Summary of the Lac Pemichangan "Trout Study" Report[1] March 2026

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Background: During the summer and fall of 2025 FLP worked with ***RAPPEL*** (Regroupement des associations pour la protection de l'environnement des lacs et des bassins versants; rappel.qc.ca) on a research project supported by ***Fondation de la faune du Quebec* - FFQ** (fondationdelafaune.qc.ca) to assess the habitat quality for lake trout in Lake Pemichangan.

Introduction: The lake trout population in Lac Pemichangan is stable and is naturally sustained as confirmed by experimental fishing surveys carried out by the Quebec Ministry of Forests, Wildlife and Parks (ministère des Forêts de la Faune et des Parcs - MFFP) in 1992, 2000, 2009 and 2017.

Spawning grounds for lake trout (*Salvelinus namaycush*) are characterised by a rocky substrate, devoid of vegetation. Previous research by MFFP has identified the introduction Eurasian water milfoil as potential limiting factor in spawning success. Milfoil is well established in Lake Pemichangan, forming dense monospecific beds which can cause habitat deterioration in nearby spawning grounds through an increase in plant debris and fine particles, a rise in predators of young lake trout, and a decline in prey.

Purpose: **The purpose of this study was to characterize five known trout spawning beds in Lac Pemichangan by assessing plant species diversity and distribution and by observing spawning at these sites in the fall.** The data will be used to provide recommendations aimed at improving the quality of spawning grounds and thereby enhance the habitat for trout in the lake.

FLP is obligated by FFQ and MFFP to restrict sharing the precise locations of the trout spawning sites on Lac Pemichangan to safeguard them.

Methodology:

Macrophyte characterization: The characterisation of aquatic plant beds and other visible aquatic plants (macrophytes) and the assessment of substrate grain size were carried out at five lake trout spawning grounds (and adjacent areas) identified in previous years by MFFP. (The survey of the macrophytes in the littoral zone was carried out from a boat between 12 August and 4 September 2025. In each transect, the dominant species was identified, along with one or two subdominant species. Other species observed within the bed were also recorded and the coverage of each bed was assessed. The proportion of milfoil in the bed was also recorded.

Grain Size: The grain size of the substrate at the spawning grounds was assessed using an aquascope, an underwater camera or by freediving. Every 50 metres a transect perpendicular to the shore was carried out to record the grain size of the substrate at one-metre intervals down to the known outer limit of the spawning ground (down to depths too great for data collection, or until the fine sediments became too abundant for that depth to be considered a spawning ground). The thickness of the periphyton (the complex mixture of algae, cyanobacteria, heterotrophic microbes, and detritus that is attached to submerged surfaces) on the substrate was measured at shallow depths or assessed qualitatively for deeper areas. The data collected was then used to delineate areas of substrate suitable for lake trout spawning within each spawning ground. This delineation

[1] Étude d'avant-projet pour améliorer la qualité de l'habitat du touladi au lac Pemichangan Été 2025 (Caractérisation des frayères à touladi – Lac Pemichangan). Préparé pour les amis du lac Pemichangan par RAPPEL (Regroupement des associations pour la protection de l'environnement des lacs et des bassins versants) Mars 2026

was based on the following criteria: a maximum of 10% fine sediment (sand and silt) and no aquatic plants; a dominant substrate ranging from gravel to rock; a minimum water depth of 1 m; and a steep gradient – which are conidiations that are known to be favourable to egg incubation.

Monitoring of Spawning Beds: Observation of lake trout broodstock at spawning sites during the spawning season was done to verify that the spawning grounds are used by trout. Visits to the spawning sites were conducted by volunteers from the association in the evenings after sunset every two days from the moment the water temperature reached 14°C until it dropped to a minimum of 6°C. When more than two specimens were observed at a spawning site it was deemed to be used for spawning and was not revisited. When no observations were recorded, a further visit by divers was to be carried out later in the autumn, once the water temperature had dropped below 6°C, to confirm the presence of lake trout eggs on the spawning grounds. Once an egg was spotted, the dive was concluded, as this confirmed that the spawning ground was being used by lake trout.

Findings:

Macrophyte characterization:

In total, across the entire study area, **23 species of aquatic plants and algae belonging to the Characeae (freshwater green plants) family were observed in the 57 plant communities surveyed as part of the project.** The species found in the greatest number of beds throughout the defined area of Lac Pemichangan are milfoil (51 beds), Illinois pondweed (45 beds), ***Chara*** and ***Nitella*** algae (26 beds) and Robbins' pondweed (24 beds). **The species dominating the largest number of beds is milfoil (29 beds).** Table 1 summarises the results of the characterisation of macrophytes in each spawning ground and in the 500 m zone on either side of it.

Chara can provide critical habitat and food for aquatic life and can uptake large amounts of nutrients from the water and sediments. Having some *Chara* in a lake is often beneficial to support a lake's fishery and overall water quality. Low levels of *Chara* can be an early indicator of lake eutrophication. As the lake becomes more eutrophic, Chara abundance will often decline. https://naturallake.com/chara/ accessed April 21, 2026

Nitella is a structurally complex macroalgae. It resembles Chara. https://plant-directory.ifas.ufl.edu/plant-directory/nitella-species/ accessed April 21, 2006

Spawning ground 1 Macrophyte beds of very high density (>75%) are found throughout the 500-metre zone on either side of the spawning ground. Seagrass beds are also present within the spawning ground. Several of these beds contain a very high proportion of milfoil (>70%). Beds 10 and 12, which contain 75% and 99% milfoil respectively, are located within the lake trout spawning ground.

Spawning ground 2 Two very dense macrophyte beds (>75%) are located at the northern end of the 500-metre zone north of the spawning ground, and one of these contains 90% Eurasian

Table 1: Data on the plant communities in Spawning Grounds

Spawning Ground #	1	2	3	4	5
Spawning ground area (m^2)	34.485	56	5.579	2.370	2.951
# beds in the spawning ground	4	0	0	0	0
# Milfoil beds in the spawning ground and within a 500 m radius	19	2	2	4	3
Area occupied by macrophyte beds in the spawning ground (m^2)	4.324	0	0	0	0
Area occupied by macrophyte beds in the spawning ground and 500 m zone (m^2)	249.371	3.82	1.637	4.14	1.281

water milfoil. No other beds have been identified in this zone. No beds were detected within the spawning ground.

Spawning ground 3 Two macrophyte beds are in a small bay to the west of the spawning ground, and one of these beds contains 90% milfoil. No beds were detected in the lake trout spawning ground.

Spawning ground 4 Four macrophyte beds are within a 500-metre radius on either side of the lake trout spawning ground. These are low- to medium-density beds containing little milfoil, except for a very small, very dense strip to the south of the spawning ground. No beds were detected within the spawning ground itself. *The 500-metre zones on either side of spawning grounds 4 and 5 overlap; consequently, one milfoil bed (52) is located within the zone of both spawning grounds. This milfoil bed is therefore included for both spawning grounds in Table 1.*

Spawning ground 5 Three macrophyte beds are located within the 500 m zone surrounding each side of the trout spawning ground. These are stands of low to high density containing little milfoil. No stands were detected within the spawning ground itself.

Based on prior aquatic surveys, there has been no advance of Eurasian water milfoil within these spawning grounds areas since 2019. Although, no Eurasian watermilfoil beds were detected in 2019 south of Spawning Ground 1, milfoil was seen int several locations within the 500-metre zone in 2025, so this site should be monitored.

Other invasive alien species: A significant presence of the Georgian crayfish (*Viviparus georgianus*) and the red-spotted crayfish (*Faxonius rusticus*) was noted particularly in Spawning Ground 1. These are two invasive alien aquatic species whose presence was already known at Lac Pemichangan.

Species status: During the survey of aquatic plants, the Illinois pondweed, a species likely to be designated as threatened or vulnerable in Quebec, was observed in 45 of the 57 surveyed beds. It was dominant in only one of these beds and was the subdominant species in 15 beds. The species is widely present in Lac Pemichangan, but rarely in high densities.

Substrate (Grain) Size:

Thirty-two transects were inventoried to assess the substrate of the five spawning grounds**. No significant areas of silting or mudding covered the coarse substrate in the defined spawning areas and no gaps in the coarse substrate were obstructed by periphyton**. **Based on this survey, the boundaries of the spawning grounds have been updated.**

Spawning ground 1 The maximum depth ranged from 2 m to 15 m with the deepest in the centre of the spawning ground. One section was shallow, between 1 m and 3 m, consisting mainly of boulders, pebbles and stones, and with a steep slope transects 8 to 11, the spawning ground widens, extending to depths of up to 15 m. remainder was characterised by pebbles, cobbles, boulders and steeply sloping rocky outcrops which are very prominent within the spawning ground. Periphyton is minimally present, measuring 0 to 1 mm across the entire spawning ground. In general, the spawning ground is of good quality with significant gaps between the coarse substrate. According to the Ministry's data, spawning ground 1 covered 34,485 m², however the area used by lake trout is only 4,385 m². Note that the most recent bathymetry data from 1979 (5-7.5m) does not correspond to the water depths (10-15m) recorded during the survey.

Spawning ground 2 This small spawning ground is found at depths of between 1 m and 3 m. The substrate consists mainly of pebbles, cobbles and boulders. At depths of 4 m and greater, the coarse substrate becomes covered with sand and the slope becomes gentler. Periphyton is minimally present, measuring 0 to 1 mm across the entire spawning ground. The spawning

ground is of good quality with significant gaps between the coarse substrate. According to MFFP data, spawning ground 2 covered 56 m², however, based on the new delineation, the area used by the lake trout is 90 m².

Spawning Ground 3 The depth of spawning ground 3 varies from 1 m to 10 m with a substrate consisting mainly of gravel, pebbles and boulders. For part of the area surveyed (depth 2 - 9 m) are too sandy to form part of the spawning ground. For the remainder, the spawning ground varies in depth between 1 m and 10 m with steep slopes with a substrate consisting mainly of large boulders, boulders, pebbles and stones. Periphyton is minimally present, measuring 0 to 1 mm across the entire spawning ground. The spawning ground is of good quality with significant gaps between the coarse substrate. According to MFFP data, spawning ground 3 covered 5.6 m², however, based on the new delineation, the area used by the lake trout is 1.63 m².

Spawning Ground 4 All transects surveyed in this spawning ground are suitable for lake trout spawning with an ideal spawning substrate consisting mainly of gravel, pebbles and boulders at depths of between 1 - 2 m. Additional spawning-friendly substrate was identified, outside the Ministry delineated spawning ground with substrate was composed of cobbles, pebbles and rock, situated on top of a large rocky outcrop. Periphyton is minimally present, measuring 0 to 1 mm across the entire spawning ground. The spawning ground is of good quality with significant gaps between the coarse substrate. According to MFFP data, spawning ground 4 covered an area of 2,370 m², however, according to the new boundaries, the area used by the lake trout is 1,454 m².

Spawning Ground 5 All transects surveyed in this spawning ground are suitable for lake trout spawning, and the depth varies from 1 m to 10 m. One section had a maximum depth of 2 m and consists of pebbles, boulders, large boulders and rock with silt or mud is accounting for 10% of the substrate. Other sections consist mainly of rock, with depths reaching up to 10 m and no traces of fine sediments. Periphyton is more abundant in this spawning ground, measuring 0–1 mm across one section and 1–5 mm across the rest. Overall, the spawning ground is of good quality, with significant gaps between the coarse substrate. According to MFFP data, spawning ground 5 covered 2,951 m², however based on the new delineation, the area used by lake trout is 986 m².

Observations on the Use of Spawning Grounds:

The lake trout spawning grounds were inspected on 17 and 19 October 2025. The visits were halted until 23 October, followed by 26 October, when the water temperature was 14 °C. During the latter visit, lake trout spawners were observed at spawning grounds 1, 3 and 4 (Table 7). Subsequently, only spawning grounds 2 and 5 were visited on October 27 and 29, and November 1, 6, 8 and 10 November. On November 11, the water temperature reached the 6 °C threshold and visits ended.

Table 2: Observations of lake trout at spawning grounds (17 Oct - 11 Nov 2025)

Spawning Ground #	1	2	3	4	5
Observation Date	Oct 26	*No more than 1 trout seen, so not reported*	Oct 26	Oct 26	*No more than 1 trout seen, so not reported*
Observation Time	20:30		20:40	20:10	
# Lake Trout Observed	5		3	3	
Water Temperature	13°C		13°C	13°C	

Because no more than one spawner was observed at spawning grounds 2 and 5, a survey involving two divers was carried out on the afternoon of 25 November 2025 to locate lake trout eggs at spawning grounds 2 and 5. However, during this visit, no lake trout eggs could be found, due to the deep gaps between the substrate and the presence of steeply sloping rock, which made observations difficult.

Discussion and Recommendations

This characterisation of the lake trout spawning grounds has demonstrated that these spawning grounds are of very good quality for lake trout reproduction; the coarse substrate and gaps between the substrate are present, little periphyton or fine sediment is recorded (unobstructed gaps), and no aquatic plants are present on the spawning grounds delineated by this study, so **no modifications are recommended**.

Eurasian water milfoil and other macrophytes are absent or scarce in lake trout spawning grounds. Where macrophytes have been recorded within the spawning grounds (spawning ground 1) they are located at the edges and do not form an integral part of the spawning ground. However, although Eurasian water milfoil has been established in this area for several years and appears to have spread since 2019, no presence of this invasive alien species has been reported within the redefined spawning ground, which is a positive sign.

At spawning ground 2, the surrounding beds are not likely to invade the spawning ground, as they are isolated in a bay to the north-east of the spawning ground.

In spawning grounds 3 to 5, milfoil beds have been recorded in several locations within the 500-metre zones around these spawning grounds, but no such sightings were made during the 2019 survey. It is possible that these are more recent establishments that could develop into denser colonies. As a precautionary measure, to prevent the colonisation of spawning grounds 3 to 5 by manual weeding could be considered on nearby milfoil beds (beds 54 to 57).

Controlling Eurasian water milfoil at the edge of the spawning ground 1 would be too difficult to carry out, however, monitoring over several years to check for the presence of milfoil and macrophytes would help ensure the long-term viability of this spawning ground. Manual removal could be considered to protect the spawning ground. **Monitoring over several years, or even every three years, would be recommended** to detect macrophytes – and could also be applied to all spawning grounds.

Excessive inputs of nutrients and sediment into a lake can cause problems for lake trout spawning grounds and can contribute to the overgrowth of macrophytes on the spawning grounds and the obstruction of the coarse substrate by periphyton. Spawning grounds 1 and 2 appear to be most at risk from this nutrient as they are the closest to the homes on the shores of Lake Pemichangan.

Here is a list of general best practices to adopt within a lake's catchment area to reduce the impact of human activities on nutrient input:

- Limit deforestation on your land;
- Stop mowing the grass and replant vegetation along the lake's shoreline, over a minimum distance of 10 to 15 metres;
- Limit and control erosion (road network, construction sites, forestry and agricultural
- practices);
- Ensure that septic systems comply with regulations and are properly maintained;
- Replace ageing septic systems;
- Ban the use of fertilisers near water bodies;
- Adopt more environmentally friendly agricultural and forestry practices (shore protection, erosion control on tracks, direct sowing, permaculture, etc.).

It is recommended that these best practices be disseminated, through whatever awareness-raising means, to all residents living on the shores of the lake so that they may be implemented.

The significant presence of red-spotted crayfish may have an impact on trout egg survival. it is documented that red-spotted crayfish feed on fish eggs, including those of lake trout.

However, this would require that red-spotted crayfish be very abundant and the density of lake trout eggs be low. Since the red-spotted crayfish is already well established in Lac Pemichangan and is difficult to control, no recommendations regarding its control are being considered.

Although no spawners or eggs were observed at spawning grounds 2 and 5, the quality of the spawning grounds is good. Furthermore, given the characteristics of the lake (oligotrophic lake, presence of significant coarse substrate, large lake, steep gradient in the first few metres of water, very deep basins in several places across the lake), it is quite possible that other unknown spawning grounds are present in the lake. Given that at least 3 out of 5 spawning grounds are in use, that other spawning grounds may be present in the lake, and that the recruitment of juveniles is increasing, it is not recommended to carry out a further dive survey with the aim of locating eggs.

The most recent bathymetric survey of the lake, dating from 1979, is not accurate in the vicinity of the spawning grounds. As it is not known whether this bathymetry is accurate elsewhere in the lake, it would be advisable to carry out a new bathymetric survey of the lake. This survey could also be used to identify other potential spawning grounds, as the location of steep slopes along the lake's shoreline would be more precisely known. Specific areas could therefore be targeted to confirm the presence of spawning fish during the spawning season.

Conclusions:

The characterisation carried out in 2025 confirmed that the lake trout spawning grounds in Lac Pemichangan generally offer good conditions for the reproduction of the species. The substrates observed are predominantly coarse, the interstices are well defined and largely unobstructed, and the proportion of fine sediments as well as the presence of periphyton remain low. Furthermore, spawners were observed at certain spawning grounds in autumn 2025, confirming their use.

The macrophyte survey also revealed a significant presence of Eurasian water milfoil in several areas of the shoreline and near certain spawning grounds (especially Spawning Ground 1). Although this invasive alien species is not currently established directly on the identified spawning grounds, its spread in certain areas of the lake remains a factor to monitor.

Overall, the results indicate that the lake trout spawning grounds in Lac Pemichangan are currently in good condition and that no major management actions are required in the short term. However, to ensure the long-term viability of these habitats, which are essential for the species' reproduction, it is recommended/proposed:

- to continue periodic monitoring of the spawning grounds, every three years;
- to detect any potential colonisation by macrophytes;
- to begin controlling milfoil by hand-pulling it to prevent colonizing spawning grounds 3 to 5;
- to raise awareness among lakeside residents of the need to adopt best practices aimed at limiting the input of nutrients and sediments into the lake, thereby helping to preserve the quality of the spawning grounds and the general habitat of the lake trout;
- to carry out a new bathymetric survey of the lake.

The protection of spawning grounds and the proactive management of invasive species and human pressures are key elements in supporting the maintenance of the lake trout population in Lac Pemichangan.