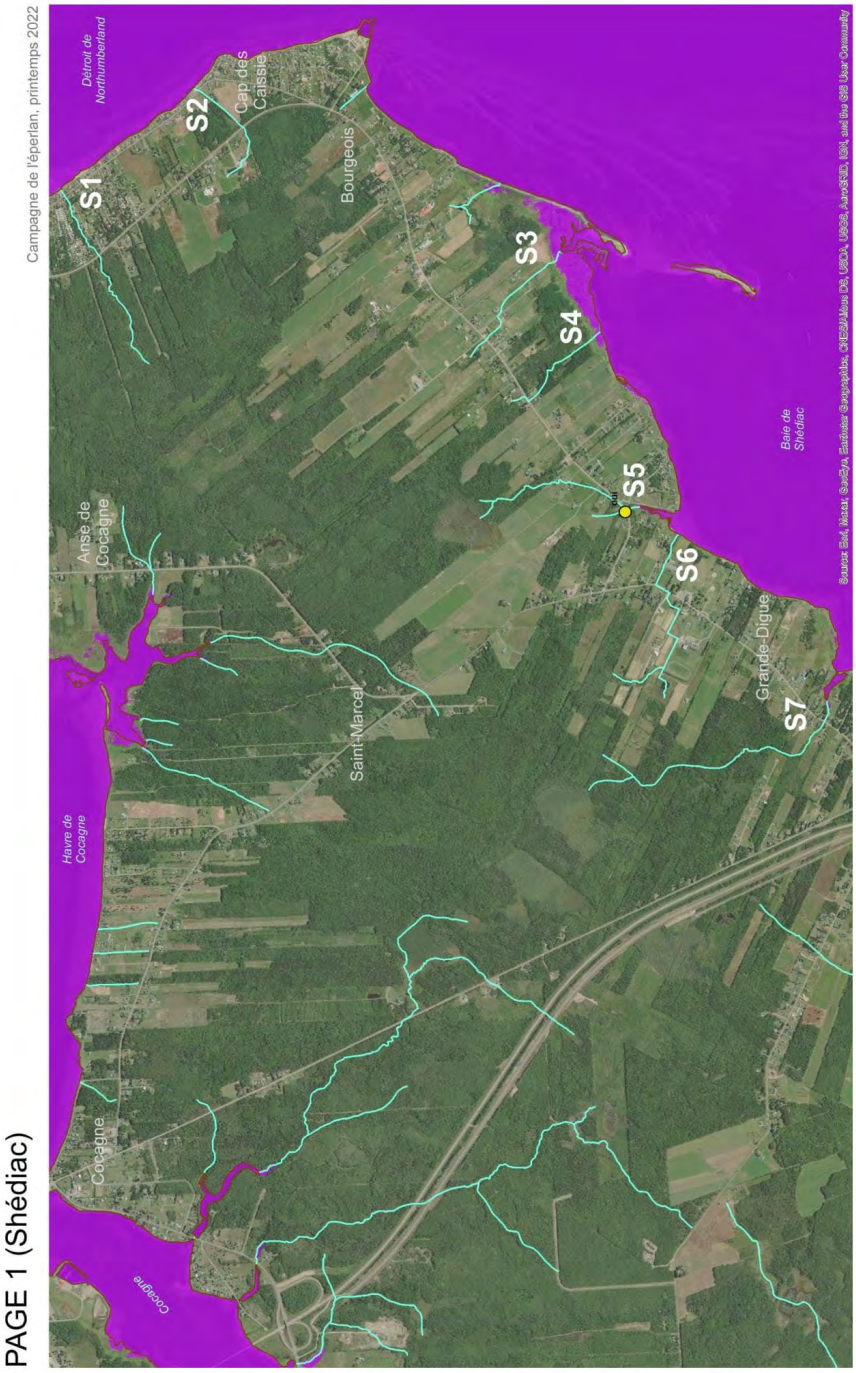


Figure B 2: Potential smelt spawning watercourses in the Shediac bay watershed pg.1

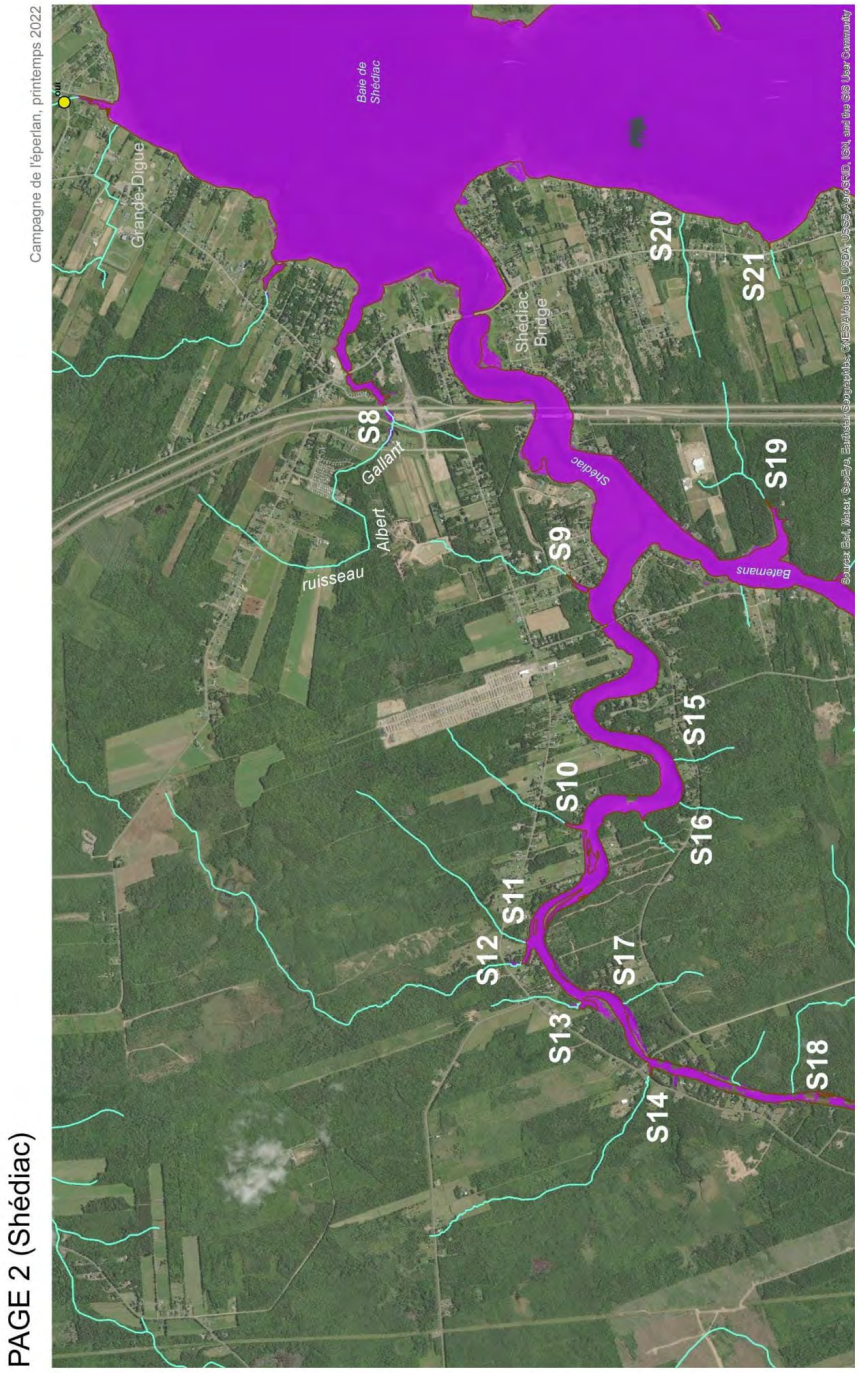


Figure B 3: Potential smelt spawning watercourses in the Shediac bay watershed pg.2

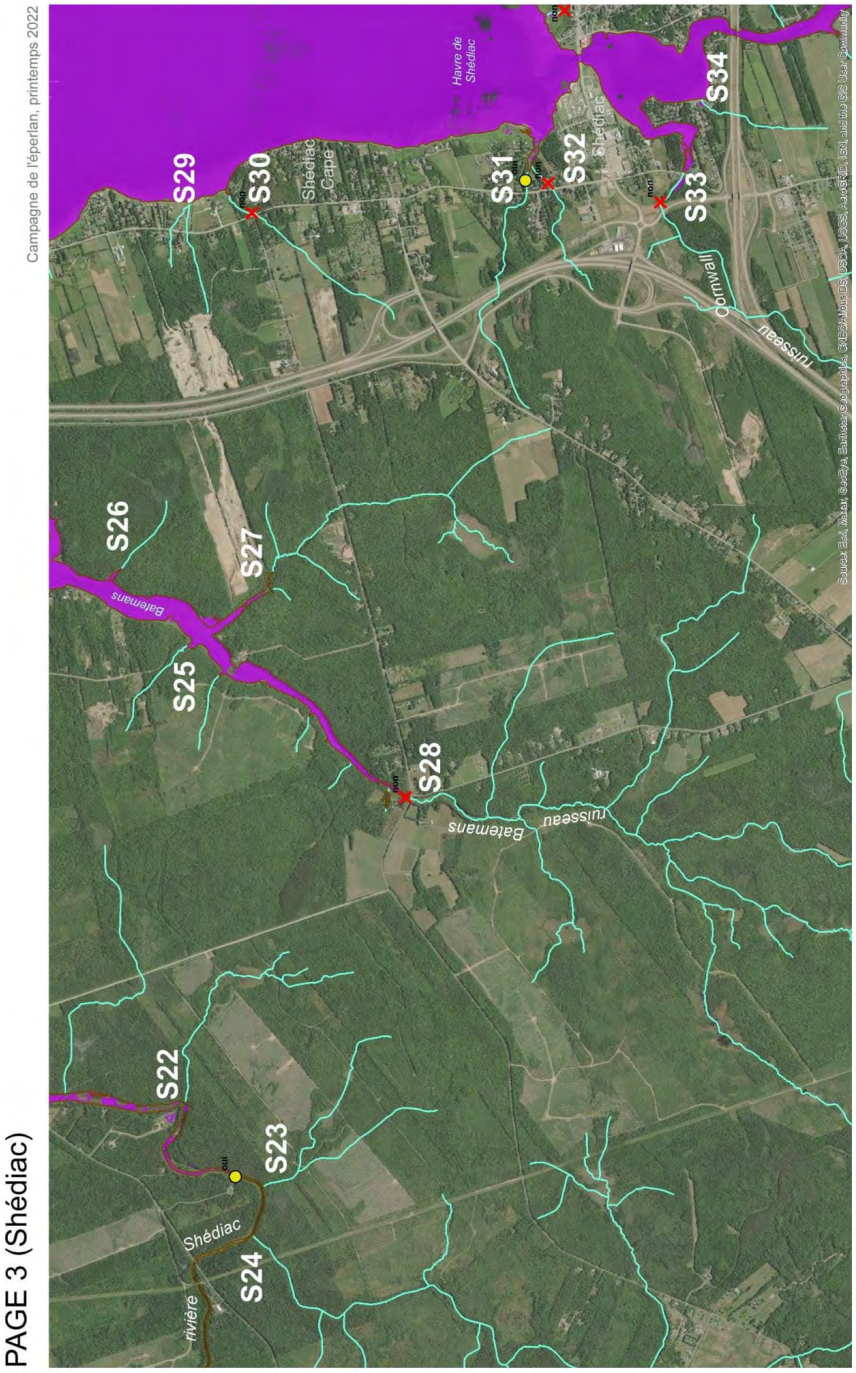


Figure B 4: Potential smelt spawning watercourses in the Shediac bay watershed pg.3

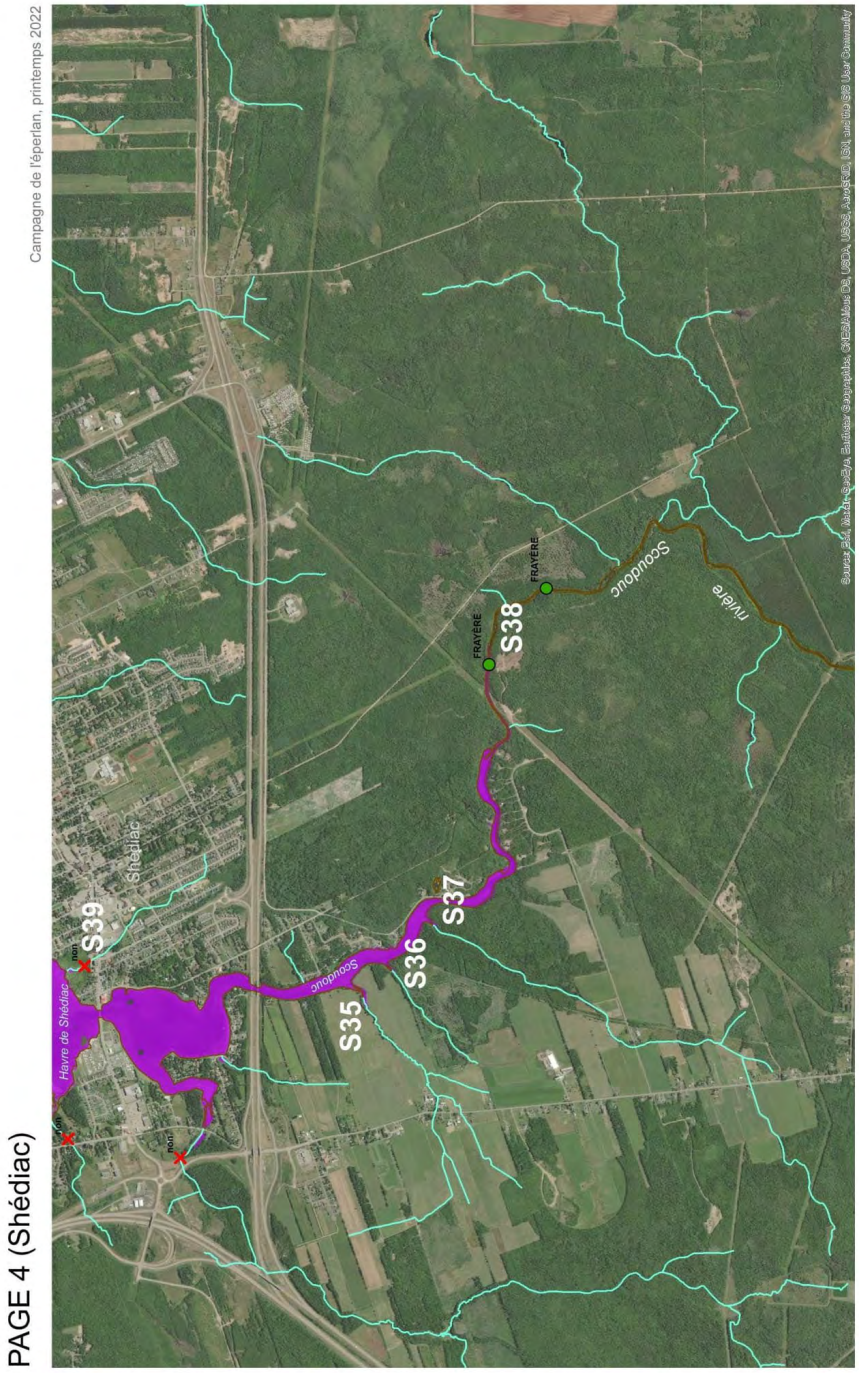


Figure B 5: Potential smelt spawning watercourses in the Shediac bay watershed pg.4

Figure B 6: Potential smelt spawning watercourses in the Shediac bay watershed pg.5

APPENDIX C – Bank Swallow Survey Field Sheets

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: Chloé + Grace Phone: (506) 533-8880 Email: sbwa@nbnet.nb.ca

Visit Details

Date (dd-mm-yy): 15-07-22 Start time (24hr): 2.00pm End time (24hr): 3:45pm Temp. (°C): 22°C

Wind: 4 Cloud Cover: 1 Precipitation: 0 *(see reverse for weather codes)*

# of birds: 5 # of burrows: 20 Colony active *(see reverse for description)*: ☑ Yes ☐ No

HH

Site and Habitat Details

Colony Location: N 46 24166° W 064 51466 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): Parlee Beach Shediac Location Public

Colony Habitat Type: ☐ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☑ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☑ Yes ☐ No ☐ Unknown If Yes, for how long? 1 years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start N 46 24166° W 064 51466
End N 46 24165° W 064 51421°

How coordinates were obtained *(e.g. GPS unit, Google Maps)*: GPS unit

Photo of colony site: ☑ Yes ☐ No

Breeding Evidence: P, ON, CF, A, FS
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	5.20m
Proximity to buildings (m)	400m
Proximity to roads (m)	400m
Max. number of people seen	20
Max. number of dogs seen – on-leash	0
Max. number of dogs seen – off-leash	0

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☑ Marsh – salt ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☑ Beach ☐

Additional notes (e.g. other threats, activities, species observed):

Curious people :)

Figure 50: Bank swallow survey for colony 1

2

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: Chloé + Grace Phone: (506) 533-8880 Email: sbwn@nbnet.nb.ca

Visit Details

Date (dd-mm-yy): 15-07-22 Start time (24hr): 3:00pm End time (24hr): 3:10pm Temp. (°C): 22°C

Wind: 4 Cloud Cover: 1 Precipitation: 0 *(see reverse for weather codes)*

# of birds: 2 # of burrows: 7 Colony active *(see reverse for description)*: ☑ Yes ☐ No

Site and Habitat Details

Colony Location: N 46.24122° W064.51218° *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details):
Parlee Beach
Shediac
Public

Colony Habitat Type: ☐ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☑ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start N 46.24122° W 064.51218 5
End 2 meters long

How coordinates were obtained *(e.g. GPS unit, Google Maps)*
GPS unit

Photo of colony site: ☑ Yes ☐ No

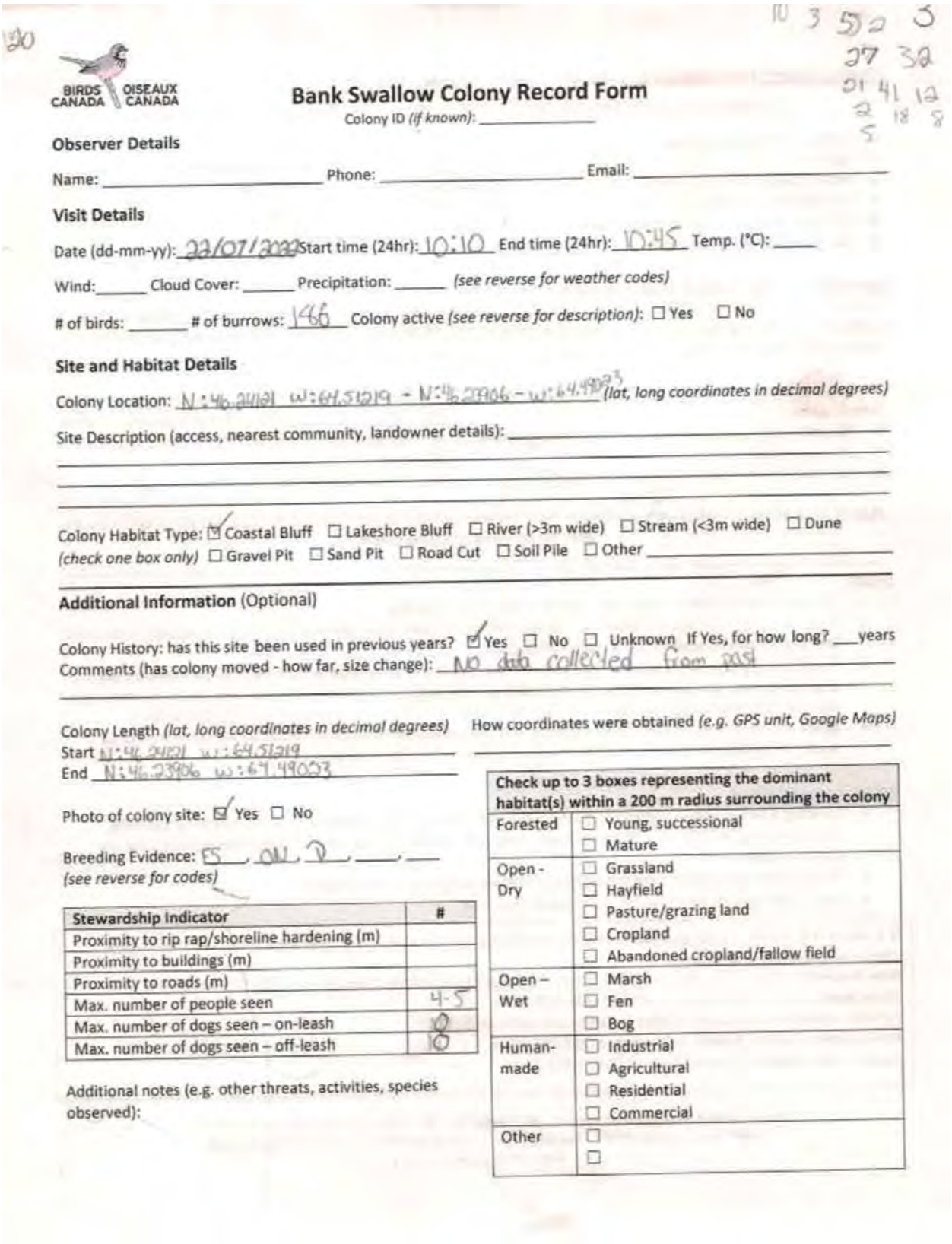
Breeding Evidence: P, ON, ___, ___, ___
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	20m
Proximity to buildings (m)	4100m
Proximity to roads (m)	~~400m~~
Max. number of people seen	20
Max. number of dogs seen – on-leash	0
Max. number of dogs seen – off-leash	0

Additional notes (e.g. other threats, activities, species observed):
informative warning signs
Curious people :)

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☑ Marsh - Salt ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☑ Beach ☐

Figure 51: Bank swallow survey for colony 2



BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: _____ Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 22/07/2022 Start time (24hr): 10:10 End time (24hr): 10:45 Temp. (°C): ____

Wind: _____ Cloud Cover: _____ Precipitation: _____ *(see reverse for weather codes)*

# of birds: _____ # of burrows: 146 Colony active *(see reverse for description)*: ☐ Yes ☐ No

Site and Habitat Details

Colony Location: N: 46.24121 W: 64.51219 - N: 46.23906 - W: 64.49023 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): _____

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☑ Yes ☐ No ☐ Unknown If Yes, for how long? ___ years
Comments (has colony moved - how far, size change): No data collected from past

Colony Length *(lat, long coordinates in decimal degrees)*
Start N: 46.24121 W: 64.51219
End N: 46.23906 W: 64.49023

How coordinates were obtained *(e.g. GPS unit, Google Maps)*

Photo of colony site: ☑ Yes ☐ No

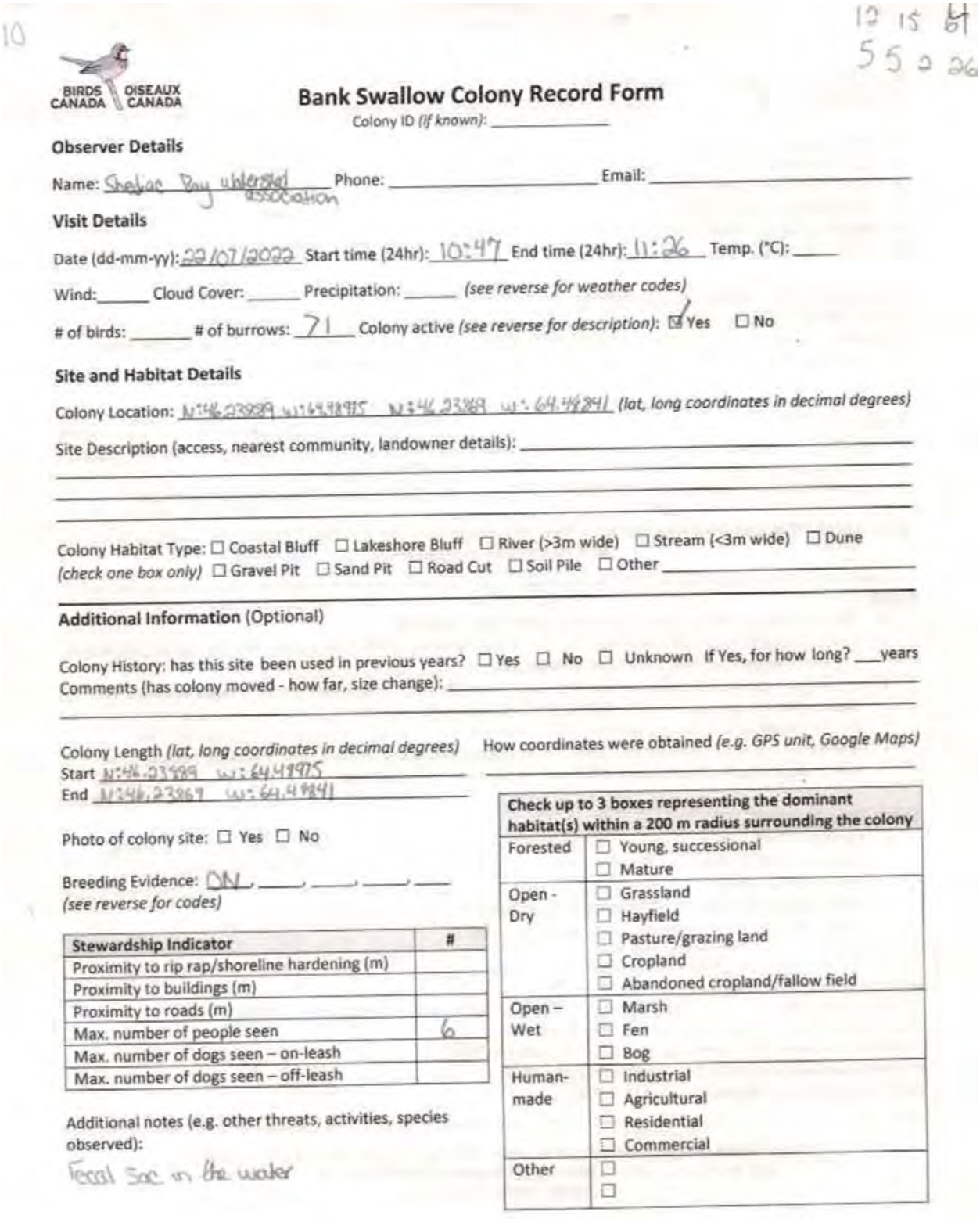
Breeding Evidence: FS, ON, D, ____, ____
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	4-5
Max. number of dogs seen – on-leash	0
Max. number of dogs seen – off-leash	0

Additional notes (e.g. other threats, activities, species observed):

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐

Figure 52: Bank swallow survey for colony 3



BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: Shediac Bay Watershed Association Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29/07/2022 Start time (24hr): 10:47 End time (24hr): 11:26 Temp. (°C): ____

Wind: ____ Cloud Cover: ____ Precipitation: ____ *(see reverse for weather codes)*

# of birds: ____ # of burrows: 71 Colony active *(see reverse for description)*: ☑ Yes ☐ No

Site and Habitat Details

Colony Location: N: 46.23989 W: 64.49975 N: 46.23969 W: 64.49841 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): _____

Colony Habitat Type: ☐ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☐ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start N: 46.23989 W: 64.49975
End N: 46.23969 W: 64.49841

How coordinates were obtained *(e.g. GPS unit, Google Maps)*

Photo of colony site: ☐ Yes ☐ No

Breeding Evidence: ON, ____, ____, ____, ____
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	6
Max. number of dogs seen – on-leash	
Max. number of dogs seen – off-leash	

Additional notes (e.g. other threats, activities, species observed):
Fecal Sac in the water

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐

Figure 53: Bank swallow survey for colony 4

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BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID (*if known*): ____________

Observer Details

Name: ____________ Phone: ____________ Email: ____________

Visit Details

Date (dd-mm-yy): 02 - 08 - 2023 Start time (24hr): 11:15 End time (24hr): 12:00 Temp. (°C): 24°C

Wind: 1 Cloud Cover: 4 Precipitation: 0 (*see reverse for weather codes*)

# of birds: 40 # of burrows: ______ Colony active (*see reverse for description*): ☑ Yes ☐ No

18 à 26

Site and Habitat Details

Colony Location: ____________ (*lat, long coordinates in decimal degrees*)

Site Description (access, nearest community, landowner details):

Private Property

ocean

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(*check one box only*) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other ____________

Additional Information (Optional)

Colony History: has this site been used in previous years? ☑ Yes ☐ No ☐ Unknown If Yes, for how long? 3 years

Comments (has colony moved - how far, size change):

Colony sight moved to the end of the coastal Bluff. More quiet / peaceful

Colony Length (*lat, long coordinates in decimal degrees*)

Start N 46.37324° W 064.57824°

End N 46.37286° W 064.57742°

How coordinates were obtained (*e.g. GPS unit, Google Maps*) ____________

Photo of colony site: ☑ Yes ☐ No

Breeding Evidence: ON, P, CF, ___, ___
(*see reverse for codes*)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	
Max. number of dogs seen – on-leash	
Max. number of dogs seen – off-leash	

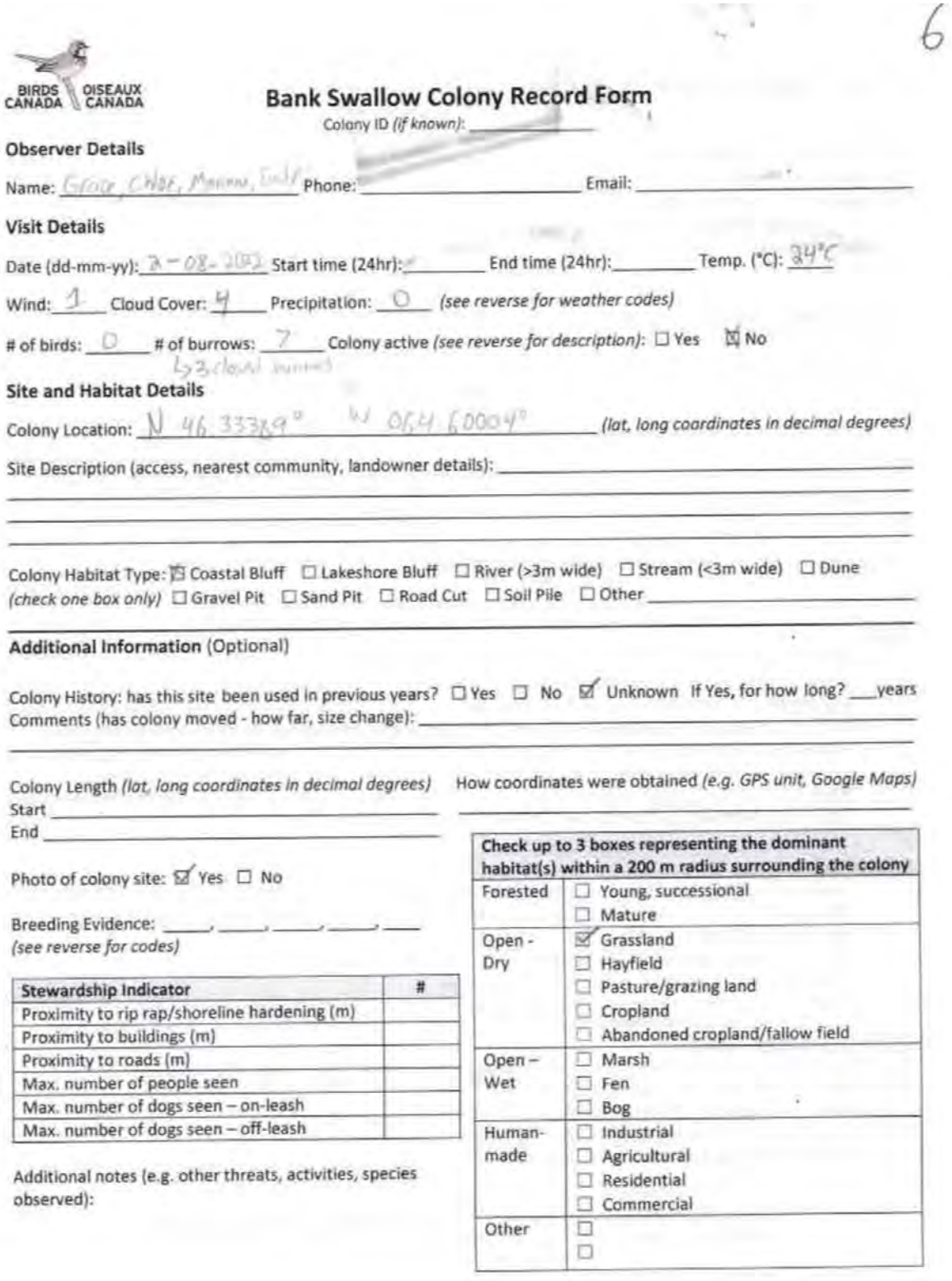
Additional notes (e.g. other threats, activities, species observed):

Different size of Bank Swallow birds

Babys born? baby flying?

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐

Figure 54: Bank swallow survey for colony 5



6

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: [illegible] Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 2-08-2022 Start time (24hr): _____ End time (24hr): _____ Temp. (°C): 34°C

Wind: 1 Cloud Cover: 4 Precipitation: 0 *(see reverse for weather codes)*

# of birds: 0 # of burrows: 7 Colony active *(see reverse for description)*: ☐ Yes ☒ No

L>3, cloud [illegible]

Site and Habitat Details

Colony Location: N 46.33389° W 064.60004° *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): _____

Colony Habitat Type: ☒ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☑ Yes ☐ No

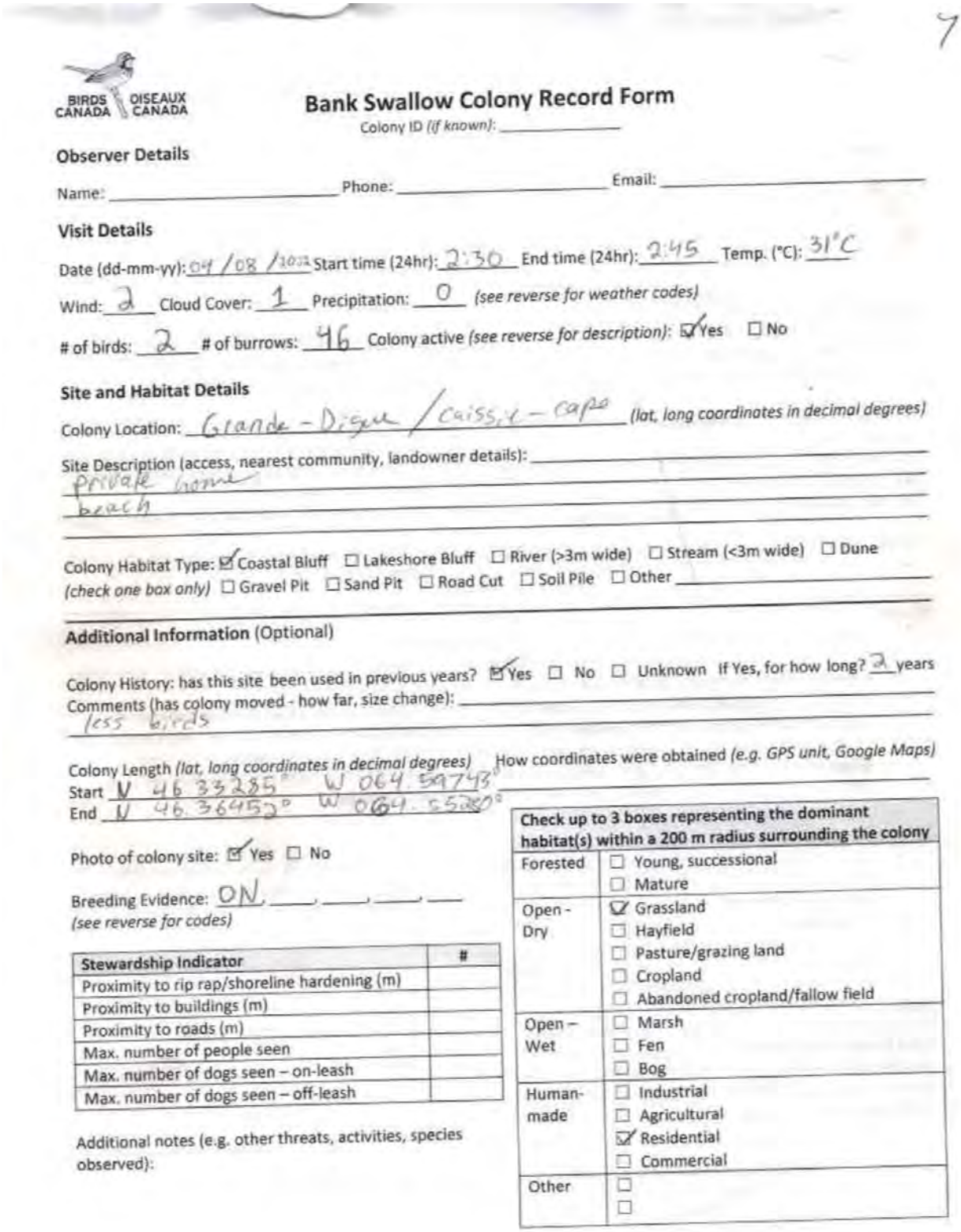
Breeding Evidence: ____, ____, ____, ____, ____
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	
Max. number of dogs seen – on-leash	
Max. number of dogs seen – off-leash	

Additional notes (e.g. other threats, activities, species observed):

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐

Figure 55: Bank swallow survey for colony 6



7

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: _____ Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 04/08/2022 Start time (24hr): 2:30 End time (24hr): 2:45 Temp. (°C): 31°C

Wind: 2 Cloud Cover: 1 Precipitation: 0 *(see reverse for weather codes)*

# of birds: 2 # of burrows: 46 Colony active *(see reverse for description)*: ☑ Yes ☐ No

Site and Habitat Details

Colony Location: Grande-Digue / caisse - cap *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): private home beach

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☑ Yes ☐ No ☐ Unknown If Yes, for how long? 2 years

Comments (has colony moved - how far, size change): less birds

Colony Length *(lat, long coordinates in decimal degrees)* How coordinates were obtained *(e.g. GPS unit, Google Maps)*

Start N 46.33285° W 064.59743°

End N 46.36453° W 064.55280°

Photo of colony site: ☑ Yes ☐ No

Breeding Evidence: ON, ____, ____, ____, ____
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	
Max. number of dogs seen – on-leash	
Max. number of dogs seen – off-leash	

Additional notes (e.g. other threats, activities, species observed):

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☐ Commercial
Other	☐ ☐

Figure 56: Bank swallow survey for colony 7

4

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: _____ Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 04/08/2022 Start time (24hr): 3:00 End time (24hr): 3:15 Temp. (°C): 31°C

Wind: 2 Cloud Cover: 1 Precipitation: 0 *(see reverse for weather codes)*

# of birds: 3 # of burrows: 28 Colony active *(see reverse for description)*: ☑ Yes ☐ No

Site and Habitat Details

Colony Location: Grande-Digue / Caissie-Cape *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): Private home beach

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information (Optional)

Colony History: has this site been used in previous years? ☑ Yes ☐ No ☐ Unknown If Yes, for how long? 2 years
Comments (has colony moved - how far, size change): less birds

Colony Length *(lat, long coordinates in decimal degrees)*
Start N 46.36301 W 064.54882
End within 5 meters

How coordinates were obtained *(e.g. GPS unit, Google Maps)*

Photo of colony site: ☑ Yes ☐ No

Breeding Evidence: ON
(see reverse for codes)

Stewardship Indicator	#
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	
Max. number of people seen	
Max. number of dogs seen – on-leash	
Max. number of dogs seen – off-leash	

Additional notes (e.g. other threats, activities, species observed):

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☐ Commercial
Other	☐ ☐

Figure 57: Bank swallow survey for colony 8