Freshwater Wetlands and Exotic Plant Species

Photo: St. Lawrence Centre

Background

Wetlands encompass those areas that are saturated with water or flooded for a sufficiently long period to influence, insofar as they are present, soil and vegetation. In addition to peatlands, these ecosystems comprise aquatic vegetation (constantly flooded), marshes (dominated by herbaceous plants) and swamps (dominated by shrubs or trees). Wetlands are a valuable monitoring element for reporting on the state of the St. Lawrence environment, due to their important contribution to biological diversity and productivity, their purifying capacity, and their role in the life cycles of a number of different plant and animal species.

Photo: Martin Jean, St. Lawrence Centre

Vast areas of wetlands have disappeared over the last 400 years. Scientists estimate that close to 80% of the St. Lawrence wetlands present at the time of Jacques Cartier are lost today. Due to a lack of detailed information, however, we are unable to be more specific about wetland distribution at that time. More recently (1945–1976), 3649 hectares of wetlands were lost between Cornwall, Ontario, and Matane, Quebec, mostly before the 1960s. These losses can be traced directly to wetland drainage and conversion to farmland, residential and commercial development, the construction of roads and hydroelectric generating stations, and development of the St. Lawrence Seaway.

Major conservation efforts have been devoted to reducing wetland losses over the past several years. Although these initiatives are vital to ensuring the existence of natural St. Lawrence ecosystems for future generations, they do not guarantee that wetland areas and plant composition will remain unchanged. A body of water is by definition an essentially dynamic element of the landscape, one that changes as a function of age, the type of substrate through which it flows, climatic and hydrologic variations, and use. Moreover, anticipated climatic changes could disrupt weather

patterns and modify the water cycle, altering the pace at which wetlands are transformed.

Wetlands are primarily concentrated in the freshwater fluvial section (Figure 1). The dynamics of these riparian wetlands were analysed on a sector-by-sector basis due to the diversity of their characteristics. To this end, maps that were actually prepared for a study of migratory bird habitats in the late 1970s were examined, along with airborne images taken by remote sensor in 1990, 1991, 1996, 1997 and 2000 and classified by main wetland type. The basic information was complemented by field survey data. From the fluvial section down to the gulf, St. Lawrence wetlands cover a total area of roughly 80 000 hectares. More than 33 600 hectares of wetlands between Cornwall and Trois-Pistoles, not including the largest aquatic plant communities, were monitored by remote sensing (Table 1). This fact sheet deals with the areas of Lake Saint-Louis, the Boucherville Islands and Lake Saint-Pierre.

The human influence on the St. Lawrence has not been limited to reducing the area occupied by wetlands. Expanded continent-wide trade, for one, has done nothing to slow the influx of exotic and invasive species to wetland areas. The more opportunistic among them take advantage of disturbances to settle in and become, in some cases, particularly abundant.

Figure 1. Area covered by the wetland monitoring study

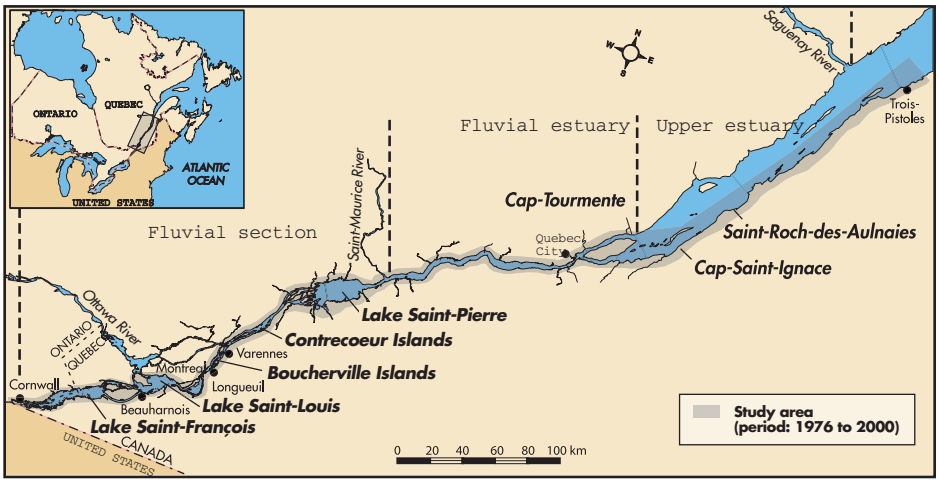


Table 1. Distribution and areal extent of wetland types, by location, estimated from maps drawn in 1990–91

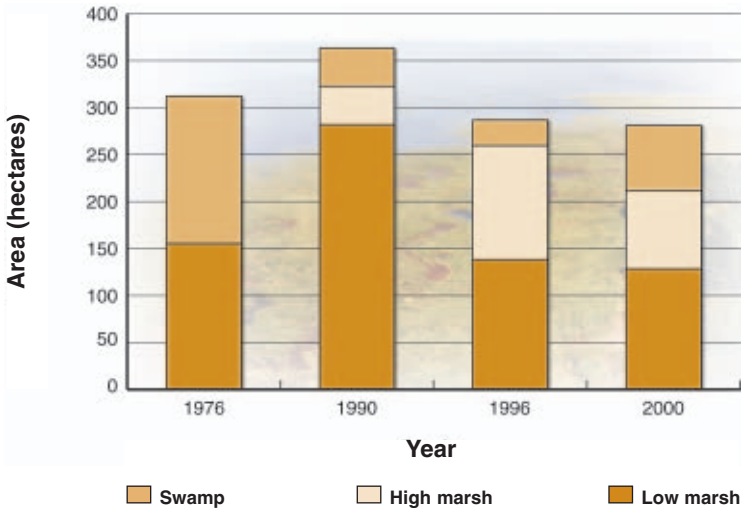
	Surface area (ha)				
Location	**Low marsh**	**High marsh**	**Shrubby swamp**	**Treed swamp**	**Total**
Fluvial section					
Lake Saint-François	322.1	1 268.6	447.3	450.6	2 488.6
Lake Saint-Louis	117.0	488.0	61.0	184.0	850.0
Boucherville	8.1	343.2	38.5	17.1	406.9
Contrecœur	259.7	801.2	12.3	52.8	1 126.0
Lake Saint-Pierre	3 700.1	7 962.4	865.0	2 962.8	15 490.3
Fluvial estuary	2 663.8	3 925.1	250.6	987.4	7 826.9
Upper estuary	1 555.3	3 833.3	63.7	34.6	5 486.9
Total	8 626.1	18 621.8	1 738.4	4 689.3	33 675.6

Overview of the Situation

Lake Saint-Louis

The areal extent of wetlands on the south shore of Lake Saint-Louis has declined since 1976, except for a one-time maximum area of 363 hectares (ha) in 1990 (Figure 2). During the period of this study (1976–2000), 34 ha of wetlands were converted to terrestrial environments, likely due to encroachment by humans. The area occupied by wetlands has increased on Saint-Bernard Island which, like the Iles de la Paix, was greatly affected by the high water levels of 1972 to 1976 (Figure 3). A major upswing in the surface area of low marshes was detected at both these sites, mostly to the detriment of open water (including submerged aquatic vegetation) and swamps. A drop in the average water level between 1990 and 1996 likely reduced the areal extent of low marshes while increasing the area of high marshes, which almost wholly replaced the swamps present in the 1970s. Lastly, from 1996 to 2000, although the wetland cover remained essentially unchanged, both treed and shrub swamps expanded slightly in size.

Figure 2. Trends in the areal extent of Lake Saint-Louis wetlands from 1976 to 2000



Boucherville Islands

In the Boucherville Islands, the wetland cover fell from 348 ha in 1976 to 324 ha in 2000, a drop of 7%, with maximum coverage in 1996 (Figure 4). Losses in the Boucherville region are attributed to human interventions, as 15 ha of low marshes on the south shore of the river and 19 ha of low marsh along the shores of the Charron and Sainte-Marguerite islands were filled in (Figure 5). Another major modification began in 1976, with the replacement of low marshes (134 ha or 57% of their total area at the time) by high marshes or open water (possibly including submerged aquatic vegetation), depending on the site. This situation is taking place primarily on the Tailhandier Flats, in the western section of the Boucherville Islands.

Lake Saint-Pierre

Trends point to complex transformations in the Lake Saint-Pierre wetlands. In terms of total surface area, the wetlands increased by 19%, from 10 831 ha in 1976 to 12 872 ha in 2000 (Figure 6). This phenomenon is explained by the growth of low marshes replacing open water environments along the edges of the lake and the appearance of swamps in Lavallière Bay (Figure 7). Forest fragmentation and the greater area of high marshes (partly wet meadows) are also observed on the south shore of the lake, probably resulting from the high water levels in the 1970s. Part of Ile de Grâce, in the Berthier-Sorel islands, changed from a mostly treed area in

Figure 3. Distribution of wetlands on the south shore of Lake Saint-Louis

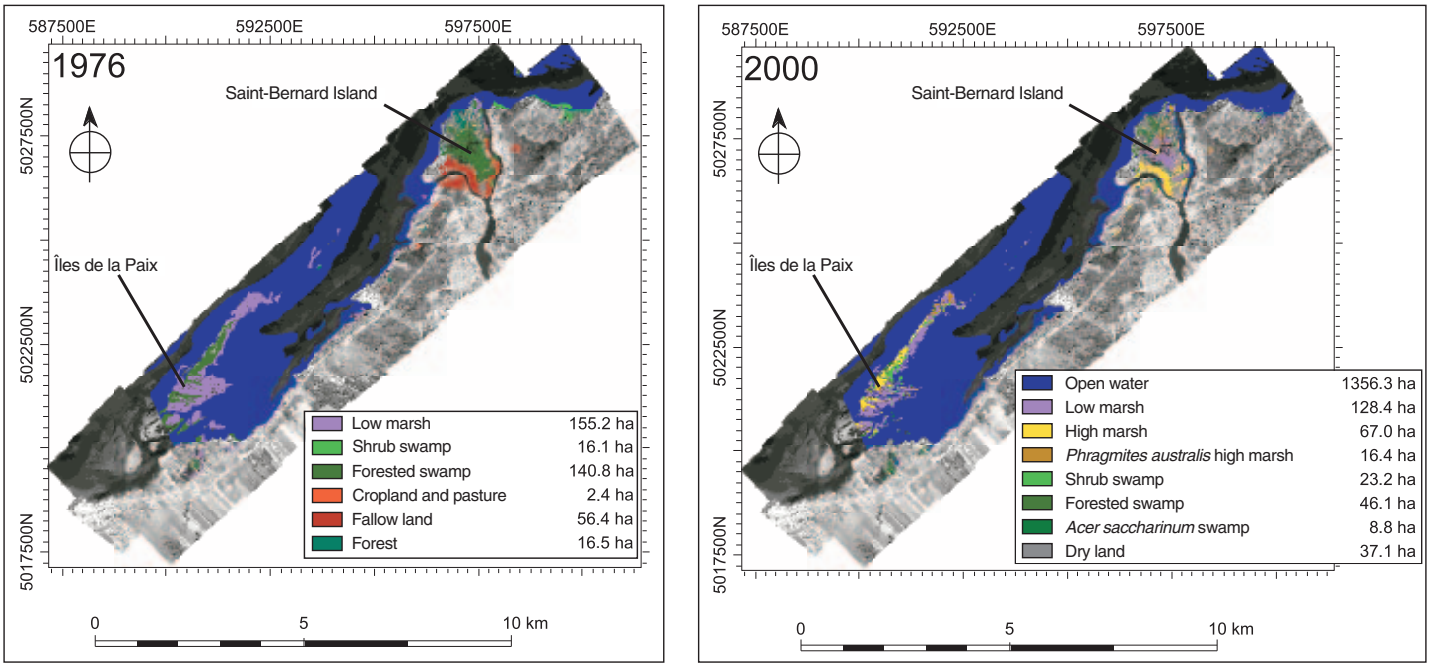
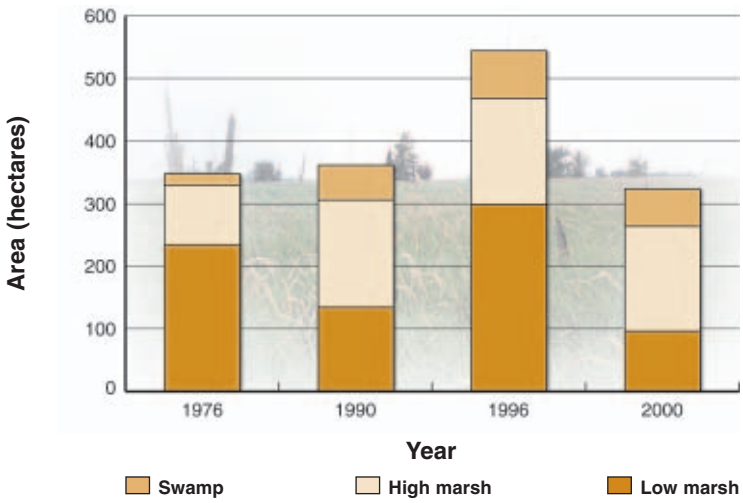


Figure 4. Trends in the areal extent of Boucherville wetlands from 1976 to 2000



1976 to a mosaic of low and high marshes in 1990. Lastly, flow diversion in the northern portion of the Berthier-Sorel island chain may be behind the opposite trend observed at Ile à l'Aigle, which is steadily moving from a marsh-dominated cover to a preponderantly swampy one. Between 1990 and 2000, part of the high marshes were transformed into shrub swamps. The overall increase in wetland cover is related primarily to a variance in the definition of certain parts of the Berthier-Sorel archipelago; identified as terrestrial forests at an earlier time, they were later classified as swamps.

Exotic and Invasive Species

The Boucherville Islands are a good example of the new challenges of managing and conserving St. Lawrence wetlands. Relatively dry conditions in some areas of low marsh caused by dredging in Montreal's harbour likely facilitated the spread of Common Reed (*Phragmites australis*). Absent from area plant surveys in the late 1970s, this invasive species occupied almost 25 ha in 2000 and continues to progress apace.

Following decades of encroachment on the entire St. Lawrence system for agricultural, urban and industrial uses

Figure 5. Distribution of wetlands on Boucherville Islands

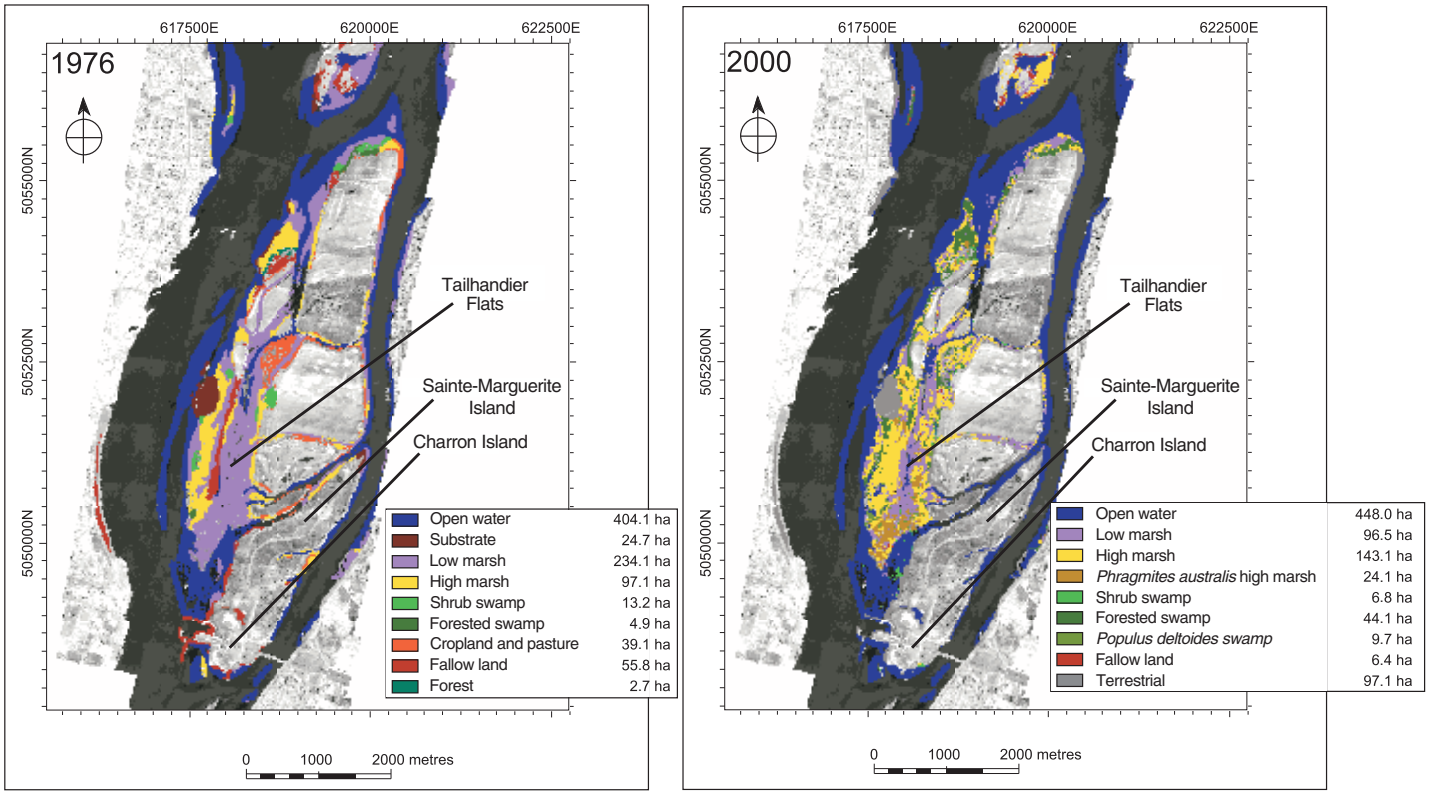
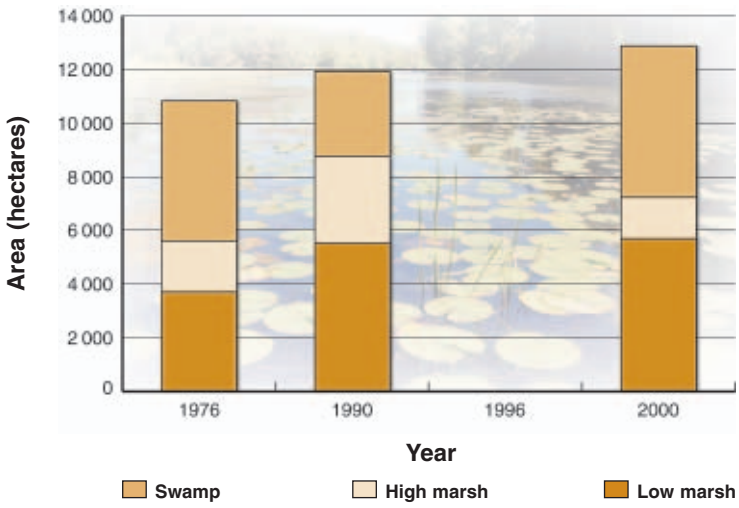


Figure 6. Trends in the areal extent of Lake Saint-Pierre wetlands from 1976 to 2000



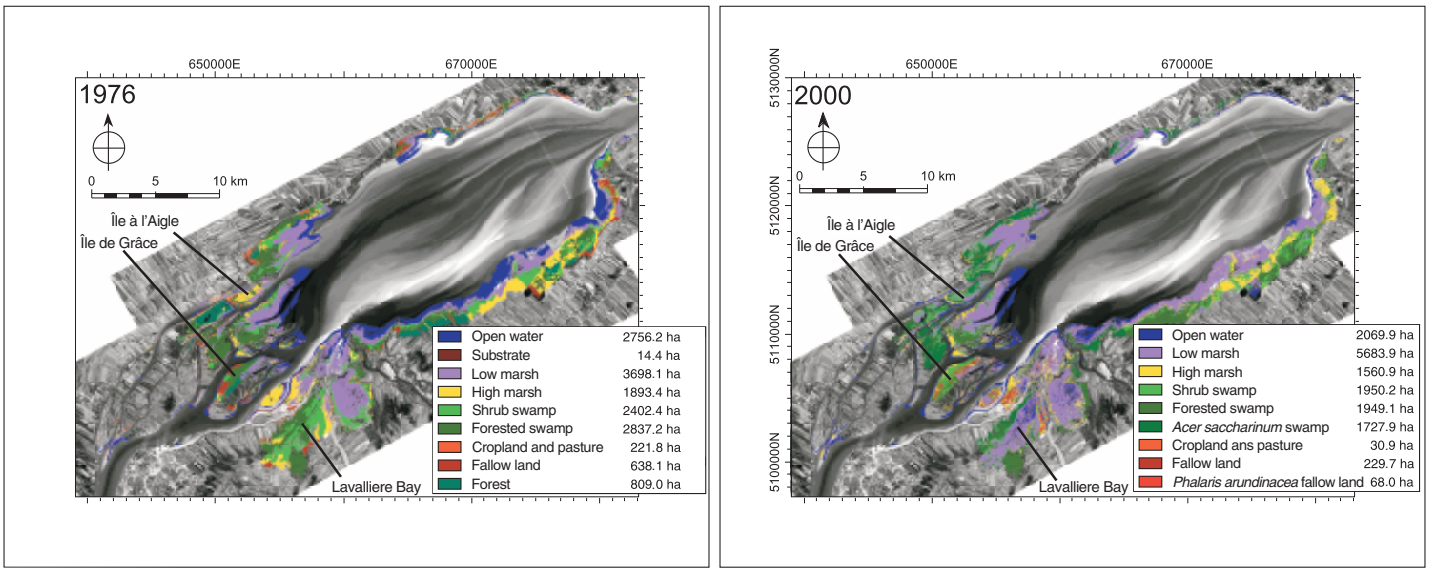
— human development remains a threat, some wetlands having been lost only during the last 25 years — the plant species composition of the remaining wetlands is being transformed. Such pressures offer a major opening for invasive non-native species to become established. Scientists agree that the biological invasion of alien plants is one of the world's biggest ecological problems, second only after the destruction of natural habitats as the leading cause for the loss of biodiversity, and almost always irreversible.

A survey of wetland plant species in 2000 and 2001 produced a snapshot of the distribution and areal extent of invasive species along the St. Lawrence. Of the total 285 species of vascular plants observed, 37 are considered exotic species. Exotic species therefore represent 13% of the wetland flora of the St. Lawrence.

Invasions of exotic plants are particularly high in the fluvial section between Lake Saint-Louis and Lake Saint-Pierre, inclusively. In Lake Saint-Louis, for example, 44% of the plant cover is taken up by exotic species, whereas such species represent only 15% of the flora in the Lake Saint-Pierre wetlands (Table 2).

Exotic species have taken over more than half of the wetland habitats on many islands, including the Iles de la Paix (Lake Saint-Louis), the Tailhandier Flats (Boucherville Islands) and the islands between Varennes and Contrecœur. Downstream of Lake Saint-Pierre,

Figure 7. Distribution of wetlands in Lake Saint-Pierre



exotic species are equally numerous, if not more so, but their impact is not as great (6 to 10% cover), except locally at Cap-Tourmente (18%), Cap-Saint-Ignace (19%), Saint-Roch-des-Aulnaies (27%), and Trois-Pistoles (17%). In general, sites that remain exposed for the greater part of the growing season (mostly high marshes) are invaded much more frequently by exotic species (11 to 65% cover) than are flooded sites such as submerged aquatic vegetation and low marshes (1 to 34% cover).

Only a few of the exotic species established along the St. Lawrence are invasive in character. The exotic plants found most significantly in the St. Lawrence marshlands are Flowering Rush (*Butomus umbellatus*) and Purple Loosestrife (*Lythrum salicaria*). Common Frog-bit (*Hydrocharis morsus-ranae*) and Eurasian Water-milfoil (*Myriophyllum spicatum*) are particularly abundant in Lake Saint-François. Moreover, certain species, considered indigenous, have been propagating very aggressively for some years already, probably due to the hybridization of North American and European varieties. This is the case for Reed Canarygrass (*Phalaris arundinacea*), which dominates at a number of high marshes. The story is the same for Common Reed (*Phragmites australis*) in parts of Beauharnois and in the Boucherville and Contrecœur islands. The impact of these plants is not uniform, however. For example, Common Reed is relatively rare in the St. Lawrence wetlands. At 71% of sites where it is found, however, it takes up more than 50% of the invaded cover. By contrast, Purple Loosestrife is clearly the most widespread exotic plant in the riparian wetlands, yet it covers more than 50% of the area at only 9% of sites where it occurs.

The situation of Flowering Rush is a good example of how rapidly a plant species can invade the St. Lawrence shoreline (Figure 8). The first specimen was harvested in Quebec in 1905 on the flats opposite Longueuil, and for several years thereafter it was found only on the south shore of the Montreal region. Starting in 1922, however, its rate of colonization averaged 16 km per year and by 1935, Flowering Rush had colonized all of the freshwater portion of the river. This invasive species is now found as far as the Gaspé region, where it has colonized the freshwater wetlands adjacent to the sea, as well as many rivers in southern Quebec.

Table 2. Distribution and cover of exotic plants along the St. Lawrence River

Sector	Number of native species	Number of exotic species	Percentage of exotic species	Percentage of cover occupied by exotic species
Lake Saint-François	88	9	9.3	17.8
Lake Saint-Louis	59	11	15.7	43.6
Boucherville	86	17	16.5	41.7
Contrecœur	25	8	24.2	44.3
Lake Saint-Pierre	99	17	14.7	27.1
Fluvial estuary	95	18	15.9	6.2
Upper estuary	87	19	17.9	10.0

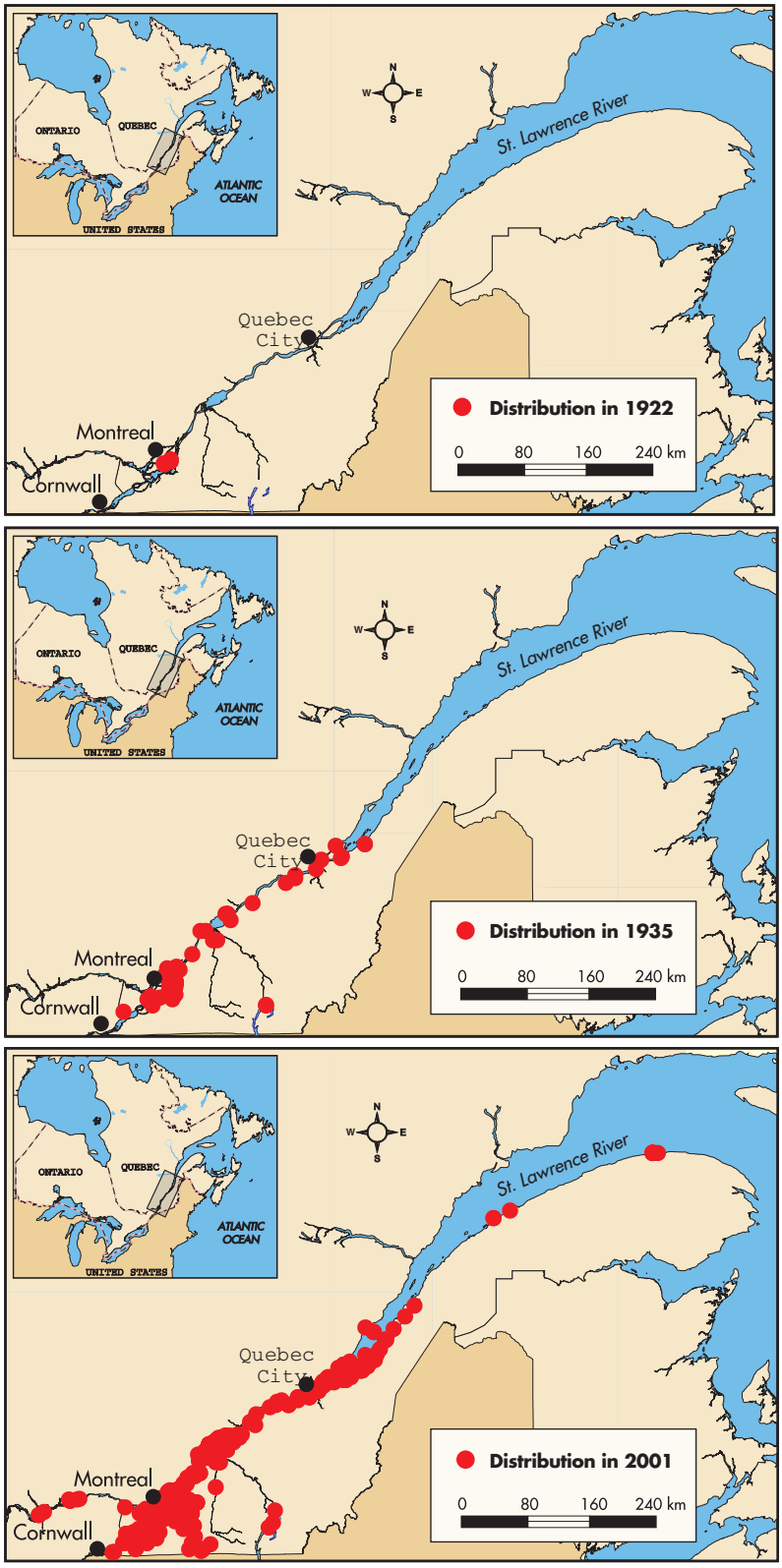
Photo: St. Lawrence Centre

KEY VARIABLES

Areal extent of wetlands

The regular production of wetland maps will enable us to estimate the surface areas of wetland classes or plant communities. By comparing these maps, coupled with detailed analyses of field surveys, scientists should have some indication of trends in these environments relative to surface areas of natural habitats and to the distribution of the main plant species, including invasive ones.

Figure 8. History of the invasion of Flowering Rush (*Butomus umbellatus*)



Outlook

We do not have the data necessary to compare the changes in the areal extent of St. Lawrence wetlands with the situation in the Great Lakes. The issue of the invasion of exotic plants along the St. Lawrence may be different from what is observed elsewhere. This is the case for Purple Loosestrife, which is considered a serious problem in north-eastern North America. The results for the St. Lawrence agree with certain recent scientific studies, which greatly minimize the impact of Purple Loose-strife on wetland flora. Nonetheless, the effect of these changes on the quality of wildlife habitats remains to be assessed.

By monitoring the surface areas and species composition of wetland vegeta-tion, we can track trends in these impor-tant ecosystems. The present exercise is an attempt to update the snapshot taken 20 years ago of the St. Lawrence wetlands. Scientists hope to maximize the use of modern technologies like high-resolution remote sensing satellites to collect data on wetland environments, thereby opening the door to a more detailed analysis of plant communities. Additionally, regular fieldwork will add to the precision of observed changes in wetlands, while allowing trends in invasive species to be monitored. Field data on wetland vegetation shows how dynamic these habitats are, both in terms of surface area and species composition. Land use by humans and fluctuating water levels, whether induced by natural hydrological cycles, climate change or other phenomena, are two of the most important factors affecting wetland dynamics.

Photo: St. Lawrence Centre

To Know More

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State of the St. Lawrence Monitoring Program

Four government partners — Environment Canada, the ministère de l'Environnement du Québec, the Société de la faune et des parcs du Québec, and Fisheries and Oceans Canada — are pooling their expertise and efforts to provide Canadians with information on the state of the St. Lawrence and long-term trends affecting it. To this end, environmental indicators have been developed on the basis of data collected as part of each organization's ongoing environmental monitoring activities. These activities cover the main components of the environment, namely water (quality and quantity), sediments, biological resources (species diversity and condition), uses and, eventually, shorelines.

For additional copies or the complete collection of fact sheets, contact the St. Lawrence Vision 2000 Coordination Office:

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The fact sheets and additional information about the program are also available on the Web site: **www.slv2000.qc.ca** .

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