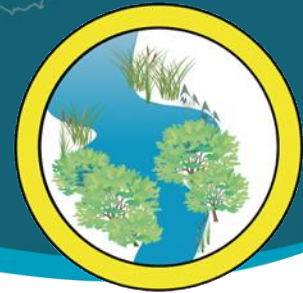


# Monitoring the State of the ST. LAWRENCE RIVER



## Freshwater Wetlands – Fourth Edition

Indicator name: Freshwater Wetlands  
Status: Moderate in 2018–2019  
Trend: Deteriorating since 1990

### Highlights

Freshwater wetland quality in the monitored areas along the St. Lawrence River is rated as moderate. This is mainly due to net losses in surface area and poor protection against external agents in the Lake Saint-Pierre sector, whereas there was no net losses in the Îles de Boucherville sector.

Over the 1990–2019 period, the trend shows a deterioration. The net balance of wetland area and the internal dynamics of Lake Saint-Pierre show a deterioration. In contrast, the internal dynamics in the wetlands of the Îles de Boucherville sector show an improvement, with the presence of alternating periods of flooding and drying. The other indices remained stable for both sectors.

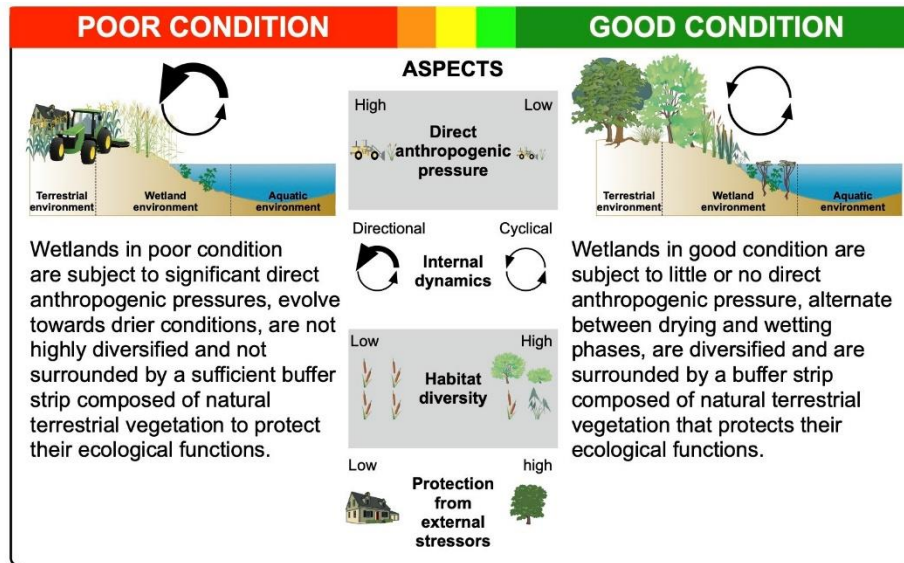


Figure 1 Assessment of the health of wetland areas

## Problem

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Wetlands—ecosystems that occur where water meets land—are found along the entire length of the St. Lawrence River. They are unique, diversified areas, long recognized for the plant and animal habitat they provide. More recently, they have been recognized as providing other major ecosystem functions and services, including flood storage, erosion protection, and improvement of water and aquatic ecosystem quality.

Over the years, the wetlands of the St. Lawrence River watershed, as in many other parts of the world, have sustained substantial losses. Today's wetlands are a pale shadow of those of the past. Although the previous edition of this fact sheet (Jean and Létourneau, 2014) showed a slowing of the rate of wetland loss, losses are present again and vegetation changes appear to indicate degradation.

The indicator estimates the state of wetlands based on the following four aspects:

- the net balance resulting from direct anthropogenic pressure on size;
- internal wetland dynamics;
- wetland habitat diversity; and
- the protection of wetlands from external stressors.

See Figure 1 and the Key Measures box for a description of the variables and their evaluation criteria.

The most recent variables are based on the analysis of high-resolution satellite images acquired in 2018 and 2019. The images can be used in conjunction with earlier ones acquired in 1990, 2002 and 2010 as part of the State of the St. Lawrence Monitoring Program, and maps by Groupe Dryade (1980) to assess wetland status and trends.

This analysis focuses on the Îles de Boucherville and Lake Saint-Pierre, two sectors that have sustained net wetland losses since 1990 according to the analysis carried out on the Cornwall – Trois-Pistoles sector by Jean and Létourneau (2011).

# Key measures

## Wetlands quality indices and criteria

**Direct anthropogenic pressures** on a wetland are estimated on the basis of the net balance of losses and gains in areas obtained by analyzing the change between the two maps and keeping only the changes directly caused by human activity.

### Status

- The net balance is positive: good;
- The net balance is null: moderate;
- The net balance is negative: poor.

### Trend

- Cumulative balance greater than 0 and greater than the balance for the 2002–2010 period: improving;
- Cumulative balance greater than 0 and less than the balance for the 2002–2010 period: stable;
- Cumulative balance less than 0 and greater than the balance for the 2002–2010 period: stable;
- Cumulative balance less than 0 and less than the balance for the 2002–2010 period: deteriorating.

**The internal wetland dynamics** are estimated based on the ratio between the total area that becomes drier (e.g. a low marsh becomes a high marsh) and the total area that becomes wetter (e.g. a high marsh becomes a low marsh). Changes in open water and shallow water.

### Status

- A ratio between 0.5 and 2: good;
- A ratio between 0.25 and 0.5 or between 2 and 4: moderate;
- A ratio less than 0.25 or greater than 4: poor.

### Trend

- Three status values of moderate or poor, with two wetter periods and one drier period, or two drier periods and one wetter period: improving;
- One or two status values of moderate or poor, with one wetter period and one drier period: stable;
- Three status values of good, regardless of whether the conditions are wetter or drier, or three status values of good, moderate or poor, with all periods being either wetter or drier: deteriorating.

**The diversity of wetland habitats** is estimated by calculating the relative proportion of wetland classes. Five classes are used for the St. Lawrence River: shallow water, low marsh, high marsh, shrub swamp and forested swamp.

### Status

- The evenness index is over 0.85: good;
- The evenness index is between 0.56 and 0.85: moderate;
- The evenness index is below 0.56: poor.

### Trend

- The status class in 2018–2019 is superior to the one in 1990: improving;
- The status class of both 2018–2019 and 1990 are the same: stable;
- The status class in 2018–2019 is inferior to the one in 1990: deteriorating.

**The protection of wetlands from external stressors** is assessed on the basis of the presence of a buffer zone of at least 50 m of natural terrestrial vegetation on the perimeter of the wetlands.

### Status

- The buffer zone exists on more than 75% of the wetland perimeter: good;
- The buffer zone exists on 50% to 75% of the wetland perimeter: moderate;
- The buffer zone exists on less than 50% of the wetland perimeter: poor.

### Trend

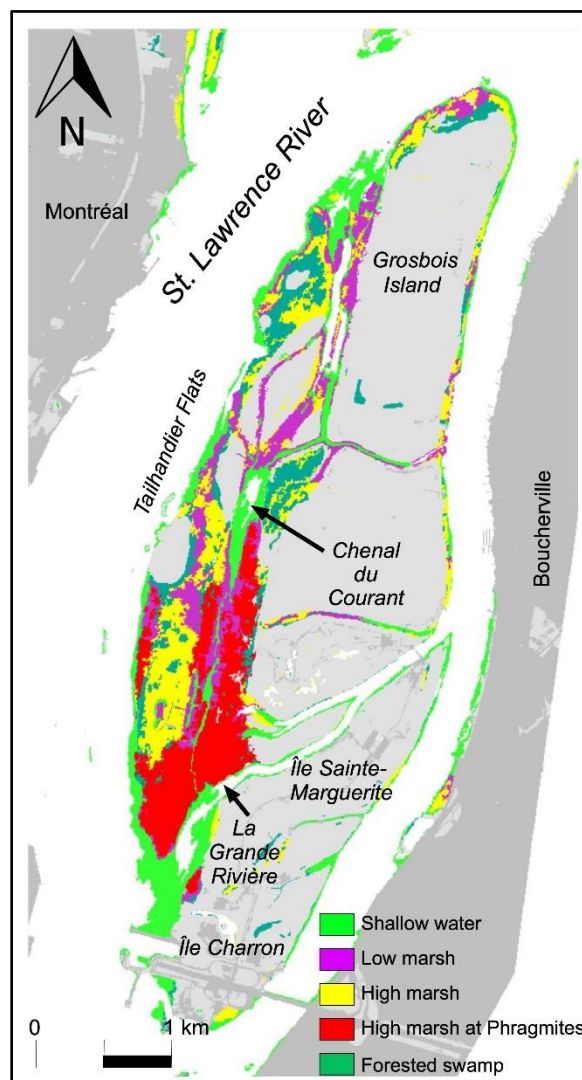
- The buffer zone increases sufficiently to move to a higher status class: improving;
- The buffer zone remains in the same status class, regardless of whether it increases or decreases: stable;
- The buffer zone declines to the point that it moves to a lower status class: deteriorating.

## Status and trends

The overall status of the wetlands in the two sectors is moderate and the overall temporal trend shows a deterioration.

### Îles de Boucherville sector

The status of the wetlands in the Îles de Boucherville sector is moderate and the temporal trend is stable.



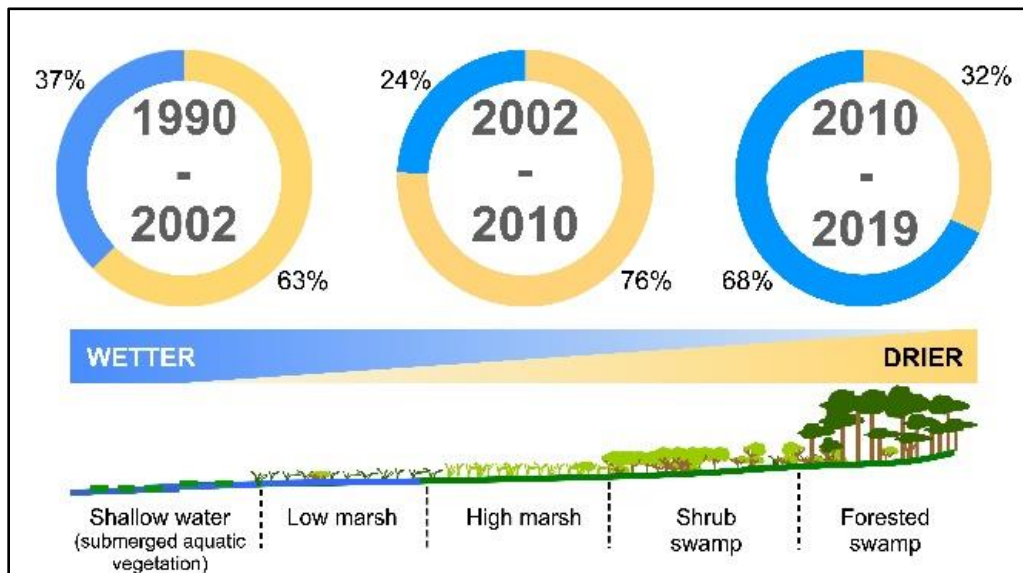
**Figure 2 Area of wetlands in 2019 in the Îles de Boucherville sector**

Direct anthropogenic pressures on the area between 2010 and 2019 are described as moderate, with a net zero gain or loss of wetlands, i.e. no lasting net loss or gain of wetlands caused by direct

human activity has been observed. The area of wetlands was estimated at 405 ha in 2010 and 494 ha in 2019. This 89-ha gain is the result of an 80-cm rise in water levels between the two dates, resulting in an increase in the area of shallow water (following the terminology proposed by the National Wetlands Working Group, 1997). This augmentation appears mainly at the entrance of La Grande Rivière and at the exit of Chenal du Courant and is not considered a permanent increase (Figure 2).

The temporal trend in direct anthropogenic pressures in the Îles de Boucherville sector since 1990 is described as stable. Although there was no lasting net loss or gain between 2010 and 2019, the 55 ha of wetlands lost between 1990 and 2002 have not been restored.

The internal dynamics of the wetlands in the Îles de Boucherville sector between 2010 and 2019 are considered moderate. The area of wetlands that became flooded is three times larger than the area that became drier (Figure 3), a phenomenon due to the rise in water levels of 80 cm between the two dates. The transition from high marsh to low marsh is the largest internal change in wetlands (64 ha), and was observed in the Îles de Boucherville, around the Tailhandier Flats and more specifically along Chenal du Courant.

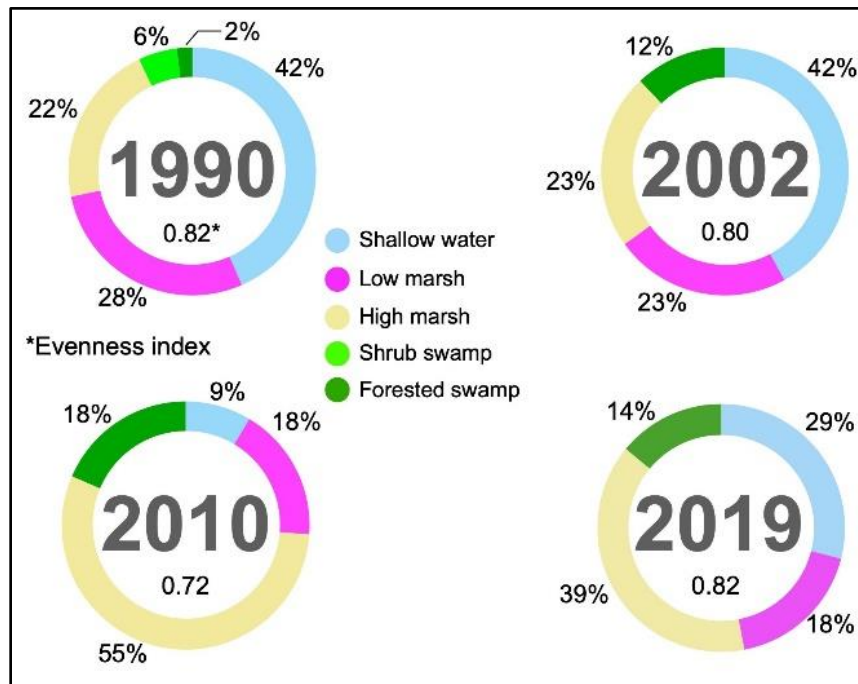


**Figure 3 Internal wetland dynamics in the Îles de Boucherville sector**

The temporal trend in internal wetland dynamics is improving. Over 30 years, the internal changes show two periods of drying followed by a period of flooding.

The diversity of wetland habitats in the Îles de Boucherville sector in 2019 is classified as moderate. High marshes account for 39% of the total area of wetlands in the sector, while no shrub swamps were detected (Figure 4).

The temporal change in the diversity of wetland habitats is stable in this sector of the St. Lawrence River, as all wetland status values obtained since 1990 are classified as moderate (Figure 4). The temporal trend shows stability in the evenness index, with the exception of 2010, a period of very low water levels. Note, however, that most of the high marshes in the area are now dominated by common reed (*Phragmites australis*), an invasive exotic species (Figure 2).

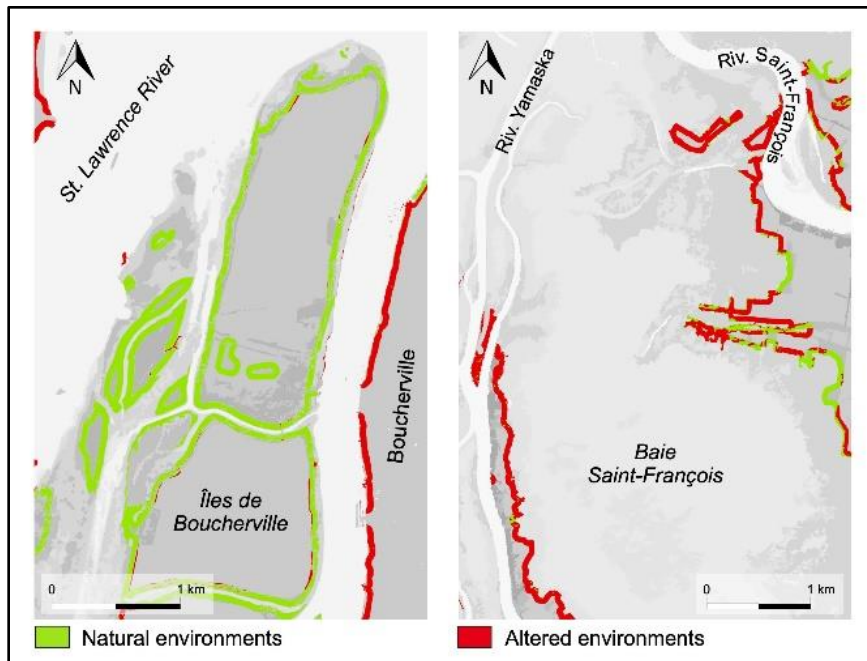


**Figure 4 Diversity of wetland habitats in the Îles de Boucherville sector**

The protection of wetlands from external stressors in 2019 in the Îles de Boucherville sector is considered moderate. In 2019, a buffer zone was present around 71% of the wetland perimeters in this section of the St. Lawrence River (Figure 5).

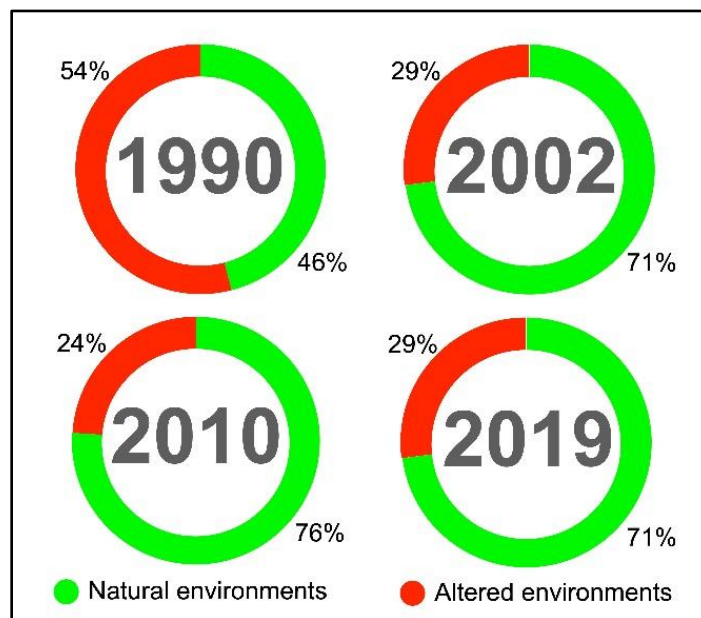
At 35% each, herbaceous habitats and forested areas occupy the largest proportion of the buffer zone. In contrast, 17% of the wetlands perimeter is adjacent to urban areas, especially along the shoreline of the City of Boucherville and the Island of Montréal, as well as certain sectors of Île Charron and Île Sainte-Marguerite.





**Figure 5 Examples of buffer zones protecting wetlands from external stressors**

Lastly, the temporal trend in the protection of the wetlands against external stressors is stable in the Îles de Boucherville sector. Indeed, the presence of this natural area has been relatively stable since 2002 (Figure 6).



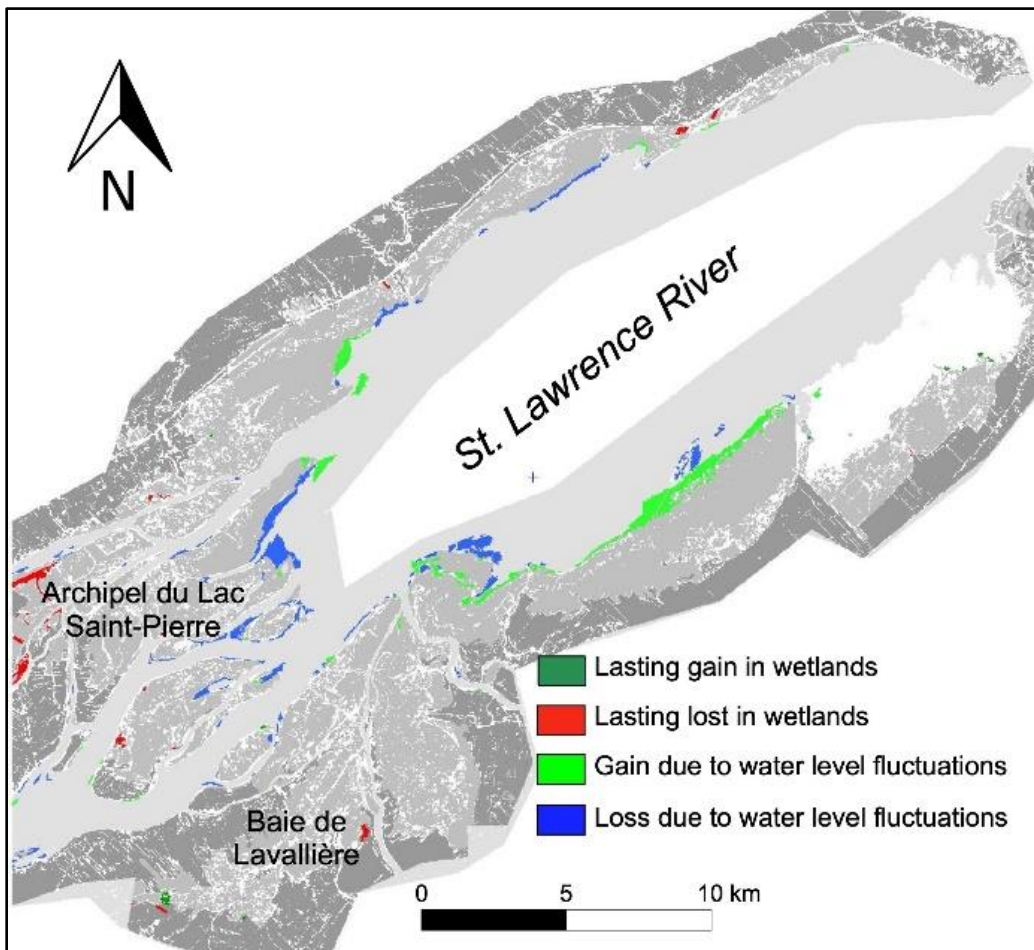
**Figure 6 Protection of wetlands from external stressors in the Îles de Boucherville sector**

## Lake Saint-Pierre

The status of the wetlands in the Lake Saint-Pierre sector is moderate–poor, and the temporal trend shows a deterioration.

Direct anthropogenic pressure on Lake Saint-Pierre between 2010 and 2018 increased, resulting in the wetlands being classified as poor. The net balance shows a lasting lost of 90 ha of wetlands during that period. This loss is associated with the mowing of high marsh dominated by reed canary grass (*Phalaris arundinacea*) in the Lake Saint-Pierre archipelago and in the upper periphery of Lavallière Bay (Figure 7).

This net loss is added to the negative balance of 789 ha recorded between 1990 and 2002, but subtracting the lasting gains of 64 ha obtained between 2002 and 2010, for a loss of 815 ha compared with 1990. The trend is therefore deteriorating for anthropogenic pressures.



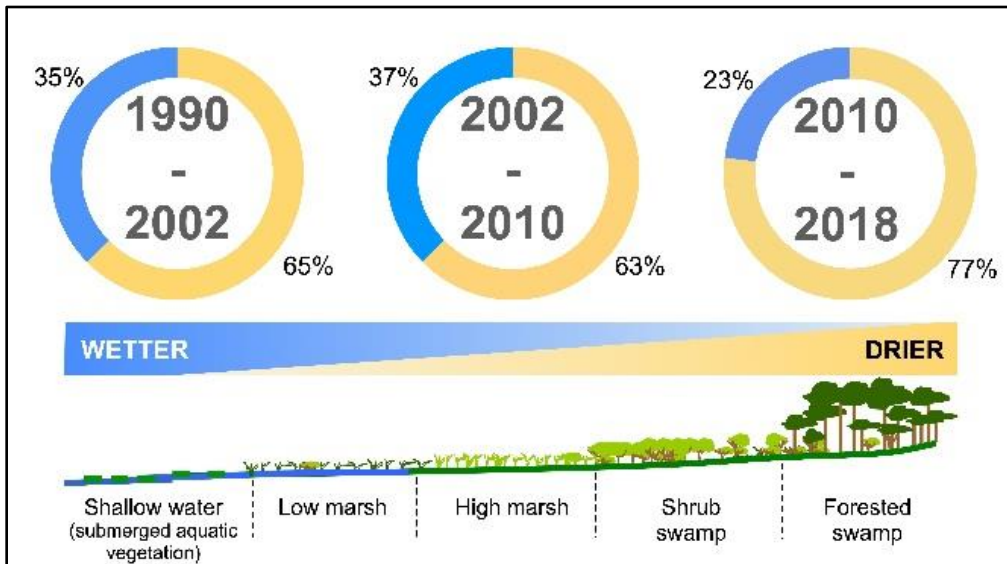
**Figure 7 Wetland gains and losses in Lake Saint-Pierre between 2010 and 2018**

The internal dynamics of the wetlands of Lake Saint-Pierre between 2010 and 2018 are classified as moderate. During this period, there was significant drying of wetlands (Figure 8) due to low



water levels in recent years. The area of wetlands that became drier was more than three times the size of the area that became wetter. As in the case of the Îles de Boucherville sector, the transition from low marshes to high marshes is the most significant change observed. In this case, a larger area, i.e. an estimated 834 ha, was affected along the shores and in the main bays.

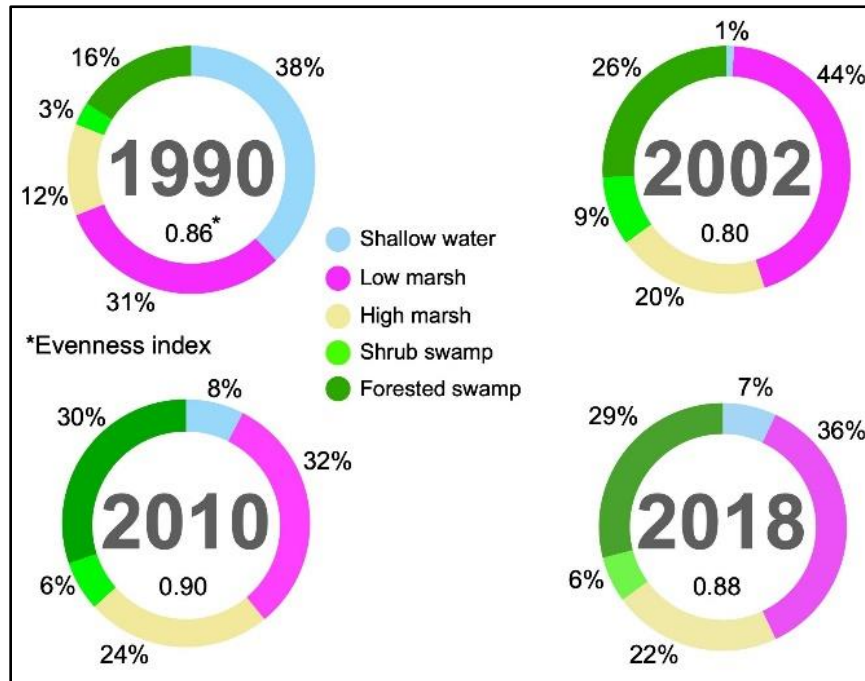
The temporal trend of the internal dynamics of the wetlands shows a deterioration due to an “aging” of the wetland classes since 1990 (from wetter to drier). Since this date, no major period of flooding has been observed (Figure 8).



**Figure 8 Internal wetland dynamics in Lake Saint-Pierre**

The diversity of the wetland habitats in Lake Saint-Pierre in 2018 is considered good (Figure 9). All five wetland classes are well represented on the territory, with low marshes, high marshes and treed swamps present in significant proportions.

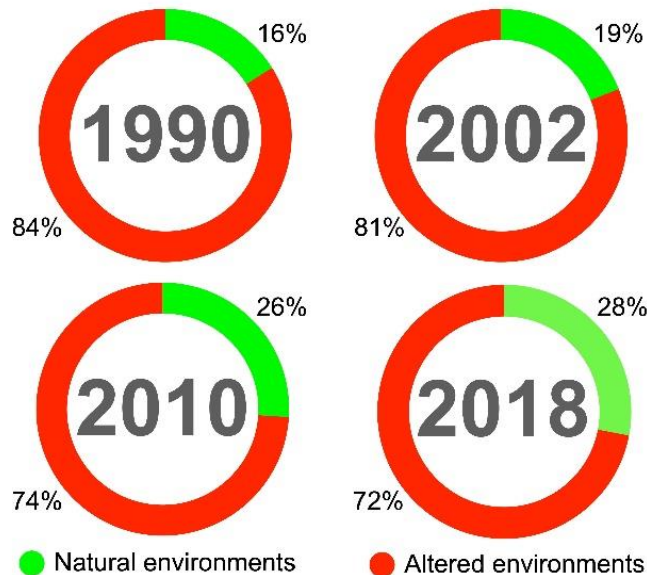
The temporal trend in the diversity of wetland habitats of Lake Saint-Pierre is considered stable (Figure 9). The relative distribution of wetland classes in 2018 remains close to that encountered in 2010.



**Figure 9 Diversity of wetland habitats in Lake Saint-Pierre**

The protection of the Lake Saint-Pierre wetlands from external stressors in 2018 is considered poor. Only 28% of the wetlands present was surrounded by a buffer zone, which consisted almost exclusively of terrestrial forests that were concentrated primarily in the upper periphery of Lavallière Bay and Bay Saint-François, and near the mouth of the Nicolet River. Farmland is present around the rest of Lake Saint-Pierre wetlands. As an example, Figure 5 shows the widespread presence of artificialized areas (mostly agriculture) in the immediate proximity of the wetlands around Bay Saint-François.

The temporal trend in the protection of wetlands from external stressors at Lake Saint-Pierre is stable. Although the trend has increased since 1990 (Figure 10), it has not reached the threshold value of 50%, which represents a significant change in status.



**Figure 10 Protection of wetlands from external stressors in Lake Saint-Pierre**

## Outlook

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Wetlands are complex ecosystems, studied by many stakeholders within their respective areas of interest. One of the best ways to take account of these diverse interests is to assess complementary aspects of the status of the wetlands. It is desirable to maintain and expand the state of knowledge in order to provide an accurate and useful picture for interested stakeholders.

Despite the advantages of using indices to assess the status of the wetlands, such an approach has its limitations. First, the choice of aspects to be monitored is critical to accurately identifying the environmental issues at play. Second, it is also important to identify indices for the aspects selected that clearly reflect them. Lastly, evaluation criteria corresponding to each of these indices must be carefully selected in order to accurately determine wetland status and changes. Discussions with the various stakeholders are continuing with the aim of improving these choices on the basis of common environmental objectives.

Technology has greatly evolved since the beginning of this project. Remote sensing tools are becoming more accurate, the number of environmental inventory techniques has increased, and science projects can now be more collaborative and replicable. Incorporating new technologies and tools has the potential to increase efficiency, reduce costs and achieve more useful science.

To properly represent the complexity of the St. Lawrence River wetlands, it would be advisable to cover all freshwater and saltwater ecosystems. In addition, the use of time series with a shorter time step (duration between two sampling dates) would allow the examination of much more

specific issues, such as changes in plant composition, and the assessment and monitoring of wetland ecosystem functions. Examining long-term trends relative to short-term variations could provide a more accurate picture of the status of the St. Lawrence wetlands. This would be particularly important in the context of climate change where the increased magnitude and frequency of extreme events will have an impact on these ecologically valuable shoreline ecosystems.

## For more information

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## State of the St. Lawrence Monitoring Program

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Five government partners—Environment and Climate Change Canada; Fisheries and Oceans Canada; Parks Canada; the Ministère de l’Environnement et de la Lutte contre les changements climatiques du Québec; and the Ministère des Forêts, de la Faune et des Parcs du Québec—and Stratégies Saint-Laurent, a non-governmental organization that works actively with riverside communities, are pooling their expertise and efforts to provide Canadians with information on the state of the St. Lawrence and the long-term trends affecting it.

For more information about the State of the St. Lawrence Monitoring Program, please consult our website:

[State of the St. Lawrence Monitoring Program | SLAP \(planstlaurent.gc.ca\)](http://planstlaurent.gc.ca)



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### **Acknowledgments**

Thanks are due to Caroline Robert, Conrad Beauvais, Rebecca Nociti-Farella and Benoit Fortin of Environment and Climate Change Canada for their contributions to the fieldwork.

*Catalogue No.* En153-114/1-2022E-PDF  
*ISBN:* 978-0-660-46839-6

*Published by authority of*

*© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change Canada, 2022*

*Published by authority of the Ministre de l'Environnement et de la Lutte contre les changements climatiques du Québec*

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*Aussi disponible en français sous le titre : Les milieux humides en eau douce – 4<sup>e</sup> édition*