PRIORITIZED ISSUES FOR 2024-2034

Degradation and/or destruction of wetlands and aquatic environments

ORGANISME
DE BASSIN VERSANT
de la rivière du Nord



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1. Factual description

1.1 Proportion of wetlands and aquatic habitats within protected areas

The region is home to approximately 16,167 wetlands (CIC, 2018; MELCCFP, 2019b), 3,354 lakes (GRHQ, 2019), and 5,258 kilometres of watercourses (GRHQ, 2019). Only a small proportion of these wetlands and aquatic environments (WAEs) is found within protected areas (MELCC, 2021). As for wetlands, 99.86% of their surface area, as well as 98.98% of lakes and 98.28% of total watercourse lengths, are susceptible to being degraded or destroyed. Table 1 presents a comparison of surface areas and lengths of WAEs within a protected area. Legal protection status does not, however, prevent upstream stresses from being felt downstream.

Table 1. Comparison of surface areas and lengths of WAEs within a protected area to those of the Integrated Water Management Zone (ZGIE).

Type of environment	Unit of measurement	Range	Value	Protection percentage (%)
Wetlands	Surface area (ha)	Protected areas	41 ha	0.14
		ZGIE	29,123 ha	
Bodies of water	Superficie (ha)	Protected areas	116 ha	1.02
		ZGIE	11,409 ha	
Watercourses	Lengh (km)	Protected areas	91 km	1.72
		ZGIE	5,258 km	

1.2 Signs of degradation in water environments

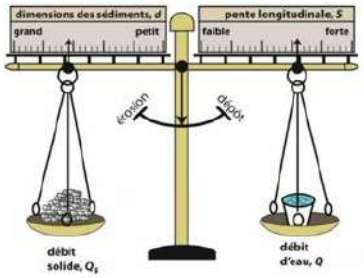
Poor water quality

The first telling sign of water environment degradation is water quality. Several elements may help diagnose the level of water quality degradation: poor physical-chemical water quality, the diversity of benthic macroinvertebrates, the trophic condition of lakes, cyanobacteria propagation, etc. The *Poor Water Quality* diagnostic report can be consulted for more information on these signs of degradation.

Modification of fluvial dynamics and riverbanks

The modification of the natural state of rivers and their banks is a highly visible sign of the degradation of water environments. The integration of hydrogeomorphology concepts has enabled a better understanding of watercourse dynamics and the impact of modifying their morphology. Indeed, these dynamics take both liquid and solid flows into account. Lane's Balance – a conceptual model presented in Figure 1 – suggests that watercourse morphologies and dynamics result from the search for equilibrium influenced by the relative contributions of liquid and solid flows (AGRCG, 2017). Lane's Balance shows that changes in either liquid or solid flow lead to morphological adjustments. An increase in liquid flow in a watercourse causes an imbalance progressing to a state of riverbed and bank erosion. Similarly, an increase in solid flow causes an imbalance progressing to a state of riverbed aggradation, unless the increase in sediment is offset by an increase in flow (AGRCG, 2017). The installation of a dam on a watercourse provides an adequate illustration of these Lane's Balance principles, since this often leads to sediment transit cutoff. In this situation, the portion of river located downstream of the dam is subjected to solid flow reduction (AGRCG, 2017).

Such a reduction creates an imbalance, and the watercourse downstream of the dam enters a phase of erosion. The situation is simplified, but Lane's Balance explains the adjustment of watercourses following a disturbance in one of these two major variables of fluvial dynamics (liquid and solid flows). Lane's Balance may be complexified by adding slope and granulometric size as variables contributing to the balanced state of a watercourse (AGRCG, 2017).



Missing section: In the ZGIE, the morphologies of several watercourses have been altered to meet human needs. Through watercourse linearization and pipeline grids as well as the presence of many dams (over 465), many impacts are felt across the ZGIE. *Shoreline Erosion* and *Flooding* are direct causes of watercourse morphology and dynamics modification and are explained in detail in their respective reports. Riverbed and bank modification has a considerable impact on their dynamics. The degradation/destruction of natural riparian buffers, the degradation/destruction of wetlands, and shoreline stabilization works are therefore examples of human activities that do not allow watercourses to evolve naturally to equilibrium and self-regulate. These activities are nevertheless very common in the ZGIE.

Figure 1: Conceptual model of Lane's Balance

The state of riverbanks is therefore another indicator of the level of degradation of water environments. The Rivière du Nord watershed has six riparian buffer quality index (RQI) benthos monitoring stations (MELCCFP, 2021). The RQI quantifies the health of riparian buffers based on nine weighted criteria to provide a quality index. These six sites are not evenly distributed across the watershed (three stations in Brownsburg-Chatham, two in Mirabel, and one in Saint-André-d'Argenteuil). All the stations in agricultural zones show an average to poor quality index, while the stations outside of agricultural zones have a good quality index. Although this sample is small, it shines a light on the impact of regulations on riparian buffers and the minimum width permitted in agricultural zones. From this difference in size, riparian buffers in agricultural watercourses are less resilient to anthropogenic stressors and consequently less capable of buffering water environment degradation. The fact that three other issue categories closely related to the degradation of water environments have been prioritized further indicates the scale of the degradation in the integrated water management zone (ZGIE).

1.3 Signs of degradation in wetlands

Of the 16,169 wetlands in the ZGIE, around 62% (9,940) face anthropogenic stressors that lead to their degradation (CIC, 2018). The relative importance of each identified stressor is presented in Table 2. Low-impact stressors alter under 25% of the surface area of wetlands, medium-impact stressors alter 26 to 50% of the surface area, and high-impact stressors alter over 50% of the surface area (CIC, 2018). In total, 56% of degraded wetlands are minimally impacted, 22% face a medium impact, and 22% are highly impacted. Furthermore, sprawling road networks and the recreational occupation of the region together represent 65% of the stressors on wetlands.

Table 2. Percentage of degraded wetlands according to stressor type and impact level

Anthropogenic stressor	Impact			
	Low	Medium	High	Total
Agriculture	1	2	4	**7**
Logging	1	0	0	**2**
Excavation	0	0	1	**1**
Drainage	0	1	1	**2**
Industrial or commercial	0	0	1	**2**
Recreation	28	4	3	**34**
Backfilling	0	0	0	**1**
Energy transportation network	2	1	3	**6**
Road network	16	10	6	**31**
Residential	6	3	4	**13**
Total	**56**	**22**	**22**	**100**

1.4 Signs of degradation common to wetlands and aquatic environments

In addition to those highlighted above, the degradation of wetlands and aquatic environments (WAEs) is possible to assess based on signs that are common to both environments. The first is the status of species considered to be at risk and benefiting from legal protection at the federal and/or provincial level. Monitoring the status of populations at a given location provides a picture of fluctuations in the quality and quantity of available wetland and water habitats. Unfortunately, to date, few exhaustive and repeated inventories of flora and fauna have been carried out in the ZGIE.

The proliferation of invasive alien species (IAS) may help measure the degradation of WAEs. Invasion levels may be highly underestimated, as unfortunately, not all observations are reported on documentation platforms (MELCCFP, 2023).

Nevertheless, the establishment of faunal or floral IAS in an ecosystem frequently results in an imbalance in biodiversity and ecological functions. Often more competitive and less at risk of predation or parasitism, IAS often invade natural environments to the point of replacing native species, affecting the interspecific relationships characterizing a given ecosystem. Examples include the Eurasian water milfoil, which is capable of rapidly covering the bottom of invaded lakes (Jacob-Racine and Lavoie, 2018), and the red-eared slider, which is regularly able to dominate the use of egg-laying sites to the detriment of endangered native species (Desroches and Rodrigue, 2020).

The creation of artificial WAEs may be a sign of WAE degradation. On one hand, many of these environments are created to compensate for the loss or alteration of WAEs. The number and surface area of artificial environments are therefore direct measurements of the level of degradation in nature. It should be noted that it normally takes many years for a WAE to reach its final dynamic. Indeed, the ecological characteristics of young human-made WAEs inevitably differ from those of natural environments before their disturbance or destruction (Ici Radio-Canada, 2020). Although artificial wetlands are good solutions for processing anthropogenic pollutants (Gorgoglione and Torretta, 2018), their capacity to support biodiversity comparable to those of natural environments is still lacking (Almeida, Sebastián-González, dos Anjos, and Green, 2020; Cheng and Ma, 2023; Levy, 2015).

1.5 Signs of destruction in wetlands and aquatic environments

It should be noted that data on wetlands is derived from relatively recent sources, the first dating back to 2007 (CIC, 2018). Wetlands mapping therefore excludes those that were destroyed before the start of studies jointly conducted by Ducks Unlimited Canada and the Gouvernement du Québec. It is estimated that 40% to 80% of wetlands in the St. Lawrence Lowlands had been completely destroyed between the start of European colonization and the early 21st century (Pellerin and Poulin, 2013). In the absence of reference values for their initial natural state, the analysis of wetlands degradation is limited to stressors identified since the first mapping surveys were carried out.

With the June 2017 adoption of the *Act respecting the conservation of wetlands and bodies of water* (ACWBW), the provincial government implemented an approach to take better stock of these environments and conserve them. The Act also set up a compensation regime for the unavoidable loss of these environments based on the *Regulation respecting compensation for adverse effects on wetlands and bodies of water* (RCAEWBW), among other regulations. WAE interventions are therefore now subject to mandatory ministerial approval. In 2023, a portrait of ministerial approval for projects with an impact on WAEs was made available, which lists the number of authorizations issued and the authorized surface areas organized by major activity category for each regional county municipalities (RCM) in the province (MELCCFP, 2023a). The data for the ZGIE RCMs are presented in Table 3. While the Ministry of the Environment, the Fight Against Climate Change, Wildlife and Parks (MELCCFP) specifies that an authorized WAE area does not necessarily entail the permanent loss of these environments, statistics provide an idea of the situation in the ZGIE. Throughout the territories of the ZGIE RCMs, as well as Mirabel, a total surface area of 1.28 km² representing 0.06% of the ZGIE was authorized for WAE intervention between 30 November 2006 and 31 December 2022. Between 16 June 2017 and 31

December 2022 – since the ACWBW came into effect – an area of nearly 0.5 km² representing 0.02% of the ZGIE was granted authorization. This represents one third of the permitted areas since 2006.

Table 3. Statistics on approved wetlands and aquatic environments interventions by regional county municipality (RCM) since 2006

Authorized interventions in wetlands and aquatic environments (WAE)	Regional county municipality (RMC)						
	Argenteuil	La Rivière-du-Nord	Les Laurentides	Les Pays-d'en-Haut	Ville de Mirabel	Deux-Montagnes	Matawinie
30 November 2006 to 31 December 2022							
Authorized area (m²)	143,310	715,763	48,170	73,870	304,980	25,410	510,860
16 June 2017 to 31 December 2022							
Number of authorizations issued	36	59	65	35	28	31	70
Authorized area (m²)	106,430	270,711	38,253	9,727	78,673	30,150	129,957
Industrial sector							
Percentage of authorizations issued (%)		8.77	1.53		14.81		
Percentage of authorized area (%)		68	30.84		59.74		
Institutional sector							
Percentage of authorizations issued (%)	51.52	35.09	36.68	52.07	22.22	58.62	37.31
Percentage of authorized area (%)	89.21	5.53	25.33	29.63	0.96	80.47	6.29
Residential sector							
Percentage of authorizations issued (%)	33.33	43.86	36.68	28.93	40.74	24.14	41.79
Percentage of authorized area (%)	9.28	22.49	35.28	25.54	25.11	11.74	22.77
Commercial sector							
Percentage of authorizations issued (%)	9.09	7.02	19.87	14.46	3.7		10.45
Percentage of authorized area (%)	0.15	3.4	7.21	44.79	0.14		1.56
Energy sector							
Percentage of authorizations issued (%)	6.06	5.26	5.24	4.55	14.81	17.24	4.48
Percentage of authorized area (%)	1.36	0.59	1.34	0.04	0.08	7.79	69.19
Mining sector							
Percentage of authorizations issued (%)							4.48
Percentage of authorized area (%)							69.19

2. General location

The degradation/destruction of wetlands and water environments are not recorded exhaustively in the ZGIE. The heterogeneity of data available across the ZGIE makes it difficult to map all the signs of degradation and destruction. However, the lack of degradation and destruction location data does not signal an absence of problems in the region. The multitude of uses found in the ZGIE as well as the diversity of users can lead to several impacts on WAEs. Supplementary information on the location of three other problem categories closely related to the degradation of water environments is available in the *Poor Water Quality*, *Flooding*, and *Bank Erosion* diagnostic report.

However, for wetlands, the three main disturbances affecting them have been identified where applicable (CIC and MDDELCC, 2016). According to this analysis, 38.7% of ZGIE wetlands do not face any stressors, while the three main stressors affecting other wetlands come from recreational (21.0%), transportation (19.1%), and residential activities (8.1%). Disturbances may vary according to the ZGIE region in question. For example, recreational disturbances seem to be more common in the Canadian Shield, while agricultural disturbances are seen more in the St. Lawrence Lowlands. In addition, the levels of stressor impact are described in four ranges: none, low, medium, and high. High impact levels are located in the southern ZGIE and in highly urbanized zones (axial highway borders and cities).

The interactive portrait presents a relative weighting of anthropogenic stressor levels in wetlands in relation to the number of environments impacted by the watershed of interest (levels 2 and 3). A weighting between 100 (100% of wetlands face no impacts [0]) and 400 (100% of wetlands have a high impact level [3]) was attributed to each watershed. Watersheds with a high proportion of wetlands with anthropogenic stressors and high impacts are mainly located in the southern ZGIE.

Finally, the number of species with Act Respecting Threatened or Vulnerable Species (ATVS) status (threatened, vulnerable, or likely to be designated threatened or vulnerable) and the number of invasive alien species (IAS) are presented for the main level-2 and level-3 watersheds in the ZGIE (Table 4) (CDPNQ, 2020; MELCCFP, 2018, 2023).

Table 4. Number of species with ATVS status (threatened, vulnerable, or likely to be designated threatened or vulnerable) and invasive alien species (IAS) by watershed

Level 2 watershed *Level 3 watershed*	Surface area (km²)	Number of species with ATVS status	Number of invasive alien species (IAS)
Rivière Watson	2.50	0	0
Ruisseau Cushing	7.89	0	0
Ruisseau Laughren	9.10	3	0
Ruisseau McVean	10.00	0	0
No name A	10.89	1	0
Rivière du Nord	254.76	34	18
Cours d'eau Silverson (Est)	2.07	0	0
Cours d'eau Silverson (Ouest)	9.87	2	0
La Petite Rivière	8.30	1	0
Le Grand Ruisseau	24.74	0	3
Rivière aux Mulets	137.67	7	3
Rivière Bellefeuille	47.64	1	0
Rivière de l'Ouest	369.21	13	1
Rivière Doncaster	226.07	1	1
Rivière Noire	140.13	2	2
Rivière Rouge	142.37	7	4
Rivière Saint-Antoine	30.64	3	0
Rivière Sainte-Marie	23.85	3	0
Rivière à Simon	165.49	5	5
Ruisseau à Régimbald	17.08	1	0
Ruisseau Bonniebrook	86.55	5	3

Ruisseau de la Boucane	6.08	1	0
Ruisseau des Hauteurs	11.69	0	1
Ruisseau Geneva	15.67	0	2
Ruisseau Lachapelle	18.44	1	0
Ruisseau Lachute	7.57	0	1
Ruisseau Laurin	6.38	1	0
Ruisseau Laurin	6.79	0	0
Ruisseau Marois	13.71	2	0
Ruisseau Morand	4.82	0	0
Ruisseau Robert	15.83	0	0
Ruisseau Saint-André-Saint-Jérusalem	8.30	0	0
Ruisseau Saint-Louis	19.40	3	0
Ruisseau Walker	2.78	0	2
Ruisseau Williams	61.74	4	1
Rivière Watson	2.50	0	0
Ruisseau Cushing	7.89	0	0
Ruisseau Laughren	9.10	3	0
Ruisseau McVean	10.00	0	0
No name A	10.89	1	0
No name B	2.15	0	2

3. Causes of the issue

A wide range of causes can explain the degradation/destruction of water environments. The causes of three other categories of problems closely linked to the degradation of water environments are available in the diagnostic reports on *Poor Water Quality*, *Flooding*, and *Bank Erosion*.

In all cases, the causes of WAE degradation/destruction boil down to unsustainable human use. Indeed, according to the Grand dictionnaire terminologique de l'Office québécois de la langue française, sustainable use is defined as the use of a biological resource or ecological service that causes little or no harm to the environment or significant damage to biodiversity (Gouvernement du Québec, 2014). Although these natural environments are theoretically legally protected under the Act respecting the conservation of wetlands and bodies of water (ACWBW), their degradation/destruction may be authorized by the MELCCFP.

Anthropogenic construction

Whether residential, industrial, commercial, institutional, or road-related, construction is the main cause of WAE degradation/destruction. Soil preparation for infrastructure projects regularly involves draining and/or filling in wetlands and/or water environments.

Soil sealing

Buildings, parking lots, and roads increase surface runoff and reduce infiltration into the water table, which is sometimes the main source of water for certain types of wetlands.

Drainage/filling

Human activities other than construction may lead to the drainage and filling of WAEs. Indeed, drainage and filling are intended to remove excess water from soils and are often found in agricultural areas.

Linearization/surface water diversion

Cultivation and farming activities in the southern part of the ZGIE have transformed the landscape formerly favourable to WAEs.

Invasive alien species (IAS)

IAS can proliferate very densely in an environment, harming its biodiversity and ecosystem services by altering environmental interactions.

Forestry sector

Unprotected stream crossings by heavy machinery, uncontrolled sediment input, and a lack of knowledge and capacity to protect spawning grounds are major stressors on WAEs in the forestry sector.

Motorized watercraft

Gasoline-powered watercraft can release significant quantities of contaminants into bodies of water. Propeller engines can inflict injuries on aquatic life and are a major cause of endangered species mortality. Inadequate cleaning of boats can enable the transmission of IAS from one water environment to another.

Shoreline artificialization

Once again, several human activities are responsible for shoreline artificialization. In addition to those mentioned under other causes, recreation and tourism activities often seek to bring their customers close to natural environments. This desire for proximity often results in shoreline artificialization (e.g., golf courses, wellness centres, municipal parks).

Misuse of the environment and irresponsible use of sensitive areas

(informal trails in wetlands, fording, etc.)

Without adequate protective measures, recreation and tourism activities can have an impact on these particularly sensitive environments, through trampling or excessive use, for example.

Population growth

Population growth in the Laurentides and the ZGIE can have a major impact on the degradation/destruction of WAEs. This growth can be directly linked to increases in construction and the unsustainable use of these environments.

Climate change

Collectively, climate changes will increase spring floods, leading to more frequent flooding in areas downstream of the ZGIE and recurring low flow periods in the summer. The WAE system balance will be profoundly disrupted, in synergy with many other categories of problems.

4. Main consequences

Wetlands and water environments have fundamental ecosystem functions. Their degradation and destruction result in a reduction or even loss of these functions and have enormous environmental, economic, and social consequences.

4.1 Environmental

- Loss of ecosystem functions:
  - Loss of water level regulation
  - Loss of contaminant filtration and sediment retention
  - Loss of carbon capture and storage
  - Potential reduction of groundwater recharge
  - Loss of animal habitats
  - Loss of biodiversity
- Increased risks associated with the impacts of modified watercourse dynamics (flooding, erosion, etc.)
- Reduced water quality
- Accelerated aging of bodies of water

4.2 Economic

- Costs arising from the loss/replacement of ecosystem services
  - Increased cost of drinking water treatment
  - Loss of supply services
  - Indirect costs related to increased greenhouse gasses
  - Indirect costs related to increased flood risks
- Water supply risks
- Loss of revenue related to the restriction of recreation and tourism due to major degradation
- Loss of shoreline property values

4.3 Social

- Loss of ecosystem services
  - Reduced landscape quality
- Water supply risks
- Human health risks
- Public safety risks due to flooding
- Restriction of uses
- Loss of enjoyment due to the restriction of uses
- Negative perception of the body of water

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