SAVE MATCHEDASH BAY

2024

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GEORGIAN BAY FOREVER PROTECTING WATER

Table of Contents

Authors 2

Acknowledgments 2

Summary 2

About Matchedash Bay 3

Project Team 4

Invasive *Phragmites* 4

- Introduction to Invasive *Phragmites* 4
- Methodologies 6
- Project Outputs 8
- Aerial Surveying 10

Species at Risk (SARs) 14

- Introduction to SARs 14
- Methods and Project Outputs 16

Community Involvement 17

2025 Outlook 18

References 19

Authors

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Acknowledgments

Georgian Bay Forever would like to acknowledge the Indigenous peoples who are the traditional guardians of this land that we call Canada, a place in which we are all treaty people. This land is everywhere the territory of those who have been present here since time immemorial, Indigenous people including the Metis and Inuit, who continue to shape and strengthen this country as a whole. In particular, we recognize that Matchedash Bay and the surrounding lands are encompassed by the traditional territories of the Haudenosaunee (Iroquois), Anishinabek, Huron-Wendat, and Mississauga. The Matchedash Bay region is covered by the J. Collin's land purchase, Robinson-Huron Treaty with the Ojibwe of the Northern and Eastern shores of Lake Huron, and the Williams Treaties made with the Chippewa of Lake Simcoe and Mississauga of the North shore of Lake Ontario.

Each of us has the opportunity to acknowledge their relationship to the land upon which they live and work and to support reconciliation with the people of Indigenous communities. Reconciliation is possible when all are open to learning from history, listening to each other with empathy and respect, and hearing the truth from Indigenous perspectives.

Funding and assistance for the 2024 Save Matchedash Bay project was provided by the Habitat Stewardship Program (HSP) through Environment and Climate Change Canada (ECCC), MTM Conservation Association, the Invasive Species Centre, the Township of Severn, the Severn Sound Environmental Association and our many individual donors. We send our sincerest thanks to all for the investment in this initiative.

M-T-M Conservation Association

Severn Sound Environmental Association

Township of SEVERN

Invasive Species Centre

This project was undertaken with the financial support of:
Ce projet a été réalisé avec l'appui financier de :

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Summary

2024 marks the 4th year of the Save Matchedash Bay project. Georgian Bay Forever (GBF) has continued to work with the local community to remove invasive *Phragmites*, monitor species at risk in the wetlands, and advance knowledge of the risk *Phragmites* pose to biodiversity in Matchedash Bay. GBF has managed invasive *Phragmites* along the eastern shorelines of Georgian Bay, Lake Huron for the past 12 years and continues to expand this project through collaboration with partner organizations, embracing current research and technologies, and reaching out to local communities.

About Matchedash Bay

Matchedash Bay is located within Simcoe County in Central Ontario, Canada. In 1996, Matchedash Bay Provincial Wildlife Area was designated a Ramsar Site, defining it as a Wetland of International Importance for the conservation and wise use of wetlands and their resources (Ramsar, 2001). It is one of 2,532 Ramsar wetlands across the globe that cover a total of approximately 258 million hectares (Ramsar, 2001). The water levels are constantly fluctuating in the day due to flow and water level changes in the North River and Coldwater River tributaries and the greater Georgian Bay, Lake Huron waterbody. It is home to over 170 species of birds, 568 vascular plant species and many fish, reptiles, amphibians, and mammals (Ramsar, 2001). This wetland is composed of a variety of habitats including swamps, cattail marshes, beaver ponds, hardwood forest, agricultural lands, native grass meadows and a coniferous wetland forest. The high productivity and diversity of wetlands, like Matchedash Bay, provide wildlife abundant opportunities for foraging, spawning, and sheltering in addition to providing large-scale benefits such as reducing the severity of floods and absorbing carbon from the atmosphere.

Various recreational activities such as canoeing, kayaking, boating, fishing, hunting, birding, and hiking are all popular in and around Matchedash Bay. The wetland is also subject to the development of cottages and marinas and nearby agricultural activities that can pose risks to the site's ecological integrity.

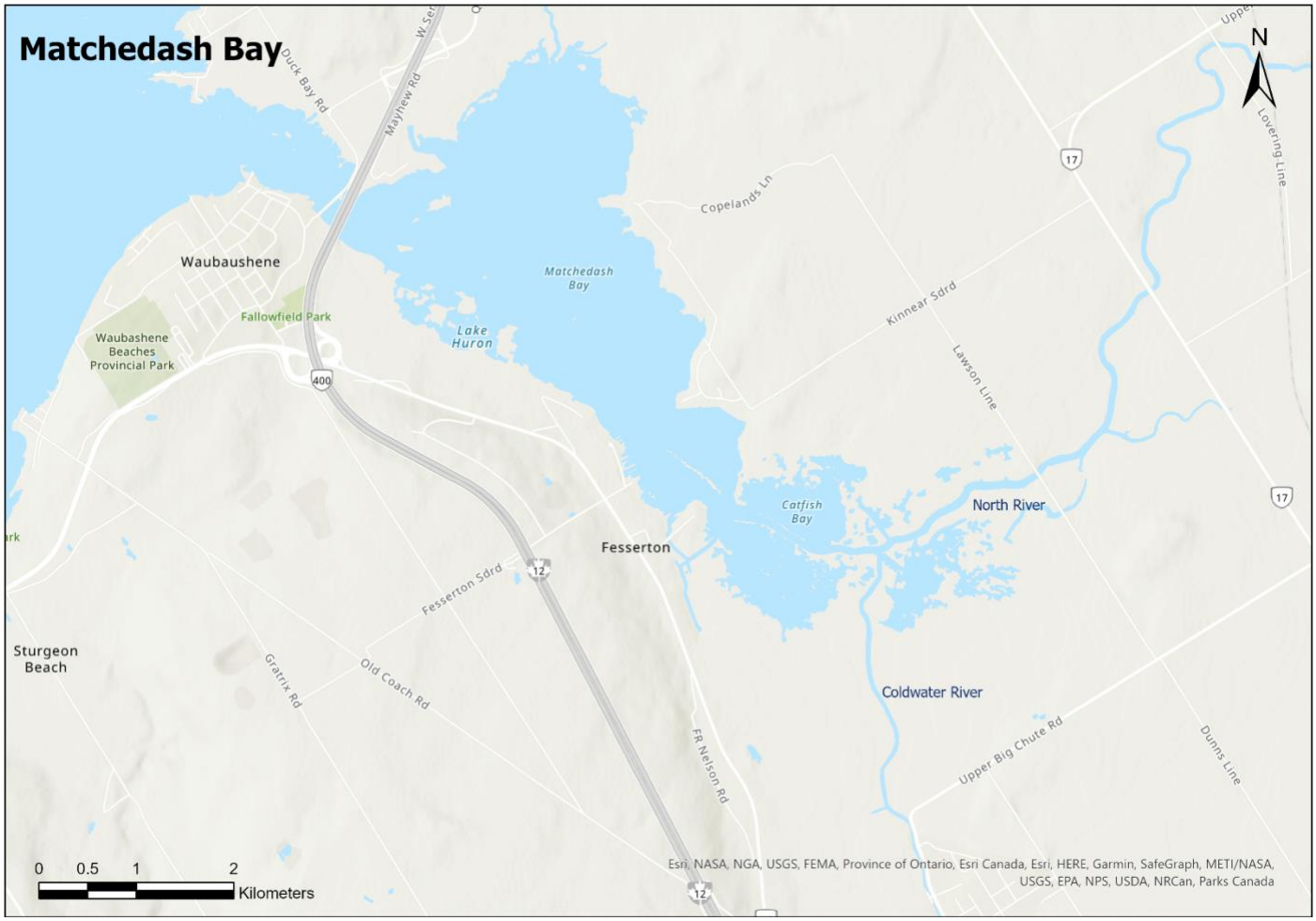

Figure 1. Map of Matchedash Bay, located within the Township of Severn.

Project Team

Nicole Carpenter is the Save Matchedash Bay Project Manager responsible for planning, organizing, and delivering goals for the current project through outreach and coordination activities. Local summer students have contributed to educational outreach activities as well as mapping and removing *Phragmites* in Matchedash Bay from June to mid-September since 2021, with plans to continue in 2025. The Marl-Tiny-Matchedash (MTM) Conservation Association continues to provide in-kind support to the Save Matchedash Bay project through spreading education and awareness to citizens and volunteering time to remove invasive *Phragmites*. Together, GBF and the Severn Sound Environmental Association (SSEA) monitor the species at risk that occur within Matchedash Bay. In previous years, the primary investigators included Michelle Hudolin (SSEA Wetlands & Habitat Biologist) and contractor Robert (Bob) Bowles, with GBF summer staff taking the lead in 2024. In addition, naturalists and local community members provide SSEA with very helpful information about past species observations in the study area.

Figure 2. Juvenile Midland painted Turtle found in spring of 2023.

Invasive *Phragmites*

Introduction to Invasive *Phragmites*

What is an invasive species?

Invasive species are non-native plants or animals that have been introduced to an ecosystem, spread easily, and disrupt the native wildlife and their habitat. They are a threat to the environment and the broader economy. Non-native *Phragmites* along with many other invasive species are a significant threat to the Great Lakes.

Phragmites in Georgian Bay

Georgian Bay and Lake Huron are home to some of Canada's most pristine coastal wetlands. Many organisms depend on these wetlands for life-sustaining activities such as foraging, spawning, sheltering and more. Two lineages of *Phragmites* are present in Canada and found in Georgian Bay: The native subspecies, *Phragmites australis americanus,* and the invasive subspecies, *Phragmites australis australis*. Invasive *Phragmites* is a reed grass that unnaturally travelled from Europe to Canada in the 1800s through human activity and has developed into a significant threat to Georgian Bay's coastal wetlands. In its natural environment, *Phragmites* does not pose any threat to other organisms and lives in balance alongside them. In North America, toxins released by the invasive lineage change the surrounding soil and water conditions and disrupt the growth of neighbouring native plants allowing invasive *Phragmites* to flourish disproportionately (Rudrappa, Bonsall, Gallagher, Seliskar, & Bais, 2007; Uddin, Robinson, Buultjens, Al Harun, & Shampa, 2017). Unfortunately, invasive *Phragmites* is flourishing in the Great Lakes coastal ecosystems, rapidly forming extremely dense monocultures, outcompeting native vegetation and reducing the biodiversity and habitat of native plants and animals. Furthermore, this growth impairs the proper functioning of wetlands, which are significant for their ability to enhance water quality, provide shelter and food for other species, and counter human-caused global heating by sequestering carbon.

Identification – Native vs. Invasive

Invasive *Phragmites* can be identified by their connecting root system of hollow rhizomes, beige stems, and tall green stalks with alternating leaves. The stalks, if well-established, can grow up to 18 feet tall. Native *Phragmites* looks quite similar but does not grow as tall or dense and will co-exist amongst other native species. In late August, invasive *Phragmites* begin to develop large purple/reddish seed heads which eventually turn beige, unlike the native *Phragmites* that develop light-coloured seeds earlier in late July. After seeds disperse in the fall, the stalks die and remain standing throughout the winter. The majority of native plants fall under the weight of snow, break down, contribute nutrients back to the soil, and allow space for new vegetation to grow come spring. The remains of dried-out stalks of invasive *Phragmites* block new growth of native plants in the spring. During the summer, one can identify a stand of invasive *Phragmites* by the presence of leftover standing stalks and seeds from years previous. To find out more information on identification, visit our website or contact us.

Figure 3. The difference in appearance between invasive (left) and native (right) Phragmites. Invasive stands grow densely with large, purple seed heads; native stands are typically sparser with wispier, tan seed heads.

Hybridization

Often, identifying the native vs. invasive lineage can be quite difficult and may require DNA sampling to be done. Recently, there have been cases in Ontario, CA and Michigan, USA where individuals have described these “difficult to identify” stands as having characteristics falling under both native and invasive lineages. In the past, GBF has experienced sites on Georgian Bay that grow quite tall and dense (invasive characteristics) but have very distinct red markings on the stalk, have light coloured, sparse seed heads, and seed earlier in the season (native characteristics). In

addition, these sites of uncertainty grow alongside patches of *Phragmites* that we can confidently say are invasive. Though rare, in the last decade there have been reports about hybridization between native and invasive *Phragmites* in the United States (Saltonstall, Castillo, & Blossey, 2014; Saltonstall, Lambert, & Rice, 2016). The first instance of hybridization in Georgian Bay was identified through genetic testing this past year with further investigation currently underway to confirm the observation. So far, very little is known about hybrid *Phragmites,* if they are effective at spreading, and if they pose a risk to the environment. Research is ongoing at various institutions across North America.

GBF intends to stay up to date on the latest hybrid research and cooperate with institutions investigating hybrids when possible. In the fall of 2021, Nicole collected 7 samples of uncertainty and sent them to the Wendell Lab at Oakland University for analysis where results concluded there were no hybrids (Wendell, Huang, Gryspeerd, & Freeland, 2021). The sites of concern all turned out to be the native lineage. The same was repeated for 2022 and onwards, with GBF and MTM Conservation Association sending samples to Trent University for analysis. GBF plans to take a more strategic approach to mapping uncertain *Phragmites* stands in 2025 to increase our ability to detect hybrids now that they are thought to occur in Georgian Bay.

Methodologies

Phragmites Control

GBF maps the eastern shoreline of Georgian Bay in June, recording the location, hydrologic condition, size, density, and status of both recurring sites (from years previous) and newfound sites. GBF returns to sites that have been mapped and cut in previous years hoping not to see any regrowth. When no regrowth is observed, the stand is put into the monitoring/eradicated category and continues to be checked for years to come.

1. **Location:** We identify the locations in which invasive *Phragmites* is present and record them using ESRI GIS mapping software (i.e., FieldMaps). We record the geographic coordinates, size, density, and take other notes to create a management plan.
2. **Timing:** The optimal cutting season is Mid-July to mid-August when the plant is directing its energy into the stalks to develop seeds but before the seeds emerge. This way, we cut the plant under water to drown it out during its primary growth stage while avoiding spreading seeds.
3. **Equipment and Cutting:** We use raspberry cane cutters, long-reach powered hedge trimmers and snippers to cut the *Phragmites* via the cut-to-drown method (i.e., cutting the stalks below the water level as close to the bottom as possible).
    - Cut each stalk underwater as close to the sediment as possible.
    - Do not disturb the roots as they can fragment and develop new shoots.
    - Stalks on land are cut with the spading method where possible (i.e., sharpened shovels are used to cut the stalks below the soil surface)
4. **Prioritize:** Priority is given to small stands and stands that have been previously cut. Removing small stands ensures early control before the stand gets large, dense, and difficult to remove. We prioritize returning to manage previously cut stands because it often takes several continuous years of cutting to completely get rid of a *Phragmites* stand. Each year, cut stands should get smaller, sparser, and easier to tackle. Controlling sites in areas of ecological or cultural importance, such as areas with species at-risk or recreational value, is also prioritized.
   **Based on suggestions made to managers by Paul et al.* (2010)*, GBF is considering updating our priority plans to include prioritizing the removal of sites where native and invasive Phragmites cooccur to reduce the risk of hybridization, pending further investigation of hybrid Phragmites in Georgian Bay.*

5. **Selective Cutting:** The selective cutting process means we only remove invasive *Phragmites* stalks, leaving native vegetation unharmed. If there are seed heads present, they are removed from the stalks and disposed of prior to cutting the plant.
6. **Clean-up:** We bundle the cut biomass and make sure we don't leave any viable pieces behind, specifically the roots.
7. **Disposal:** A designated spot near the stand is identified where the cut stalks can dry and decay. It is far enough from the waters edge that rising waters and storm waves will not pull the biomass back into the water. The disposal site is checked the following year to ensure it is not promoting *Phragmites* growth.
8. **Follow-up:** *Phragmites* is a perennial reed grass, meaning it will grow back every year. If left untreated, it will grow back larger and denser. If treated (cut), the stand will grow back smaller and sparser, until eventually there is no regrowth. This process can take 2-7 years of cutting activities depending on the size and location of the stand. Eventually native plants will return, and the habitat will be restored.

For more information or training on how to remove invasive *Phragmites* from shorelines in Georgian Bay, contact Science Projects Manager Nicole Carpenter at nicole.carpenter@gbf.org or 905-880-4945 ext. 7.

Interested in volunteering? Email here and let us know!

PHRAGBUSTERS
WWW.GBF.ORG

Project Outputs

Highlights

- 118 invasive *Phragmites* sites found in Matchedash Bay.
- 26 sites cut, or 903 m^2.
- 18 sites in the monitoring/eradicated stage.
- 62 native *Phragmites* sites found!
- 293 ha of wetland mapped using our drone.

Maps and Tables

*Table 1. Status of the invasive Phragmites stands located in Matchedash Bay since the start of the Save Matchedash Bay Project in 2021. The percentage of controlled invasive Phragmites lowers over time despite our increase in area cut and sites eradicated because we continue to discover new sites each year due to our increased efforts and proficiency monitoring Phragmites in Matchedash Bay. * Note that GBF did not start measuring the area of cut Phragmites until 2023.*

Year	Total sites	New Sites	# of sites Eradicated/ Monitored	# of sites Cut	Area Cut (m^2)	# of sites Controlled (Eradicated/ Monitored + Cut)	# of sites Untreated	% Eradicated/ Monitored	% Cut	% Control
2024	**118**	**16**	**18**	**26**	**903**	**44**	**74**	**15%**	**22%**	**37%**
2023	102	22	18	30	692	48	54	18%	30%	48%
2022	80	40	9	38	NA*	47	33	11%	48%	59%
2021	44	41	0	18	NA*	18	26	0%	40%	40%

Follow the link to an interactive map of all stands on the eastern shoreline of Georgian Bay in 2024, or simply Ctrl + Click the map below: https://arcg.is/vSSvy0

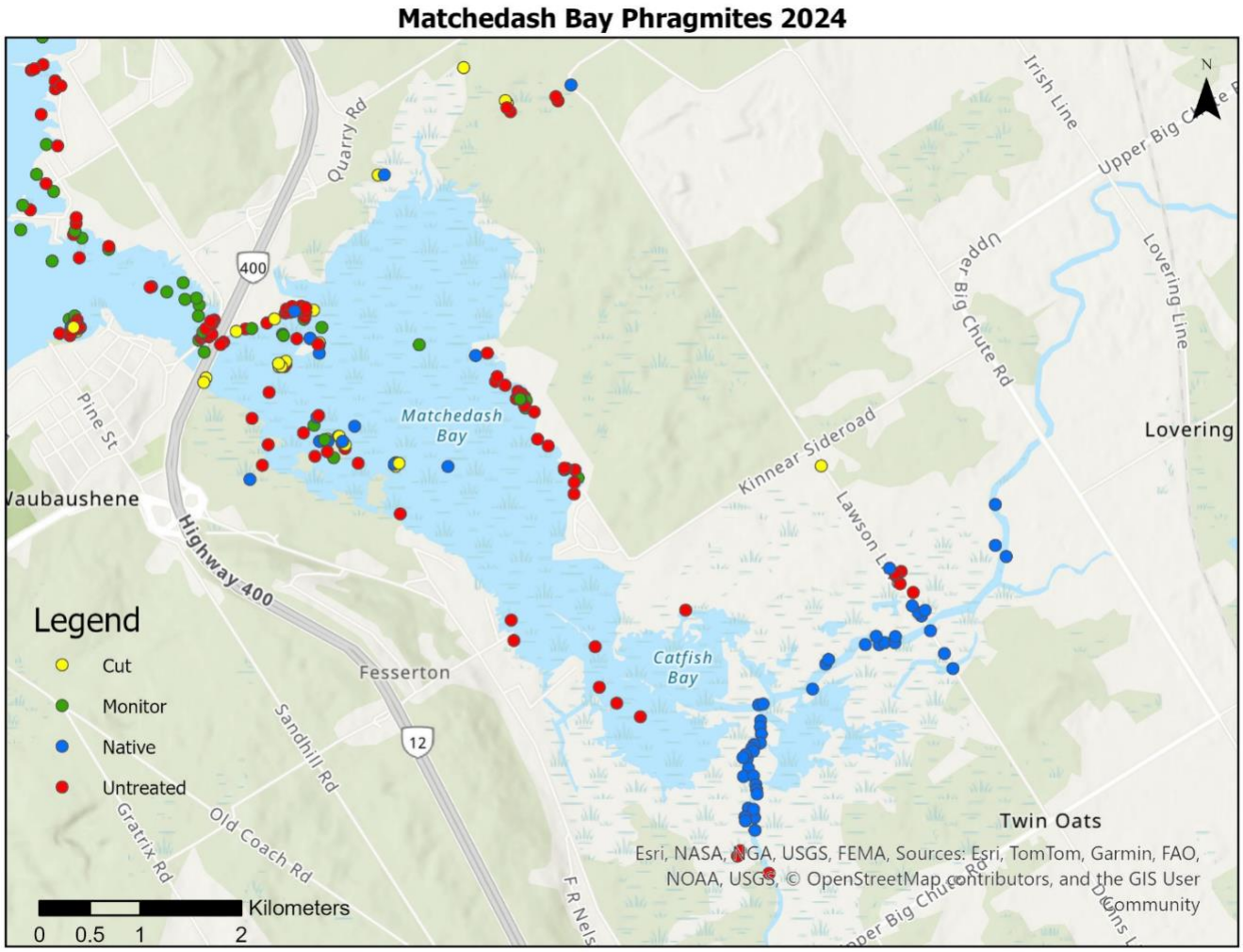

Figure 4. The status and location of the Phragmites stands that were manually mapped by GBF staff in 2024 in Matchedash's main bay and surrounding wetlands.

Aerial Surveying

As new research arises, technology advances, and invasive *Phragmites* continues to threaten aquatic ecosystems, Georgian Bay Forever recognizes the need for innovation within invasive species management. Remote sensing provides an efficient and cost-effective approach for classifying complex wetland environments. With a remotely piloted aircraft system (RPAS), Georgian Bay Forever has begun collecting multispectral imagery of wetland ecosystems invaded with invasive *Phragmites*. In 2024, GBF's invasive species' team deployed the multispectral drone over various sites around the Matchedash Bay wetlands. These sites are known to have both native and invasive *Phragmites,* and the imagery can be processed and analyzed using Geographic Information Systems to identify vegetation indices and specifically, the abundance of invasive *Phragmites*. The goal is to re-run flight missions on an annual basis to keep track of *Phragmites* growth over time, detect new sites and determine best management practices. In the late summer and fall of 2024, 22 flight missions were conducted over the course of 8 days, with a total coverage of 293 ha.

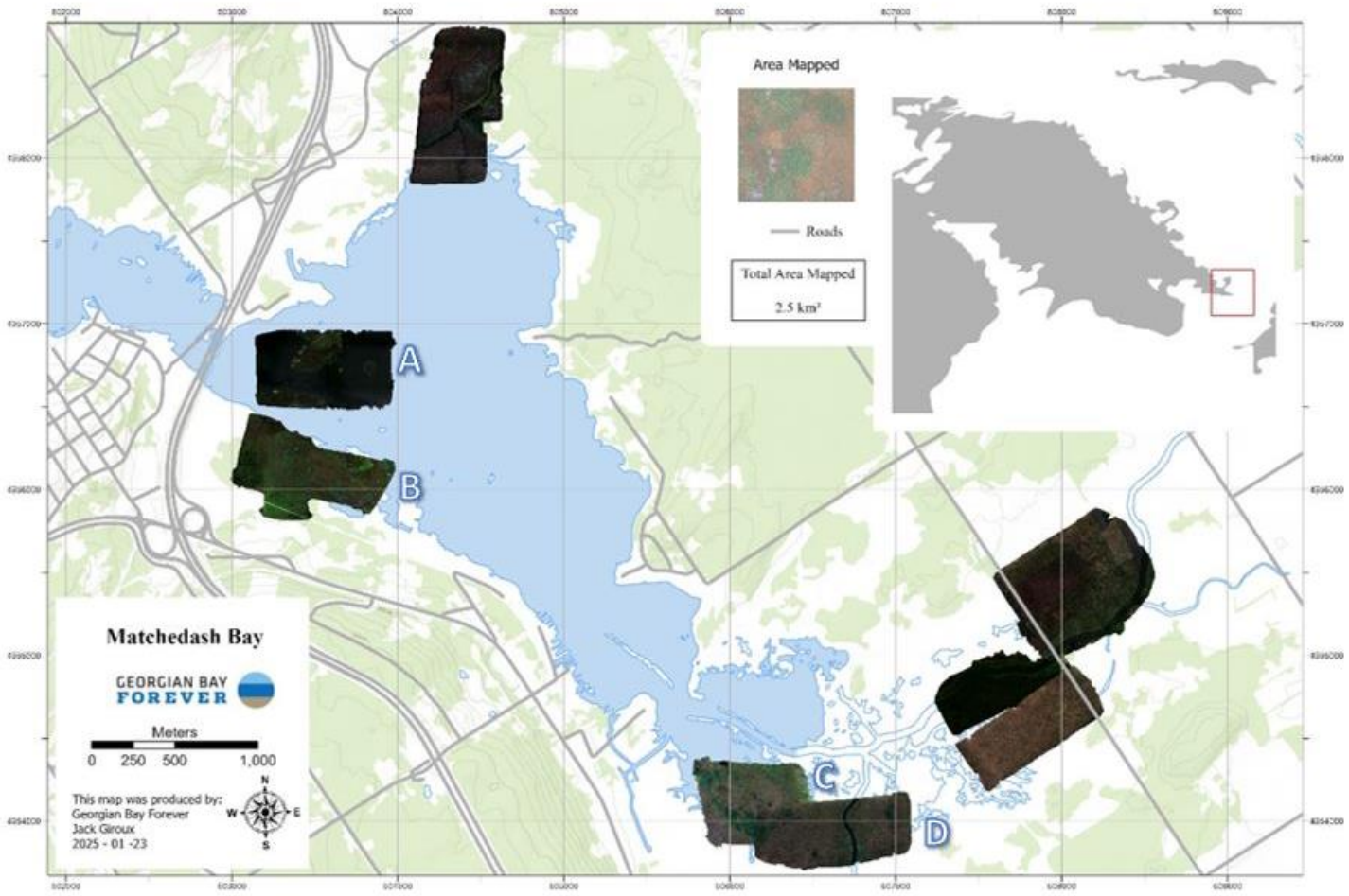

Figure 5. Map depicting drone coverage in Matchedash Bay in the 2024 season. The dark rectangles contain aerial imagery collected with GBF's DJI Matrice 300 drone. In these images, and those enlarged in Figures 6-9, invasive Phragmites can be visually identified by their vibrant green colour and tendency to grow in circular formations.

*Table 2. The total and average area mapped, photos taken, and flight duration for the 22 drone flights GBF conducted over and around Matchedash Bay in 2024. *Note totals and averages include flights conducted outside Matchedash Bay in the adjacent Severn Sound.*

2024 Flight Data	Total	Average per Flight
Area (m2)	2 930 000	133 000
Photos	17 490	795
Flight Time (h:m:s)	5:02:57	0:13:46

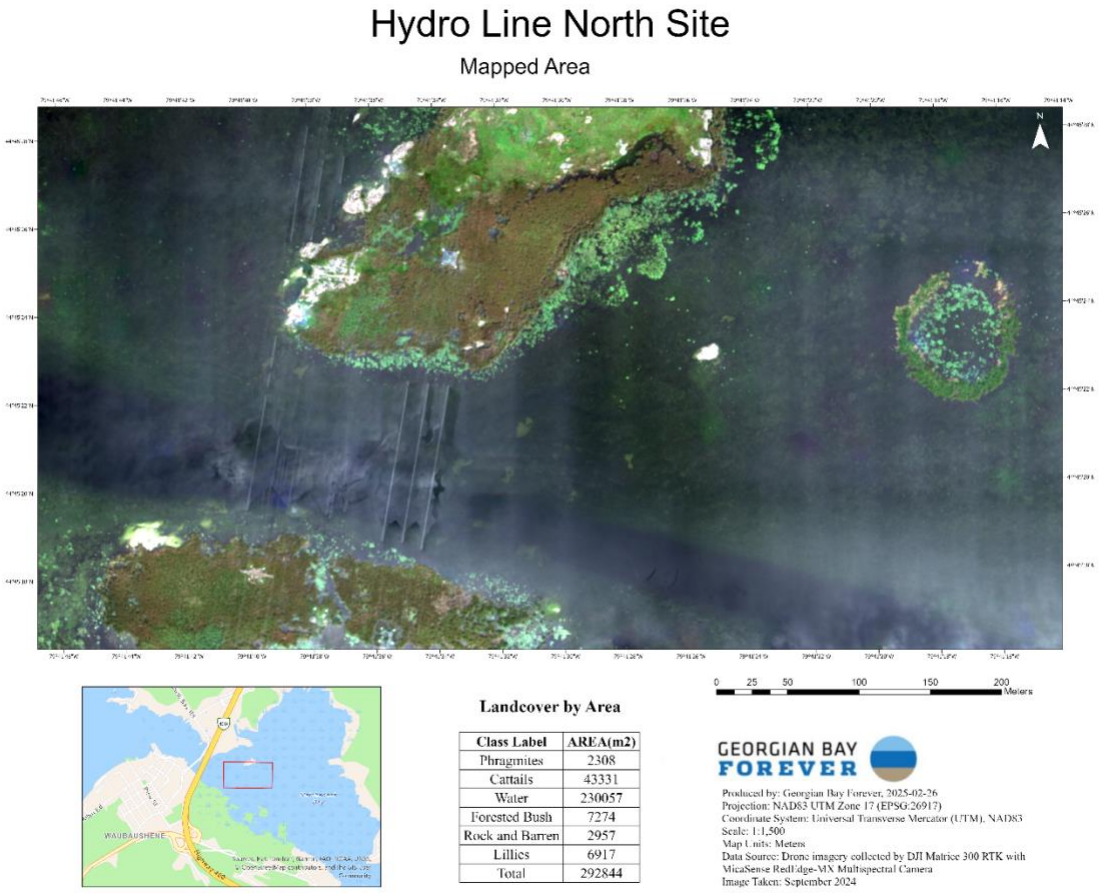

Figure 6. Aerial imagery collected from area A in Figure 5 above. Esri software detected 2308 m^2 of invasive Phragmites in this image. The vertical lines intersecting the image are powerlines.

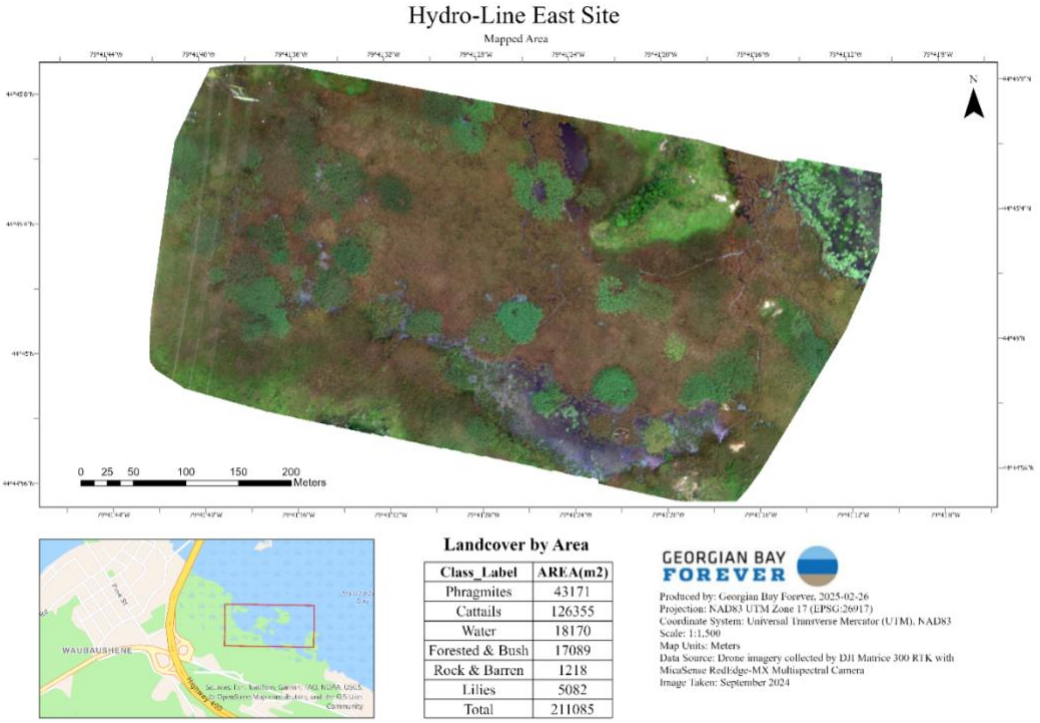

Figure 8. Aerial imagery collected from area B in Figure 5 above. Esri software detected 43171 m^2 of invasive Phragmites in this image. The vertical lines on the left are powerlines.

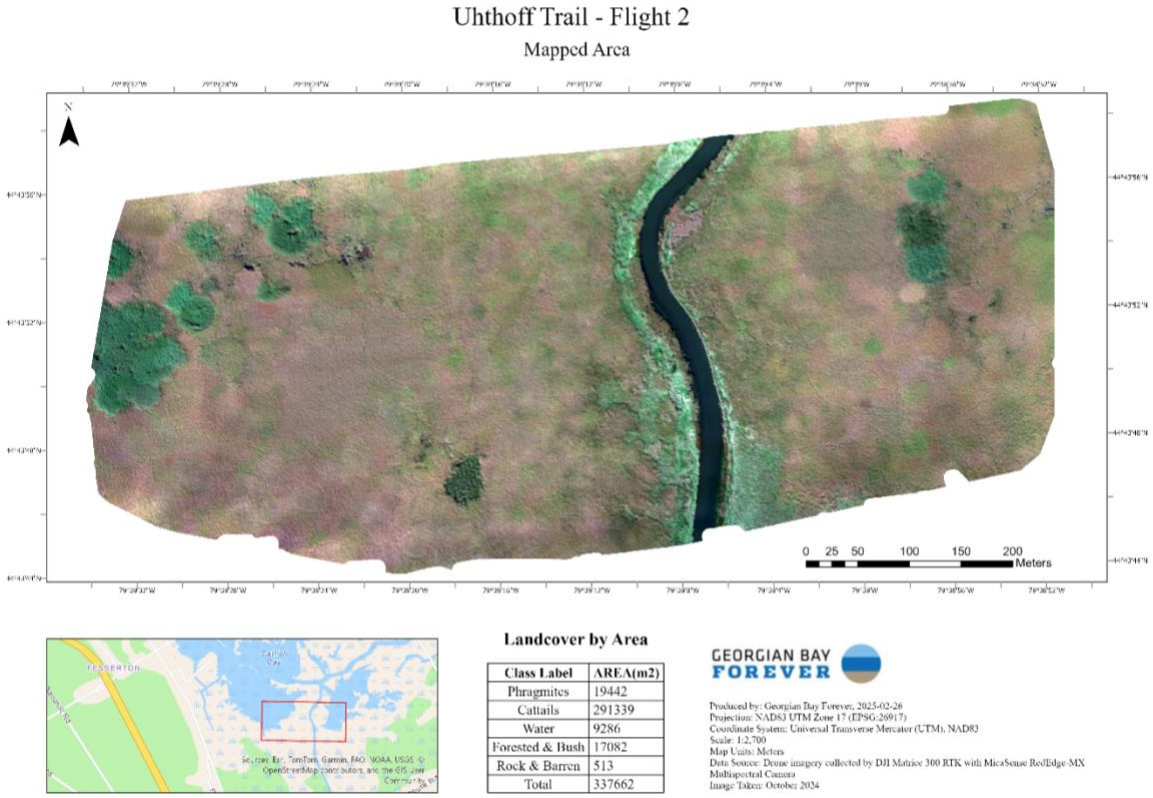

Figure 7. Aerial imagery collected from area D in Figure 5 above. Esri software detected 19442 m^2 of invasive Phragmites in this image.

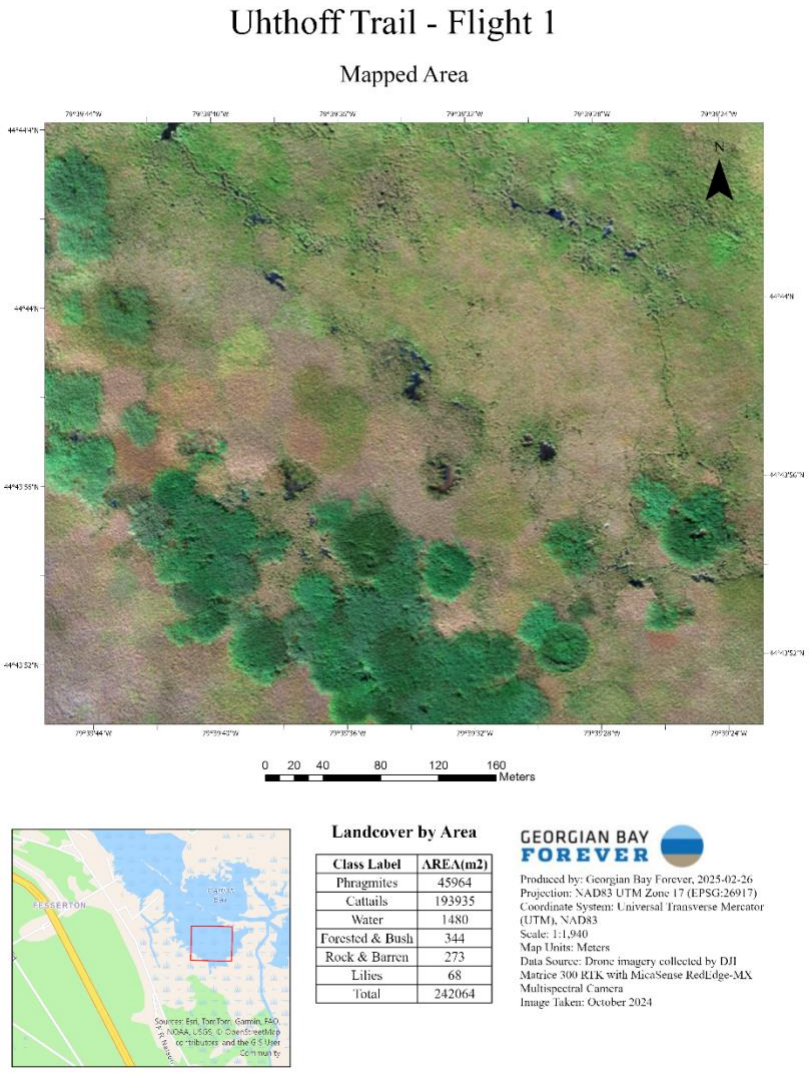

Figure 9. Aerial imagery collected from area C in Figure 5 above. Esri software detected 45964 m^2 of invasive Phragmites in this image.

This study explores the use of Esri's out-of-the-box Deep Learning software to detect *Phragmites* across various landscape conditions. Utilizing high-resolution (7cm) Red, Green, Blue, Red Edge, and Near Infrared bands, we delineated over 3000 training samples from 18 sites across Matchedash Bay. Our plan is to explore the phenological, morphological, and temporal conditions influencing *Phragmites* detection. As of currently, the resulting model obtained a *Phragmites* identification accuracy of 93%, with an overall accuracy of 90% including other land cover classes. Fall (August - October) provides significant spectral contrast between the two dominant landcover classes (*Phragmites* and *Typha* spp.), improving model performance. This comprehensive workflow and image capture guide can help researchers detect new and established *Phragmites* growth, plan for and measure the success of management strategies, and offer key insights into the structural dynamics of *Phragmites* spread.

Figure 10: Georgian Bay Forever's DJI Matrice 300 with RTK station launching in the Matchedash Bay wetlands.

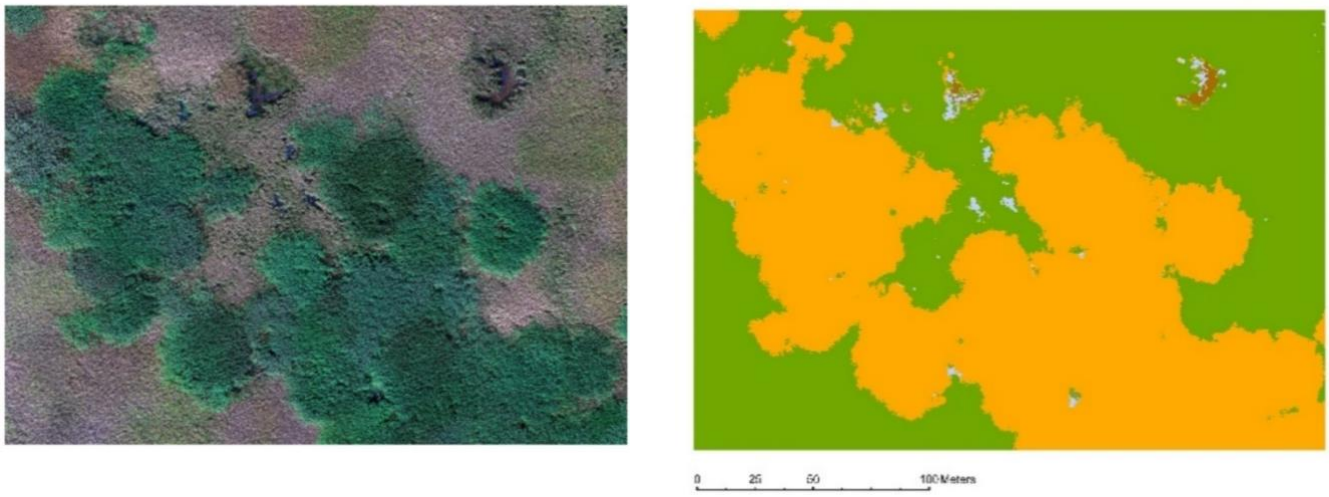

Figure 11: Classified image of invasive Phragmites using Deep Learning Technologies.

Species at Risk (SAR)

Introduction to Species at Risk

What are species at risk?

Species at risk are naturally occurring species that are in decline to such an extent that they are in danger of becoming extirpated or extinct. In Canada, these species are grouped into several categories; from most to least at risk, the categories are extirpated, endangered, threatened, and special concern (Species at Risk Act, 2002). Extirpated species are those that persist somewhere in the world, but have been eliminated from a specific area, such as timber rattlesnakes, which occur in the United States but were extirpated from Canada largely due to human persecution. Endangered species describe species that are at immediate risk of extirpation or extinction, whereas threatened species are those that are likely to become endangered if actions are not taken to restore their populations. Lastly, species of

special concern include species that are particularly vulnerable to becoming threatened or endangered based on a combination of their traits and threats they face.

Figure 12. a) American hart's tongue fern (Asplenium scolopendrium) is designated as a species of special concern at the provincial and federal levels. b) The eastern hog-nosed snake (Heterodon platirhinos) is designated as threatened at the provincial and federal levels.

Canada and Ontario have separate lists of species at risk, but there is significant overlap between them. The Species at Risk Act provides details on how species at risk are designated and protected in Canada, with a list of species designated as extirpated, endangered, and threatened outlined under Schedule 1 and the list of species of special concern found under Schedule 3. The Endangered Species Act is a similar document for the species at risk of Ontario, with an easily viewable list available here. Various threats can result in a species becoming at risk. Common causes of species decline include habitat loss and degradation, persecution, disease, invasive species, climate change, and overexploitation. Mitigating the impacts of such factors and bolstering species populations through conservation efforts can help slow, and hopefully reverse, species decline.

Species at risk in Matchedash Bay

Habitat loss and fragmentation are the leading causes of species decline in Canada and around the world (WWF, 2022). In Ontario, historical and ongoing development of wetlands has resulted in a 70% loss of our original wetlands south of the Canadian Shield, despite inhabiting more than 20% of Ontario's species at risk (Ontario Nature, n.d.). The diverse habitats contained within the Matchedash Bay Provincial Wildlife Area provide a haven for biodiversity in southeastern Georgian Bay. The mix of swamps, marshes, beaver ponds, hardwood forest, native grass meadows, and wet coniferous forest permit a range of plants and animals to thrive within a broader landscape otherwise dominated by anthropogenic influence. Sheltered, undisturbed wetlands allow secretive marsh birds to forage or breed, shallow, fishless waters give amphibians appropriate sites to mate and lay eggs, and the presence of natural meadows lets rare wildflowers support native pollinators; Matchedash Bay Provincial Wildlife Area supplies such opportunities to various sensitive and at-risk species.

Phragmites and species at risk

The establishment of invasive *Phragmites* has a potential to affect a variety of habitats and species, particularly those already at risk. Its ability to outcompete native vegetation and grow extremely tall and dense can impede the ability of these sensitive species to survive. Invasive *Phragmites* is considered a high concern for at-risk species like wetland plants susceptible to encroachment, marsh breeding birds, rare amphibians requiring early-successional habitat to reproduce, and turtles that travel great distances to nest or require open sand for nesting (Nichols, 2024). Invasive *Phragmites* is present in the Matchedash Bay watershed and threatens to interfere with at-risk species' efforts to forage, grow, and reproduce without continued management.

Figure 13. A water-level view from inside a mature invasive Phragmites stand. It can be difficult, and often impossible, for fish, marsh birds, and other small animals to navigate the dense growth.

Methods and Project Outputs

Our current project involves species at risk monitoring in collaboration with Severn Sound Environmental Association and volunteers. Visual encounter surveys were performed by GBF in spring, with the expected SAR sightings recorded for this location and 4 nest protectors placed during the nesting season and removed in the fall. Further field investigations took place in summer and early fall to document the species of concern within various habitats in the study area. Field work involved visual encounter surveys along roads and around an inland pond where we noted potential and predated nest sites and used binoculars to identify species from a distance. Additionally, staff recorded incidental SAR observations made while conducting other stewardship activities. No mark and re-capture activities were conducted. Provincial Survey protocols for species at risk in Ontario were followed (Ontario Ministry of Natural Resources and Forestry, 2015). We plan to continue this monitoring in 2025, with the addition of habitat enhancement activities.

Information about species at risk and their locations is quite sensitive and not intended for public disclosure, thus will not be discussed in this report. If you have any questions, concerns, or comments, please contact Nicole.carpenter@gbf.org.

Figure 14. GBF students monitoring for SARs.

Community Involvement

Coldwater Fall Fair

In September, GBF shared an educational booth with the Marl Tiny Matchedash (MTM) Conservation Association at the Coldwater Fall Fair. Together we educated 65 fair attendees about invasive species and conservation in Matchedash Bay and beyond. When we attend events like the Coldwater Fair, we aim to provide a space for community members, that may not otherwise have the opportunity, to connect with and ask questions about their local environment.

Figure 15. GBF Science Projects Manager, Nicole, and an MTM volunteer manning the shared booth at the Coldwater Fall Fair.

MTM Conservation Association and New Signage

In 2023, MTM Conservation Association and GBF teamed up to redesign some of the signage at trailheads and boat launches around Matchedash Bay as the old ones were falling out of date and into disrepair. This year, staff and volunteers from both organizations began installing some of the new and improved signs. The new signs provide updated information about the recreational use, ecological importance, and invasion of *Phragmites* in the wetlands and along the trails. New signs will continue to be installed in 2025!

Figure 16. The newly installed sign at Brereton Trail.

Figure 17. The old sign at Cowan Trail being removed by GBF staff and MTM volunteers in contrast with the newly installed sign.

2025 Outlook

Looking into 2025, GBF will continue to monitor and manage invasive Phragmites in Matchedash Bay. Similar to years previous, it will be mapped in June, and a priority plan will be developed. Any small sites mapped will be cut first along with any sites that were cut in 2024 to work toward eradication. GBF will continue to educate the community and recruit volunteers for Phragmites removal throughout July and August. As the end of summer approaches, GBF will begin the planning and implementation of our ongoing aerial surveying across the wetland with our multispectral drone. Our goal in 2025 is to survey as much, if not all, of Matchedash Bay and the surrounding marshes in search of invasive phragmites with the drone. We also look forward to continuing our partnerships with the MTM Conservation Association and Severn Sound Environmental Association for further Phragmites efforts, species at risk monitoring, and overall habitat enhancement.

Figure 18: North River.

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