ENGLISH VERSION PROVIDED BY THE MCGREGOR LAKE ASSOCIATION

AGENCE DE BASSIN VERSANT DES 7

Association du lac McGregor
McGregor Lake Association

CARTOGRAPHIE DES HERBIERS DE MYRIOPHYLLE À ÉPIS ET INDIGÈNES AU LAC MCGREGOR

Agence de bassin versant des 7
733 Boul. St-Joseph, bureau 430
Gatineau (QC) J8Y 4B6

Octobre 2024

TABLE OF CONTENT

Introduction

For several years, McGregor Lake has been affected by the presence of Eurasian Milfoil (Myriophyllum spicatum), an exotic and invasive aquatic plant. The presence of this aquatic plant harms both the water activities and recreational tourism of users as well as the health of the lake. Swimming, fishing, and boating can be impacted, along with the lake's environment, where the density of pondweed mats can destroy spawning grounds and influence the amount of dissolved oxygen in the water.

Thus, in 2015, the McGregor Lake Association carried out the first mapping of the Eurasian Milfoil beds. In 2019, the association commissioned the watershed agency of 7 (ABV des 7) to update the mapping in order to track the progression of this invasive aquatic plant. During summer 2024, a new update has been requested from the ABV des 7 to monitor the beds, but also to identify ways which could be considered to control the proliferation of the plant in the lake.

Mandate

The McGregor Lake Association contacted the Watershed Agency of 7 in February 2024 with the aim of updating the mapping of the Eurasian Milfoil beds and additionally mapping the native beds present in McGregor Lake.

As part of a potential management plan for Eurasian Milfoil at McGregor Lake, the Association is primarily seeking to obtain an update on the characterization and mapping of both Eurasian Milfoil and native beds. This data will be crucial to support potential permit requests to the Ministry of the Environment, Climate Change, Wildlife, and Parks (MELCCFP) in the event that the McGregor Lake Association and the Municipality of Val-des-Monts wishes to proceed with the successful implementation of a management plan for the pondweed.

The McGregor Lake Association has also asked the ABV des 7 team to pay attention to the presence of cyanobacteria on-site while conducting surveys for aquatic beds.

1. McGregor Lake and Its Watershed

The watershed of McGregor Lake, as well as McGregor Lake itself, is located in the municipality of Val-des-Monts, which is part of the MRC des Collines-de-l'Outaouais. This lake is part of the watershed of the Blanche River, which flows into the Ottawa River. It is accessible from Gatineau by following Highway 50 and then Route QC-366 West towards Sauvé Road in Val-des-Monts. Located approximately 35 km from the city of Gatineau, McGregor Lake has a very complex shape with numerous bays and 13 main islands. It is oriented along a northwest-southeast axis between the coordinates 45.655837˚, -75.645171˚ and 45.624551˚, -75.630014˚.

1.1 Characteristics of McGregor Lake

The following table summarizes the main characteristics of McGregor Lake.

TABLE 1 TECHNICAL DATA SHEET OF MCGREGOR LAKE

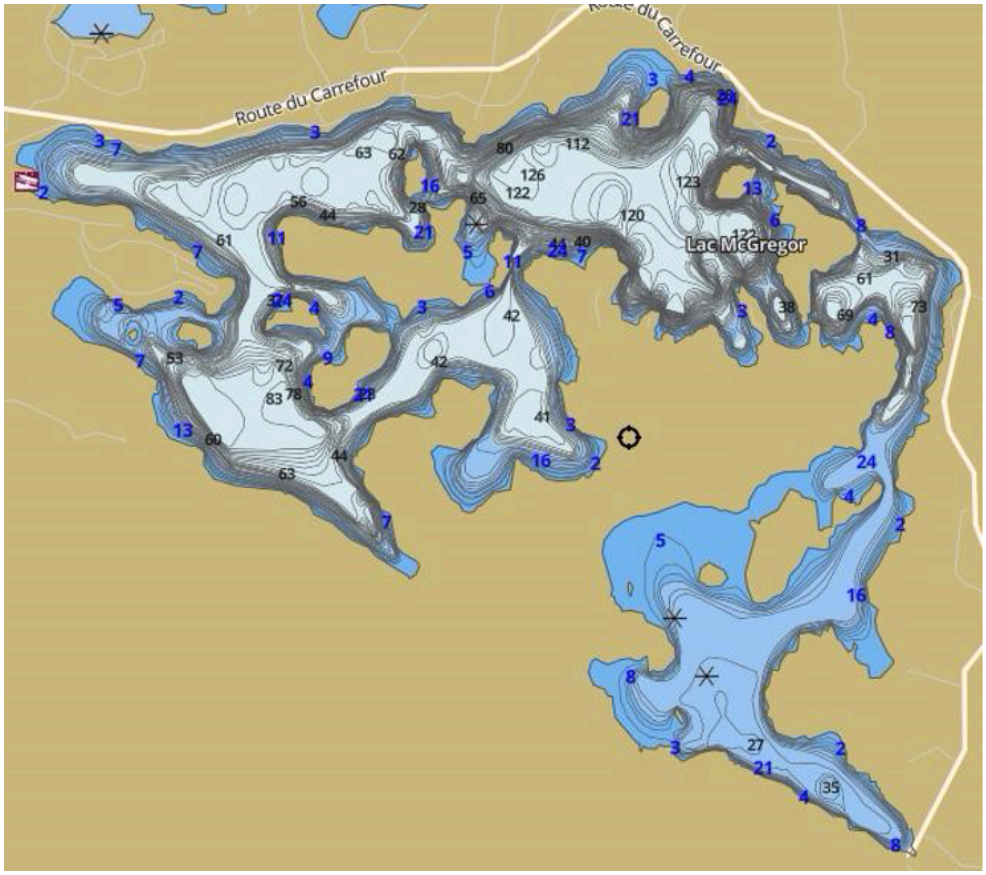
Paramètres	Données morphométriques
Altitude	141,7 m (465 pi)
Surface Area	5,443 km^2 (544,3 ha)
Maximum Width	2 250 m
Maximum Length	8 370 m
Transparency*	4,5 m
Maximum Depth	41,75 m (137 pi)

*The transparency measurement was taken in the days following episodes of heavy rain. These weather conditions may have influenced the results, making the measurement potentially unrepresentative of reality.
(McGregor Lake Association, 2023)

1.2 Bathymetry

McGregor Lake has a maximum depth of 41.75 m in the northeastern section of the lake south of Mangin Island. Elsewhere in the lake, the depths of the basins vary significantly, ranging between 12 and 25 m. The slope is noticeably steeper in the northeastern section of the lake where the deepest basins are located compared to the northern and southern parts of the lake, which have gentler slopes. Theoretically, there should therefore be larger areas of aquatic beds in the northern and southern parts, and near the lake's islands, since there is a greater extent of shallow depth found there.
(GPS Nautical Charts, 2024)

FIGURE 1 BATHYMETRIC MAP OF MCGREGOR LAKE ACCORDING TO GPS NAUTICAL CHARTS



1.3 Hydrology

McGregor Lake is fed from the northwest by Lake Laurin, Lake Bonin, and Lake McGlashan through the Pélissier Stream, which connects the lakes. The lake is also fed by lakes Brassard, Dam and Grand and several tributaries, particularly in the northeast where Route 366 runs alongside the lake. To the south, McGregor Lake narrows to become Courville Bay before continuing its course and discharging into Lake Hynes approximately 2 km from McGregor Lake.

2. Eurasian Milfoil

Eurasian Milfoil (Myriophyllum spicatum) is a perennial aquatic plant that lives submerged at depths between 0.5 and 7 m (mostly between 0.5 and 4.5 m). The plant roots at the bottom and grows toward the surface where it branches out and forms a mat. Native to Europe, Asia, and North Africa, it is believed to have been accidentally introduced to North America in the 1940s. It is considered the most adaptable exotic species to a variety of different environments, making it highly invasive.

This plant is therefore more competitive than other plant species, developing in mass and gradually eliminating other species through competition. The introduction of Eurasian Milfoil into lakes leads to significant disturbances in the environment and a substantial decrease in biodiversity. The formation of a dense bed prevents native plant species from growing and aquatic fauna from inhabiting the area. Eurasian Milfoil can even establish itself in spawning grounds, leading to their destruction and threatening fish populations. A high density of plants results in significant oxygen consumption, leading to anoxia problems (i.e., a lack of oxygen in the deeper waters of the lakes).

Theoretically, Eurasian Milfoil can reproduce in two ways: either sexually through seeds or asexually through stem fragmentation (cuttings). A unique feature of this species is that it produces roots on its stems in the aerial part of the plant, which later detach naturally. These cuttings with roots subsequently move with the current and waves. They quickly establish themselves in the lakebed to create a new bed or reinforce the original bed. In practice, the spread of Eurasian watermilfoil occurs through the fragmentation of its branches, a phenomenon that can occur naturally or be caused by human activities,
Eurasian Milfoil primarily reproduces this way, which is the main cause of its spread. Human activities such as fishing, water sports, boating, and the transport of boats from one lake to another contribute to this dissemination.
(Government of Quebec, 2023c; MELCCFP, 2023)

FIGURE 2 MONOSPECIFIC BED OF Eurasian Milfoil

3. Inventory Methodology

3.1 Inventory of Aquatic Beds

During aquatic bed inventories, it is important to choose a vessel with a draft that allows access to shallow areas without significantly damaging the plants. Generally, three people are required on-site: a driver for the vessel, an observer who notes the beds, and a person who records GPS data and assists with navigation and visual observations.
The inventory was carried out on August 6, 7, 8, 13, and 14, 2024. Data on aquatic beds were compiled using a form on an electronic tablet (Appendix 1). A description of the bed, including its composition and density, is made before recording its position and shape using georeferenced points with a Garmin GPSmap 62. All beds were identified, including native beds without Eurasian Milfoil. In this case, the beds were classified into three categories:
- Native: composed of less than 5% Eurasian Milfoil with the presence of 95% native species;
- Mixed: composed of between 6% and 79% Eurasian Milfoil;
- Monospecific: composed of more than 80% Eurasian Milfoil.

GPS points were also recorded when one to three isolated stems of Eurasian Milfoil were observed. These points were classified as occurrences of sporadic Eurasian Milfoil. The inclusion of mentions of Eurasian watermilfoil had not previously been made during the 2015 and 2019 inventories. However, the team judged that this would be important data to add since the presence of strands of Eurasian watermilfoil in an area could possibly indicate the presence of seagrass if dispersal intensifies.

3.2 Field Equipment

Some plants can be identified with the naked eye, while others need to be observed using an aquascope (Fig. 3), which is a hollow tube that can be placed in the water and has a lens at its end. When submerged, the Aquascope allows for direct viewing of the bottom of the water without the reflections or bubbles that hinder identification. The use of the aquascope is intended to locate submerged aquatic plants that are difficult to see through the water due to sunlight reflections at the surface. Polarized sunglasses also help reduce surface reflections and improve visibility of aquatic plants.

FIGURE 3 AQUASCOPE USED FOR AQUATIC BED INVENTORY

3.3 Mapping of Beds

The mapping of native and Eurasian Milfoil beds (Fig. 4) was performed using ArcGIS Pro software version 2.9.9. It is important to carry out the mapping of beds as accurately as possible in order to know their exact distribution in the lake. This allows for quick identification and location of beds using landmarks known to local residents.
The mapping provides the distribution of monospecific beds of Eurasian Milfoil, mixed, and native beds within McGregor Lake, as well as sporadic mentions of Eurasian Milfoil. The maps have been integrated into the report in the results section.
(MELCCFP, 2023)

4. Results

4.1 Overview of the Situation at McGregor Lake

During the characterization of native and Eurasian Milfoil beds at McGregor Lake, a total of 34 native beds, 29 mixed beds, 41 monospecific beds, and 35 sporadic mentions were recorded (Fig. 4). The smallest monospecific bed covers 0.55 m², while the largest reaches 26,191.41 m² (Table 3). The beds were generally found at depths ranging from 0.5 to 7 m, but were more abundant between 0.5 and 4.5 m. The majority of the beds are composed of emergent or floating-leaf plants. The mapping shows that beds containing Eurasian Milfoil are present throughout the lake, but more particularly in shallow littoral zones. Rocky areas that become deep quickly are generally free of beds.
The southern portion of the lake is the area where the most significant monospecific and mixed beds were recorded. This area is very shallow and likely one of the most frequented, which may lead to accelerated fragmentation of Eurasian Milfoil beds due to motorized traffic. These areas are therefore more sensitive and should be considered a priority.
The native beds are primarily composed of Brasenia schreberi, Nuphar variegata, Nymphaea odorata, Potamogeton amplifolius, Potamogeton richardsonii, and Potamogeton robbinsii (Appendix 2).

TABLE 2 MAIN SURFACE CHARACTERISTICS OF BEDS BASED ON TYPE (2024)

	Indigène	Mixte	Monospécifique
Plus petit herbier (m^2)	2,92	0,17	0,55
Plus vaste herbier (m^2)	165 633,65	39 405,16	26 191,41
Superficie totale (m^2)	477 672,96	194 623,62	97 698,42
Superficie du lac (%)	9%	4%	2%

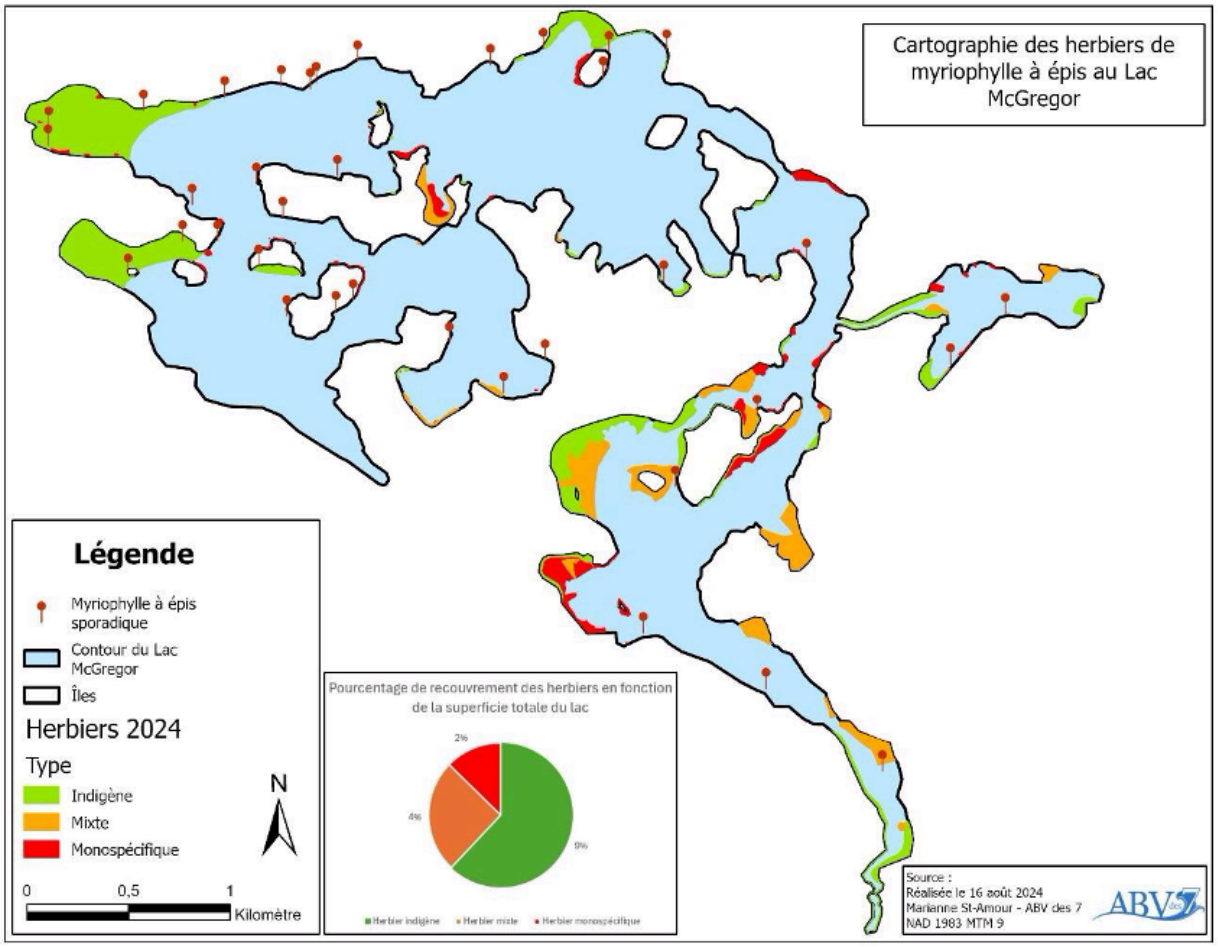


FIGURE 4 MAPPING OF NATIVE BEDS AND Eurasian Milfoil ACROSS MCGREGOR LAKE

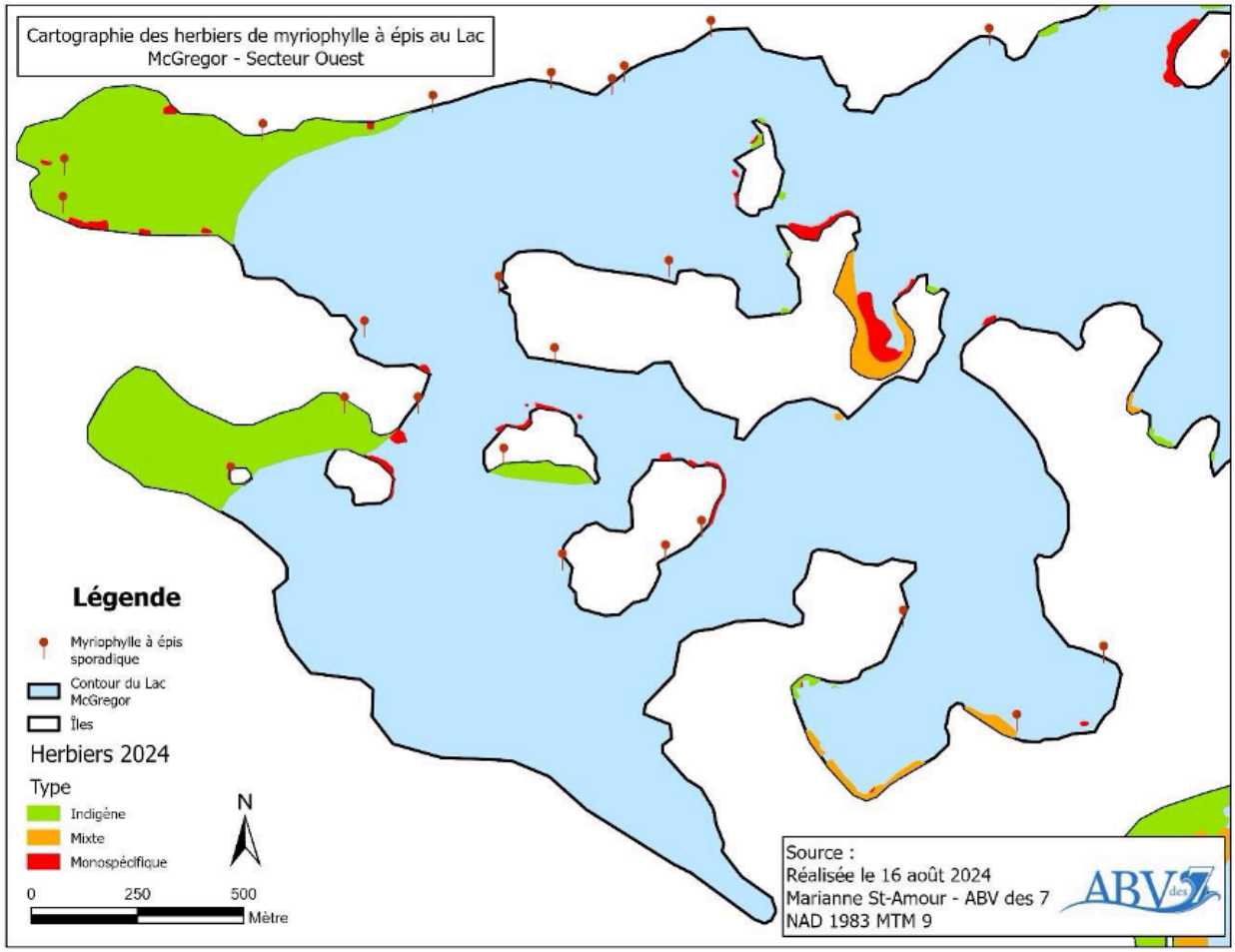


FIGURE 5 MAPPING OF NATIVE BEDS AND Eurasian Milfoil IN THE WESTERN PART OF MCGREGOR LAKE

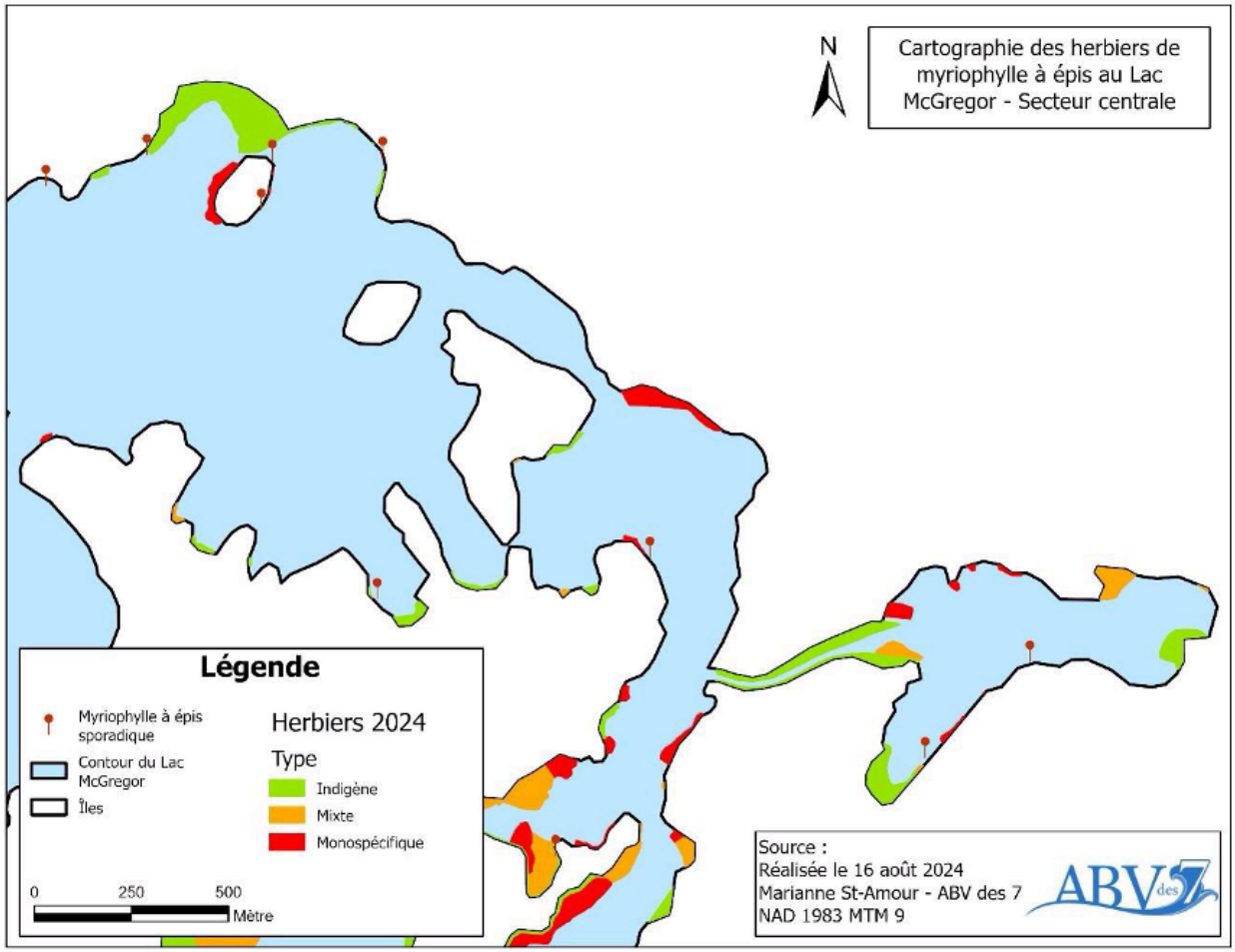


FIGURE 6 MAPPING OF NATIVE BEDS AND Eurasian Milfoil IN THE CENTRAL PART OF MCGREGOR LAKE

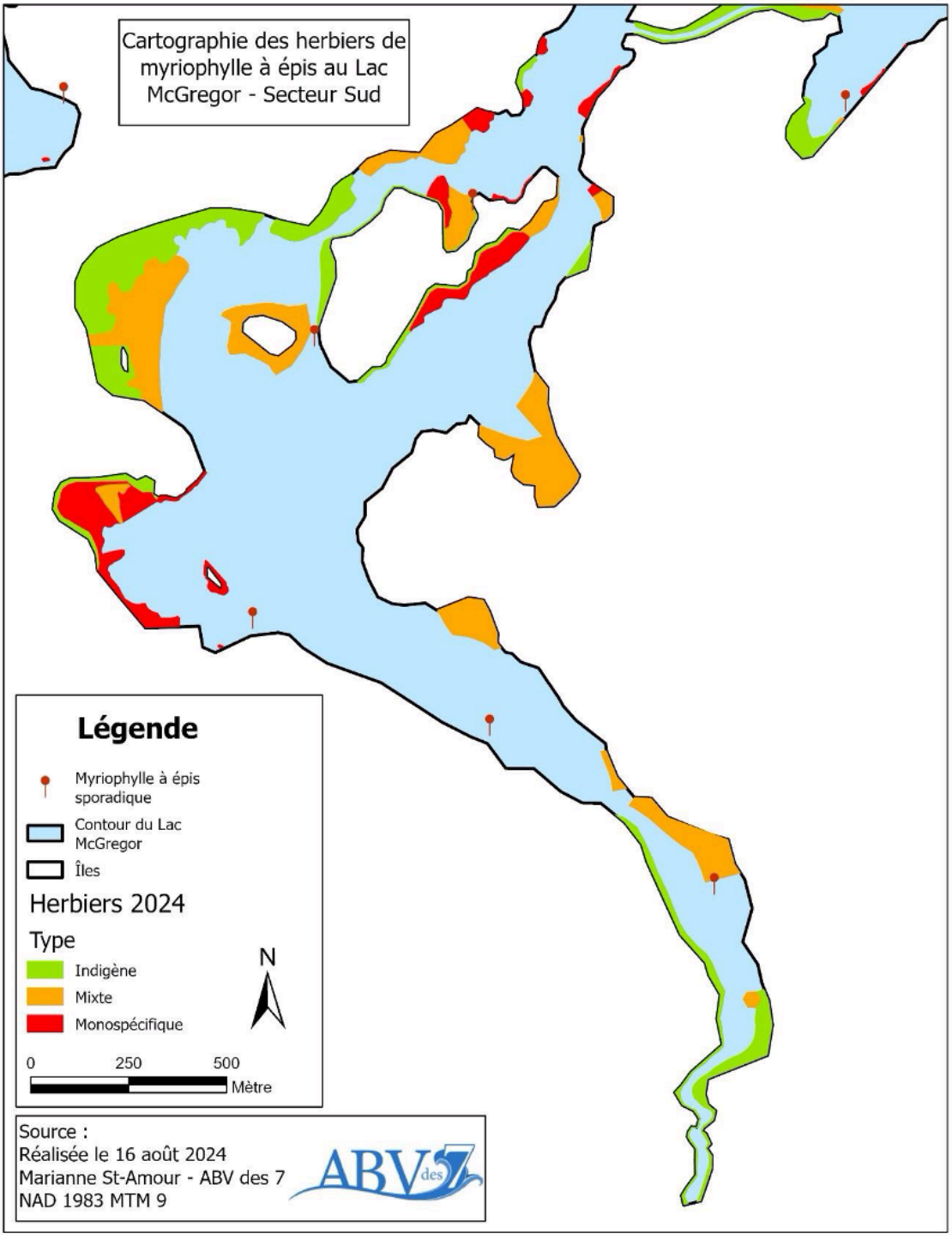


FIGURE 7 MAPPING OF NATIVE BEDS AND Eurasian Milfoil IN THE SOUTHERN PART OF MCGREGOR LAKE

Figures 4 to 7 are maps of the different sections of the lake. Fig. 5 represents the western part of the lake, Fig. 6 represents the central part of the lake, and Fig. 7 represents the southern part of McGregor Lake.

The mapping of aquatic beds in McGregor Lake from 2015 (Appendix 3), conducted by the Val-Des-Monts Lakes Federation, shows that six locations are occupied by Eurasian Milfoil beds.

According to the 2019 report, the mapping carried out that year (Appendix 4) indicates that certain herbaria identified in 2015 are no longer present. In addition, new herbaria seem to have been identified in 2019 compared to 2015. However, no additional information is available to explain these discrepancies, although is the hypothesis put forward in the report, suggesting a lack of in-depth identification in 2015. In order to better understand these variations, a more in-depth scientific study or a dedicated research project would be necessary. These differences could result from several factors, including variations in abiotic conditions (temperature, light, hydrodynamics,quality of water), of the disturbances anthropogenic (shoreline developments, nautical activities), or even biological processes such as that interspecific competition, dispersal of plant fragments and dynamics growth of milfoil. A more detailed analysis would make it possible to identify the mechanisms at the origin of these changes and to adapt management strategies consequence.

In 2024, we observe that the area of several monospecific beds has increased since 2019, and several mixed beds have also been added.

4.2 Summary of Cartographic Analysis

We were able to faithfully reproduce the distribution of the main beds in McGregor Lake (Fig. 4). In summary, the observations regarding the distribution of Eurasian Milfoil are as follows:

- Eurasian Milfoil generally occupies the shallow areas of the lake at depths less than 4.5 m but can extend beyond that. It forms dense, monospecific mats in several locations, with the largest covering an area of approximately 26,191.41 m².
- In the case of dense monospecific beds, Eurasian Milfoil predominantly (over 80%) outcompetes other native species or completely dominates them. The monospecific beds total an area of 97,698.42 m² and number 41, which represents 1.79% of the total surface area of the lake.

- Mixed beds contain Eurasian Milfoil but are mixed with other native aquatic species in proportions less than 80% and greater than 5%. In this proportion, the mixed beds, numbering 29, occupy a total area of 194,623.62 m². The largest covers an area of 39,405.16 m², while the smallest is only 0.17 m². Mixed beds represent 3.57% of the total area of McGregor Lake. The increase in the number of mixed herbaria compared to 2019 could be explained by a difference of classification, some of these herbaria could have been considered as mono specifics in previous assessments. In addition, a sub-estimation of the surface area of seagrass beds in 2019 could also explain the significant gaps observed in terms of recovery. However, inIn the absence of additional data, it remains impossible to determine whether this increase results from an underestimation in 2019 or whether it is attributable to anthropogenic activities influencing the dynamics of the lake.

- Native beds are those where Eurasian Milfoil is either absent or present in a proportion of less than 5%. In this proportion, the 34 native beds occupy a total area of 477,672.96 m², which represents 8.76% of the total area of the lake.

- Sporadic mentions of Eurasian Milfoil refer to observations of one to three isolated stems in the lake. A total of 35 sporadic mentions of Eurasian Milfoil were recorded across McGregor Lake and its bays.

- The area of the beds observed in 2024 (native, mixed, and monospecific) covers 769,995 m², which represents approximately 14% of the total area of the lake. The surveys from 2019 and 2015 indicated that the total area of beds covered 15,176 m² and 34,439 m², respectively, excluding the native beds.

Referring to the maps of Annex 4 as well as the 2024 maps, the location of several herbaria seems to correspond, although differences in surface area are notable. In order to validate these observations and rule out any overestimation of the size of the herbaria, the field team carried out GPS point surveys more detailed within the different herbaria, thus making it possible to obtain the best possible correlation between reality and cartography.

TABLE 3 COMPARISON OF INVENTORIES FROM 2015, 2019, AND 2024

	Indigène			Mixte			Monospécifique		
	2015	2019	2024	2015	2019	2024	2015	2019	2024
Superficie totale (m2)	N.D	N.D	477 672,96	N.D	510	194 623,62	34 439	14 666	97 698,42
Superficie du lac %	N.D	N.D	9%	N.D	0,01%	4%	0,64%	0,28%	2%

5. Conclusion and Recommendations

Lake McGregor is a body of water with a complex morphology, subject to the presence of numerous homes on its banks and various recreational activities on its waters. These anthropogenic activities make Lake McGregor vulnerable to nutrient enrichment. This enrichment can come from water discharges wastewater, runoff from residential areas and soil erosion, among others. Enrichment leads to the expansion of aquatic grass beds, which benefit from a greater quantity of nutrients for their growth. Moreover, the presence of recreational activities in seagrass meadows can promote fragmentation and propagation of plants in the lake.

The increase in the number, area, and location of monospecific and mixed Eurasian Milfoil beds since 2019 is a sign. Although the beds are not represented in an alarming proportion in the lake, their presence indicates that the lake now requires increased monitoring and that control measures are necessary.

To date, it is not possible to state if the spread of Eurasian watermilfoil is due to lake enrichment and/or presence of recreational activities in seagrass beds without more in-depth studies.

To limit the spread of aquatic plants in McGregor Lake, temporary more important containment measures can be put with more yellow buoys than those already put in place by the Association and signage limiting motorized boat traffic are highly recommended while waiting for more concrete control measures.

Since the plant spreads primarily through fragmentation, it is important for the McGregor Lake Association to educate beyond those efforts made to local residents. In this sense, campaigns of raising awareness among users, AirB&B vacationers, visitors, and all users could be put in place by the municipality in order to enable efforts to continued awareness to prevent motorboat traffic in beds where the presence of Eurasian Milfoil has been reported. Additionally, jute mats could be installed in areas deemed priority if the density of Eurasian Milfoil justifies it.

The McGregor Lake association carries out important awareness-raising work, through the sending of a leaflet to each resident of the lake as well as with messages presented at its annual general meeting, and publications on the media social networks and in its newsletter. However, considering that the plant mainly spreads by fragmentation, it is important that the McGregor Lake Association raise awareness more and continually to local residents in order to prevent the circulation of motor boats in seagrass beds where the presence of Eurasian milfoil has been reported.

The following recommendations are also suggested for the McGregor Lake Association in collaboration with the municipality of Val-des-Monts:

- **Monitoring of aquatic beds:** An inventory at least every three years of the density of aquatic beds is recommended to characterize the evolution of the beds over time. Additionally, there should be annual monitoring to ensure that invasive plants do not spread further.

- **Control method for Eurasian Milfoil**: As a control method, the installation of jute mats over monospecific beds in the areas most likely to cause their fragmentation is the method that has demonstrated the best effectiveness at the lowest cost. Installation is done manually at selected sites after obtaining authorization certificates.

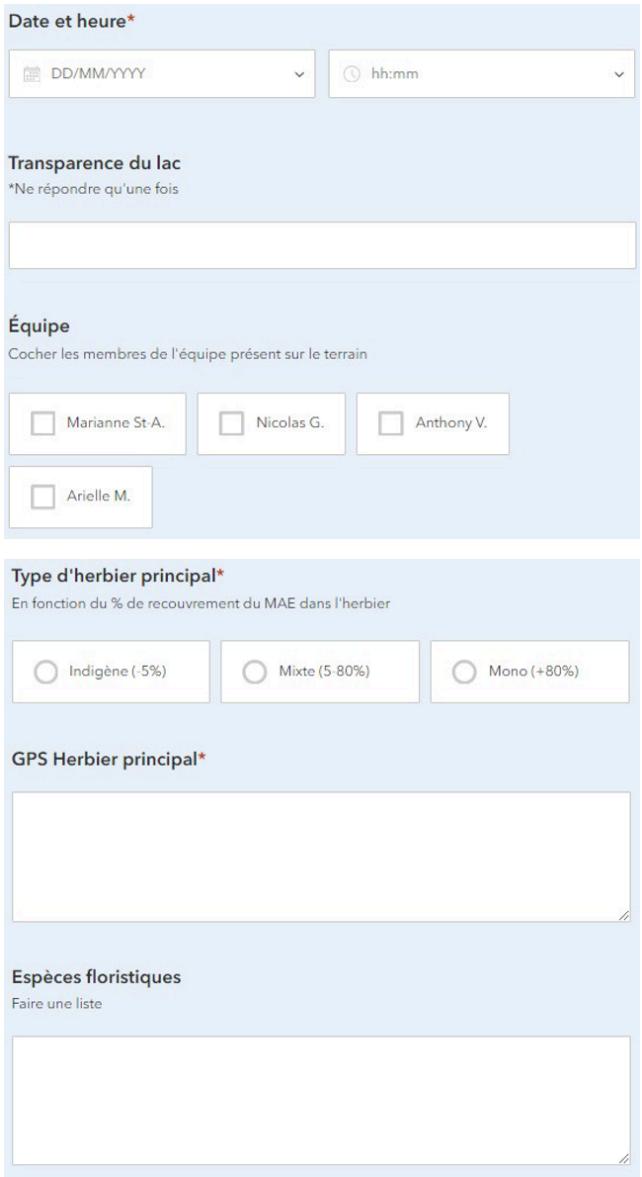
- **Cleaning of boats:** Some municipalities, as is the case with the Val-des-Monts municipality, and associations in other regions operate cleaning stations to encourage users to clean their boats. In fact, the municipality of Val-des-Monts has completed two installations at city hall and the fire station in Perkins And is planning a third in Poltimore. At McGregor Lake, the access ramp is under the exclusive responsibility of the municipality of Val-des-Monts. It would be essential to collaborate with the municipality of Val-des-Monts in order to further increase efforts to monitor access to the lake, in particular by setting up surveillance stations at the lake access ramp during the summer season and setting up more boat cleaning stations to limit the spread of milfoiland promote better protection of the lake. Mandatory or more supervised use of the boat cleaning stations and access to the lake would have the benefit of better protecting it by limiting the risks of introducing invasive exotic species. Also, it has been observed that some owners let users put their boats (possibly not permitted at the landing stage) from their land. Although the association is already taking steps to improve this situation, It is necessary to set up an awareness campaign annually to ensure compliance with these measures. It is also strongly recommended to clean any type of floating recreational equipment on which plants could stick together and be transported to another lake to avoid the introduction of invasive aquatic species, at the entrance and, if possible, at the exit.

This report aims to update the situation of Eurasian Milfoil in McGregor Lake and provide a source of information on control options available to the McGregor Lake Association, in collaboration with the municipality of Val-des-Monts. It is important to emphasize that the recommended control methods are management measures for Eurasian Milfoil, but these measures should not overshadow the need to continuously reduce phosphorus inputs and decrease sedimentation rates in the lake to control the growth of aquatic plants that form significant beds in several areas. The update of the mapping of Eurasian Milfoil beds can also be disseminated and communicated to all users of the lake to ensure its protection and help limit the spread of the beds.

The McGregor Lake Association also wished for the ABV des 7 team to pay particular attention to the presence of cyanobacteria during field surveys. The ABV des 7 can confirm that no cyanobacteria were observed on the dates when the team was present at the lake. However, this does not mean that the lake is free of cyanobacteria or that residents might not observe blooms if favorable conditions arise.

6. APPENDICES

1 – Field Sheet

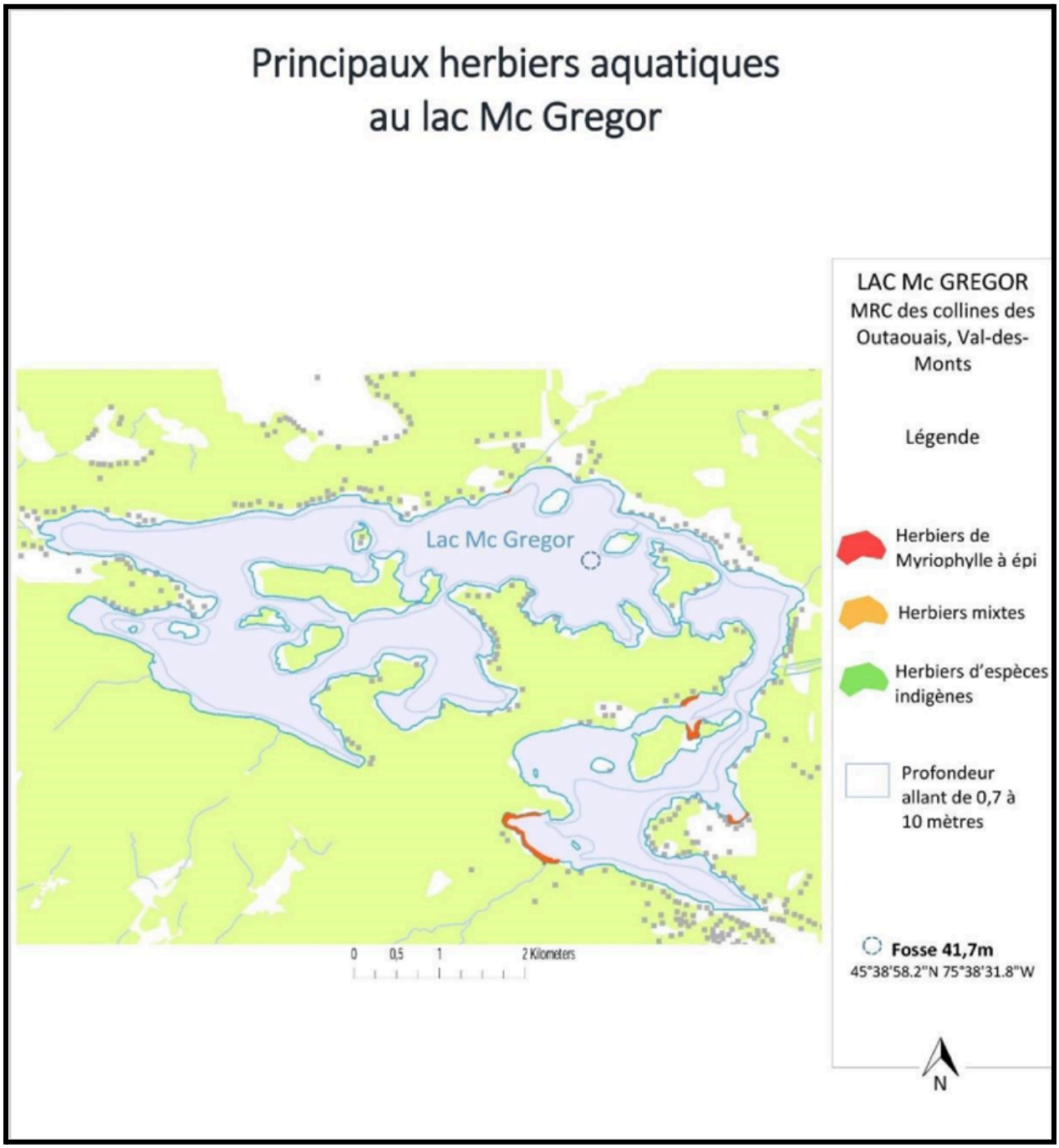


2- Summary Table of Recorded Floral Species

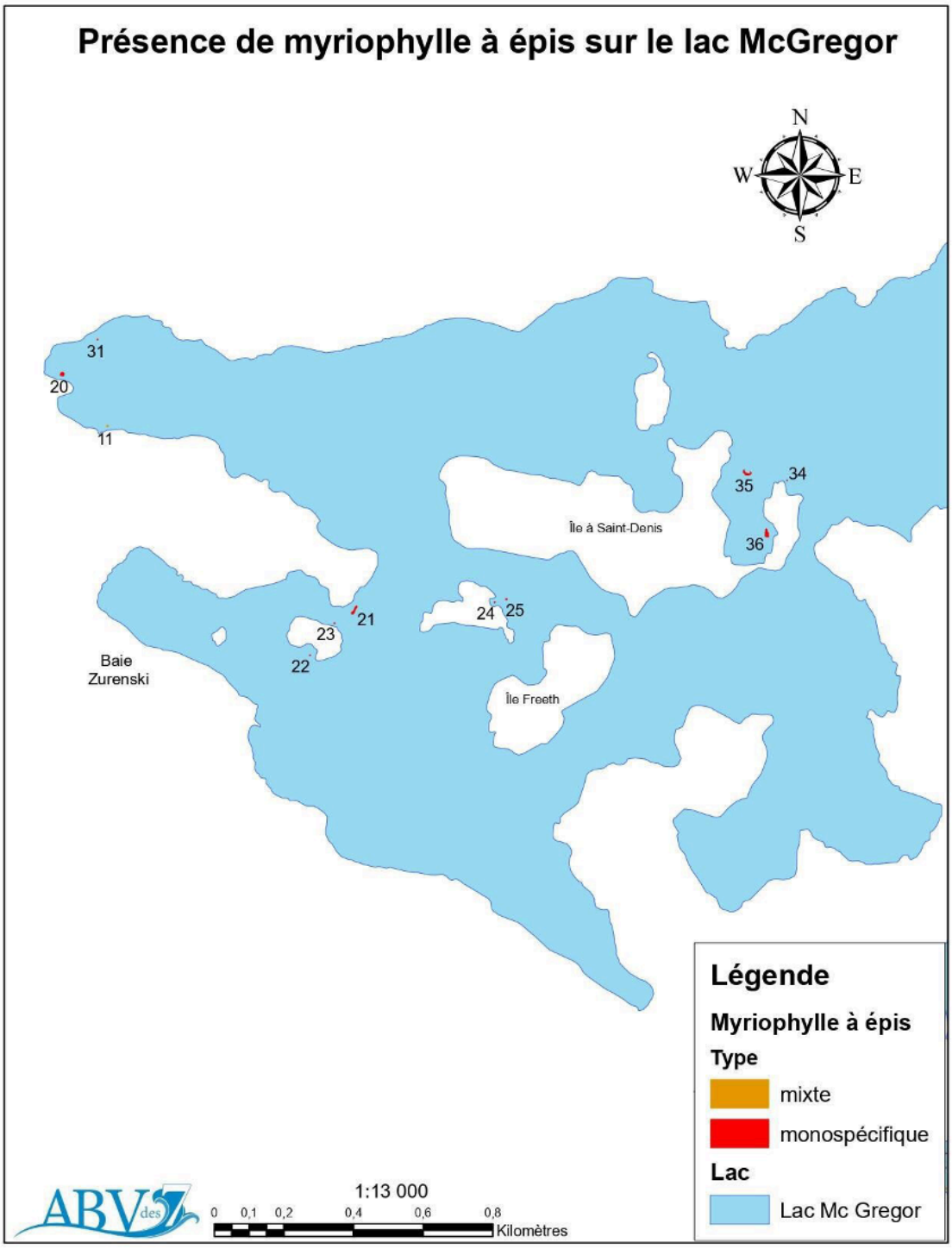
Latin Name Common Name

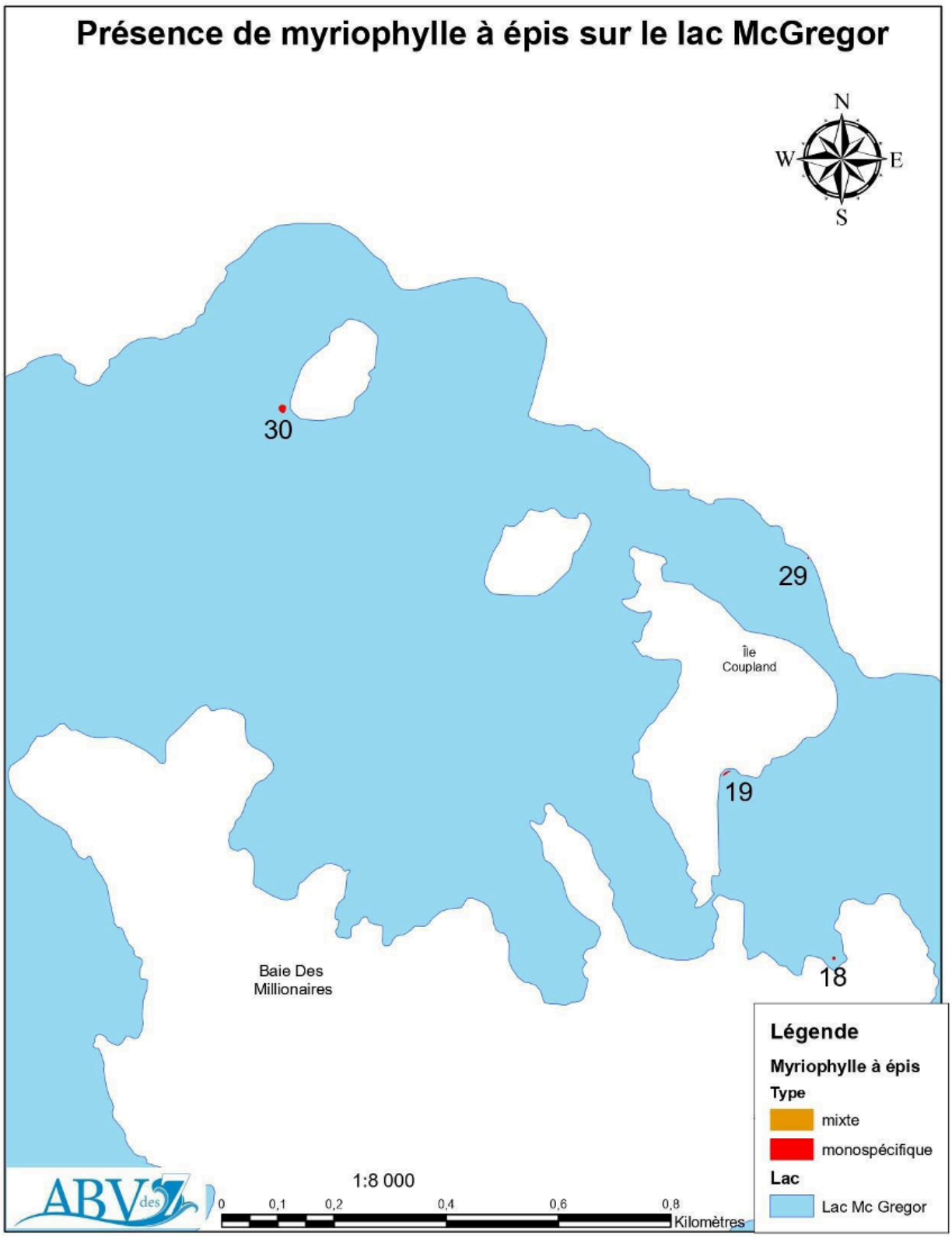
Brasenia schreberi Water Shield
Elodea canadensis Canadian pondweed
Eriocaulon aquaticum common pipewort, northern pipewort, seven-angled pipewort and hatpins
Nuphar variegata bullhead pond-lily, yellow pond-lily
Myriophyllum spicatum Eurasian watermilfoil, spiked watermilfoil
Najas flexilis slender naiad and nodding waternymph
Nymphaea odorata Fragrant water lily
Nuphar microphylla Small leaved (yellow) pond lily
Potamogeton gramineus Grass leaved pondweed
Potamogeton natans Floating/broad leaf pondweed
Potamogeton amplifolius Large leaf pondweed
Potamogeton richardsonii Richardsons pondweed
Potamogeton robbinsii Robbins pondweed
Pontederia cordata Pickerel weed
Sagittaria latifolia Broadleaf Arrowhead
Eleocharis palustris Common Spike-rush
Utricularia vulgaris Common Bladderwort
Vallisneria americana tapegrass, wild celery, and American eelgrass:

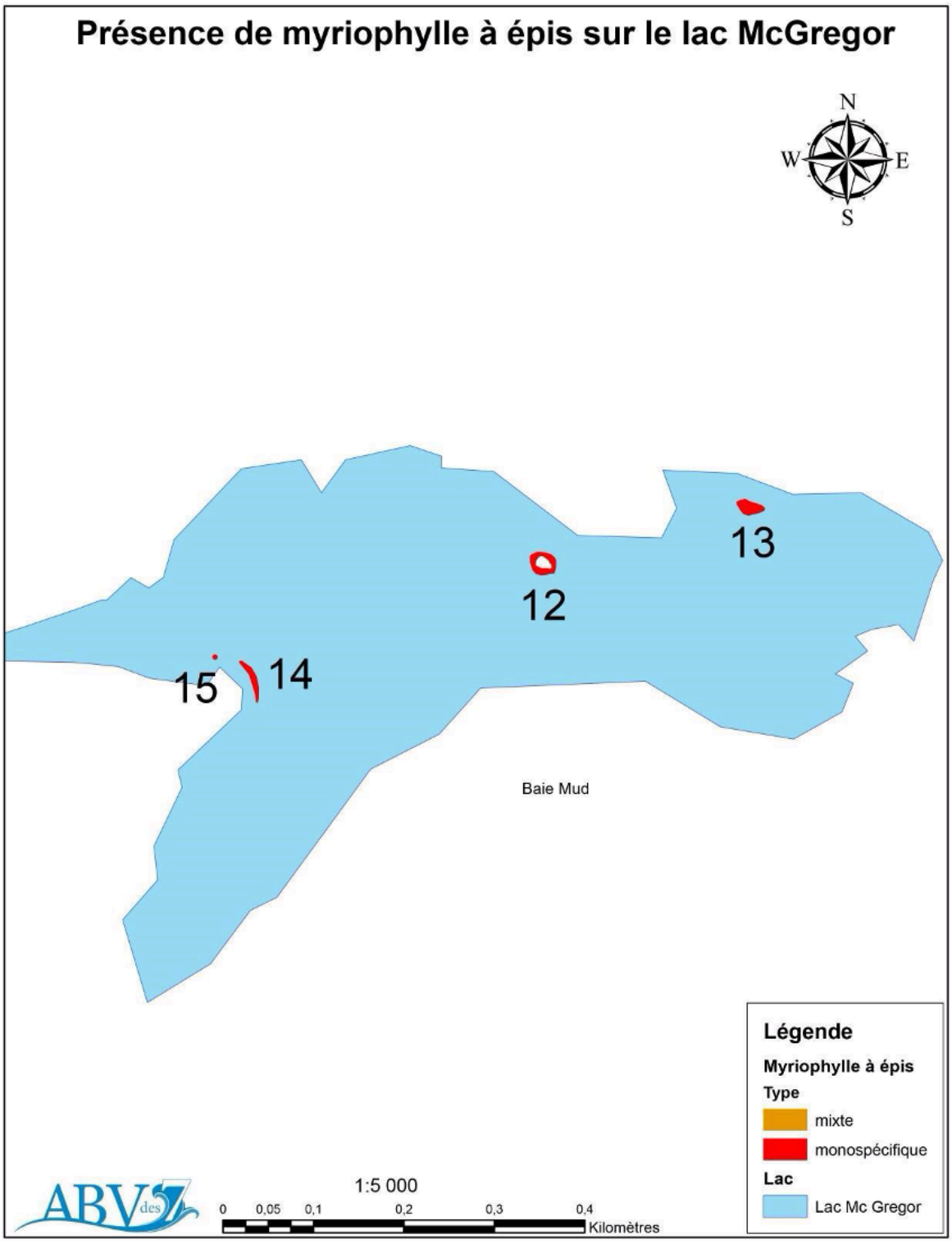
3- Mapping of Beds from 2015



4- Mapping of Beds from 2019




Présence de myriophylle à épis sur le lac McGregor
N
W
E
S
30
29
Île
Coupland
19
18
Baie Des
Millionaires
Légende
Myriophylle à épis
Type
mixte
monospécifique
Lac
Lac Mc Gregor
1:8 000
0
0,1
0,2
0,4
0,6
0,8
Kilomètres


Présence de myriophylle à épis sur le lac McGregor
N
W
E
S
13
12
15
14
Baie Mud
Légende
Myriophylle à épis
Type
mixte
monospécifique
Lac
Lac Mc Gregor
1:5 000
0
0,05
0,1
0,2
0,3
0,4
Kilomètres