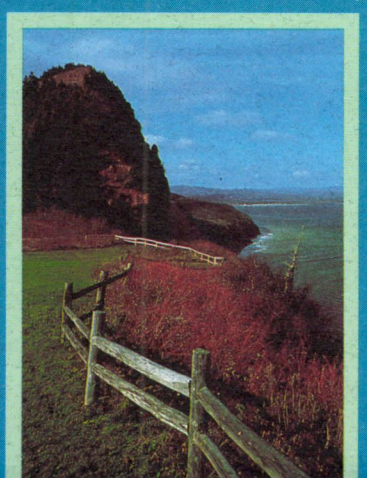
Thematic report on the state of the St. Lawrence River, published by the ST. LAWRENCE CENTRE

# St. Lawrence UPDATE



## THE ST. LAWRENCE RIVER: DIVERSIFIED ENVIRONMENTS





...nment ... Environnement Canada
...rvation and ...tion Conservation et Protection
Québec Region Région du Québec

# MANAGEMENT PERSPECTIVE

*The St. Lawrence Action Plan aims to protect, conserve and restore the St. Lawrence for both environmental and socio-economic reasons. The St. Lawrence provides habitats for a great many animal and plant species, and also contributes in many ways to the well-being of the human population. To date, residents and travellers alike have derived a wealth of benefits from the River, from drinking water to commercial and sports fishing, not to mention transportation and various touristic, recreational and industrial uses.*

*We can contribute to safeguarding the St. Lawrence by acquiring as much information as possible on the resources and uses of the River, and obtaining a better understanding of the relationships between human activities and the environment. This information must therefore be made accessible so that it can be used for decision-making by all those who are concerned with the appropriate management of the river resource, in a perspective of sustainable development. In this way, today's society will be able to recover certain uses of the River and learn to appreciate resources too often neglected, while leaving an incalculable heritage to future generations.*

*Such is the context in which this thematic report on the various environments of the St. Lawrence has been prepared by the Knowledge of the State of the Environment Branch of the St. Lawrence Centre (Environment Canada), in fulfilment of its mandate to draw up a profile of the state of the River. The main objective of this report is to provide information on the diversity and importance of these environments in the maintenance of ecosystems. By identifying the agents of disruption and assessing the state of certain natural environments and threatened species, this report will help readers better understand intervention work undertaken with regard to these environments.*

*This report is intended for all those interested in environmental issues related to the St. Lawrence River, including environmental groups, the education sector (colleges and universities), consultants, managers and scientists, as well as all those who seek a document summarizing currently available information on the diversified environments of the St. Lawrence.*

# ABSTRACT

*The St. Lawrence River is Québec's main waterway and a vital artery of the North American continent: most of Québec's population is concentrated along its banks. And yet, people have not always used the wealth of the River wisely, seeming to forget that it is also home to many plants and animals. As a result, we now have endangered species right on our own doorstep.*

*This document, published in conjunction with the St. Lawrence Action Plan, is intended as a unique reference source that is accessible to all. It brings together a wealth of information previously found scattered in different sources and includes such topics as environments and habitats, the diversity of fauna and flora, species that are representative of a given environment, and the priority species identified under the Action Plan, as well as the main natural and man-made threats and the direct and indirect measures undertaken to remedy them.*

*The St. Lawrence corridor comprises six main natural and artificial environments that must be shared in harmony by plant, animal, and human life. These areas - designated pelagic, wetlands, open, forest, island and marginal environments - contain well-defined sites that provide for all the behavioural and energy requirements of the wildlife living there. Known as essential wildlife habitats, these sites can be found in the pelagic, wetland, island and marginal environments, all four of which are directly linked to the River. Although the biophysical characteristics of these environments enable them to support a wide variety of flora and fauna, the fact remains that some species are now in danger. To learn more about them and in order to protect and conserve them, 32 animal species and 246 vascular plants have been listed as priority species under the Action Plan.*

*The anthropogenic stresses on environments in the St. Lawrence corridor have already resulted in the loss of 3643 ha of wetlands between 1950 and 1978. As well, from 1945 to 1988, close to 21 000 ha of fish habitats underwent some sort of physical change. To counter this assault, and in response to increased awareness of the problem, federal, provincial and municipal legislation has been developed to take concrete action against the deterioration of the river corridor environments, with the help of initiatives taken by non-governmental organizations and volunteer groups.*

*Following a few initially separate initiatives, these groups are now learning to work together, putting the means at their disposal to more efficient use and preventing the further fragmentation of areas whose biological integrity is vital for everyone.*

*Together with the various other documents produced under the Action Plan, this report is intended to fulfil an essential mission: to increase understanding and awareness, thereby supporting the plans and actions of all those concerned with rectifying past errors and building for the future in a spirit of sustainable development.*

# RÉSUMÉ

*Le Saint-Laurent est l'artère principale du Québec, et l'une des artères vitales du continent américain. La majorité de la population du Québec est concentrée le long de ses rives. Mais l'homme n'a pas toujours su utiliser avec discernement cette manne incomparable que représente le fleuve, semblant oublier les autres habitants naturels : la faune et la flore. Résultat : des espèces en situation précaire se trouvent maintenant chez nous.*

*Le présent ouvrage publié dans le cadre du Plan d'action Saint-Laurent (PASL), constitue une source de référence unique et accessible à tous, qui réunit une foule d'informations, autrefois disséminées. On y parlera de milieux et d'habitats, de biodiversité faunique et floristique, d'espèces dites représentatives d'un milieu particulier, d'espèces prioritaires identifiées par le PASL, des principaux assauts naturels et anthropiques, ainsi que des mesures directes et indirectes qui sont entreprises pour y remédier.*

*Le corridor du Saint-Laurent comprend six principaux milieux, naturels et artificialisés, que doivent se partager en toute harmonie la faune, la flore et l'homme. Ces milieux sont dits pélagiques, humides, ouverts, forestiers, insulaires et marginaux. On y retrouve des sites bien délimités qui permettent aux espèces fauniques de satisfaire leurs exigences comportementales et énergétiques. Nommés habitats fauniques essentiels, ces sites se répartissent entre autres parmi les milieux pélagiques, humides, insulaires et marginaux, tous quatre directement liés au fleuve. Les caractéristiques biophysiques de ces milieux leur permettent de supporter une grande diversité faunique et floristique. Il n'en demeure pas moins que certaines espèces sont en situation précaire. Afin de mieux les connaître, les protéger et les conserver, 32 espèces fauniques et 246 plantes vasculaires ont été désignées espèces prioritaires par le PASL.*

*Quant aux stress anthropiques qui affectent les milieux de vie du corridor du Saint-Laurent, ils se sont déjà traduits par la perte de 3643 ha de milieux humides, entre 1950 et 1978. Par ailleurs, entre 1945 et 1988, près de 21 000 ha d'habitats du poisson ont subi des modifications physiques. Pour contrer un tel assaut et faisant suite à une période de conscientisation, des législations fédérales, provinciales et municipales, jointes à des initiatives d'organismes non gouvernementaux et de bénévoles, ont entrepris d'enrayer très concrètement la dégradation des milieux du corridor fluvial.*

*Après quelques actions isolées, les intervenants apprennent maintenant à se concerter pour mieux rationaliser l'usage des divers moyens, et éviter tout danger de morcellement nouveau de territoires dont l'intégrité biologique demeure vitale pour tous.*

*Avec l'ensemble des autres travaux du PASL, ce rapport devrait permettre, en passant par les étapes indispensables de la connaissance et de la conscientisation, de favoriser les plans et les actions de tous ceux qui désirent contrebalancer les erreurs du passé, et bâtir pour l'avenir, dans une perspective de développement durable.*

# ACKNOWLEDGMENTS

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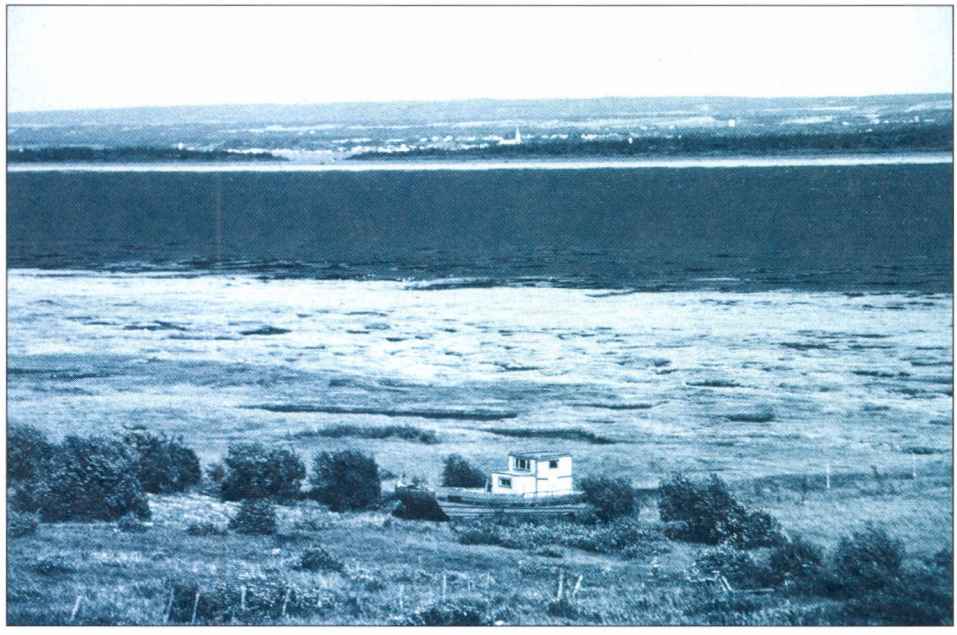
# INTRODUCTION

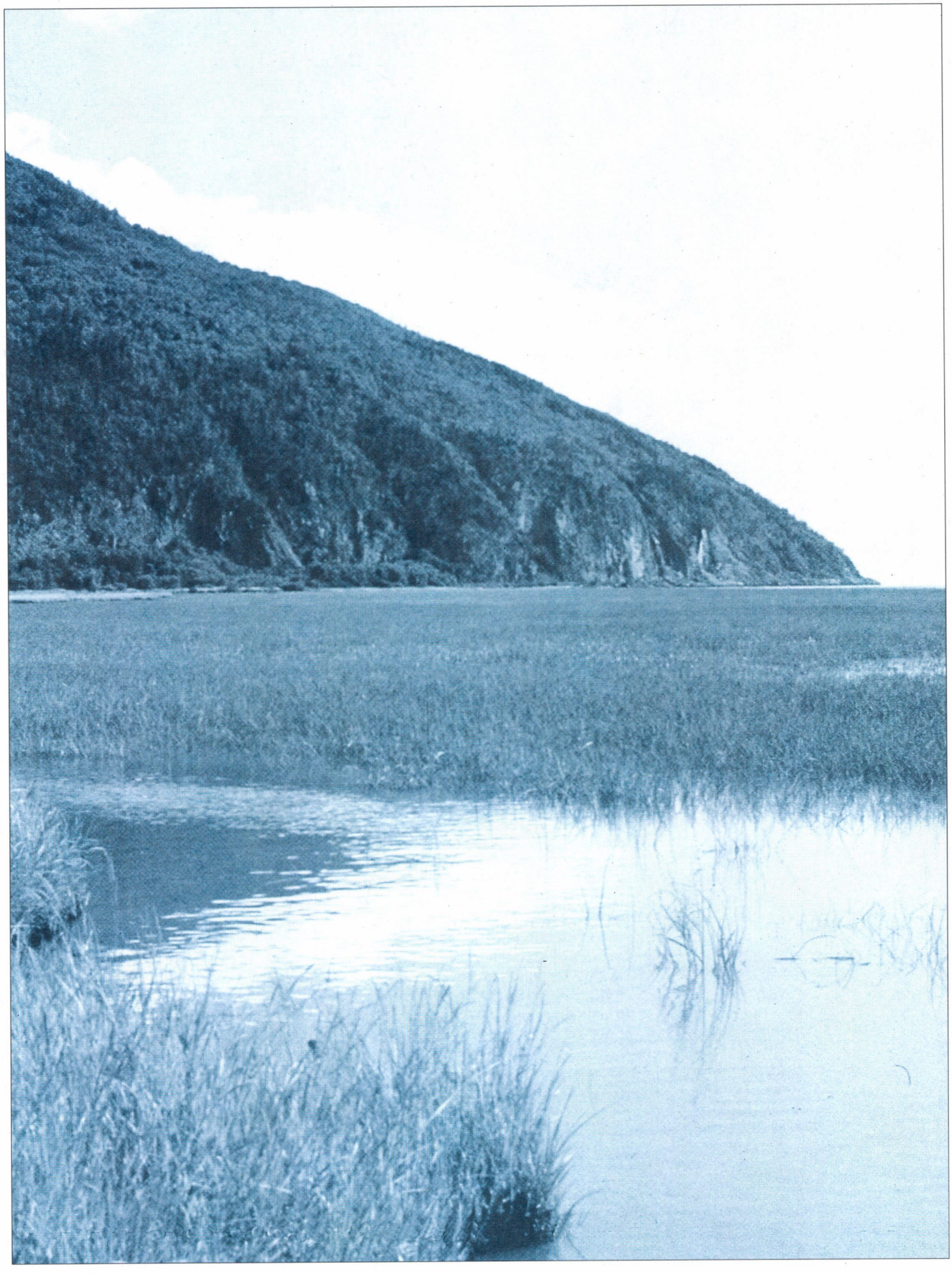


SLC - Danielle Gingras

The geographical space that constitutes the St. Lawrence corridor shapes an environment that is home to many species of plant and animal life, and to humans. The fact that this area contains diversified environments should be emphasized. On land as in water, the aquatic, wetland, open, forest, marginal and island environments that make up this land primarily offer shelter to all forms of life.

## *Structure of the report*

Our first task is to provide a general description of these environments. We then go on to emphasize the vital importance of those wildlife habitats termed **essential**. Next follows a more comprehensive characterization of environments directly linked to the River; that is, the pelagic, wetland, island and marginal environments. At this stage, representative species will be described, to offer some idea of the wide variety of animal and plant life sheltered by the St. Lawrence. Species of vulnerable status will serve to illustrate the importance of each natural environment associated with the River and its role in ensuring the maintenance and diversity of ecosystems. The chapter which follows explains the types of stresses placed on the various environments (human activities, for example), and the accompanying repercussions (such as the loss of wetlands and physical changes to fish habitats). The last chapter will describe measures taken to promote protection of both the species and the natural environments of the St. Lawrence.



CWS - Léo-Guy De Repentigny

CHAPTER 1

# Methodology

This report is a review of documentation based on various existing or in-progress sources of information. Federal government departments (Environment Canada, and Fisheries and Oceans) and provincial ministries (ministère du Loisir, de Chasse et de la Pêche; ministère de l'Environnement du Québec; ministère de l'Énergie et des Ressources), contributed information to this project, as did non-governmental organizations (Union Québécoise pour la Conservation de la Nature, Ducks Unlimited Canada), and various private sector groups and institutions (research centres and universities).

## *Definitions: habitat and environment*

Certain terms will be defined in order that readers can better grasp the significance of the various St. Lawrence corridor environments in the maintenance of ecosystemic equilibrium. In this way, we will also facilitate understanding of the information contained in this study.

A **habitat** is a spatial location in which the biotic and abiotic factors are such that they permit a given species or population to satisfy its vital requirements; that is, feeding, reproduction, migration and shelter. A habitat is thus the area in which a given species occurs naturally.

According to Ramade (1989), three fundamental aspects define the relationship between a species and the natural environment:

- *Range*, which represents the area of a continent or ocean in which a given living species may be found.
- *Habitat*, which corresponds to the location in which a species occurs naturally and which comprises its immediate environment, both biotic and abiotic.
- *Ecological niche*, which is the place and functional specialization of a species in a biological community.

Because the St. Lawrence is home to more than half the plant and animal species of Québec, presenting the habitats of each would be an enormous task. As defined by Amavis (1982), an "environment" is characterized by the preponderant influence of one or more agents or factors, and may therefore be quite extensive. As such, this definition is valid for an area as large as the River itself. The term "habitat" will be restricted for use in describing the environment in which a given species lives.

## *Study area*

This study covers the entire St. Lawrence River as defined by the St. Lawrence Action Plan: "*That portion of the waterway which includes wetland and riparian environments between the Québec-Ontario border and Blanc-Sablon on the north shore and Gaspé on the south; it also includes the waters around Anticosti Island and the Îles de la Madeleine, as well as the Saguenay River.*" (Working group on priority flora and fauna of the St. Lawrence corridor, 1990).

## *Classification of St. Lawrence environments*

The varied interests of all the authors consulted for this report has resulted in a variety of classifications.

We chose to adapt the classification given by Lemay (1987) in order to obtain a comprehensive picture of the environments of the St. Lawrence corridor. These environments will therefore be presented successively, moving from water to land. The natural environments directly associated with the St. Lawrence – that is, the pelagic, wetland, island and marginal environments, which are all influenced by the biophysical characteristics of the River – will be presented in terms of their hydrological particularities, as expressed in the hydrographic divisions identified from upstream to downstream (fig.1).

## *Classification of species*

In this classification, we will first match the various fauna and flora with the natural environments with which they are most often associated. We will also identify a number of species which have been assigned special status that is reflective of their precarious situations.

### Representative species

For each natural environment linked to the River, the wildlife species commonly found there, or those with a vast range, are identified and considered to be species representative of this environment. Common or dominant plant communities will also be presented for each of these environments.

### Action Plan priority species

#### *Priority of identification*

Many plant and animal species found in the corridor are among the **Action Plan priority species**, species so designated in 1990 by the working group on priority flora and fauna of the St. Lawrence corridor. This group, made up of representatives from the Canadian Wildlife Service, Environment Canada, Fisheries and Oceans, the ministère du Loisir, de la Chasse et de la Pêche, and the ministère de l'Environnement du Québec drew up its list on the basis of the following selection criteria:

*a)* Any species generally recognized as vulnerable or threatened in the St. Lawrence

*b)* Any species which regularly uses the St. Lawrence and which COSEWIC (Committee on the Status of Endangered Wildlife in Canada) has designated as vulnerable, threatened or endangered in Canada

*c)* Any species generally recognized as vulnerable or threatened in Canada, and found all along the St. Lawrence

*d)* Any species, whether commercially exploited or not, which regularly uses the St. Lawrence, and which is problematic due to its habitat or due to the state of its populations.

These criteria consider the number of sites used by the species, its population size and the specificity of a species for a given habitat.

Action Plan priority species with a COSEWIC-designated status are identified in tables 1 and 2. This committee assigns three statuses:

- *Vulnerable species.* Any indigenous species particularly at risk because of low or declining numbers, occurrence at the fringe of its range or in restricted areas, or for some other reason.
- *Threatened species.* Any indigenous species that is likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed.
- *Endangered species.* Any indigenous species threatened with imminent extinction or extirpation throughout all or a significant portion of its Canadian range.

It should also be noted that, depending on the chosen scale of analysis, the status of a species may change. Thus, the status assigned to bird species in Québec by the Canadian Wildlife Service (CWS) of Environment Canada does not systematically correspond to the one designated by COSEWIC for all of Canada. For example, *Caspian tern*, designated vulnerable by COSEWIC, is rated as an endangered species in Québec (Robert, 1989). Similarly, the *Yellow rail*, which has no COSEWIC status, is a vulnerable species in Québec (Robert, 1989), whereas the *Peregrine falcon*, which is endangered in Canada, is classified as vulnerable in Québec due to the success of the peregrine falcon recovery program.

#### Flora

Of the 2500 vascular plants identified in Québec, 1800 are indigenous species. In the course of research conducted under the Action PLan, Gratton and Dubreuil (1990) determined that 183 plant species could be considered priority species in the St. Lawrence corridor on the basis of their limited distribution at 10 observation stations or less in Québec. Using more extensive selection criteria, the ministère de l'Environnement du Québec has identified 374 vascular plants that are potential candidates for designations as threatened or vulnerable in Québec (Lavoie, 1992). Over two-thirds, or 246, are found in a one kilometre-wide corridor on either side of the St. Lawrence (Lavoie, 1992a). Of these 246 species (which are listed in table 1), nine are trees, 14 are shrubs and 223 are herbaceous plants belonging mainly to the Cyperaceae, Compositae, Cruciferae, Graminea, Polypodiaceae and Rosaceae families.

The identification of vascular plants deemed priority species necessarily requires measures for better understanding and monitoring their populations, and protecting their habitats.

Note that nine species of vascular plants carry both an official COSEWIC-assigned status and are termed priority species under the Action Plan.

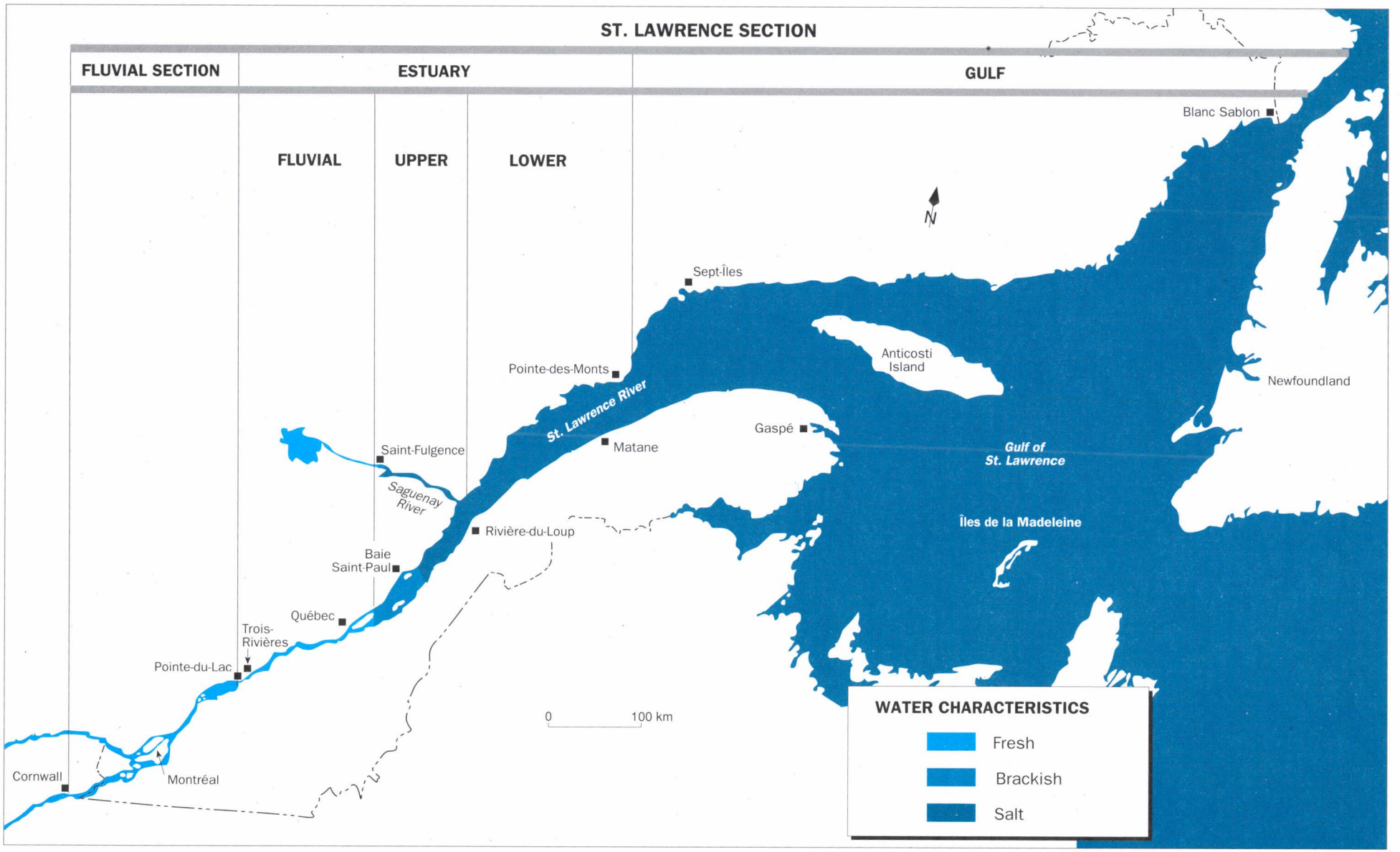
#### Fauna

Included among the Action Plan priority species are eleven species of fish, eleven bird species, two species of amphibians, five species of reptiles and three species of marine mammals (Huot, 1991), as shown in table 2.

Two species of fish, two species of marine mammals, one species of reptile and six species of birds have both an officially-designated COSEWIC status and are classified priority species under the Action Plan.

#### *Priority of action*

The identification of both plant and animal priority species is aimed at guiding actions undertaken within the context of the Action Plan in the maintenance of the diversity and integrity




Source: St. Lawrence Centre and Université Laval, 1990.

**Figure 1** **Hydrographic divisions of the St. Lawrence**

**Table 1 Alphabetical list of Action Plan priority vascular plants**

*Acer nigrum*
*Adlumia fungosa*
*Agastache nepetoides*
*Agrimonia pubescens*
*Alchemilla filicaulis ssp. filicaulis-P09**
*Allium canadense*
*Allium tricoccum*
*Alnus serrulata*
*Amelanchier amabilis*
*Angelica laurentiana*
*Antennaria eucosma*
*Antennaria straminea*
*Aplectrum hyemale*
*Arabis holboellii var. collinsii*
*Arabis holboellii var. holboellii*
*Arabis holboellii var. retrofracta*
*Arabis laevigata*
*Arctostaphylos rubra-P09,P11**
*Arethusa bulbosa*
*Arisaema dracontium* [1]
*Armoracia lacustris*
*Arnica griscomii ssp. griscomii*
*Arnica lanceolata*
*Arnica lonchophylla ssp. lonchophylla*
*Asclepias exaltata*
*Asclepias tuberosa var. interior*
*Aster anticostensis* [2]
*Aster laurentianus* [1]
*Aster linariifolius*
*Aster novi-belgii var. villicaulis*
*Astragalus aboriginum var. aboriginum*
*Astragalus americanus*
*Astragalus robbinsii var. fernaldii*
*Athyrium pycnocarpon*
*Bartonia virginica*
*Bidens discoidea*
*Bidens eatonii*
*Bidens heterodoxa*
*Botrychium campestre*
*Botrychium pallidum*
*Botrychium rugulosum*
*Botrychium spathulatum*
*Braya humilis var. humilis*
*Bromus pubescens*
*Calamagrostis purpurascens var. purpurascens*
*Camptosorus rhizophyllus*
*Cardamine bulbosa*
*Cardamine concatenata*
*Carex alopecoidea*
*Carex appalachica*
*Carex argyrantha var. argyrantha*
*Carex atherodes*
*Carex backii*
*Carex bicknellii*
*Carex cephalophora*
*Carex folliculata*
*Carex formosa*
*Carex hirtifolia*
*Carex hitchcockiana*
*Carex hostiana*
*Carex lupuliformis*
*Carex molesta*
*Carex muhlenbergii*
*Carex petricosa var. misandroides*
*Carex platyphylla*
*Carex prairea*
*Carex prasina*
*Carex sartwellii*
*Carex sparganioides var. sparganioides*
*Carex sychnocephala*
*Carex trichocarpa*
*Carex typhina*
*Ceanothus americanus*
*Celtis occidentalis*
*Cerastium nutans var. nutans*
*Chamaesyce polygonifolia*
*Cicuta maculata var. victorinii* [1]
*Cinna arundinacea*
*Cirsium foliosum var. minganense*
*Cirsium muticum var. monticolum*
*Claytonia virginica*
*Corallorhiza odontorhiza*
*Corallorhiza striata*
*Corema conradii*
*Corylus americana*
*Crataegus brainerdii*
*Crataegus crus-galli*
*Crataegus dilatata*
*Crataegus suborbiculata*
*Cyperus engelmannii*
*Cyperus lupulinus ssp. lupulinus*
*Cyperus lupulinus ssp. macilentus*
*Cypripedium arietinum*
*Cypripedium calceolus var. planipetalum*
*Cypripedium passerinum var. minganense*
*Cypripedium reginae*
*Desmodium nudiflorum*
*Desmodium paniculatum*
*Draba aurea-P01,09**
*Draba glabella var. pycnosperma*
*Draba peasei*
*Drosera linearis*
*Dryopteris clintoniana*
*Dryopteris filix-mas*
*Echinochloa walteri*
*Elodea nuttallii*
*Elymus riparius*
*Elymus villosus*
*Epilobium ciliatum var. ecomosum*
*Eragrostis hypnoides*
*Erigeron compositus*
*Erigeron hyssopifolius var. villicaulis*
*Erigeron lonchophyllus*
*Erigeron philadelphicus ssp. provancheri* [1]
*Eriocaulon parkeri*
*Erysimum inconspicuum var. coarctatum*
*Festuca hyperborea*
*Festuca vivipara ssp. hirsuta*
*Fimbristylis autumnalis*
*Floerkea proserpinacoides*
*Galearis spectabilis*
*Galium circaezans*
*Gaylussacia dumosa var. bigeloviana*
*Gentianella propinqua ssp. propinqua-P09, P11**
*Gentianopsis macounii*
*Gentianopsis nesophila-P09**
*Gentianopsis victorinii* [1]
*Geranium maculatum*
*Goodyera pubescens*
*Gratiola aurea*
*Gratiola neglecta var. glaberrima*
*Gymnocarpium robertianum*
*Hackelia virginiana*
*Halenia deflexa ssp. brentoniana*
*Hedeoma hispidum*
*Hedysarum boreale ssp. mackenziei*
*Hudsonia tomentosa*
*Iris virginica var. shrevei*
*Isanthus brachiatus*
*Isoëtes tuckermanii*
*Juncus greenei*
*Juncus longistylis*
*Justicia americana* [2]
*Lactuca hirsuta var. sanguinea*
*Lathyrus ochroleucus*
*Lesquerella arctica var. arctica*
*Lindernia dubia var. inundata*
*Listera australis*
*Lycopus americanus var. laurentianus*
*Lycopus virginicus*
*Lysimachia hybrida*
*Lysimachia quadrifolia*
*Monarda didyma*
*Muhlenbergia richardsonis*
*Myriophyllum heterophyllum*
*Najas guadalupensis*
*Nymphaea tetragona*
*Oenothera fruticosa ssp. glauca*
*Onosmodium molle var. hispidissimum*
*Oxytropis deflexa var. foliolosa-P11**
*Oxytropis viscida var. viscida*
*Panax quinquefolius* [2]
*Panicum clandestinum*
*Panicum depauperatum var. depauperatum*
*Panicum virgatum*
*Pellaea atropurpurea*
*Peltandra virginica ssp. virginica*
*Phegopteris hexagonoptera* [1]
*Physostegia virginiana var. granulosa*
*Piperia unalascensis*
*Platanthera blephariglottis*
*Platanthera flava*
*Platanthera orbiculata var. macrophylla*
*Poa fernaldiana*
*Poa secunda*
*Podophyllum peltatum*
*Podostemon ceratophyllum*
*Polanisia dodecandra ssp. dodecandra*
*Polygala senega*
*Polygonum careyi*
*Polygonum hydropiperoides var. hydropiperoides*
*Polygonum punctatum var. majus*
*Polygonum punctatum var. parvum*
*Polystichum lonchitis*
*Potamogeton illinoensis*
*Potamogeton pusillus var. gemmiparus*
*Proserpinaca palustris*
*Pterospora andromeda*
*Pycnanthemum virginianum var. virginianum*
*Quercus alba*
*Quercus bicolor*
*Ranunculus flabellaris*
*Ranunculus longirostris*
*Rhus vernix*

**Table 1 (cont'd)**

| | | |
|---|---|---|
| *Rhynchospora capillacea* | *Selaginella apoda* | *Utricularia geminiscapa* |
| *Rhynchospora capitellata* | *Solidago simplex ssp. randii var. racemosa* | *Valeriana sitchensis ssp. uliginosa* |
| *Rosa rousseauiorum* | *Sorghastrum nutans* | *Verbena simplex* |
| *Rosa williamsii* | *Sparganium androcladum* | *Veronica catenata* |
| *Rubus flagellaris* | *Sparganium glomeratum* | *Veronica peregrina var. peregrina* |
| *Sagittaria calycina var. spongiosa* | *Spiranthes casei* | *Viola affinis* |
| *Salix sericea* | *Spiranthes lucida* | *Viola rostrata* |
| *Samolus parviflorus* | *Sporobolus asper var. asper* | *Wolffia borealis* |
| *Sanicula canadensis var. canadensis* | *Sporobolus cryptandrus* | *Wolffia columbiana* |
| *Saururus cernuus* | *Sporobolus heterolepis* | *Woodsia alpina* |
| *Schizachne purpurascens var. pubescens* | *Staphylea trifolia* | *Woodsia oregana* |
| *Scirpus clintonii* | *Strophostyles helvula* | *Woodsia scopulina* |
| *Scirpus heterochaetus* | *Taenidia integerrima* | *Woodwardia virginica* |
| *Scirpus pendulus* | *Taraxacum latilobum* | *Xyris montana* |
| *Scirpus pumilus ssp. rollandii* | *Taraxacum laurentianum* | *Zizania aquatica var. aquatica* |
| *Scirpus smithii* | *Torreyochloa pallida var. pallida* | *Zizania aquatica var. brevis* |
| *Scirpus torreyi* | *Triglochin gaspense* | |
| *Sedum villosum* | *Ulmus thomasii* | |

Source: Lavoie, 1992a.

* The symbol P (population), followed by a figure corresponding to the number of the administrative region which appears after the name of a species, indicates that this species is considered likely to be designated threatened or vulnerable only in this part of its Québec range.
P01: Bas-Saint-Laurent; P09: Côte-Nord; P11: Gaspésie, Îles de la Madeleine.

*COSEWIC status*: 1. Vulnerable. 2. Threatened.

*Note*: The ministère de l'Environnement du Québec is currently conducting research to determine the common names of vascular plants likely to be classified as threatened or vulnerable.

of the populations living in the St. Lawrence River. This process requires information acquisition and actions such as those recommended by the working group on the priority flora and fauna of the St. Lawrence corridor; that is:

- Identify habitats in order to undertake protective measures (e.g. acquisition, management, restoration), as part of the Action Plan's Habitat Protection Program
- Develop and implement recovery plans
- Identify and implement measures needed to prevent new developments in the St. Lawrence corridor from jeopardizing the survival of these species or contributing to their decline
- Acquire information critical to making a more accurate assessment of the situations of those species for which problems are anticipated
- Raise public awareness to the risk associated with a reduction in the biological diversity of the St. Lawrence.

## *Iconography and presentation*

All the plates depicting fish were generously provided by the Aquarium du Québec, to which we also owe the plates on marine mammals. The geographical distribution maps for certain species of fish were taken from Mongeau *et al.* (1974).

The illustrations of amphibians and reptiles were reproduced with the kind authorization of the Canadian Museum of Nature in Ottawa. Information on species distribution, updated in 1992, covers several years of observation and comes mainly from the Centre de données sur le patrimoine naturel du Québec (MENVIQ).

As for birds, the plates used are from the Canadian Wildlife Service (CWS) of Environment Canada. The distribution maps include observation data up until 1992, and were obtained from the Centre de données sur le patrimoine naturel du Québec and the CWS.

The illustration of Philadelphia Fleabane, ssp. Provancher, a priority vascular plant, was kindly provided by botanist André Sabourin; for Dragonroot, we have used the sketch by Brother Alexandre in Marie-Victorin (1931), p. 26 (fig. 3).

Fact sheets have been prepared for some priority vascular plants, chosen on the basis of their distribution in the various environments studied, and because of the availability of information. A similar sheet was also prepared for each priority wildlife species living in a natural environment linked to the River, in order to demonstrate the diversity of river resources, the fragile or precarious nature of their habitat and, occasionally, the uses made of the species. A brief note on the biology of the species concerned is included, followed by a description of its breeding habitat and the reasons why it is considered a priority species. A distribution map is also provided for each species, when available. In order to avoid the repetition of information on a given priority wildlife species from one environment to another, the species is introduced after the description of the environment in which it is most commonly found.

**Table 2 List of Action Plan priority wildlife species**

*FISH*

- American shad (*Alosa sapidissima*)
- Atlantic sturgeon (*Acipenser oxyrhynchus*)
- Atlantic tomcod (*Microgadus tomcod*)
- Brassy minnow (*Hybognatus hankinsoni*)
- Copper redhorse[2] (*Moxostoma hubbsi*)
- Grass pickerel (*Esox americanus vermiculatus*)
- Lake sturgeon (*Acipenser fulvescens*)
- Rainbow smelt (*Osmerux mordax*)
- Redfin pickerel (*Esox americanus americanus*)
- River redhorse[1] (*Moxostoma carinatum*)
- Striped bass (*Morone saxatilis*)

*MARINE MAMMALS*

- Harbour porpoise[2] (*Phocoena phocoena*)
- Harbour seal (*Phoca vitulina*)
- St. Lawrence Beluga[3] (*Delphinapterus leucas*)

*REPTILES AND AMPHIBIANS*

*Amphibians*
- Northern chorus frog (*Pseudacris triseriata*)
- Pickerel frog (*Rana palustris*)

*Reptiles*
- Blanding's turtle (*Emydoidea blandingi*)
- Brown snake (*Storeria dekayi*)
- Map turtle (*Graptemys geographica*)
- Northern water snake (*Nerodia sipedon*)
- Spiny softshell (*Apalona spinifera*)

*BIRDS*

- Bald eagle (*Haliaeetus leucocephalus*)
- Caspian tern[1] (*Sterna caspia*)
- Horned grebe (*Podiceps auritus*)
- Least bittern[1] (*Ixobrychus exilis*)
- Loggerhead shrike[2] (*Lanius ludivicianus*)
- Peregrine falcon[3] (*Falco peregrinus ssp. anatum*)
- Piping plover[3] (*Charadrius melodus*)
- Red-headed woodpecker (*Melanerpes erythrocephalus*)
- Roseate tern (*Sterna dougallii*)
- Sedge wren (*Cistothorus platensis*)
- Yellow rail (*Coturnicops noveboracensis*)

Sources: Working group on priority flora and fauna of the St. Lawrence corridor, 1990. Committee on the Status of Endangered Wildlife in Canada, 1991.

*COSEWIC status*: 1. Vulnerable. 2. Threatened. 3. Endangered.

CHAPTER 2

# An Overview of the St. Lawrence Corridor

**The St. Lawrence, where water flows from fresh to brackish to salt; whose environments range from wet to dry, and humid in between. The St. Lawrence, where the human influence is felt in the water, on land and in the air, in the insistent hand of human ingenuity ever reaching for economic wealth, recreation, food and aesthetics - often at the risk of an abundant natural legacy. The vast St. Lawrence corridor is a veritable research laboratory for the study of biodiversity, in terms of its heterogeneity, complementarity and fragility.**

The six principal natural or artificial environments of the River corridor are: the pelagic, wetland, open, forest, island and marginal environments. Their distribution along a 10 km-wide strip between Cornwall and Tadoussac – information which was obtained using LANDSAT satellite remote sensing data from 1989 – is shown in figure 2: note that marginal environments do not appear. The locations and distinct features of these environments are briefly described, so that readers can better understand the complex relationships which may exist between the natural environment and the human activities likely to bring changes to it.

## *Pelagic environments*

The pelagic environments of the St. Lawrence comprise all the fresh, brackish and salt water bodies, along with an area of free water. River widenings (river lakes) and narrowings alternate from Cornwall to Québec. Further downstream, the Gulf becomes a veritable inland sea. These phenomena will be described in greater detail in chapter 4.

## *Wetland environments*

Wetlands are found at the junction of land and water environments, and are synonymous with habitat diversity and great productivity. These areas include emergent or submergent aquatic plant communities, marshes, swamps, and peat bogs.

These environments include all sites saturated with water, or flooded by tides or spring floods, over a period long enough to influence the soil and vegetative components. Neither strictly land nor strictly aquatic environments, wetlands border the St. Lawrence, the Ottawa River and the Richelieu River. In 1978, riparian environments (water plant communities and marshes) covered 48 245 ha along the St. Lawrence, 4 287 ha along the Ottawa River and 2 403 ha along the Richelieu River (Environment Canada, 1985).

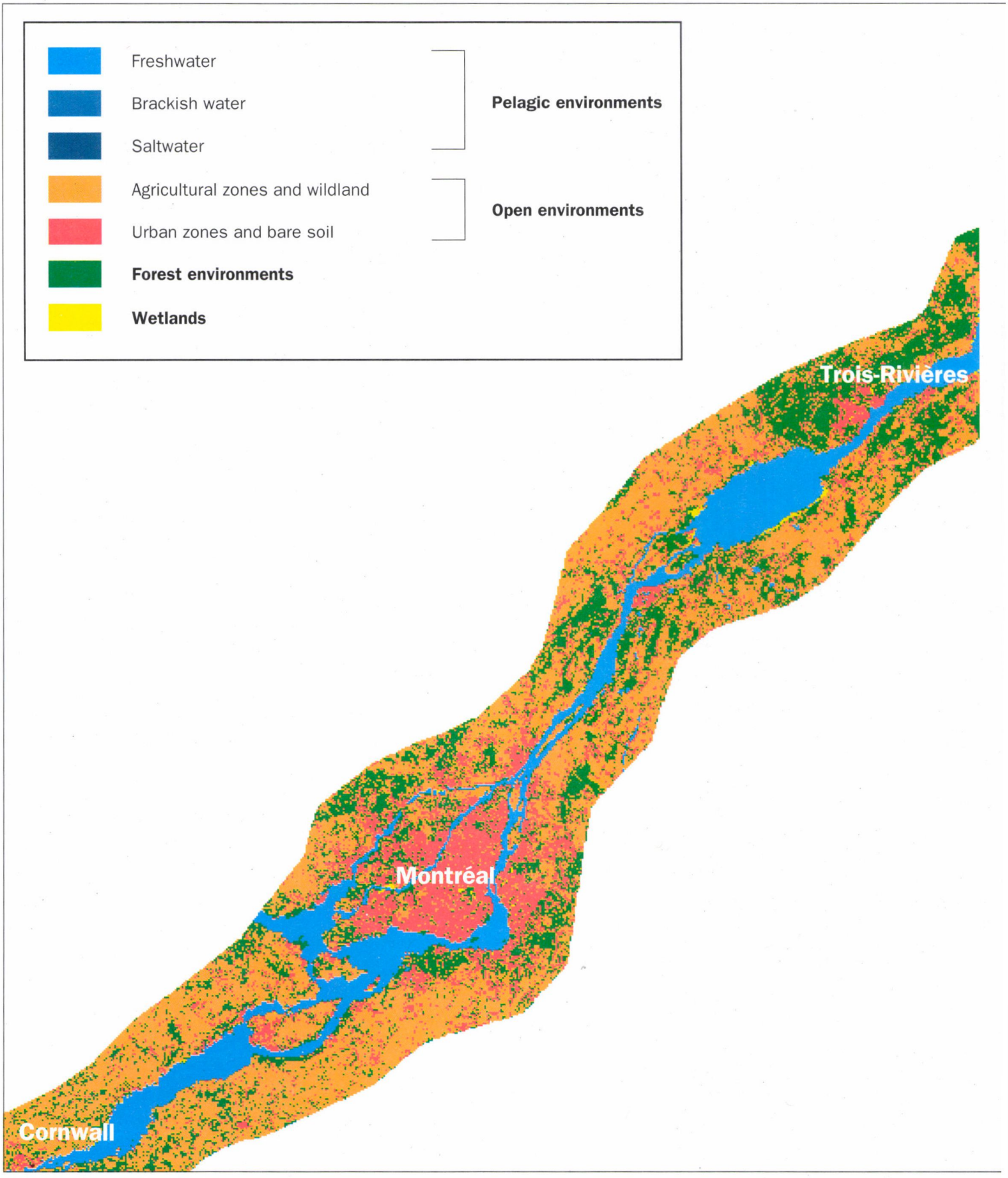
The ecological role and importance of these environments for flora and fauna have long been recognized; they limit flooding, protect banks from erosion, filter suspended solids, provide food reserves, and form breeding sites.

### Aquatic plant communities

These are found in permanent or semi-permanent water bodies that are relatively large and stable, where waters are stagnant or flowing (UQCN, 1989). These environments are dominated by floating vegetation and/or floating leaves and/or algae, and/or submerged or emergent vegetation (Jacques and Hamel, 1982).

### Marshes

The water level of marshes varies with the seasons; during low water periods, they reveal beaches with dense vegetation and muddy areas. These are



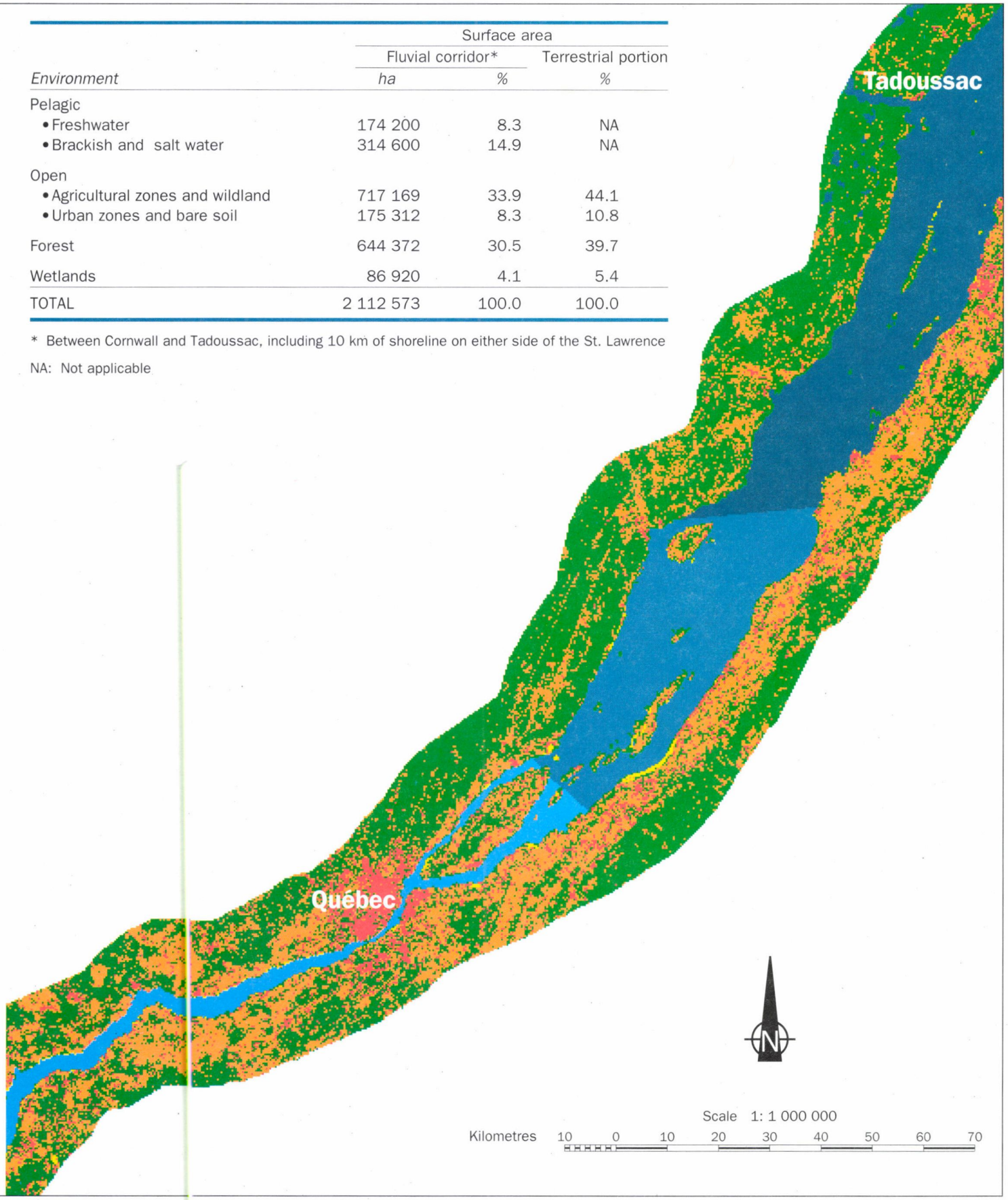

Source: St. Lawrence Centre, LANDSAT™ image (August, 1989).

**Figure 2 General distribution of St. Lawrence corridor environments between Cornwall and Tadoussac in 1989**

| Environment | Surface area: Fluvial corridor* ha | Surface area: Fluvial corridor* % | Surface area: Terrestrial portion % |
|---|---|---|---|
| Pelagic | | | |
| • Freshwater | 174 200 | 8.3 | NA |
| • Brackish and salt water | 314 600 | 14.9 | NA |
| Open | | | |
| • Agricultural zones and wildland | 717 169 | 33.9 | 44.1 |
| • Urban zones and bare soil | 175 312 | 8.3 | 10.8 |
| Forest | 644 372 | 30.5 | 39.7 |
| Wetlands | 86 920 | 4.1 | 5.4 |
| TOTAL | 2 112 573 | 100.0 | 100.0 |

* Between Cornwall and Tadoussac, including 10 km of shoreline on either side of the St. Lawrence

NA: Not applicable



wetlands with herbaceous vegetation that is periodically flooded up to a height of 2 metres (Jacques and Hamel, 1982).

### Swamps

Swamps are wooded wetlands. Woody species are represented by shrubs and trees, and may be joined by grasses and mosses. Stagnant or slow flowing surface water can occur seasonally or persist for extended periods of time (Jacques and Hamel, 1982).

### Peatlands

Although peatlands can be found in the St. Lawrence corridor, they are not associated with the River per se. We will thus deal with them immediately, in general terms, so as to offer a more complete picture of the variety of environments found in the river corridor.

Peatlands are ecosystems with poor drainage, where the debris of mosses, grasses, shrubs and trees accumulate year after year to form peat deposits (Buteau, 1992). Peaty environments develop when climate and drainage lend themselves better to the accumulation of organic matter than to its decomposition. Water circulates poorly in these environments, and the groundwater stays close to the surface, creating anaerobic conditions which inhibit or slow the activity of soil-decomposing micro-organisms. In 1987, Québec was Canada's leading producer of peat, which is used mainly for gardening purposes. Over 75 percent of Québec's annual production comes from peatlands located between Rivière-du-Loup and Matane (UQCN, 1990).

According to Buteau (1988), the north shore of the St. Lawrence is characterized by peatlands that are almost entirely *bogs*. This type of peatland is little influenced by groundwater rich in minerals from the surrounding soil. There may or may not be wooded areas. The surface peat is acidic and lightly or moderately decomposed; vegetation consists mainly of sphagnum, lichens, ericaces, and black spruce. *Fens* lie on the south shore of the River between Île d'Orléans and Kamouraska, and downstream of Cap-Chat (fig. 3). They are also found on Anticosti Island and in the Minganie region. In this case, the surface peat is less acidic and better decomposed than in bogs. Vegetation consists mainly of mosses, herbaceous species, shrubs and larch.

Information compiled by Buteau in 1988 showed that peat deposits over 30 cm thick and extending over more than 40 ha cover 78 750 ha in the Côte-Nord region; 8 615 ha in the Bas-Saint-Laurent; and 51 492 ha in the St. Lawrence Lowlands. In 1988, 10 000 ha of peat bogs in the St. Lawrence Lowlands were being harvested *in situ* for commercial markets. Also in 1988, peat moss was being harvested over 3 500 ha in the Bas-Saint-Laurent.

## *Open environments*

On riverbanks and certain islands – such as the islands of Laval and Montréal, Île Perrot and Île d'Orléans – urban and agricultural areas make up open environments that are, in fact, artificial environments created entirely by human hands.

### Urban areas

This land is occupied by densely-populated urban infrastructures. The most productive habitats for wildlife in urban environments are located near waterways, in wooded pockets, on golf courses and in urban park developments. In 1989, some 11 percent of the 10 km riverfront strip running from Cornwall to Tadoussac consisted of developed areas and bare soil. Of this area, 86 598 ha (Grenier, 1991) were classified as high-density development areas, since they essentially corresponded to the main urban centres bordering on the River, i.e. Montréal, Québec and Trois-Rivières.

### Agricultural areas

Agricultural zones are found in rural areas and primarily comprise cultivated fields and grasslands, as well as lands used for horticulture, livestock, grain and market gardening. They form a transitional zone between the urban and natural environments (Lemay, 1987). According to Grenier (1991), the areas of land used for forage (grasslands and pastures) and annual crops (corn and cereals) was estimated at 307 019 ha and 211 099 ha, respectively, in 1989. This same year, wildland (scrubland and herbaceous vegetation) occupied an area of 199 051 ha. Overall, agricultural zones covered 717 169 ha of land, or just over 44 percent of the 10 km-wide riverside strip between Cornwall and Tadoussac.

## *Forest environments*

As shown in figure 4, the *hardwood forest* extends primarily across the St. Lawrence Lowlands, from Cornwall to the area of La Pocatière on the south shore, or from La Malbaie on the north shore of the St. Lawrence. It is comprised of three vegetation groupings. The first, comprised of maple groves with hickory and linden, includes the Montreal archipelago and extends to Sorel. The second contains maple groves with linden and yellow birch, and stretches from the Yamaska River in the west past Saint-Jean-Port-Joli in the east. The last grouping contains maple groves with yellow birch and stretches to La Malbaie on the north shore and Saint-Pascal (Kamouraska) on the south shore (Thibault, 1988). In 1989, the hardwood forest covered an area estimated at 142 085 ha (Grenier, 1991), 45 percent of which was downstream from Trois-Rivières.

The *mixed forest* constitutes a transitional zone between the hardwood forest and the coniferous forest. It includes most of the land on the south shore, as well as a narrow strip around the Gaspé peninsula. It also takes in the lowlands of the Lake Saint-Jean basin and the Laurentian foothills along the Saguenay or St. Lawrence rivers, between Baie-Saint-Paul and Forestville (Thibault, 1988). According to Grenier (1991), this forest covered 223 331 ha between Cornwall and Tadoussac in 1989.

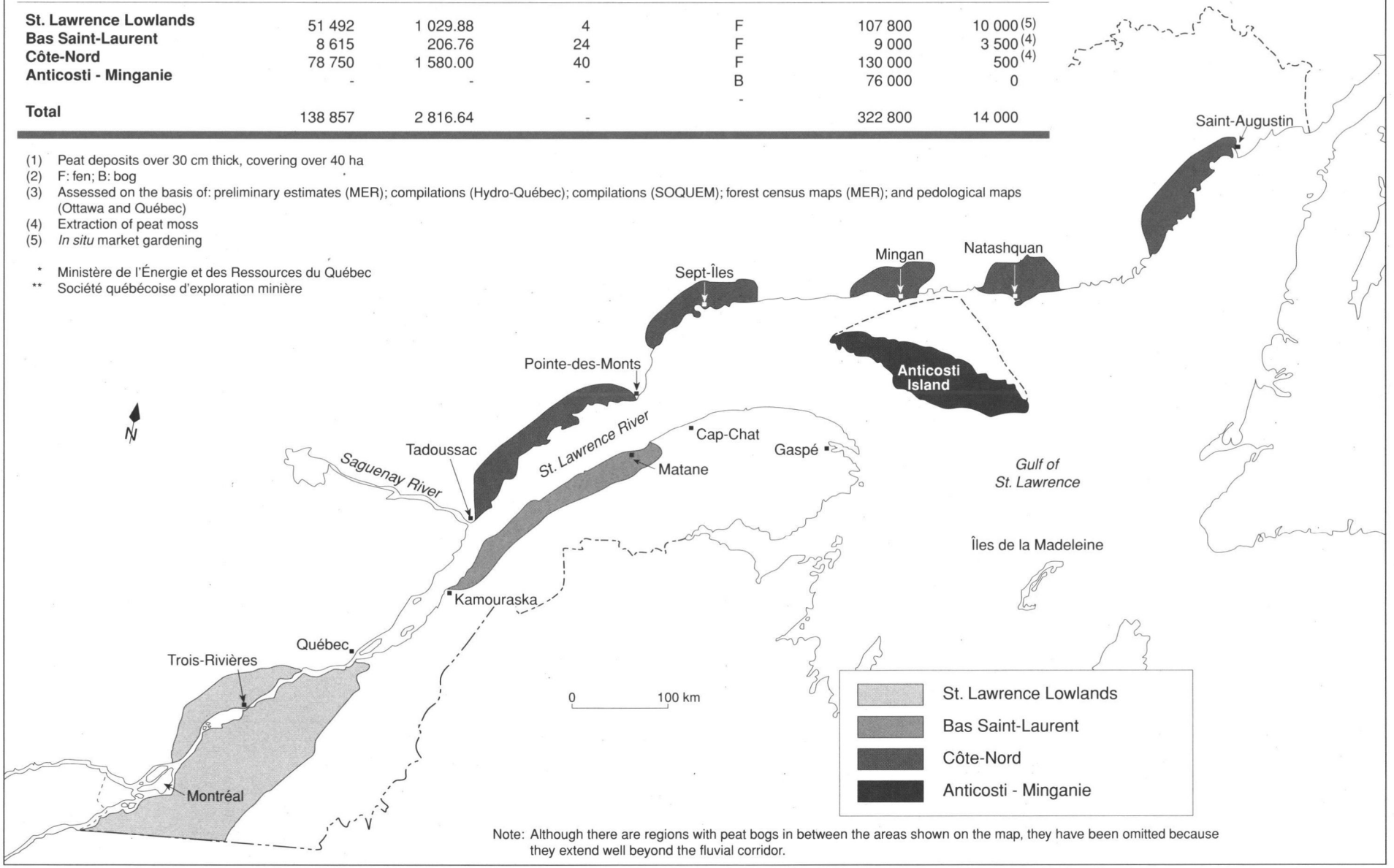
The *coniferous* or *boreal forest* is made up of two main sections: the fir bush, which extends along the north shore of the River past Forestville, and which includes the northeastern part of Anticosti Island; and the pure spruce stands found on the Îles de la Madeleine, the southern part of Anticosti Island and on the River's north shore, downstream from Havre-Saint-Pierre. In 1989, this grouping covered a surface area of 278 956 ha (Grenier, 1991).

The forest environment occupies 40 percent of the riverfront strip between Cornwall and Tadoussac (Grenier, 1991).

| Region | Resources Inventory (1) (MER)* | | | Dominant trophic regime (2) | Potential resource (3) (ha) | Area harvested (ha) |
|---|---|---|---|---|---|---|
| | Surface area (ha) | Total volume (x $10^6$ $m^3$) | Fibrous peat (%) | | | |
| **St. Lawrence Lowlands** | 51 492 | 1 029.88 | 4 | F | 107 800 | 10 000 (5) |
| **Bas Saint-Laurent** | 8 615 | 206.76 | 24 | F | 9 000 | 3 500 (4) |
| **Côte-Nord** | 78 750 | 1 580.00 | 40 | F | 130 000 | 500 (4) |
| **Anticosti - Minganie** | - | - | - | B | 76 000 | 0 |
| **Total** | 138 857 | 2 816.64 | - | - | 322 800 | 14 000 |

(1) Peat deposits over 30 cm thick, covering over 40 ha
(2) F: fen; B: bog
(3) Assessed on the basis of: preliminary estimates (MER); compilations (Hydro-Québec); compilations (SOQUEM); forest census maps (MER); and pedological maps (Ottawa and Québec)
(4) Extraction of peat moss
(5) *In situ* market gardening

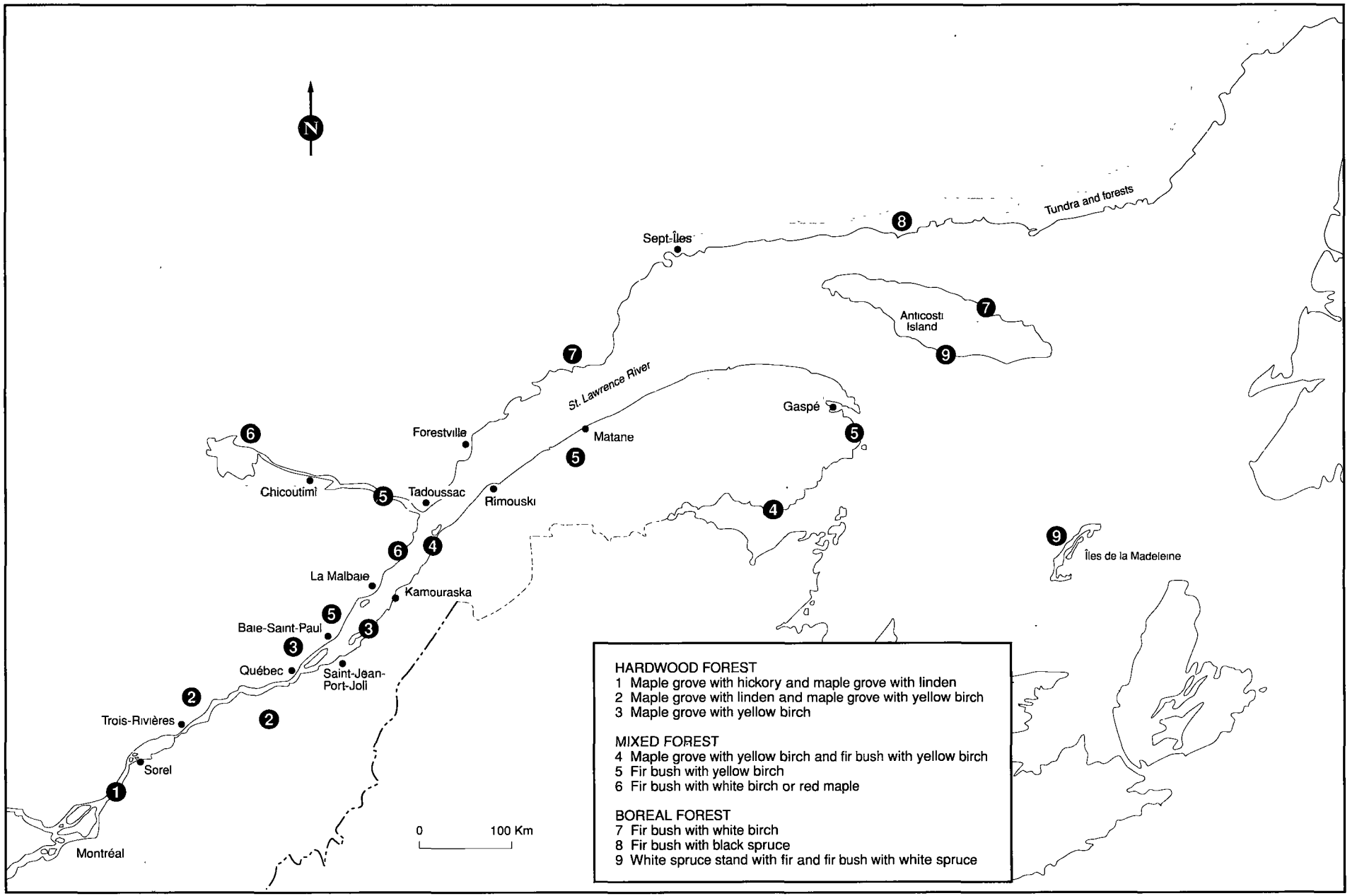
* Ministère de l'Énergie et des Ressources du Québec
** Société québécoise d'exploration minière




Note: Although there are regions with peat bogs in between the areas shown on the map, they have been omitted because they extend well beyond the fluvial corridor.

Source: Buteau, P., 1988, modified.

**Figure 3 Distribution of peat bogs in the St. Lawrence corridor**




Source: Thibault, 1988, modified.

**Figure 4 Forest vegetation groupings of the St. Lawrence corridor**

## *Island and marginal environments*

Islands and isolated woodlots are classified as island sanctuaries (Lemay, 1987). *Marginal environments*, on the other hand, are usually geographically isolated habitats covering a small surface area, with biophysical conditions which differ from those of the surrounding environment. Marginal environments include cliffs, rocky escarpments, cornices, taluses, grottos and caves. These habitats are found largely in regions where limestone is the indigenous rock.

CWS - Léo-Guy De Repentigny

CHAPTER 3

# *Essential Wildlife Habitats and the St. Lawrence*

**The wildlife of the St. Lawrence corridor must have access to good basic grounds that contain the various habitats indispensable for their survival. Human recognition of these special areas is part of this process. All that remains is to learn to share unprotected areas harmoniously.**

At the heart of the various environments described in the previous chapter exist certain sites that play a determining role in the maintenance or development of a given population. These sites are in fact areas that are required absolutely by wildlife species, whether year-round or for merely limited periods, in order to meet their specific behavioural needs (migration, reproduction, etc.) or energy requirements (feeding, locomotion, etc.). The disappearance of these sites will sooner or later result in the extinction of the population that depends on them (Sarrazin et al., 1983).

## *Types of essential wildlife habitats*

To properly reflect this strong dependency, it seemed natural to call these particular sites **essential habitats**. Since they are found in, but not exclusive to, the river corridor, they are described in table 3.

## *Essential wildlife habitats of the fluvial corridor*

**National wildlife areas** were created with a view to safeguarding our ecological heritage, protecting territories and maintaining essential wildlife habitats. They constitute choice habitats, but are also breeding and feeding areas required by migrating birds and a variety of wildlife. There are eight of them in the river corridor.

Twenty-one **migratory bird sanctuaries** are located in the St. Lawrence corridor, along with three **staging areas**, at the Beauharnois Canal, Havre-aux-Basques and Portage.

As shown in figure 5, 26 **heronries** sheltering colonies of *Great Blue Heron*, *Black-crowned Night-Heron* and *Great Egret* are distributed as follows over the study area: seven in the Fluvial Section, seven in the Upper Estuary, seven in the Lower Estuary, one along the length of the Saguenay River and four in the Gulf, three of which are in the Îles de la Madeleine (Desrosiers, 1990).

**Nursery areas and spawning grounds** are indispensable to the perpetuation of fish resources. Two types of spawning grounds were identified in a study by Therrien *et al.* (1990) on that stretch of the St. Lawrence River between Cornwall and Montmagny:

- *Actual spawning ground.* Site where specific research has led to the observation of spawning activity in target species or the result of spawning (eggs).
- *Potential spawning ground.* Site whose boundaries are as yet approximate and which has been identified on the basis of one or more of the following criteria:
  - Capture of spawners
  - Adequate physical environment (substrate, current), in proximity of an actual spawning ground

- Area formerly recognized as an actual spawning ground and currently unused, but with its carrying capacity intact
- Location having characteristics appropriate for spawning by a rare or threatened species
- Recognized nursery or larval development area.

Nursery and larval development areas have been combined with potential spawning grounds since in most cases they coincide. Spawning grounds have been identified for 17 species, four of which have been designated priority species under the Action Plan: the *American Shad, Lake Sturgeon, Atlantic Tomcod* and *Copper Redhorse*. The other species, chosen for their commercial or sports fishing interest, are the *Brown Bullhead, Channel Catfish, Rock Bass, Pumpkinseed, Yellow Walleye, Sauger, Northern Pike, Lake Whitefish, Black Crappie, Longnose Sucker, White Sucker, Brook Charr* and *Yellow Perch*. Table 4 indicates the main characteristics of each species; figures 6a and 6b show their location between Cornwall and Île d'Orléans.

**Table 3 Definition of essential wildlife habitats**

| *Habitat* | *Definition* |
|---|---|
| Feeding area | Part of the vital territory of a species, basically reserved for feeding. |
| Rearing area | Area where young are raised. |
| Nesting area | Areas where birds nest; in the case of herons, these are called heronries provided the site has a minimum of 5 nests, all used during at least one of the last five breeding years. |
| Migration area | Area visited during migration to satisfy essential needs (food, shelter, rest), particularly in the case of birds and fish. |
| Staging area | Area used by birds for resting and feeding during migration. |
| Nursery area | Area where fish develop through the larval and post-larval stages. In most cases, and among freshwater fish in particular, these areas have specific characteristics in terms of depth, currents and physico-chemical properties. |
| Spawning ground | Site where fish spawn. |

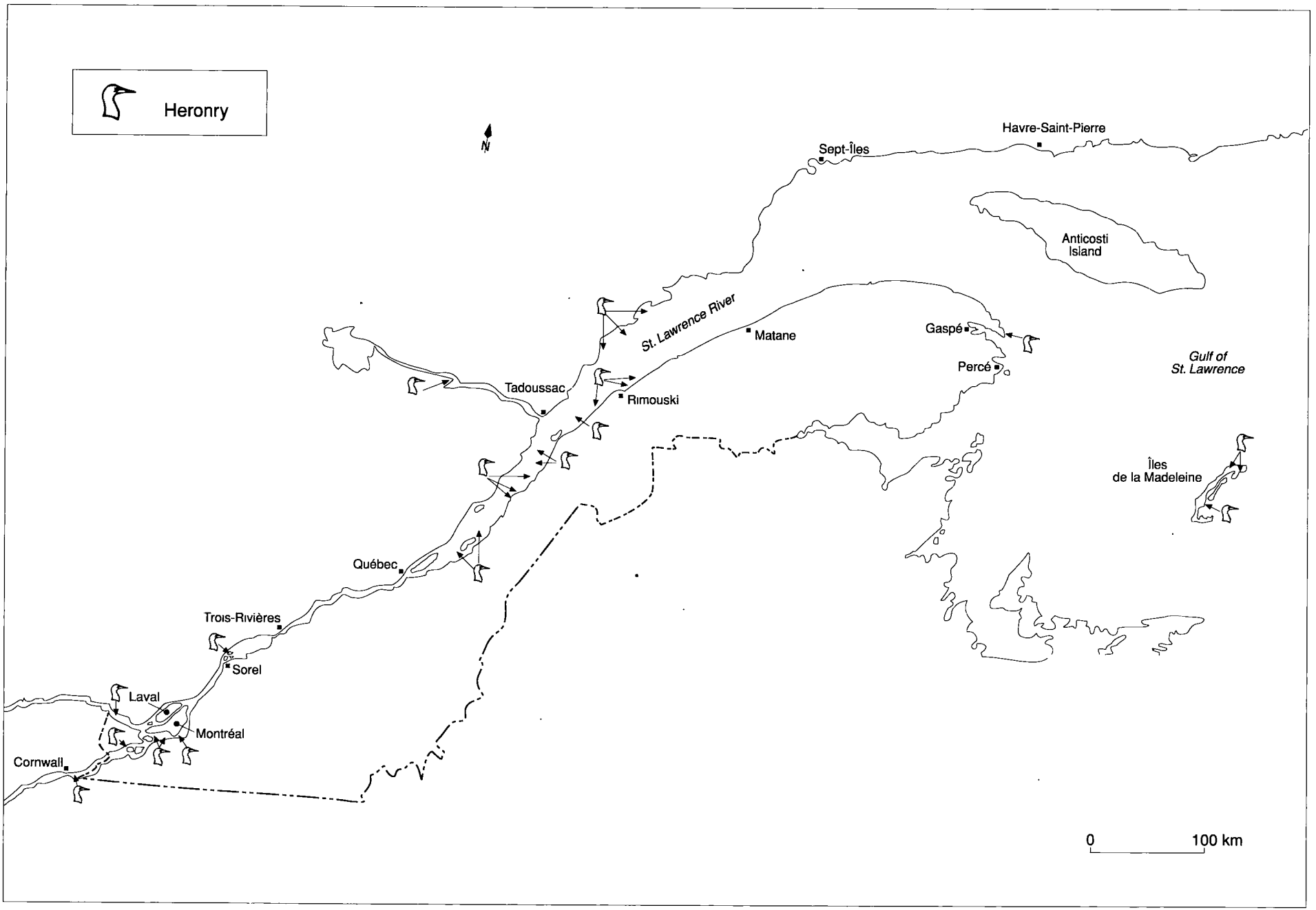
**Table 4 Characterization of spawning grounds of the main fish species of the St. Lawrence River, Cornwall-Montmagny section**

| *Species* | *Current (cm/s)* | *Depth (m)* | *Substrate** | *Vegetation*** | *Temperature (°C)* | *Period* |
|---|---|---|---|---|---|---|
| American Shad | ≥20 | 0.5 - 2.0 | S G P | A | 12 - 18 | May - June |
| Brown Bullhead | 0 - 60 | 0.1 - 1.2 | L C S G | ESHV, SH | 16 - 26 | June |
| Channel Catfish | 0 - 60 | 0.6 - 1.8 | L S | SH | 20 - 30 | June - July |
| Rock Bass | 0 - 40 | 0.0 - 2.0 | C S G R | SH | 15 - 21 | June |
| Pumpkinseed | 0 - 20 | 0.1 - 0.3 | C S G R | SH | 20 - 28 | May - July |
| Walleye sp. | 0 - 200 | 0.1 - 1.5 | S G P R | AS | 3 - 11 | April - June |
| Lake Sturgeon | ≥10 | 0.6 - 4.0 | S G P R | A | 8 - 18 | May - June |
| Northern Pike | 0 - 20 | 0.1 - 1.2 | L C | FHGL | 4 - 15 | April - May |
| Lake Whitefish | 0 - 200 | 0.0 - 7.0 | S G P R | A | 2 - 10 | Oct. - Dec. |
| Black Crappie | 0 - 20 | 0.2 - 2.5 | L S G | ESHV, SH | 18 - 20 | June - July |
| White Sucker | 0 - 110 | 0.3 - 2.3 | S G P R | A | 9 - 18 | May - June |
| Longnose Sucker | 0 - 45 | 0.1 - 0.3 | S G P | AS | 5 - 18 | April - May |
| Brook Charr | ≥20 | 0.0 - 0.6 | G P R | A | 5 - 10 | Sept. - Nov. |
| Yellow Perch | 0 - 20 | 0.5 - 3.0 | L C S G | FHL, ESHV | 7 - 12 | April - May |
| Atlantic Tomcod | ≥10 | 0.0 - 4.0 | S G | A | 0 - 4 | Dec. - Feb. |
| Copper Redhorse | moderate | 1.5 - 2.0 | P R | P | 18 | June - July |

Source: Therrien *et al.*, 1990.

* C = clay AS = vegetation absent or sparse L = silt S = sand G = gravel P = pebbles R = rock

** A : absence of vegetation
AS : vegetation absent or sparse
ESHV : emergent semi-aquatic herbaceous vegetation
FHGL : flooded herbaceous graminoid land plants
SH : submerged herbaceous vegetation
FHL : flooded herbaceous land plants
P : presence of unspecified vegetation




Source: Desrosiers, 1991.

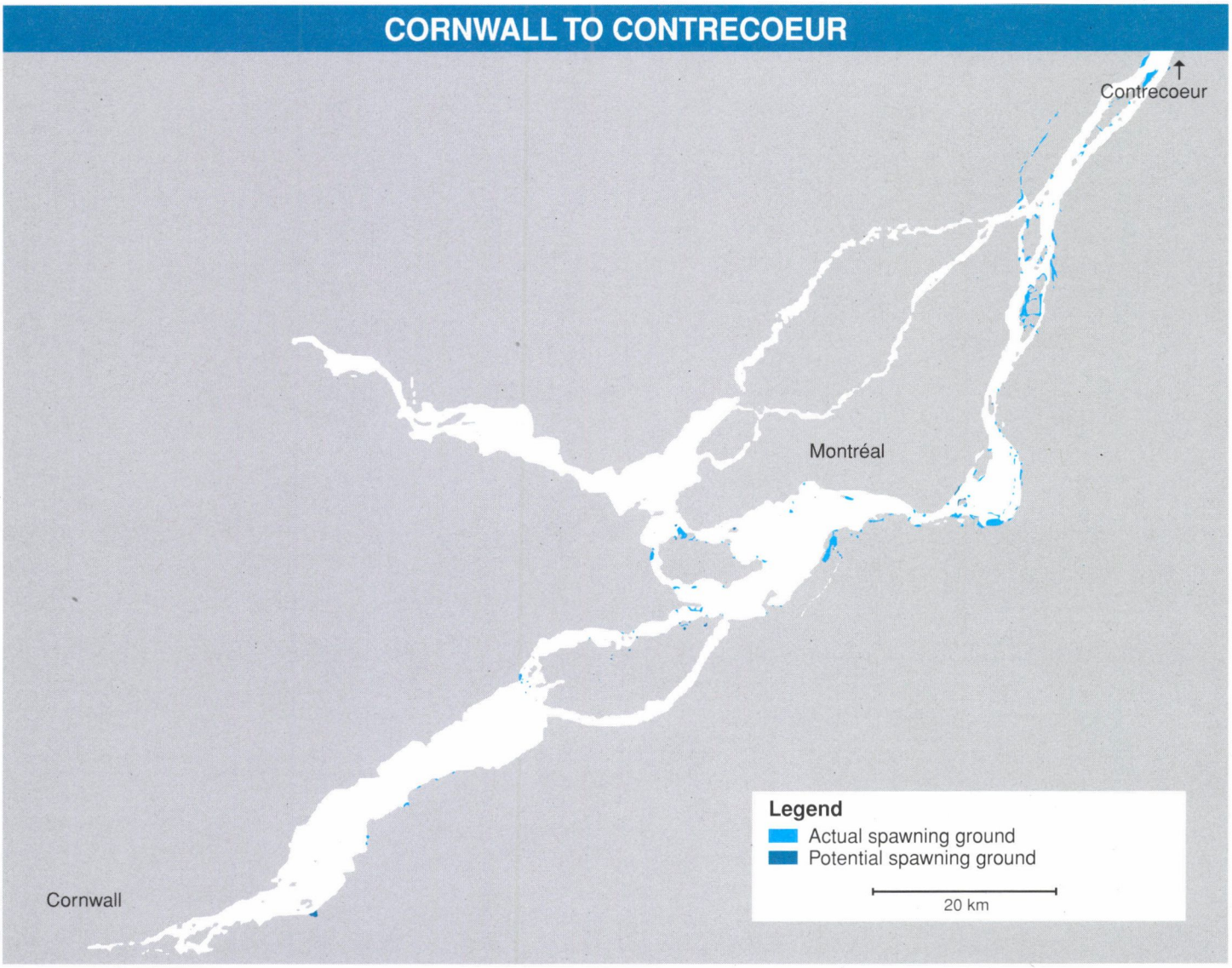
**Figure 5 Distribution of heronries in the St. Lawrence corridor from 1980 to 1990**

Certain spawning grounds are potentially high-use areas, since their biophysical characteristics meet the needs of a wide variety of species. This is true of spawning grounds in the Sorel delta, which is used by such species as *Lake Sturgeon, Northern Pike, Brown Bullhead, Yellow Perch* and *Yellow Walleye* (Therrien *et al.*, 1990). Other spawning sites are used by a more limited number of species.

Whatever the number of species using these sites, however, they are all indispensable to the survival of fish.

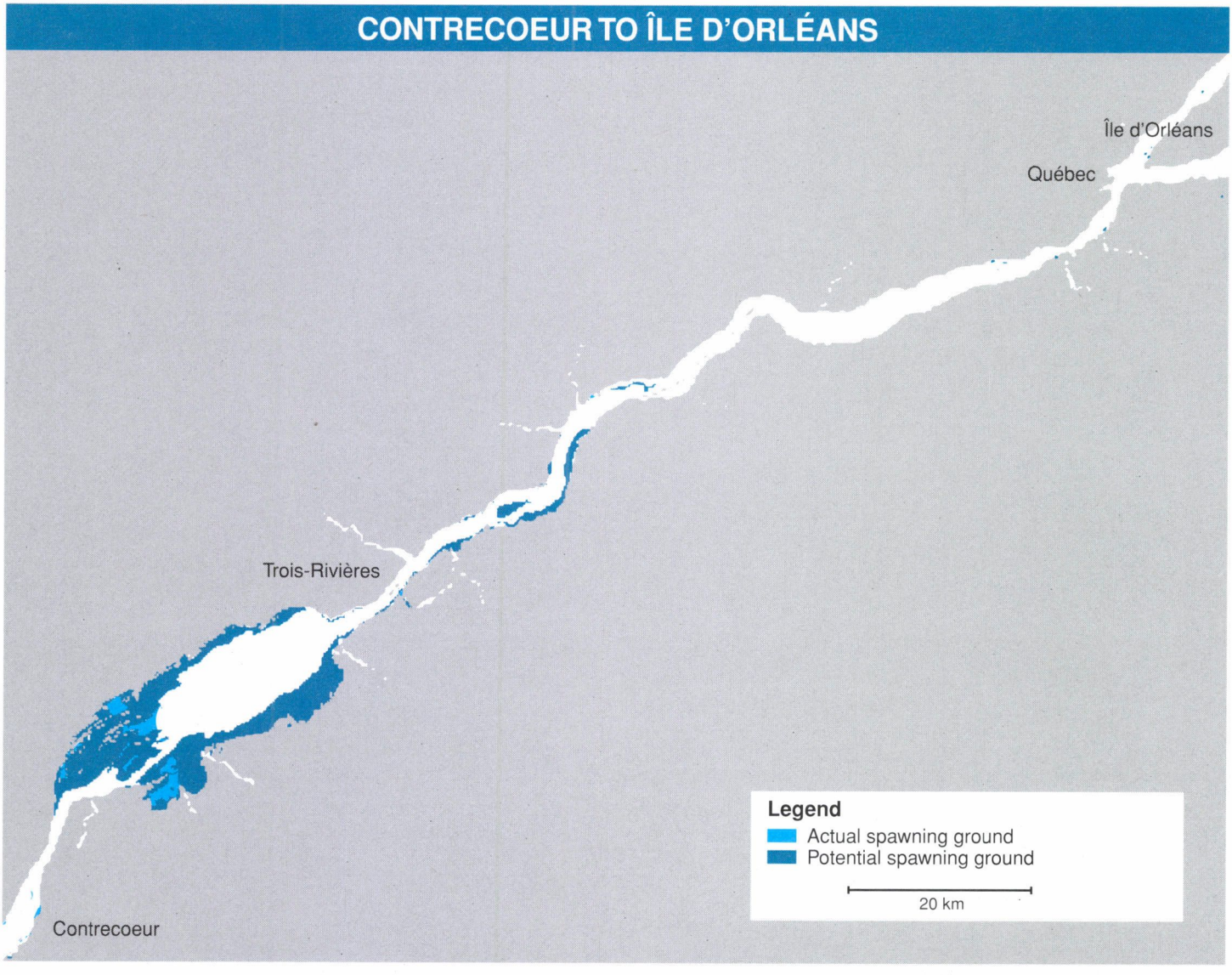
For other species living in marine environments (e.g. *Atlantic Herring*), mating takes place at sea in the fall and closer to the coast in the spring, particularly around Île Verte, in the Îles de la Madeleine, and near Havre-Saint-Pierre on the Côte-Nord (Cleary, 1984). *Atlantic Cod*, for example, lays its eggs in deep water and they drift with the currents (Halliday *et al.*, 1982).

These essential wildlife habitats are distributed among the environments linked directly to the St. Lawrence; that is, the pelagic, wetland, island and marginal environments, which are described in the chapters that follow.



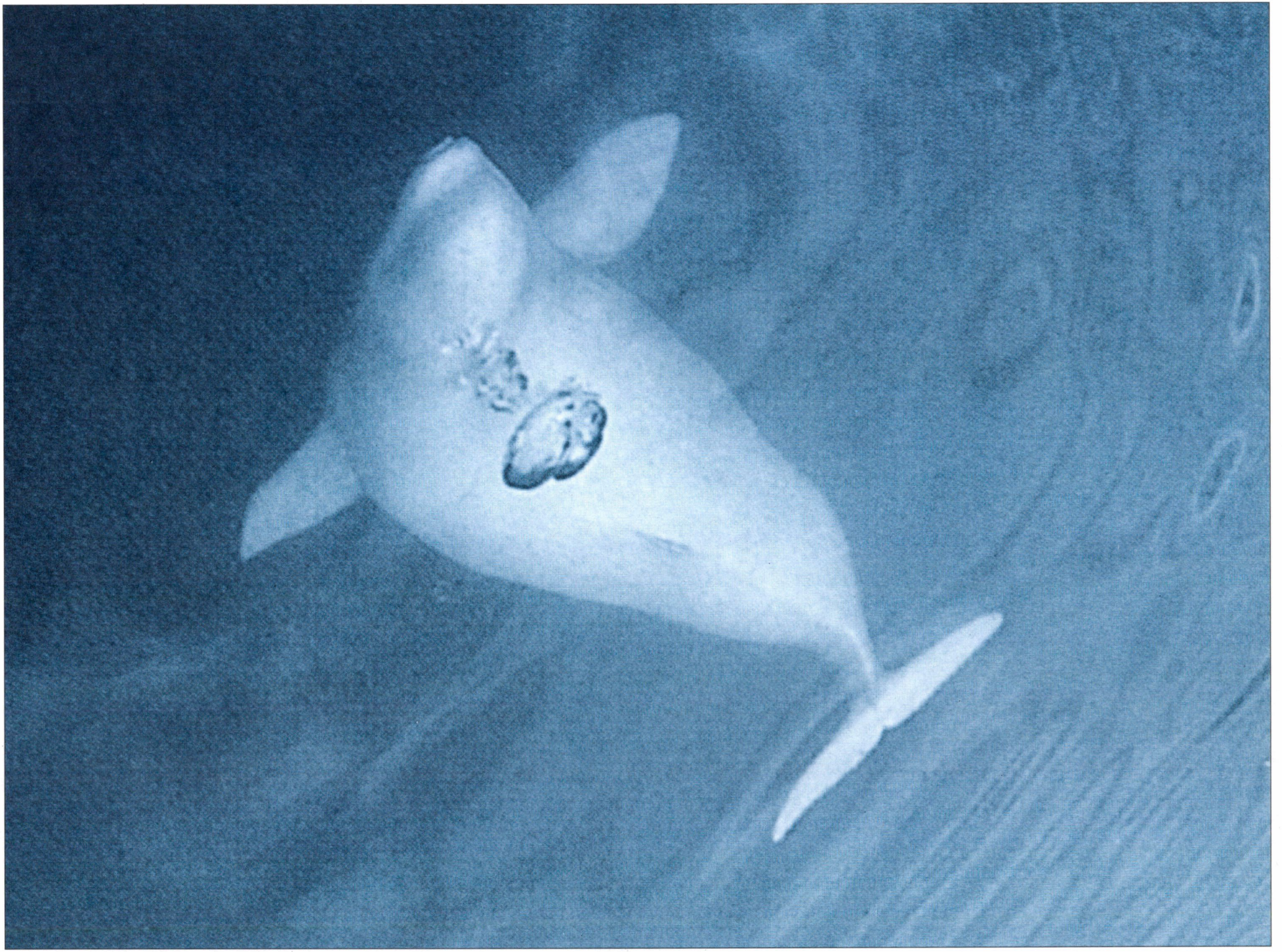

Source: Therrien, J. *et al.*, 1990.

**Figure 6a Freshwater distribution of main fish species' spawning grounds (Cornwall to Contrecoeur)**




Source: Therrien, J. *et al.*, 1990.

**Figure 6b** **Freshwater distribution of main fish species' spawning grounds (Contrecoeur to Île d'Orléans)**



CPS - Robert Michaud

CHAPTER 4

# *Pelagic Environments*

**From the River through the Estuary to the Gulf, close to 190 species of fish live in the St. Lawrence. In fresh, brackish or salt water, the survival of these species is not always guaranteed, as demonstrated by the near-disappearance of Striped Bass since 1965. Among the mammals, the Beluga whale symbolizes the struggle for survival. Let us hope that the recognition of priority species under the Action Plan will help make the difference.**

The characteristics of the river waters favour, among other things, the survival of some 190 species of fish (Ghanimé *et al.*, 1991), distributed throughout the fresh, brackish and salt water environments which characterize the River as it moves through the Fluvial Section to the Estuary and into the Gulf. Many animal and plant species depend on these pelagic environments for their survival.

## *Freshwater*

The stretch of river from Cornwall to the eastern tip of Île d'Orléans includes the Fluvial Section and the Fluvial Estuary from which freshwater flows. Over this length, the River widens at four places to form successively lakes Saint-François and Saint-Louis, the La Prairie basin, and Lake Saint-Pierre. These four water bodies made up a large share of the 174 164 ha occupied by the freshwater segment of the St. Lawrence in 1989 (Grenier, 1991).

Between Cornwall and Sorel, the River is composed of three main water masses, each with its own physical and chemical characteristics. The brown waters of the Ottawa River, characterized by high turbidity and low mineral content, meet the green waters of the Great Lakes, heavily mineral-laden, but with little turbidity and low nutrient content (Environment Canada and *La revue maritime L'Escale*, 1990), to form gradually mixed waters. A local phenomenon (gyre) may be seen where these water masses meet around Lake Saint-Louis: this is a gyral current (Verrette, 1990). Past Sorel, new water masses are formed by the junction of the River's main tributaries.

The very uneven currents in this stretch of the River provide varied habitats for birds and fish. The Lachine Rapids, where the current reaches up to four metres per second (St. Lawrence Centre and Université Laval, 1992), form an ideal spawning ground for species fished for sport, such as walleye (Therrien *et al.*, 1990). These tumultuous waters resist freezing and contribute to water oxygenation. Downstream of the rapids are stretches of free water that serve as overwintering grounds for certain duck and gull populations. Lake Saint-Louis alone is home to 77 species of fish and some 540 species of aquatic plants (Comité d'étude sur le fleuve Saint-Laurent, 1978), making it one of the richest aquatic environments in Québec.

From the outlet of Lake Saint-Pierre to the eastern tip of Île d'Orléans, the Fluvial Estuary covers an area of approximately 64 188 ha (Grenier, 1991). The bathymetric characteristics of the Fluvial Estuary are similar to those of the Fluvial Section of the River, with the exception of a 40 m-deep trough near Beaupré, downstream of Québec. From Donnacona onward, the formerly distinct brown water masses of the Ottawa River and green water masses of the Great Lakes mix, resulting in 0.2 m freshwater tides. These tides may be as high as 7 m at Québec.

All freshwater plankton groups are found in this portion of the River, although the following dominate because of their biomass: cryptophyta such as *Chroomonas acuta* and *Rhodomonas Minuta*, diatoms like *Melosira granulata*, and chlorophyta such as *Sphaerocystis schroetrie* (Jarry and Paquet, 1992).

Zooplankton is represented by such species as *Bosmina longirostris, Eucyclops serrulatus* in summer, and *Eurytemora affinis* throughout the year (Ghanimé *et al.*, 1990).

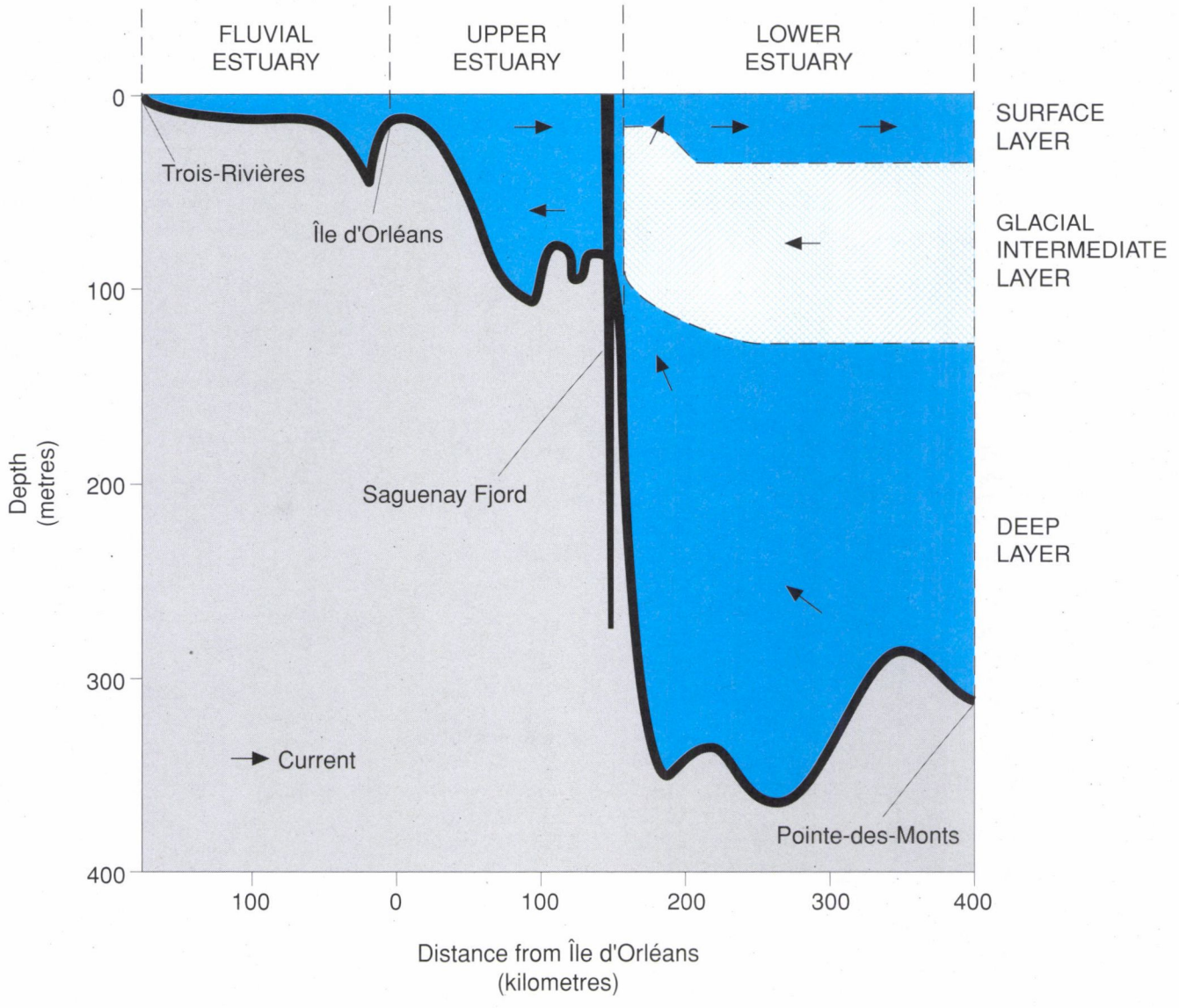
The main species of St. Lawrence freshwater fish harvested commercially, for subsistence and by sports fishermen, are Northern Pike, Pumpkinseed, Brown Bullhead, Yellow Perch, Sauger, Black Crappie and Smallmouth Bass. The Common Carp and White Sucker are both fished commercially and for subsistence. (Robitaille, 1991).

## *Freshwater meets saltwater*

The Upper Estuary extends 314 550 ha from the eastern tip of Île d'Orléans to Tadoussac (Grenier, 1991). High tides can reach six metres. The waters are brackish as far as Baie-Saint-Paul, and become salty further downstream. The reversal of tidal currents and the increased salinity gradient contribute to the large quantity of suspended solids, forming an area of high turbidity known as a silt plug (St. Lawrence Centre and Université Laval, 1991).

The mouth of the Saguenay River forms a habitat distinctive to the Upper Estuary because the Laurentian Channel goes from 350 m to 25 m in depth over a distance of 16 km, as shown in figure 7. This difference in levels involves the mixing of surface and deep waters, causing nutrients to rise; this place is a particularly productive one, as a result.

The Saguenay River can be divided into two sections: from Alma to Saint-Fulgence is the shallow Fluvial Section, followed by a one to three km-wide estuarine section with a




Source: Environment Canada and *La revue maritime L'Escale*, 1990.

**Figure 7 Bathymetric profile of the St. Lawrence Estuary and the Laurentian Channel**

maximum bottom depth of 320 m, where tides vary from 4 to 6 m (St. Lawrence Centre and Université Laval, 1991). It is not possible to show the influence of the salinity gradient in this river (Ghanimé *et al.*, 1990). Many of the organisms found here are typical of Arctic-type fauna found much farther north. The main fish representatives of this fauna are Atlantic Poacher, Arctic Cod and Atlantic Halibut (St. Lawrence Centre, 1990a).

The Upper Estuary therefore acts as a food reservoir and sanctuary for many plant and animal species, including the Beluga whale. In summer, some zooplankton species such as *Bosmina longirostris* and *Neomysis americana* may be found. Fish species typically found in salt and brackish waters also live here, including capelin, herring, plaice, lumpfish and tomcod (Ghanimé *et al.*, 1990).

## *Saltwater*

From Tadoussac to Pointe-des-Monts, the physical conditions in the Lower Estuary are similar to those of the marine environment, although the salinity factor is lower, varying between 25‰ and 30‰ at the surface. A number of zooplankton species are found, including *Calanus finmarchicus, Calanus hyperboreus* and *Thysanoessa raschi* (Ghanimé *et al.*, 1990).

Within Québec's borders, only the Gulf of St. Lawrence can be classified as a marine environment. It has the same characteristics as the sea, with tides of up to 3 to 5 m and well-defined currents like the Labrador and Gaspé currents. The Gulf borders the estuarine environment at Pointe-des-Monts on the north shore, and Matane on the south shore. At Sainte-Anne-des-Monts, the River is approximately 100 km wide (St. Lawrence Centre, 1992).

This inland sea, measuring approximately 19 500 000 ha (St. Lawrence Centre and Université Laval, 1991), is characterized by salinity as high as 32‰ at the surface, and by areas of great depth. The Laurentian Channel, with a maximum depth of 450 m, is located here, allowing contact with the Atlantic Ocean (Lemay, 1987). This channel is characterized by the water's marked stratification. In summer, for example, the following layering may be seen: relatively warm surface waters, ice-cold intermediate waters and, at greater depths, very salty waters with fairly stable temperatures (St. Lawrence Centre and Université Laval, 1991).

Zooplankton species such as *Thysanoessa inermis* and *Thysanoessa longicaudata* live here year-round (Ghanimé *et al.*, 1990). Representative invertebrates are lobster, crab and shrimp. Fish include capelin and cod, harvested for food, sale and sport, as well as Atlantic Herring, which is not, however, popular with sports fishermen. Also found are Witch Flounder, Canadian Plaice and Winter Flounder, which are only fished commercially (Robitaille, 1991). A number of species of marine mammals also live in the Lower Estuary and the Gulf (whales, dolphins and killer whales). Wilson's Storm-Petrel is one of the pelagic birds found in the Gulf. Seabirds such as the Northern Gannet, cormorants, guillemots and murres also use the saltwater environment (St. Lawrence Centre and Université Laval, 1992a).

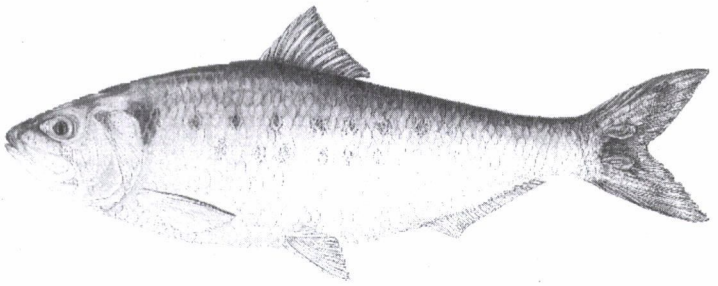
## *Action Plan priority species*

None of the Action Plan priority plant species grows in the pelagic environments of the St. Lawrence. As for wildlife species, data sheets follow on each of the eight fish species and three species of marine mammals living in these environments. Each sheet will help explain why these species are being given such special attention.

# AMERICAN SHAD

*Alosa sapidissima*

Fish

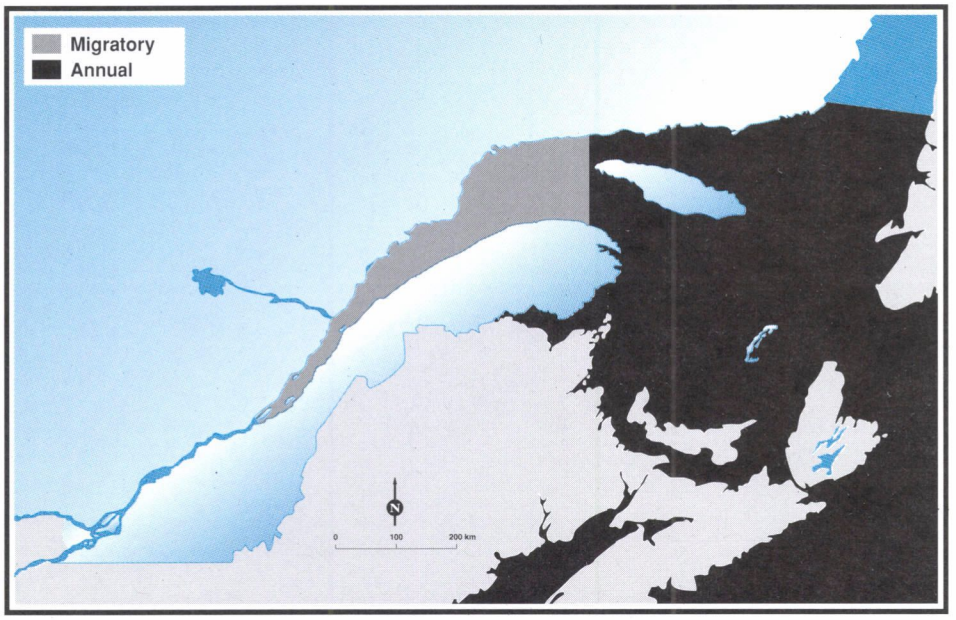


The American Shad is an anadromous fish; that is, a fish that lives in saltwater and reproduces in freshwater. It normally migrates to freshwater in the spring to breed. Its non-sticky eggs drift with the current. The young spend their first summer in freshwater, where they remain until the temperature reaches the 20 degree mark. The shad then stays in the sea for three to seven years, until it reaches sexual maturity. It will never again leave the saltwater, except for a brief annual stay in freshwater to reproduce.

The shad uses mainly the River's south shore during its breeding migration. In mid-May, it is found near Île Verte; from May to June, in the Montreal archipelago; and in summer, around the Bay of Fundy and Labrador. Spawning grounds are characterized by shallow depths which vary from 0.5 to 3 m, but which can reach 10 m; the substrate is sandy or pebbly. Some 16 potential spawning grounds have been located between Île d'Orléans and Gentilly (Bouchard, 1976).

The main cause of declining shad stocks over the years can be linked to difficulty accessing spawning grounds. Construction of the des Prairies River dam in 1928; restoration of the dam at Île des Moulins in 1979; development work on Notre-Dame and Sainte-Hélène islands for Expo 67; excavation of the St. Lawrence Seaway; and the physico-chemical deterioration of the water: these are all agents of disruption for this species (Fisheries and Oceans, 1991).

**Known range**

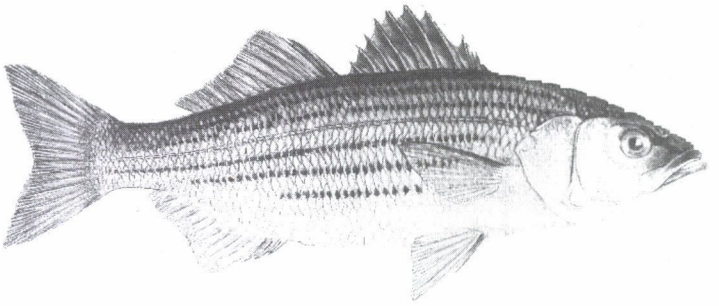



Taken from: Scott and Scott, 1988.

# STRIPED BASS

*Morone saxatilis*

Fish



The Striped Bass population of the St. Lawrence Estuary has all but disappeared since 1965 (Robitaille, 1991); only a few isolated specimens are still spotted occasionally (Perreault, 1992). This anadromous fish reproduced in the springtime. Striped Bass travelled up the St. Lawrence in the fall, to winter in the vicinity of Lake Saint-Pierre. Striped Bass is characterized by its great adaptability to variations in environmental conditions (salinity, temperature and pH). This fish lives in salt and brackish waters. The species is well-adapted to the muddy or turbid water of the estuary environment with which it is associated (Talbot, 1966).

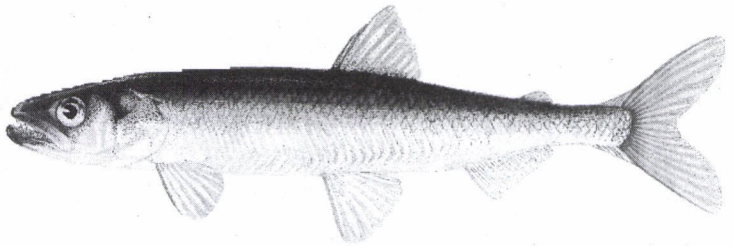
Spawning takes places at the water surface, after which the fertilized eggs float underwater and are carried along by the current. No information is available on traditional spawning grounds.

While the exact reasons for its disappearance have not yet been identified, it is thought that the deterioration of its habitat was a major cause of the species' decline in the St. Lawrence. Construction work on the St. Lawrence Seaway canals between 1954 and 1959, along with development of the islands for Expo 67 and of Île aux Sternes in the northeastern part of Lake Saint-Pierre in 1965 may have contributed to the deterioration of spawning grounds (Fisheries and Oceans, 1991).

# RAINBOW SMELT

*Osmerus mordax*

Fish



An anadromous and carnivorous species, the Rainbow Smelt makes two annual migrations: one in the spring to spawn in rivers, and the other in the fall, to feeding sites upstream of Québec. It is found along the entire length of the River, both in the Estuary and in the Gulf, and also in the Saguenay River.

Spawning generally takes place in shallow waters, on rocky bottoms where the current is moderate to rapid. The main known spawning grounds are in the Boyer and Ouelle rivers (Magnin and Beaulieu, 1965). The species still reproduces in the Ouelle River, while its main spawning ground in the Boyer River has remained practically unused since 1983. Fertilized eggs are sticky and attach themselves to the first solid substrate they touch. They remain stationary in the current until they hatch (Fisheries and Oceans, 1991).

A number of factors may be responsible for the decline of this population, including the many parasites to which smelt are host and overfishing during the spawning period. Also worth mentioning is the construction in 1973 of two bridges in the middle of the main spawning ground in the Boyer River. These bridges narrowed the river and reduced its flow conditions (Fisheries and Oceans, 1991). As well, the sustained inflow of nutrients from the many livestock operations in the Boyer River basin caused a proliferation of filamentous algae, which carpet the riverbed and thus clog the spawning grounds (Fisheries and Oceans, 1991).

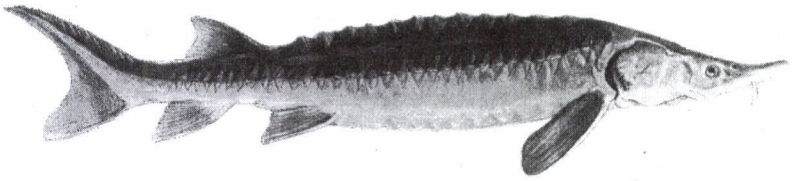
**Known range**


Taken from: Scott and Scott, 1988.

# LAKE STURGEON

*Acipenser fulvescens*

Fish

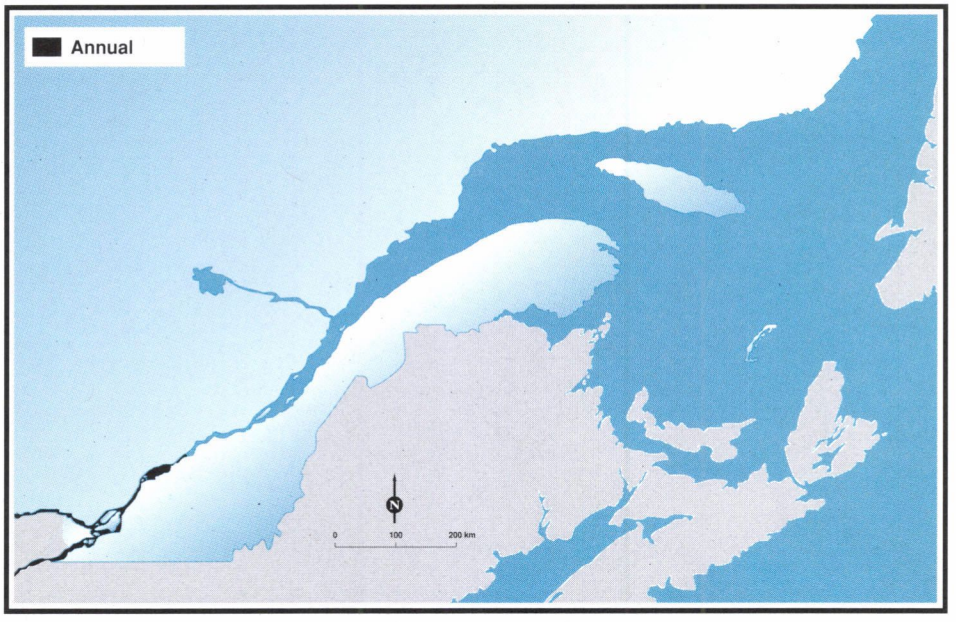


Lake Sturgeon live in freshwater and feed on the bottom, sucking organisms from the gravel, sand and mud. They live to a ripe age, 100 years and more for females and about half that for males. They grow slowly, breeding at between 14 and 23 years of age for females; 12 and 19 years for males. They can be found in the River until the waters become brackish. Lake Sturgeon live in high concentrations in lakes Saint-Louis, including the La Prairie basin, and Saint-Pierre (Fisheries and Oceans, 1991).

Lake Sturgeon in the St. Lawrence area seem to breed in limited numbers and in specific spawning grounds, including those of the L'Assomption, des Prairies, Mille Îles, Ouareau and Saint-Maurice rivers. It should be noted that these tributaries are among the most polluted rivers of the Québec portion of the St. Lawrence. The Ouareau River spawning ground was almost buried by a landslide in 1990 (Fisheries and Oceans, 1991). Spawning, which takes place every five to ten years, occurs in spring, in rapidly flowing waters and often at the foot of obstacles.

The gregariousness of Lake Sturgeon, its sedentary nature and the small number of spawners make it vulnerable to environmental accidents and all types of exploitation (Dumont, 1987).

**Known range**



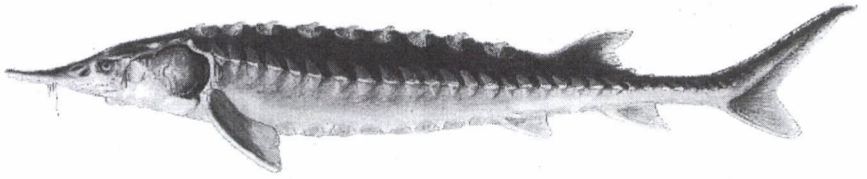

Taken from: Scott and Crossman, 1974.

ACTION PLAN PRIORITY SPECIES

# ATLANTIC STURGEON

*Acipenser oxyrhynchus*

Fish



Atlantic Sturgeon, an anadromous species, is distinguished from the Lake Sturgeon by its much longer snout. This fish is found in the waters of the St. Lawrence River from Lake Saint-Pierre to the Basse-Côte-Nord, primarily along the south shore between Québec and Rivière-du-Loup.

Atlantic Sturgeon, which live about 60 years, breed between May and July. Their previously-known spawning grounds in the Batiscan, Bersimis, aux Outardes and Manicouagan rivers seem to be unused today. Troughs at the bottom of waterfalls, with fast currents and bottoms of gravel, pebbles or hard mud, are ideal spawning grounds.

The factors advanced for the catch's annual decrease during the 1960s are construction of the St. Lawrence Seaway, which took place in the late 1950s; local overfishing; development of the Expo 67 site at Montréal; and the harnessing of certain north shore rivers, which may have blocked access to spawning grounds (Fisheries and Oceans, 1991)

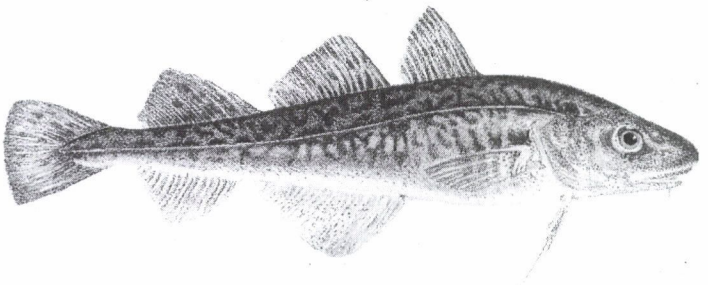
**Known range**


Taken from: Scott and Crossman, 1974.

# ATLANTIC TOMCOD

*Microgadus tomcod*

Fish



The Atlantic Tomcod is an anadromous fish which has the particular habit of spawning in winter under the ice in tributaries of the St. Lawrence; there are no indications of spawning grounds in the River itself. We know that Atlantic Tomcod was formerly widespread as far as Lake Saint-Pierre. Individuals over one-year-old seem to prefer the intertidal marshes of wetlands (Mailhot et al., 1988). Tomcod is fished commercially, for sport and for food.

Spawning grounds are found in the Sainte-Anne and Ouelle rivers.

The main cause of the population decline was the production of two consecutively weak cohorts in the winters of 1984-1985 and 1985-1986. Deterioration of the environment, combined with changes in the flow pattern of the river waters, may be responsible for this situation (Fisheries and Oceans, 1991).

**Known range**


Taken from: Scott and Scott, 1988.

# RIVER REDHORSE

*Moxostoma carinatum*

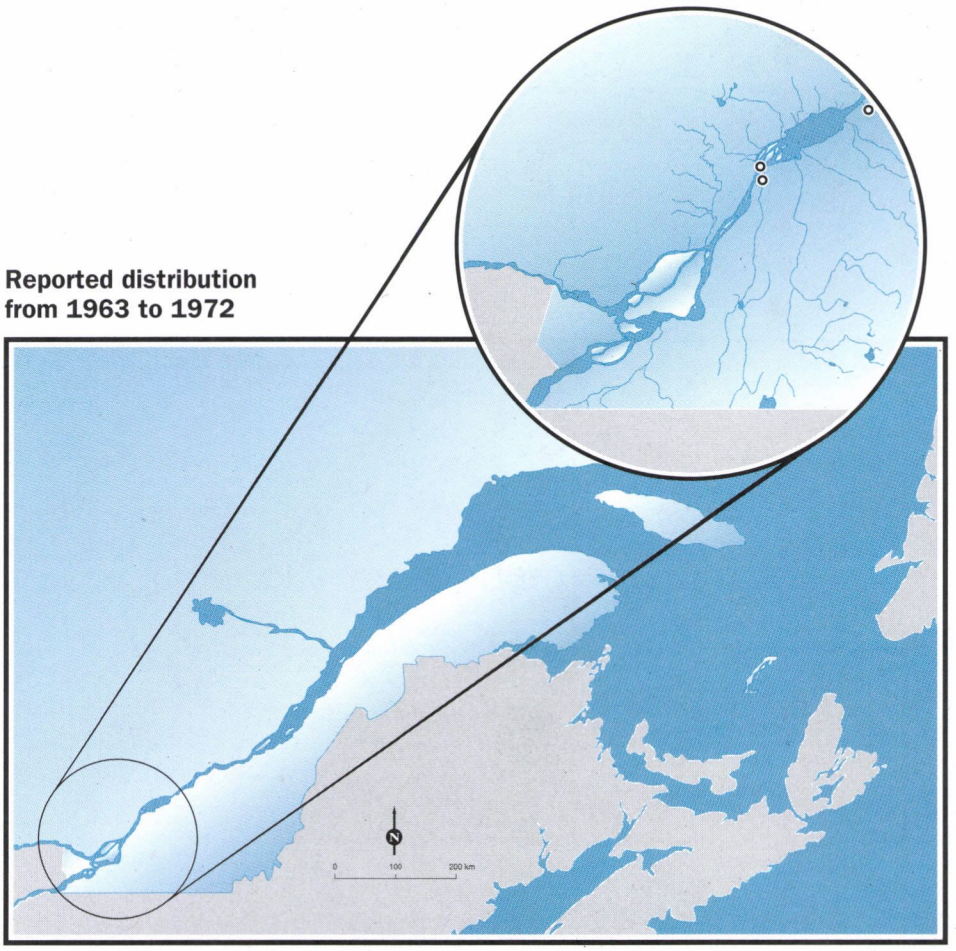
Fish

River Redhorse are found at the mouth of the Richelieu rapids, from the Chambly basin to Lake Saint-Pierre (Bergeron, 1983).

They spawn in the spring, probably in the larger rivers, and occasionally swim up the main tributaries (Scott and Crossman, 1974).

The River Redhorse appears to be very sensitive to pollution and silting.

**Reported distribution from 1963 to 1972**




Taken from: Mongeau *et al.*, 1974.

# COPPER REDHORSE

*Moxostoma hubbsi*

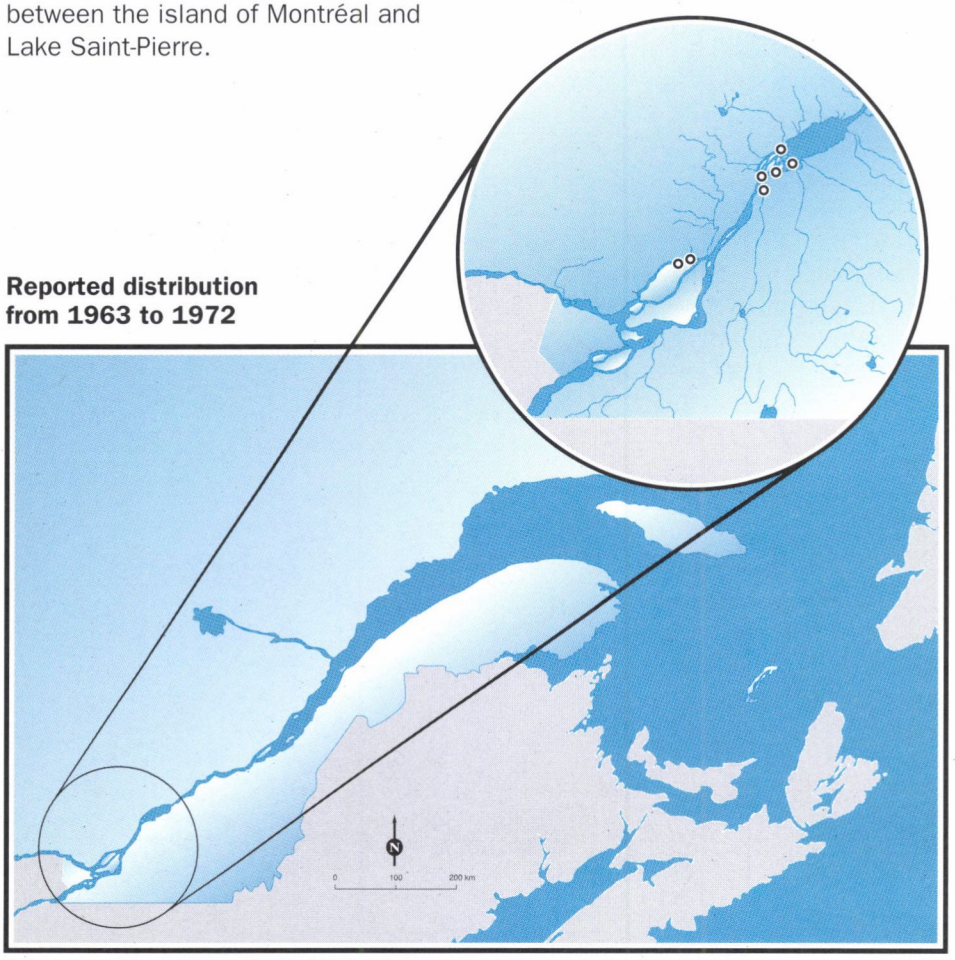
Fish

The Copper Redhorse is a species endemic to the drainage basin of the St. Lawrence River. It is characterized by its slow growth; sexual maturity is reached at about age 10 and despite its fertility, it remains very rare (Mongeau et al., 1986). In the St. Lawrence, this fish has been found between the island of Montréal and Lake Saint-Pierre.

Copper Redhorse spawn in the spring (Scott and Crossman, 1974). Two spawning grounds have been identified in the Richelieu River: the first, downstream of the Saint-Ours dam, and the second downstream of the Chambly dam. Spawning sites frequented are generally less than two metres deep and have rocky bottoms, with currents of less than two metres per second.

The decline of the species has been attributed to the proliferation of aquatic plant communities caused by eutrophication of waterways, increased turbidity and the silting up of water bottoms.

**Reported distribution from 1963 to 1972**




Taken from: Mongeau *et al.*, 1974.

# ST. LAWRENCE BELUGA

*Delphinapterus leucas*

Marine mammal

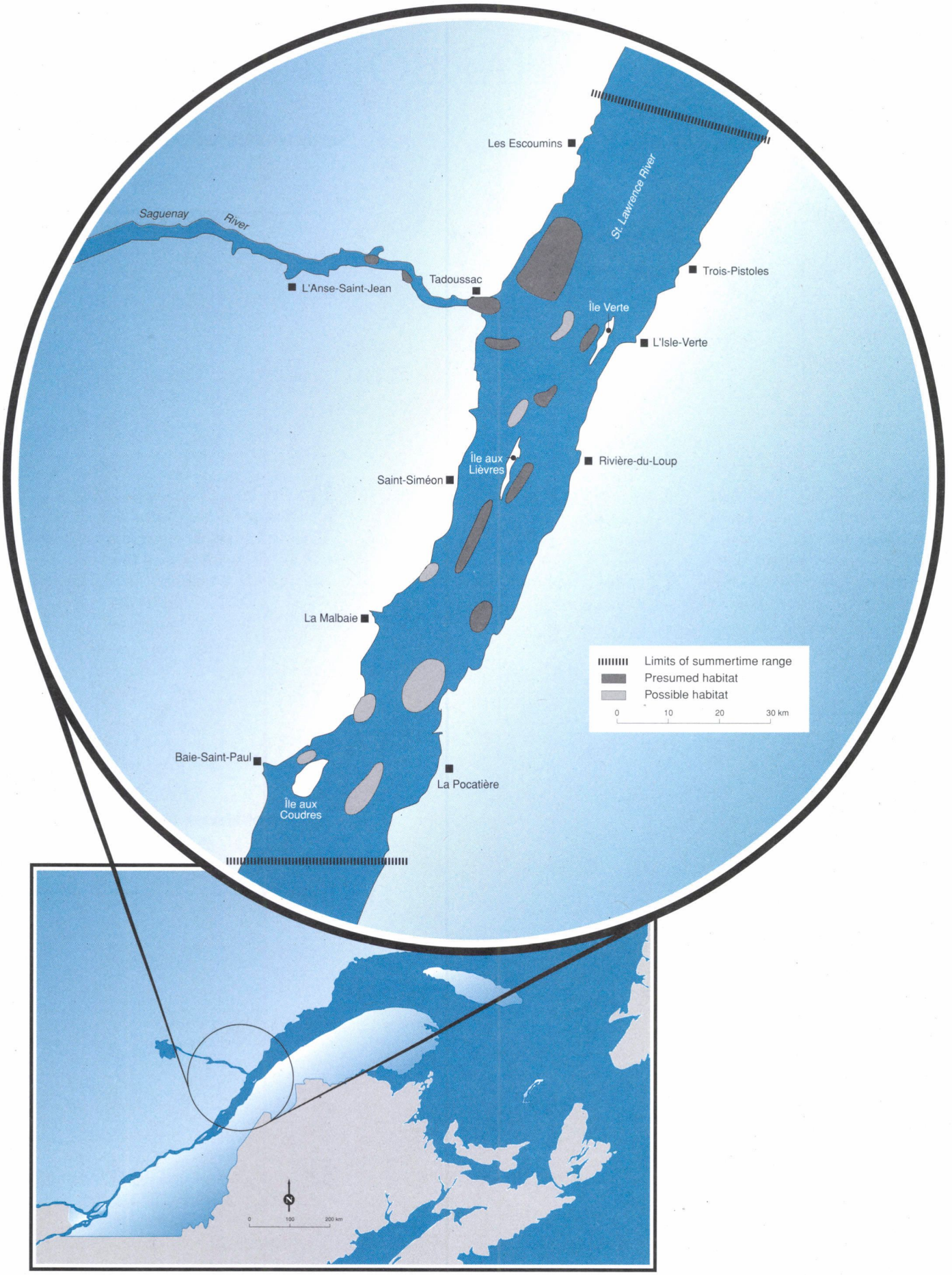
The St. Lawrence Beluga population numbers between 350 and 750 individuals (Michaud et al., 1990). They are most often found in the Upper and Lower estuaries. In winter and early spring, they are sighted as far as Pointe-des-Monts and Sainte-Anne-des-Monts. In summer, fall and late spring, they are found mainly from Île aux Coudres and the Îles de Kamouraska, in the west, to as far as the Escoumins and Île aux Basques further east. Most, however, concentrate around the mouth of the Saguenay River because of the rise of cold water from greater depths - a phenomenon known as upwelling (Fontaine, 1988).

The presumed habitats shown on the distribution map are those for which, through systematic observation over a number of years, there exists a body of data confirming regular use of the area by beluga. Possible habitats correspond to observation data collected over only a few years.

The available information does, however, allow us to describe briefly the physico-chemical characteristics of these habitats. Their depths vary from 5 to 66 m, with water bottoms consisting most commonly of mud, sand and gravel, and having a vast range of currents (from slow to fast-moving, with the occasional eddy). Salinity varies from 12.7‰ to 24.8‰, depending on location (Désilets, 1990). The biological data is insufficient to establish a link with the presence of known or potential prey (Désilets, 1990).

Beluga mate between April and June and calves are born from July to September. Known calving areas are south of Île aux Lièvres, in the Alouettes flats and in Sainte-Marguerite bay (Michaud *et al.*, 1990).

The St. Lawrence Beluga has been classified an endangered population since 1983. Hunting has been banned since 1978, but three population-decreasing factors still remain: disturbance, pollution (PCBs, PAHs, DDT, Mirex, various organochlorines), and loss of habitat (numerous projects conducted in and around the River, and construction of dams on the Manicouagan River).




Source: Michaud, R. *et al.*, 1990.

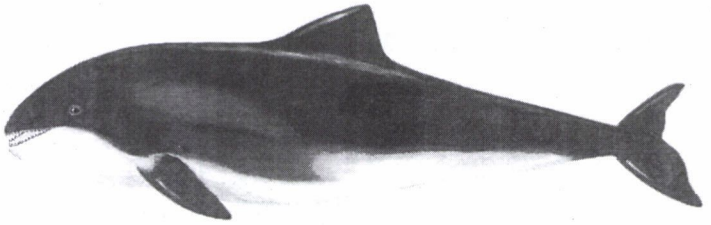
**Summertime range of the St. Lawrence Beluga.**

ACTION PLAN PRIORITY SPECIES

# HARBOUR PORPOISE

*Phocoena phocoena*

Marine mammal



The St. Lawrence River downstream of Tadoussac is home to the Harbour Porpoise. This small, toothed whale feeds mainly on herring, pollock and mackerel. Harbour Porpoises usually swim in pods of 10 to 15, although groups of some 200 individuals are occasionally seen. They swim fairly slowly, can dive to depths of 80 m and remain underwater for 3 to 6 minutes.

Females apparently calve offshore in May or June (Prescott and Richard, 1982).

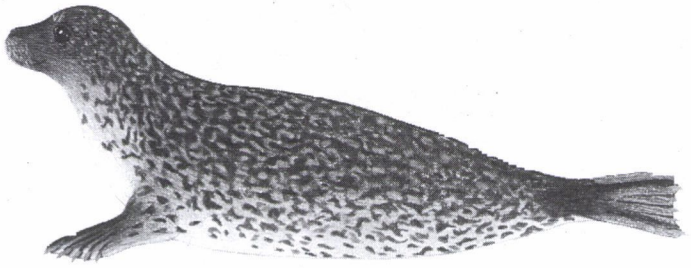
The Harbour Porpoise's COSEWIC designation in 1990 as a threatened species for the Western Atlantic justifies its inclusion among the Action Plan priority species.

ACTION PLAN PRIORITY SPECIES

# HARBOUR SEAL

*Phoca vitulina*

Marine vitulina



Harbour Seals are found in the St. Lawrence starting at Île aux Coudres. They usually stay in coastal waters, but sometimes swim up certain watercourses. Harbour Seals find their food in the water, feeding mainly on herring, plaice and squid. They are sedentary in nature and form small population groups in isolation from one another.

Females calve in the Gulf of St. Lawrence in May or June, bearing a single pup.

The payment of bounties for Harbour Seal kills caused the population to decline severely, until the bounty program was dropped in 1976 (Prescott and Richard, 1982). This animal's selection as a priority species is deserved by virtue of the absence of information on the Harbour Seal.

CHAPTER 5

# *Wetlands*

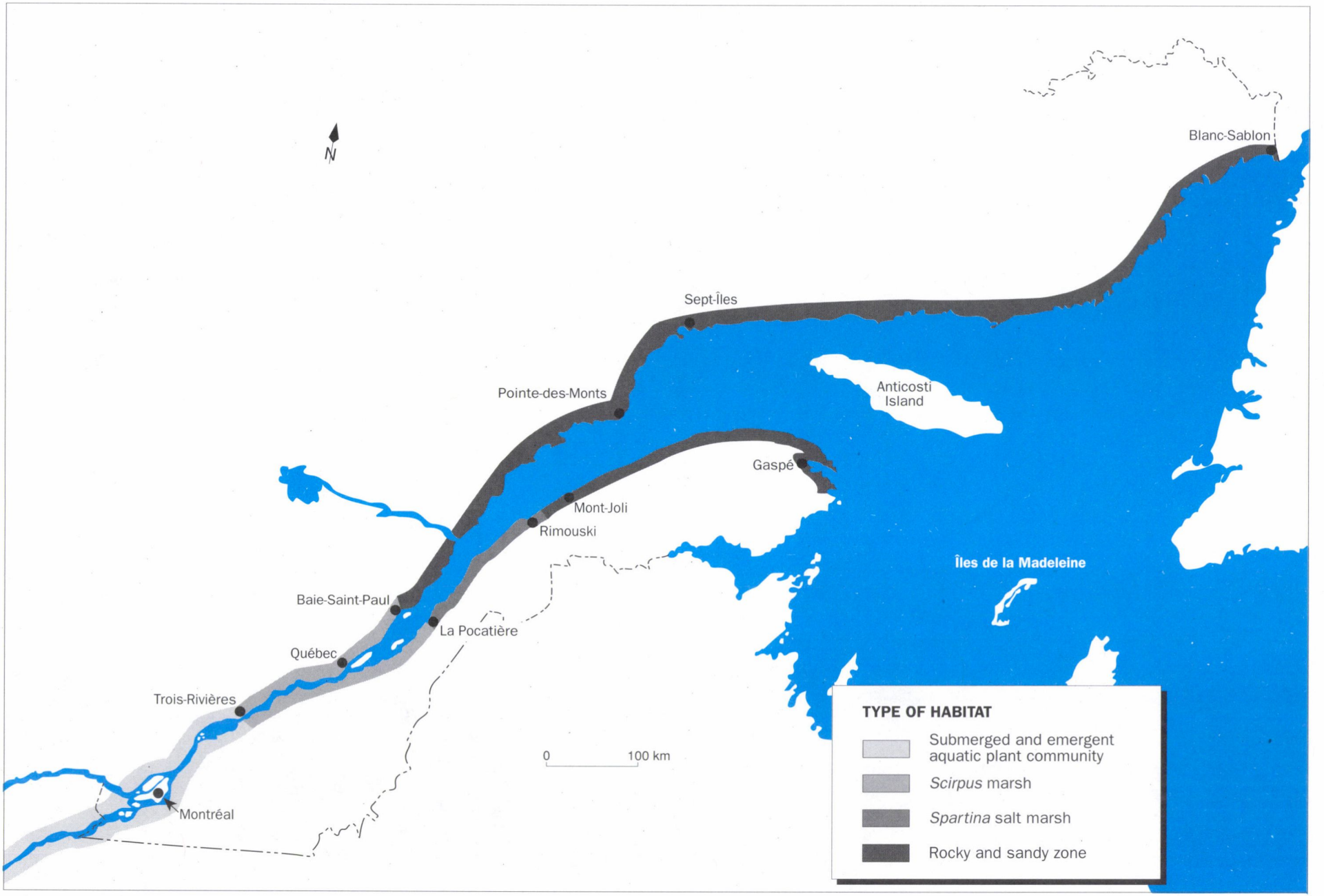
**Neither totally wet nor totally dry, and sometimes subject to the comings and goings of the tide, wetlands are transitional zones that offer shelter to a variety of plants and wildlife. These environments, which occupy barely 5 percent of the corridor surface area between Cornwall and Tadoussac, are vulnerable to any ill-considered action. They certainly deserve the label: CAUTION! FRAGILE.**

Wetlands border the entire length of the St. Lawrence from Cornwall to Blanc-Sablon. Both submerged and emergent aquatic plant communities can be seen, as can *Scirpus* marsh, *Spartina* salt marsh, and areas of rock and sand crossed by marshes. These environments are found on either side of the St. Lawrence corridor, the very axis of the St. Lawrence River and a major eastern North American flyway. Lehoux and Bourget (1986) estimated that 700 000 birds stopped there every year between 1974 and 1981 during spring and fall migrations. In winter, numbers drop to some 200 000 birds. Figure 8 overviews the distribution of waterfowl habitats, and clearly shows changes from one region to another.

Between Cornwall and Trois-Rivières, wetlands consist mainly of submerged and emergent aquatic plant communities; *Scirpus* marsh dominates from Trois-Rivières to Baie-Saint-Paul. From there on, the south shore is characterized by *Spartina* marshes as far as Rimouski, followed by areas of rock and sand all along the Gaspé peninsula. On the north shore, rock and sand mark the landscape starting at Baie-Saint-Paul. Also found are barachois, lagoons gradually filled in by water and wind-borne debris which over time become part of the shoreline.

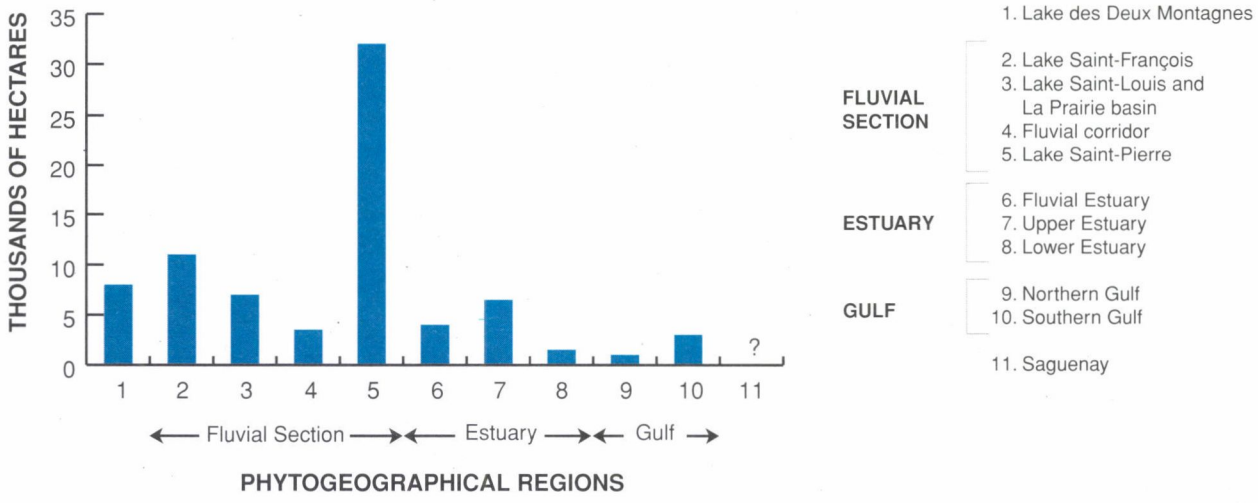
Figure 9 offers an overview of the spatial scope of the St. Lawrence wetlands. The Fluvial Section generally takes in most of the wetlands. Note that the Lake Saint-Pierre region is first in terms of surface area, with approximately 32 000 ha, followed by Lake Saint-François with some 11 000 ha (Gratton and Dubreuil, 1990).

Table 5 shows the surface area of aquatic plant communities and marshes found between the low water line and the highest high water level. This survey was conducted in 1978 on the Québec section of the St. Lawrence River, and includes all the islands except Anticosti Island. We can see that submerged and emergent aquatic plant communities are found in the shallow freshwater zone. The greatest area of submerged aquatic plant communities, however, is found in the lentic (still or slow-moving) water zone between Cornwall and Grondines: at 23 170 ha, the area is equivalent to 68% of the total area of riparian wetlands. *Scirpus* marshes are found in lotic freshwater zones (fast-moving waters between Grondines and Île d'Orléans), and in brackish waters as far as La Pocatière. *Spartina* salt marshes are found on the southern coast from Kamouraska to Rimouski, and on the northern coast from Baie-Saint-Paul to Baie-Comeau. They dominate in the saltwater stretch and are flooded by the semi-diurnal tides that reach amplitudes of four metres (St. Lawrence Centre and Université Laval, 1991a). Over the remaining study area, we find saltwater herbaceous vegetation associated with lagoons, sand spits and river mouths. This vegetation serves as breeding grounds for molluscs and crustaceans, and major spawning grounds for commercially harvested fish species, such as herring and plaice (St. Lawrence Centre and Université Laval, 1991a).




Source: Lehoux, D. and A. Bourget, 1986.

**Figure 8** **General location of waterfowl migration and nursery habitats in the fluvial corridor**




Source: Gratton, L. and C. Dubreuil, 1990, modified.

**Figure 9 Spatial scope of St. Lawrence wetlands**

The study by Grenier (1991) estimated the total surface area of wetlands (which includes aquatic plant communities, marshes and swamps) at 86 920 ha over a 10 km strip on either side of the St. Lawrence between Cornwall and Tadoussac. Approximately 52 174 ha lie in the Fluvial Section; 19 636 ha in the Fluvial Estuary; and 15 110 ha in the Upper Estuary. Lake Saint-Pierre alone accounted for 35 765 ha, or 41 percent, of the total area covered by wetlands.

Although these figures cannot be compared with the 1978 figures due to differences in methodology and study area, they do offer us more recent data on the order of magnitude of wetlands. In 1989, wetlands accounted for only a little over 5 percent of the total 10 km riverfront strip between Cornwall and Tadoussac (Grenier, 1991). These environments are important to the equilibrium of ecosystems and ecological productivity, they are home to a number of species and their presence is limited along the River: all are reasons for the special interest wetlands command.

Two main types of wetlands are associated with the presence of fresh, brackish or salt water, depending on whether or not there are tides.

## *Non-tidal wetlands*

Wetland environments with no tides are found strictly in freshwater. These wetlands, or aquatic herbaceous vegetation, are plentiful in the Fluvial Section upstream of Lake Saint-Pierre. Apart from the dominant groupings of green algae of the *Nitella* and *Chara* genuses, and of *Chladophora glomerata* (Lapierre, 1992), figure 10 divides these wetlands into four classes containing various macrophytes (plants visible to the naked eye).

The vegetation begins successively with the *aquatic plant community*, found in the water and permanently inundated. The plant groupings which make up this community are aquatic herbaceous vegetation with submerged and floating plants, including such groups as American Eel-grass, Spiked Water-Milfoil and Canada Waterweed.

Next are the marshes, also permanently flooded and made up of herbaceous vegetation with *Scirpus americanus*. Emergent species include such plant groups as cattails, Arrowheads and Broad-fruited Bur-reed. This environment is rich in nutrients.

Exposed environments, *wet meadows* and *swamps*, follow. The wet meadow, flooded only in the spring, is characterized by the presence of Purple Loosestrife and grasses such as Reed Canary Grass and Canada Reed Grass; swamps contain willow stands with shrubs and other trees, and the beginning of the forest.

The *riparian zone*, located at the border of the tidal influence zone, consists of plants adapted to the land environment.

*Aquatic herbaceous vegetation* shelters such fish species as Northern Pike, Smallmouth Bass and Yellow Perch (St. Lawrence Centre and Université Laval, 1992), as well as bird species such as the Pied-billed Grebe, Black Tern, Great Blue Heron, Northern Pintail and Common Moorhen. Noteworthy among the invertebrates is the crayfish.

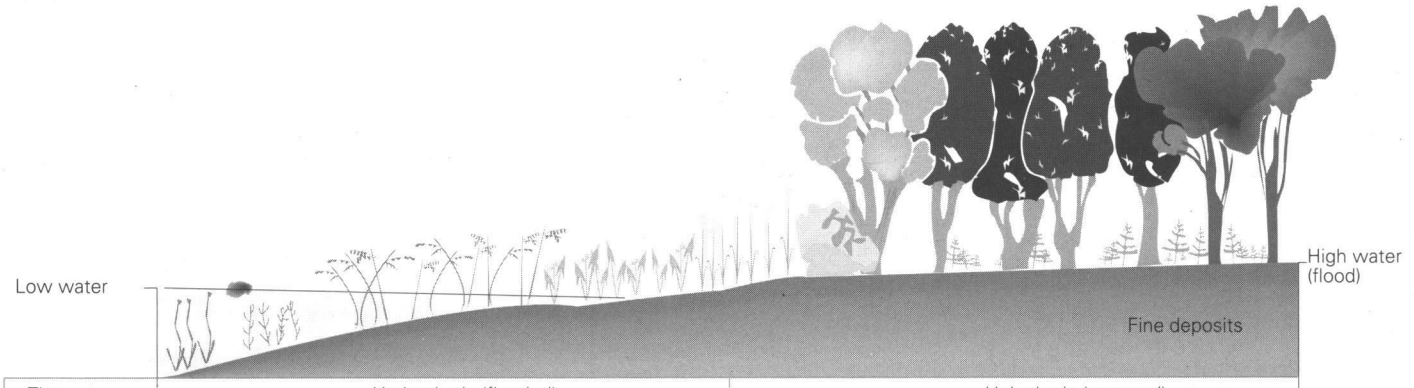
## *Tidal wetlands*

Tidal wetlands extend from the outlet of Lake Saint-Pierre to the Gulf of St. Lawrence. They may be subdivided according to the tide line stages that form the various sections of the habitat. Tides tend to reduce biological diversity, as does the gradual passage from fresh to salt water. The distribution of plant and animal species living in these environments is influenced by

**Table 5 Surface area of riparian wetlands along the St. Lawrence in 1978 (ha)**

| | *Shallow waters* | | *Marshes* | | | | | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Zone* | *Submerged aquatic plant community* | *Emergent aquatic plant community* | *Aquatic herbaceous vegetation with Scirpus americanus* | *Aquatic herbaceous vegetation* | *Aquatic herbaceous vegetation with Scirpus on rock* | *Aquatic herbaceous vegetation with Spartina alterniflora* | *Aquatic herbaceous vegetation with Spartina patens* | *Saltwater herbaceous vegetation* | *ha* | *%* |
| **Lentic freshwater** | | | | | | | | | | |
| St. Lawrence | 23 170 | 9 490 | - | - | - | - | - | - | 32 660 | 68.0 |
| **Lotic freshwater** | | | | | | | | | | |
| North and south shores of the St. Lawrence | - | - | 2 590 | 879 | 1 156 | - | - | - | 4 625 | 9.5 |
| **Brackish water** | | | | | | | | | | |
| North and south shores of the St. Lawrence | - | - | 1 554 | 363 | 448 | - | - | - | 2 365 | 5.0 |
| **Saltwater** | | | | | | | | | | |
| Estuary and islands | - | - | - | - | - | 2 167 | 536 | 1 708 | 4 411 | 9.0 |
| Gaspé peninsula | - | - | - | - | - | 93 | 37 | 1 090 | 1 220 | 2.5 |
| Côte-Nord | - | - | - | - | - | 88 | - | 1 249 | 1 337 | 3.0 |
| Îles de la Madeleine | - | - | - | 563 | - | 148 | - | 916 | 1 627 | 3.0 |
| **Total** | | 32 660 | | | | 15 585 | | | 48 245 | 100 |

Source: Environment Canada, 1985, modified.




| Tier | Hydrophytic (flooded) | | | Helophytic (exposed) | | | |
|---|---|---|---|---|---|---|---|
| Class | Aquatic plant community | Marsh | | Wet meadow | Swamp | | |
| Association | Submerged and floating herbaceous vegetation | Herbaceous vegetation with *Scirpus americanus* | Herbaceous vegetation | Graminoids | Willow with shrubs | Willow with other trees | Silver maple | American elm or eastern cottonwood |

Source: Couillard and Grondin, 1986, modified in St. Lawrence Centre and Université Laval, 1991a.

**Figure 10 Hydrosere representative of aquatic herbaceous vegetation**

tide levels, frequency of flooding, resistance to dehydration and the prevailing type of interspecies relationship (predation/competition). In the freshwater section, tidal influence is felt in the Fluvial Estuary from the outlet of Lake Saint-Pierre. Figure 11 shows a three-tiered hydrosere, which is characteristic of the *Scirpus* marsh found both at this level and in the brackish waters upstream of the Upper Estuary.

The *lower tier* of the *Scirpus* marsh, between lower low water, spring tide (LLWST) and lower low water, mean tide (LLWMT), is a generally submerged zone. This part of the habitat is characterized by a bare, muddy bottom.

The *middle tier* lies between the limit of lower low water, mean tide and that of higher high water, mean tide (HHWMT). It is dominated by *Scirpus americanus*, with little floral variety.

The last level is the *upper tier*, between higher high water, mean tide, and higher high water, spring tide (HHWST). Plant communities include groupings of herbaceous vegetation, willow stands with shrubs, Northern Red Ash and White Elm. As for fish, species living in this hydrosere are the Atlantic Tomcod, Smelt, Yellow Perch and Northern Pike. Bird species include the Greater Snow Goose, Northern Pintail, Swamp Sparrow, Common Snipe, along with puddle ducks such as the Black Duck and Green-winged Teal (St. Lawrence Centre and Université Laval, 1992).

In the Lower Estuary, the vegetative succession changes and *Spartina* salt marsh dominates (fig. 12). The following groupings are successively found: fucus mud flat (lower tier); herbaceous vegetation with *Spartina alterniflora* (middle tier); herbaceous vegetation with *Spartina patens*, and salty herbaceous vegetation with ice extraction pans (upper tier). Among the bird species found are the Black Duck, Green-winged Teal, Northern Pintail and Greater Snow Goose. Fish include the American eel, smelt and herring (St. Lawrence Centre and Université Laval, 1992).

In the Gulf, salty herbaceous vegetation is the characteristic hydrosere (fig. 13). The *lower tier* is composed of a sandy/muddy substrate and a grouping of eelgrass. Herbaceous vegetation with *Spartina alterniflora* dominates in the *middle tier*. The *upper tier* is distinguished by low grass and herbaceous vegetation with scaly Sedge, rushes and Baltic sea Bulrush.

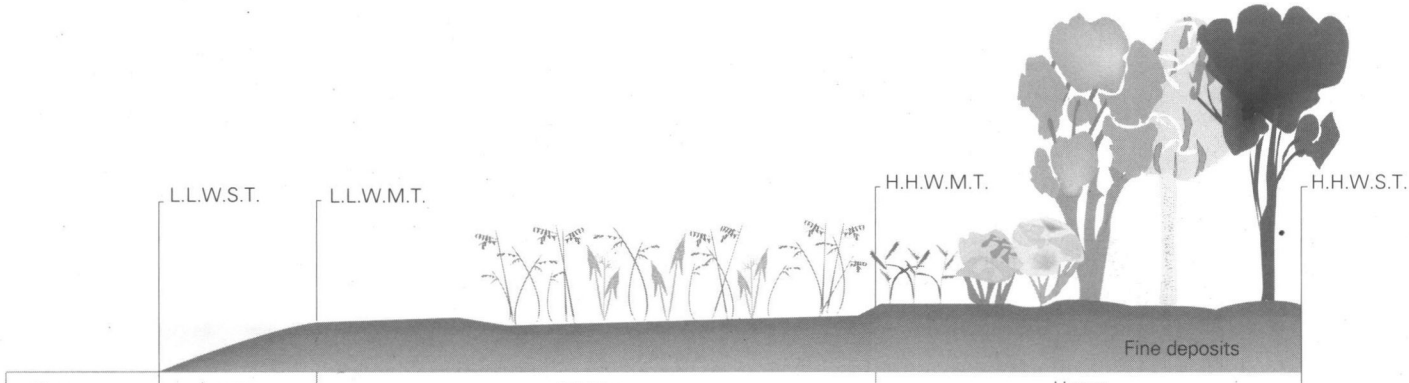
Among fish species found are herring and plaice, as well as crustaceans such as Lobster, Rock crab and molluscs (mussels and clams). Common Eider and Scoter species are among the shorebirds for which conditions are conducive to survival (St. Lawrence Centre and Université Laval, 1992a). Puddle ducks rarely frequent the northern part of the Gulf; instead, we find seabirds nesting in colonies. This region forms the western limit of nesting areas for certain species, such as the Great Cormorant and Arctic Tern (Ghanimé *et al.*, 1990).

It should be noted that a relatively wide band with the characteristics of land environments may be added to the various types of wetlands. This riparian zone provides the drainage conditions and forest cover needed by most wildlife species adapted to a more land-based lifestyle. The availability of water, together with the greater diversity and stratification of vegetation, the edge effect, and a variety of micro-climates mean that this zone alone contains the greatest share of Québec's wildlife resources (Lemay, 1987).

## *Action Plan priority species*

Two hundred and forty-six species of the Action Plan's priority vascular plants are found in a one kilometre-wide strip along the River. Of these, 108 are associated with the riparian wetlands of the St. Lawrence; 82 have been observed only in these wetlands (table 6). The 26 other species have also been seen in one or another of the open, forest, island or marginal environments.

Among the wildlife species inhabiting these natural environments are three species of fish, two species of amphibians, five species of reptiles and three species of birds. The data sheets that follow present some of the vascular plants and all the priority wildlife species that depend on the St. Lawrence wetlands.

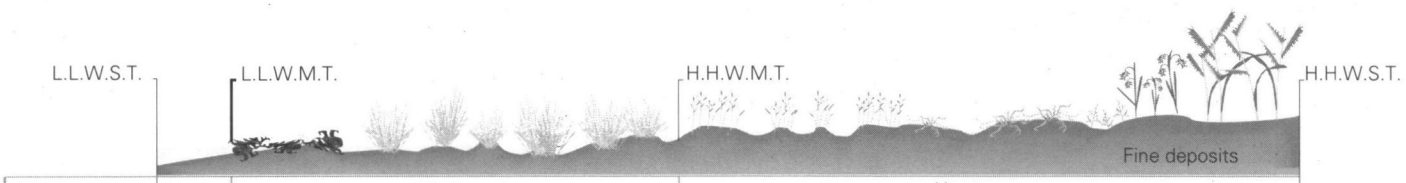



| Tier | Lower | Middle | Upper | | | |
|---|---|---|---|---|---|---|
| Association | Bare mud flat | Herbaceous vegetation with *Scirpus americanus* | Herba-ceous vegetation | Willow with shrubs | Red ash | White elm |

L.L.W.S.T. = lower low water, spring tide
L.L.W.M.T. = lower low water, mean tide
H.H.W.M.T. = higher high water, mean tide
H.H.W.S.T. = higher high water, spring tide

Source: Couillard and Grondin, 1986, modified in St. Lawrence Centre and Université Laval, 1991a.

**Figure 11 Hydrosere representative of a *Scirpus* marsh**

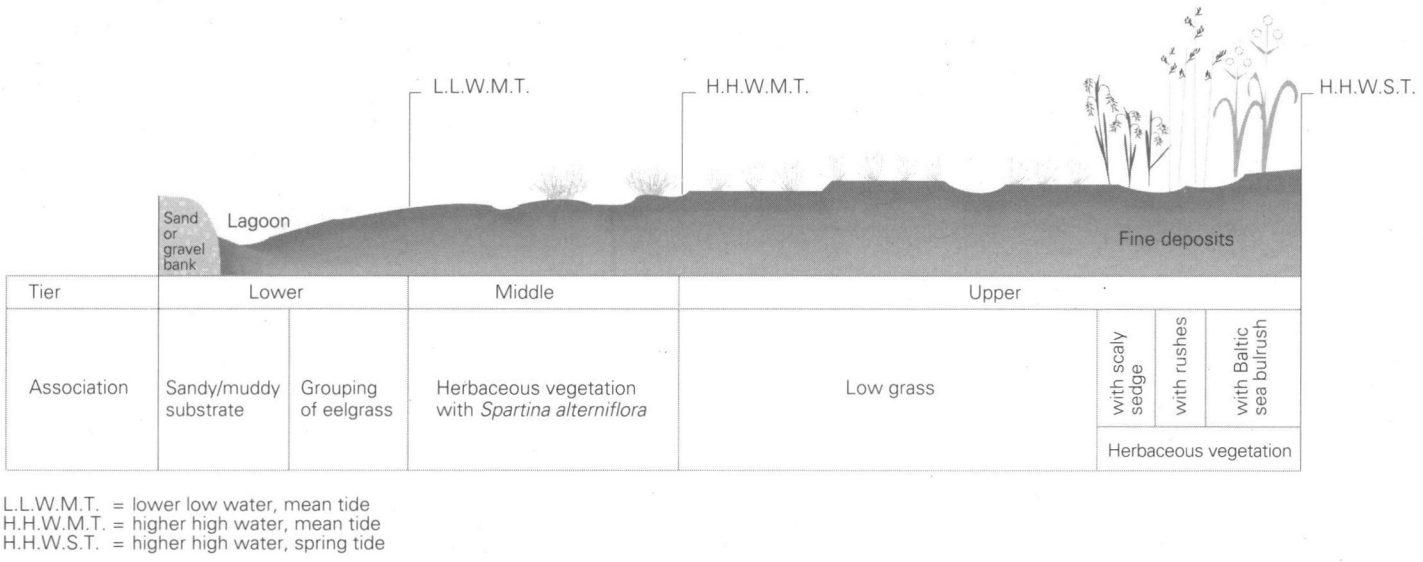



| Tier | Lower | Middle | | Upper | |
|---|---|---|---|---|---|
| Association | Fucus mud flat | Herbaceous vegetation with *Spartina alterniflora* | | Herbaceous vegetation with *Spartina patens* | Salty herbaceous vegetation with ice extraction pans |

L.L.W.S.T. = lower low water, spring tide
L.L.W.M.T. = lower low water, mean tide
H.H.W.M.T. = higher high water, mean tide
H.H.W.S.T. = higher high water, spring tide

Source: Couillard and Grondin, 1986, modified in St. Lawrence Centre and Université Laval, 1991a.

**Figure 12 Hydrosere representative of a *Spartina* salt marsh**




L.L.W.M.T. = lower low water, mean tide
H.H.W.M.T. = higher high water, mean tide
H.H.W.S.T. = higher high water, spring tide

Source: Couillard and Grondin, 1986, modified in St. Lawrence Centre and Université Laval, 1991a.

**Figure 13 Hydrosere representative of salty herbaceous vegetation**

**Table 6 List of priority vascular plants seen only in the riparian wetlands of the St. Lawrence**

*Allium canadense*
*Alnus serrulata*
*Arisaema dracontium*[1]
*Armoracia lacustris*
*Aster laurentianus*[1]
*Bidens discoidea*
*Bidens eatonii*
*Bidens heterodoxa*
*Cardamine bulbosa*
*Carex atherodes*
*Carex folliculata*
*Carex hostiana*
*Carex lupuliformis*
*Carex molesta*
*Carex sartwellii*
*Carex typhina*
*Cerastium nutans var. nutans*
*Chamaesyce polygonifolia*
*Cicuta maculata var. victorinii*[1]
*Cyperus engelmannii*
*Cyperus lupulinus ssp. macilentus*
*Echinochloa walteri*
*Elodea nuttallii*
*Elymus riparius*
*Epilobium ciliatum var. ecomosum*
*Eragrostis hypnoides*
*Erigeron philadelphicus ssp. provancheri*[1]
*Eriocaulon parkeri*
*Fimbristylis autumnalis*
*Gentianopsis macounii*
*Gentianopsis victorinii*[1]
*Geranium maculatum*
*Gratiola aurea*
*Gratiola neglecta var. glaberrima*
*Iris virginica var. shrevei*
*Isoëtes tuckermanii*
*Juncus longistylis*
*Justicia americana*[2]
*Lindernia dubia var. inundata*
*Lycopus americanus var. laurentianus*
*Lycopus virginicus*
*Lysimachia hybrida*
*Lysimachia quadrifolia*
*Najas guadalupensis*
*Onosmodium molle var. hispidissimum*
*Peltandra virginica ssp. virginica*
*Physostegia virginiana var. granulosa*
*Platanthera flava*
*Podostemon ceratophyllum*
*Polanisia dodecandra ssp. dodecandra*
*Polygonum hydropiperoides var. hydropiperoides*
*Polygonum punctatum var. parvum*
*Potamogeton illinoensis*
*Potamogeton pusillus var. gemmiparus*
*Proserpinaca palustris*
*Pycnanthemum virginianum var. virginianum*
*Quercus bicolor*
*Ranunculus flabellaris*
*Ranunculus longirostris*
*Rhynchospora capitellata*
*Salix sericea*
*Saururus cernuus*
*Scirpus clintonii*
*Scirpus heterochaetus*
*Scirpus smithii*
*Scirpus torreyi*
*Selaginella apoda*
*Sorghastrum nutans*
*Sparganium androcladum*
*Sparganium glomeratum*
*Spiranthes lucida*
*Torreyochloa pallida var. pallida*
*Triglochin gaspense*
*Verbena simplex*
*Veronica catenata*
*Veronica peregrina var. peregrina*
*Viola affinis*
*Wolffia borealis*
*Wolffia columbiana*
*Woodsia alpina*
*Woodsia oregana*
*Woodsia scopulina*

Source: Lavoie, 1992a.
*COSEWIC status*: 1. Vulnerable. 2. Threatened.

# DRAGONROOT

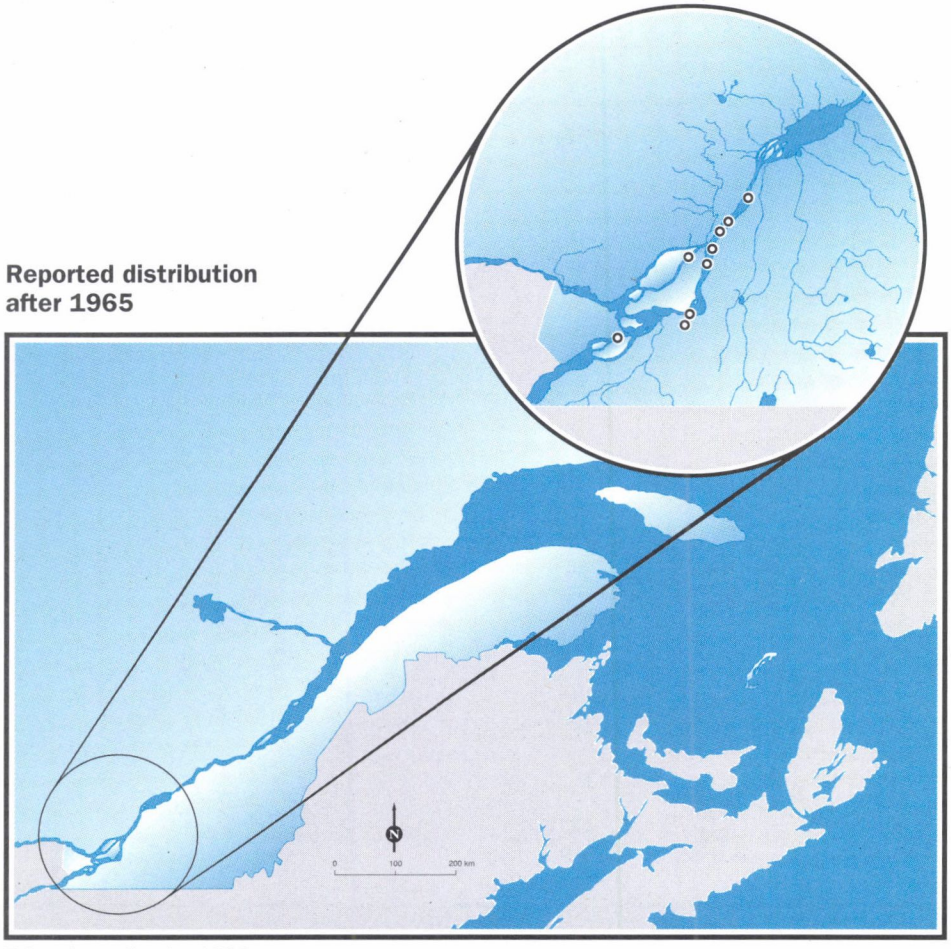
*Arisaema dracontium*

Vascular plant

The Dragonroot reaches its northern limit in Québec in either the wooded or bare clay drift deposits of the Hochelaga and Sorel archipelagos, where it has been sighted at a dozen stations.

This perennial herbaceous plant grows to nearly one metre in height. Flowering occurs in May and June. The red berries form a sub-cylindrical, globular head encased in a leaf which opens with the flowers and differs in shape and colour from the other leaves (spathe).

The pressures of urbanization on its habitat, especially in the form of recreational development, coupled with its limited distribution in Canada justify the vulnerable status assigned by COSEWIC in 1984.




Taken from: Gauvin, 1984.

# GULF OF ST. LAWRENCE ASTER

*Aster laurentianus*

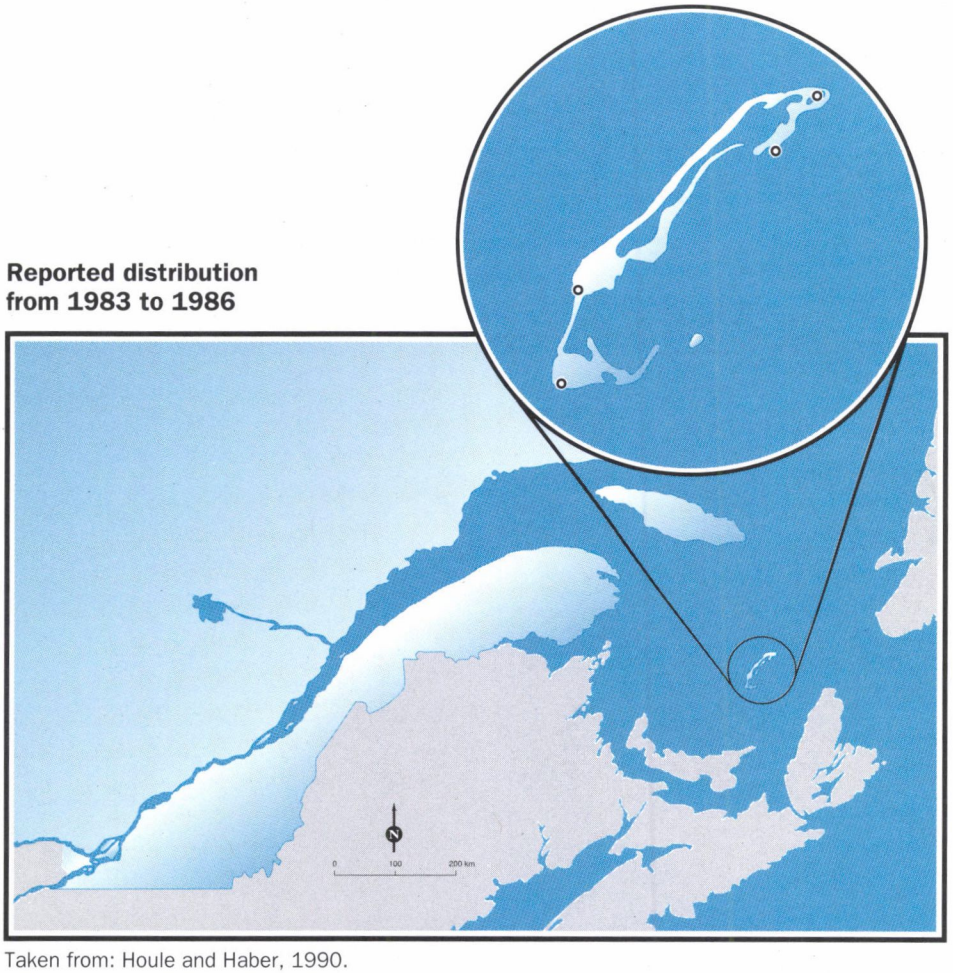
Vascular plant

This plant, endemic to the Gulf of St. Lawrence, is restricted to the damp sands of the seashore and is currently reported at about 15 stations: two in New Brunswick, four in Prince Edward Island and eight in the Îles de la Madeleine.

An annual pioneer composite, it flowers from late August to mid-September. Its seeds are released in late October.

Its very limited range justifies the vulnerable status assigned by COSEWIC in 1989.

**Reported distribution from 1983 to 1986**




Taken from: Houle and Haber, 1990.

# AMERICAN WATER-WILLOW

*Justicia americana*

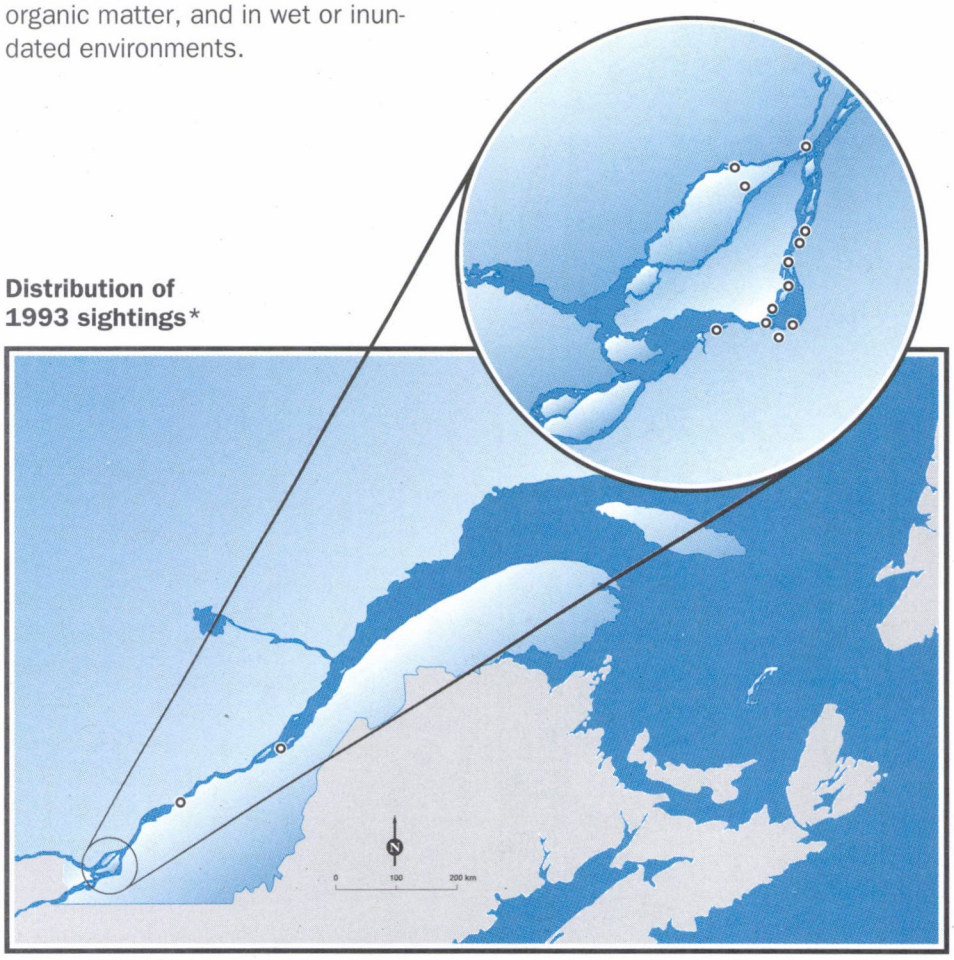
Vascular plant

A plant of the U.S. Midwest [or southern periphery], its Québec range is limited to five stations distributed along the Fluvial Section of the St. Lawrence where there are no tides: the Hochelaga archipelago, in particular. This is a pioneer species which forms pure colonies on sand, gravel or organic matter, and in wet or inundated environments.

This perennial herbaceous species can reach one metre in height. It flowers in summer, and is pollinated by bees, diptera (two-winged insects) and butterflies. At maturity, two to four kidney-shaped seeds are projected up to one metre away.

Its habitat was partially destroyed or disturbed by construction work on the St. Lawrence Seaway and the Expo 67 site. This plant is considered threatened throughout Canada. (COSEWIC, 1984).

**Distribution of 1993 sightings***




Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until March, 1993.

# VICTORIN'S GENTIAN

*Gentianopsis victorinii*

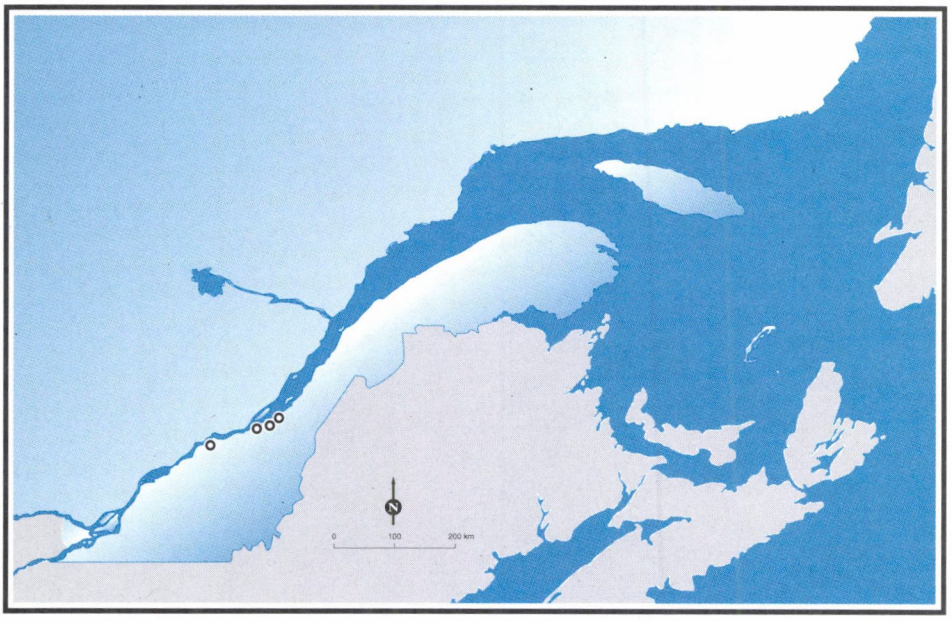
Vascular plant

A herbaceous plant endemic (that is, confined to a clearly defined area) to the high-tide zone of the St. Lawrence Fluvial Estuary, it is distributed among about 20 stations between Deschambault and Islet.

This is an annual which reproduces by cross-pollination. Flowers begin to appear in early August. The corolla is distinctive in that it closes at about 4:30 pm; it also stays closed during overcast weather. Seeds have papillae that enable them to float.

The destruction of certain stations and the plant's very limited overall distribution led to its designation as vulnerable by COSEWIC in 1987.

**Reported distribution after 1965**




Taken from: Legault, undated.

# ARROW-GRASS

*Triglochin gaspense*

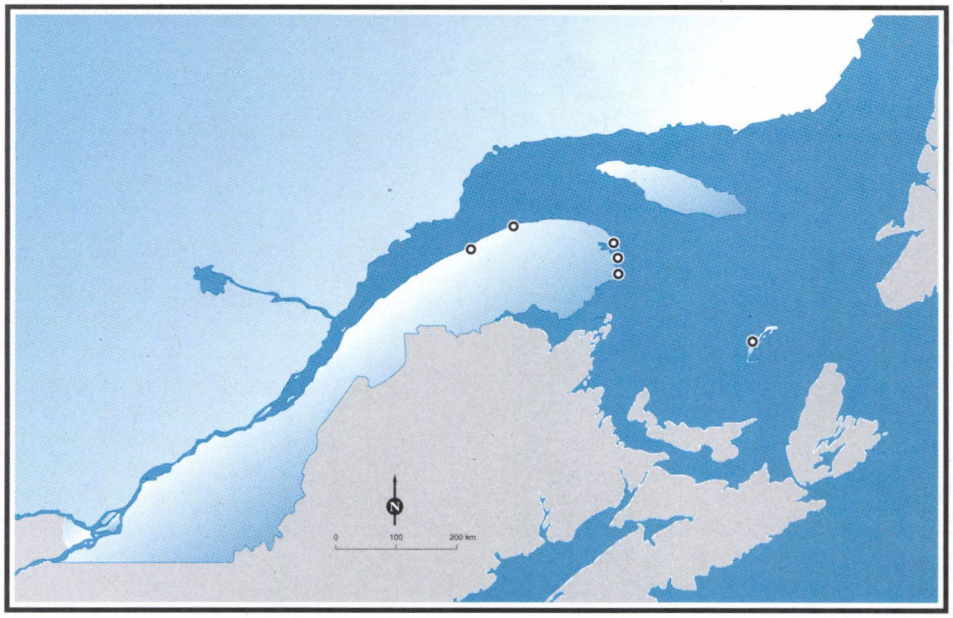
Vascular plant

Another species endemic to the Gulf of St. Lawrence, this plant grows in the salt marshes of the Maritime provinces, the Gaspésie, the Îles de la Madeleine and the Basse-Côte-Nord.

This is a small herbaceous perennial that flowers in summer.

At present, this species is considered rare throughout its range.

**Reported distribution**




Taken from: Ford and Ball, 1988.

# PHILADELPHIA FLEABANE, SSP. PROVANCHER

*Erigeron philadelphicus ssp. provancheri*

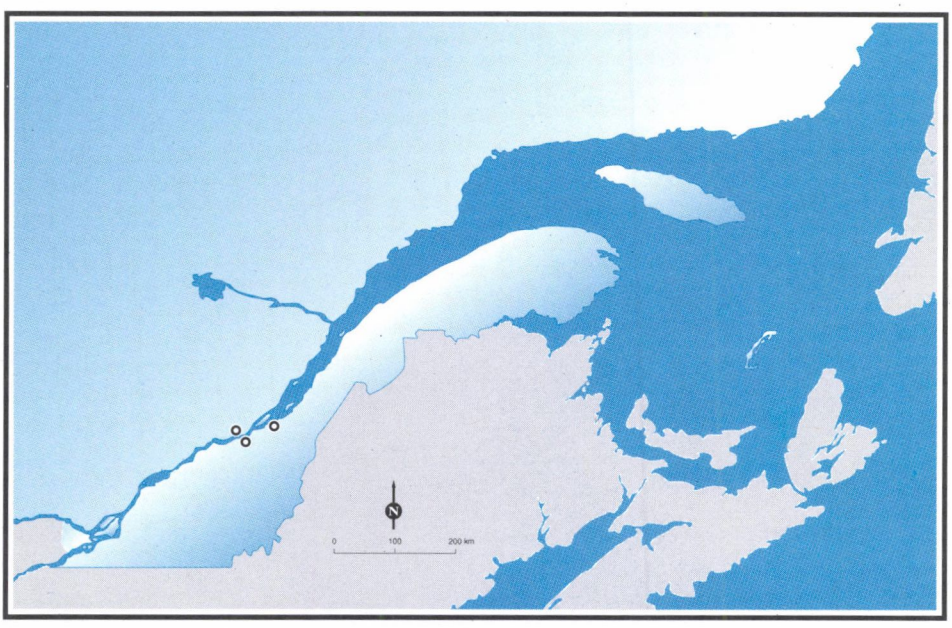
Vascular plant

A small herbaceous plant endemic to northeastern North America, it is currently found at only three stations in the Fluvial Estuary of the St. Lawrence, a tidal freshwater environment. It grows on gravel and in the cracks and crannies of the geolittoral zone (submerged at high tide).

Flowering begins in June and can last until the fall. Flower heads (sessile flowers clustered tightly around a central receptacle so as to resemble a single flower), produce fruits about 10 days after flowering and seeds are scattered by the wind a few days later. This is a short-lived perennial.

Because of its extreme natural scarcity, this composite is considered vulnerable in Canada (COSEWIC, 1992).

**Reported distribution in 1990**




Source: Sabourin, 1992.

# REDFIN PICKEREL

*Esox americanus americanus*

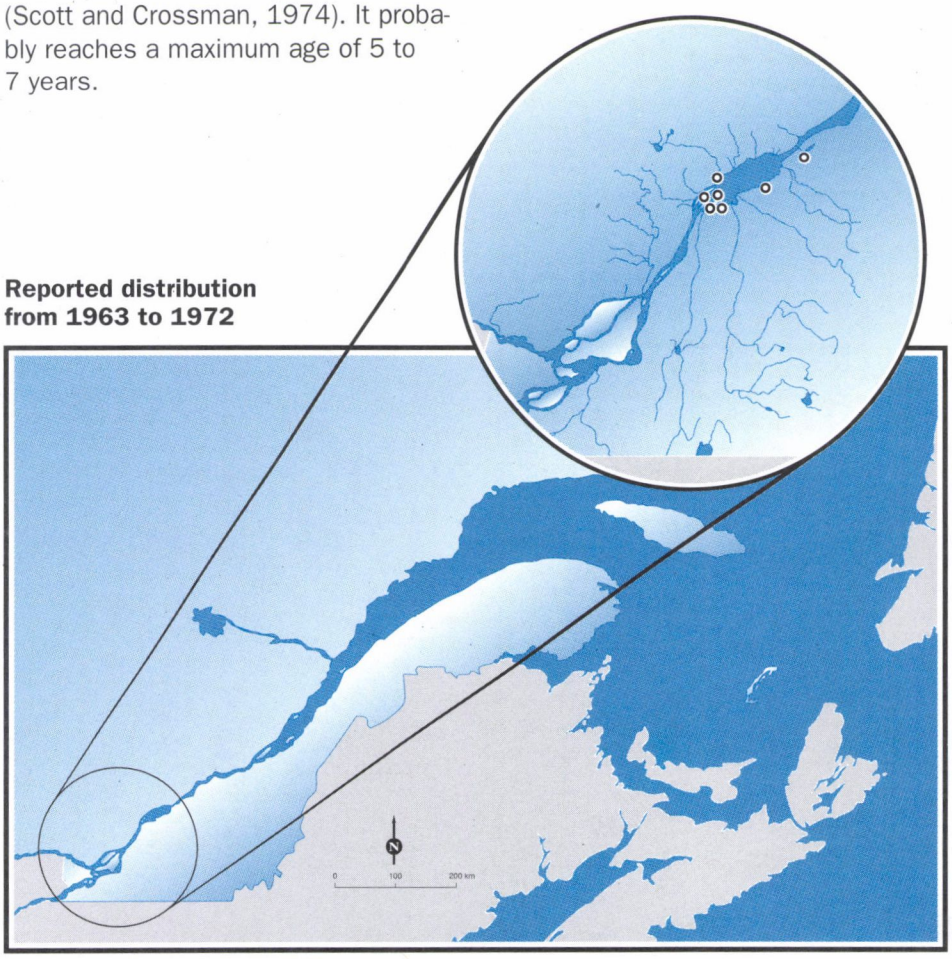
Fish

The Redfin Pickerel lives on the perimeter of Lake Saint-Pierre, in the Richelieu River and its tributaries, and also in Lake Champlain. It lives in areas where the current is weak and the vegetation dense; the young live in shallow waters. This species reputedly cross-breeds with Grass Pickerel (Scott and Crossman, 1974). It probably reaches a maximum age of 5 to 7 years.

Spawning takes place in the spring; however, as with other pike, more in-depth studies tend to indicate that there is also a spawning period in the fall (Scott and Crossman, 1974).

The limited feeding and breeding habitats of Redfin Pickerel are responsible for its classification as a priority species under the Action Plan, as designated by the working group on the priority flora and fauna species of the St. Lawrence corridor.

**Reported distribution from 1963 to 1972**




Taken from: Mongeau *et al.*, 1974.

# GRASS PICKEREL

*Esox americanus vermiculatus*

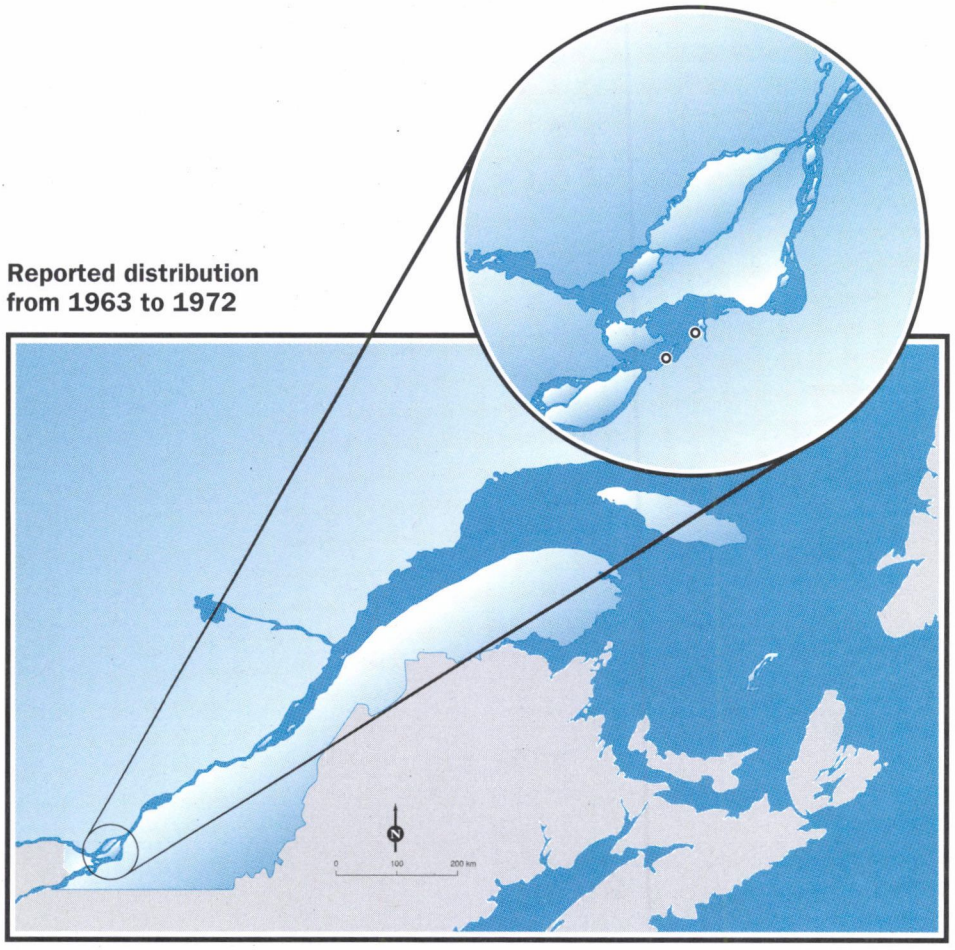
Fish

This pike is found from the confluence of the Ottawa River and the St. Lawrence to the Great Lakes; it also inhabits small, muddy streams with gentle currents and dense vegetation. The Grass Pickerel is well adapted to high temperatures. Its lifespan is 6 to 7 years (Scott and Crossman, 1974).

Spawns in the spring, between late March and early May.

The Grass Pickerel was identified as an Action Plan priority species due to the limited number of habitats suited to its feeding and reproductive habits.

**Reported distribution from 1963 to 1972**




Taken from: Mongeau *et al.*, 1974.

ACTION PLAN PRIORITY SPECIES

# BRASSY MINNOW

*Hybognathus hankinsoni*

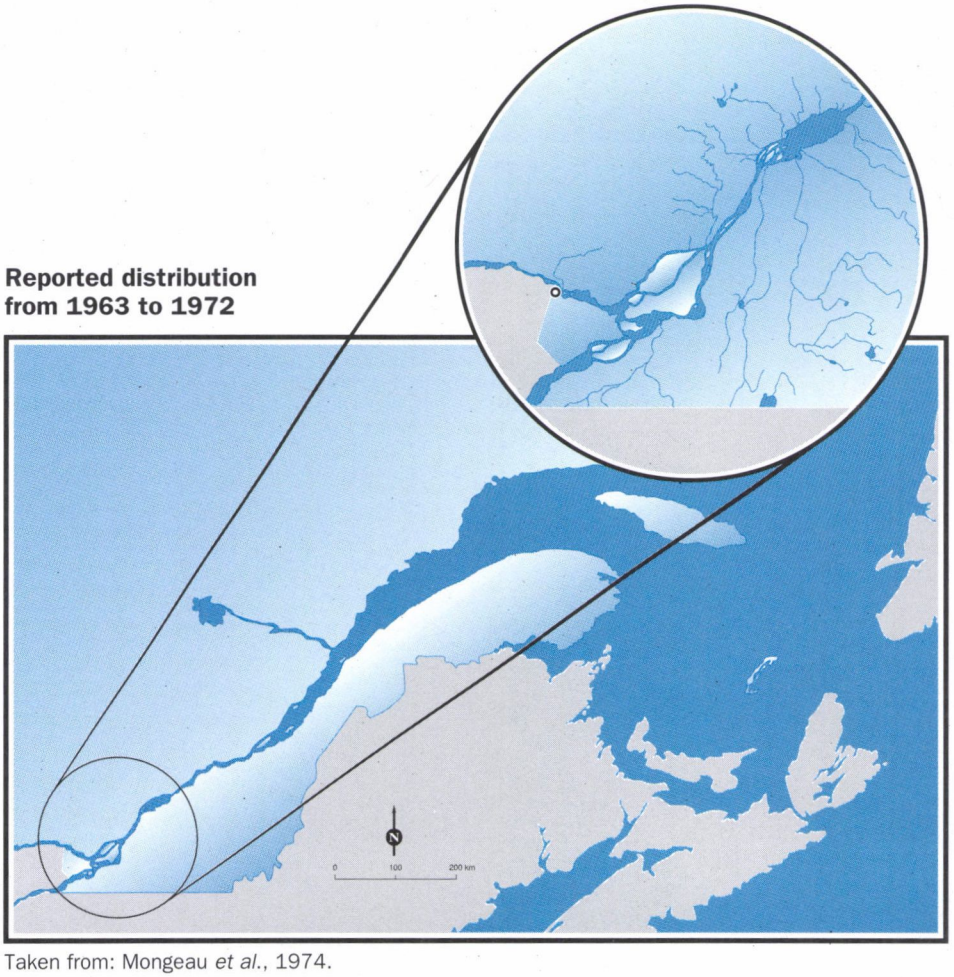
Fish

Charette creek is the Brassy Minnow's only known habitat along the St. Lawrence (Dubé, 1991). Its diet is believed to consist of phytoplankton and other algae, zooplankton and some aquatic insects (Scott and Crossman, 1974).

Spawning clearly takes place in May and June, with eggs being deposited on muddy bottoms.

Low abundance and the fragility of breeding sites along the St. Lawrence make this species a priority under the Action Plan (Lavergne, 1992).

**Reported distribution from 1963 to 1972**




Taken from: Mongeau *et al.*, 1974.

# PICKEREL FROG

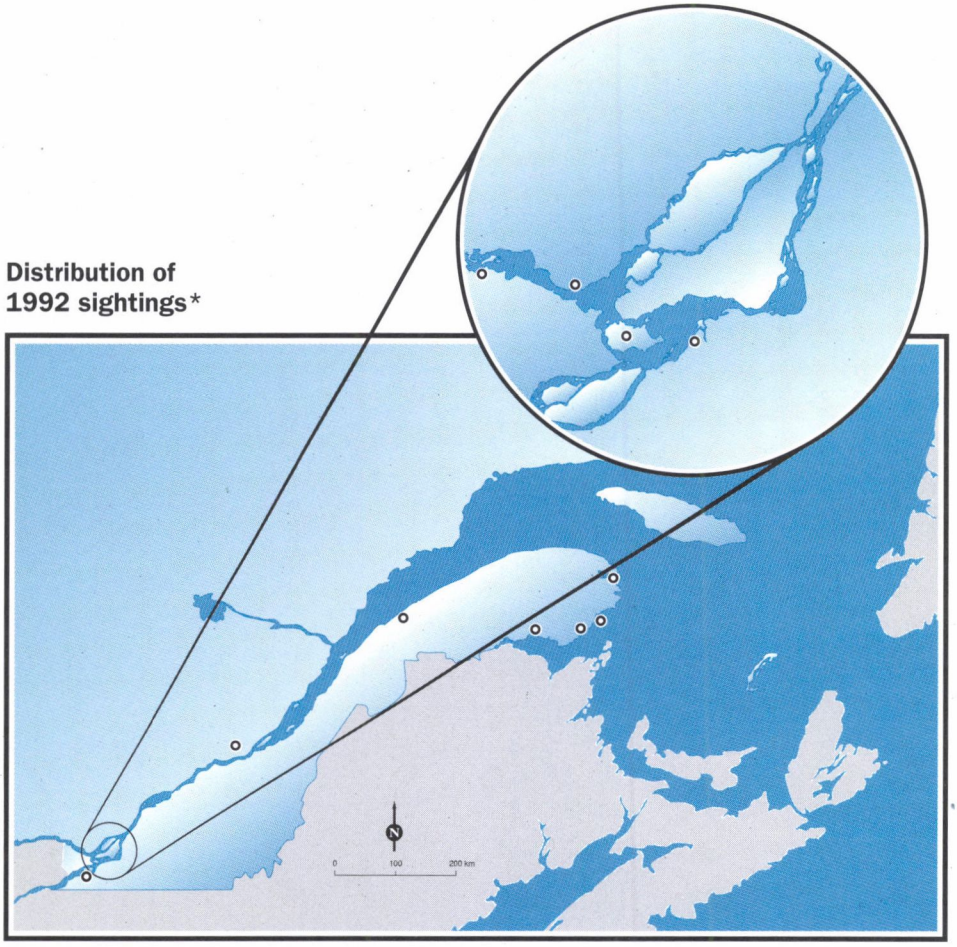
*Rana palustris*

Amphibians

The Pickerel Frog is found in south-western Québec and Gaspésie, where it lives in the cool, clear waters of lakes, ponds and springs with dense vegetation.

This creature appears threatened by the expansion of farmland and by urbanization (Dryade, 1989).

**Distribution of 1992 sightings***




Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# NORTHERN CHORUS FROG

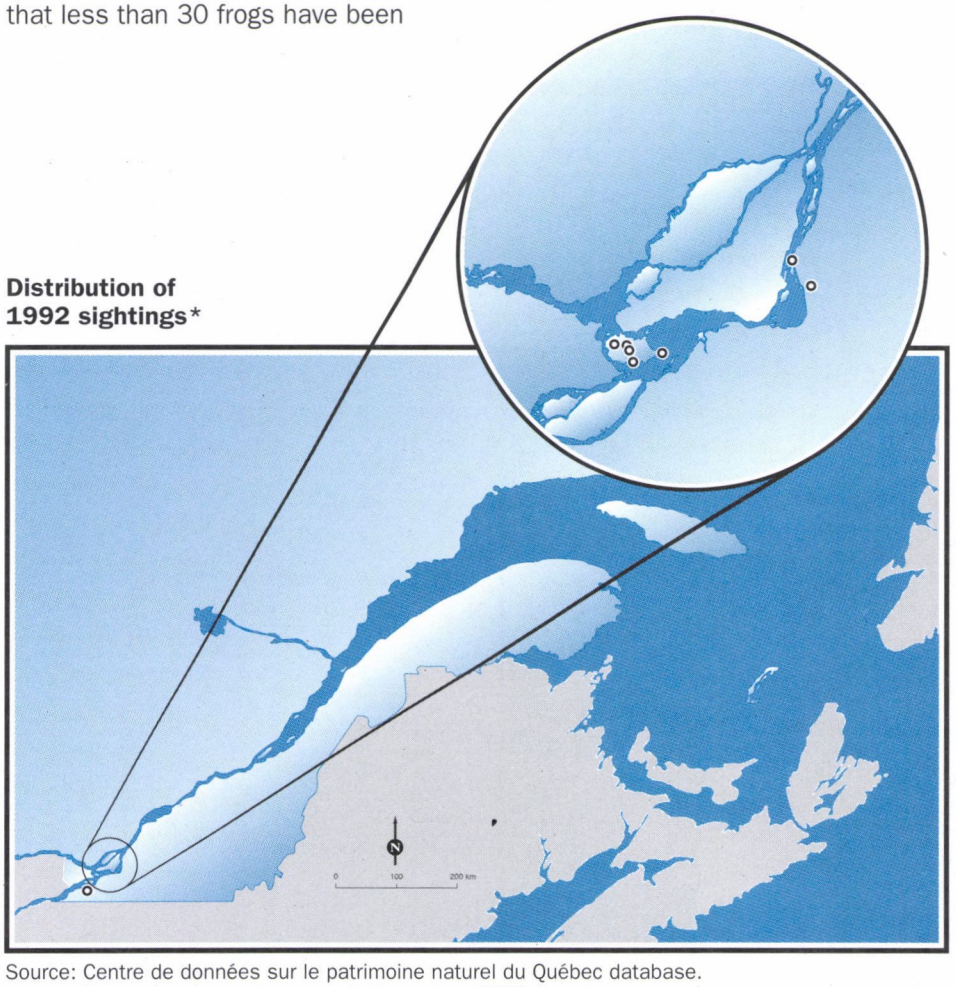
*Pseudacris triseriata*

Amphibians

This frog is found in fields and clearings upstream of Montréal (Ghanimé *et al.*, 1990). It favours meadows, wetlands and farmland (The Audubon Society Pocket Guides, 1988). On Île Perrot, for example, this species was well represented 10 or 15 years ago, but was so decimated by construction that less than 30 frogs have been heard croaking in four ponds over several nights (Bider, 1988). All the frogs were on the high plateau, an area considered marginal only a few years ago.

This species is extremely rare in southern Québec; its distribution appears to be limited to areas likely to be developed (Bider, 1988).

**Distribution of 1992 sightings***




Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# BROWN SNAKE

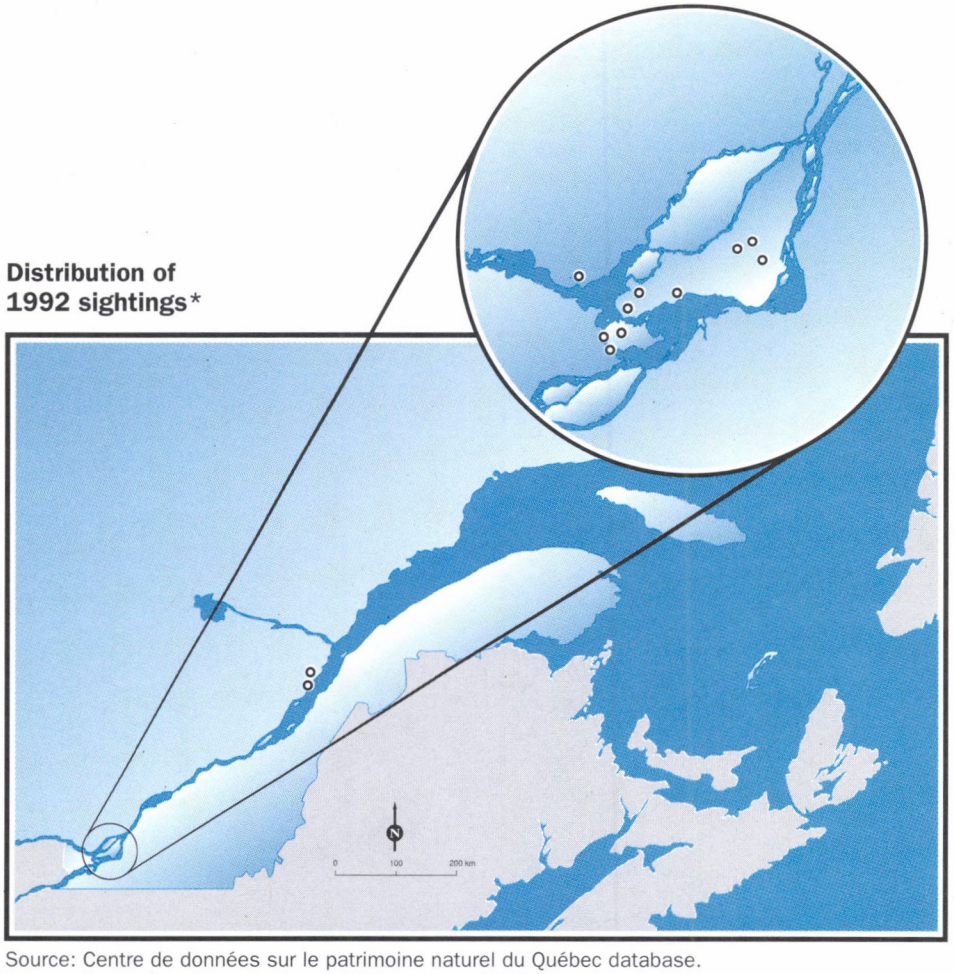
*Storeria dekayi*

Reptiles

This snake lives in clearings, meadows and fallow fields in the St. Lawrence Lowlands as far as Lake Saint-Pierre (Ghanimé *et al.*, 1990). It can be found both on beds of leaves and on flat rocks (The Audubon Society Pocket Guides, 1988).

According to Bider, a major part of its habitat on Île Perrot is being destroyed due to housing construction. In 1988, one specimen was found at Oka (Bider, 1988).

**Distribution of 1992 sightings***

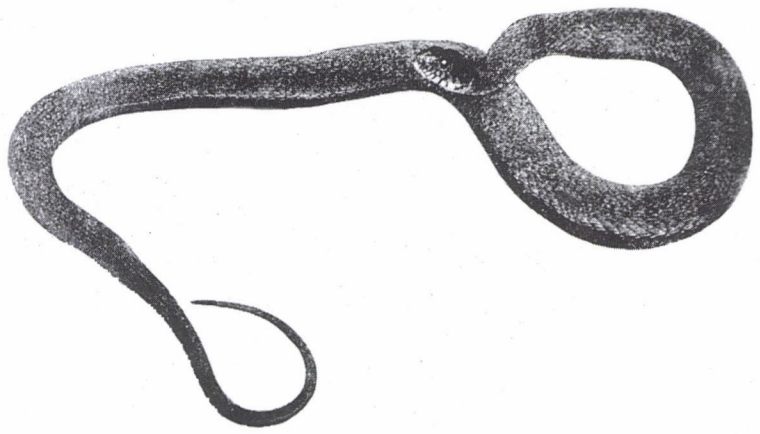



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# NORTHERN WATER SNAKE

*Nerodia sipedon*

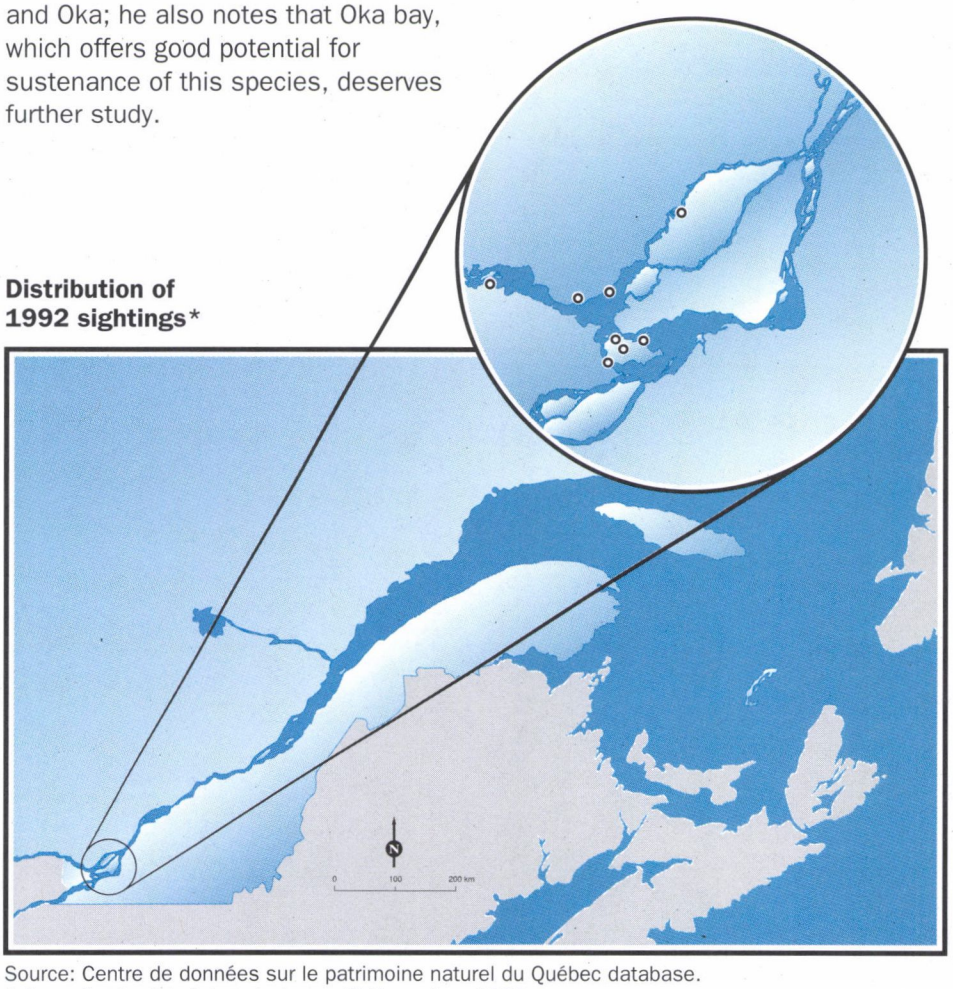
Reptiles



This snake lives at the edge of rivers and ponds, and on rocky shorelines up to Montréal (Ghanimé *et al.*, 1990). It favours sunny, damp areas (The Audubon Society Pocket Guides, 1988). Bider (1988) mentions that in 1988, the only specimens sighted were in the western part of Montréal and Oka; he also notes that Oka bay, which offers good potential for sustenance of this species, deserves further study.

Since sightings are restricted to a very limited area and former sites are now used for home construction (Bider, 1988), this species is considered a priority under the Action Plan.

**Distribution of 1992 sightings***

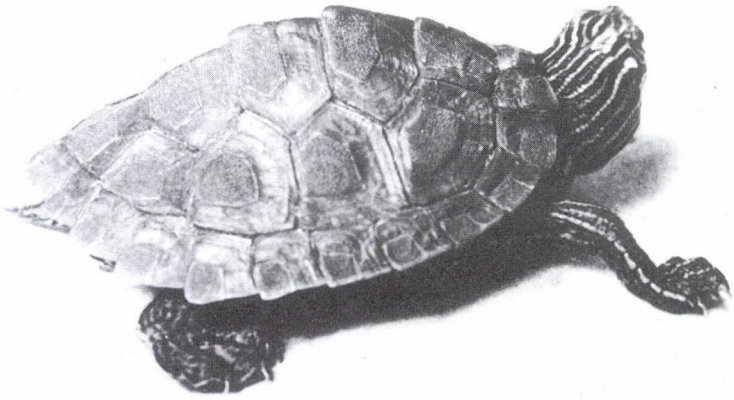



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# MAP TURTLE

*Graptemys geographica*

Reptiles

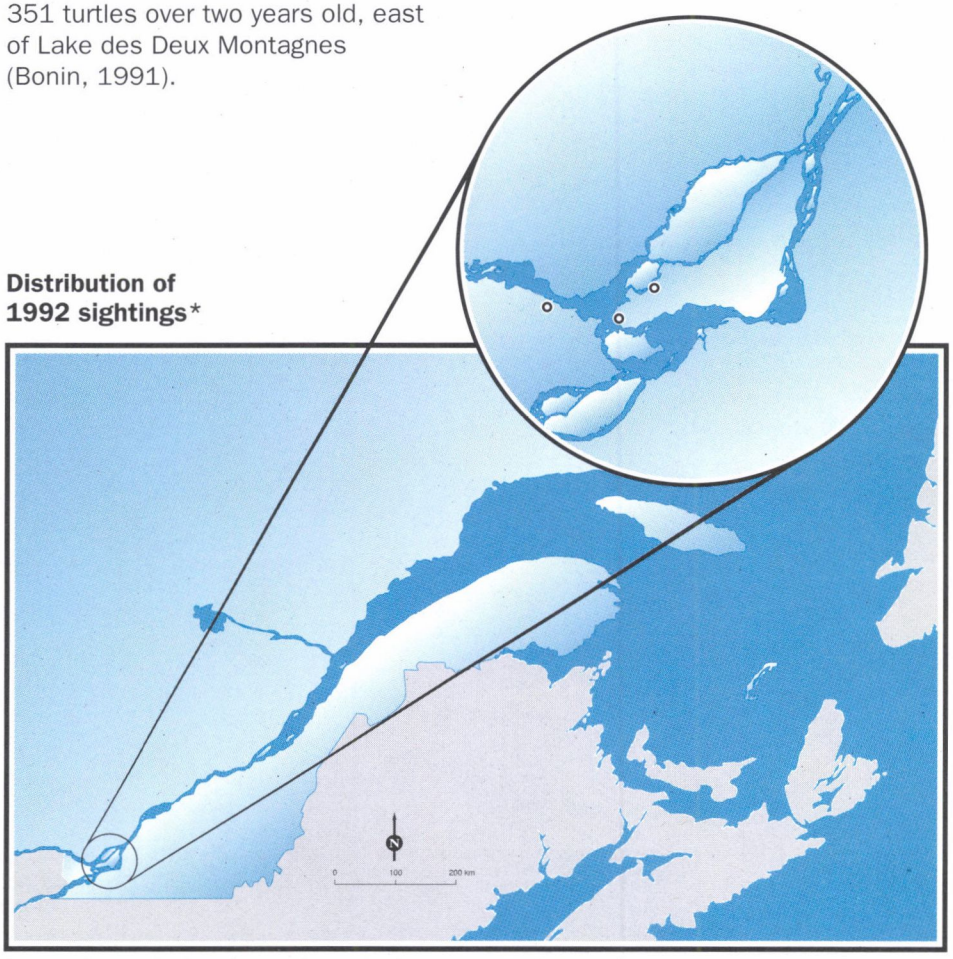


Almost exclusively aquatic, this turtle is found in the Saint-François and des Deux Montagnes lakes. It is seen regularly in only one part of Lake des Deux Montagnes, west of the island of Montréal and Île Bizard. The only demographic study available dates from 1979 and records some 351 turtles over two years old, east of Lake des Deux Montagnes (Bonin, 1991).

Its breeding success appears to have been quite limited over the past ten years (Bonin and Bider, 1990). This turtle has fairly specific needs during the summer and winter, which can only be satisfied in sites with rapidly flowing water and in bays about one metre deep (Bider, 1988). Hibernation sites for the Lake des Deux Montagnes population thus appear to be characterized by the presence of currents and turbulence which facilitate underwater breathing by increasing dissolved oxygen. Such is the case at the site upstream of the rapids at Cap-Saint-Jacques, which has two troughs over 6 m deep (Bonin, 1991).

The destruction of banks and the pollution of its habitat threaten this species (Bonin, 1991). The main known population in Québec is located in Lake des Deux Montagnes, where control structures affect water levels, and modifications to banks and intensive recreational use are the main factors threatening the turtle's reproduction and survival (Bonin, 1991).

**Distribution of 1992 sightings***

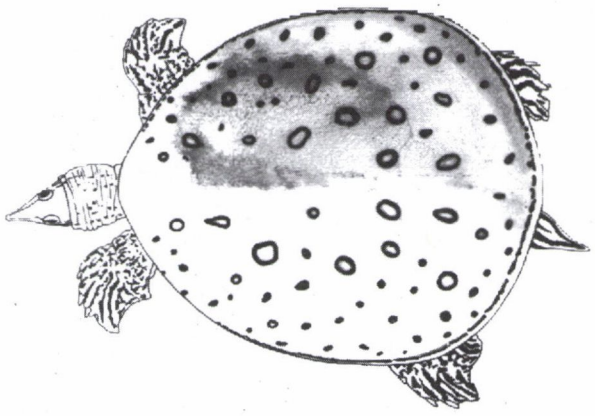



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# SPINY SOFTSHELL

*Apalona spinifera*

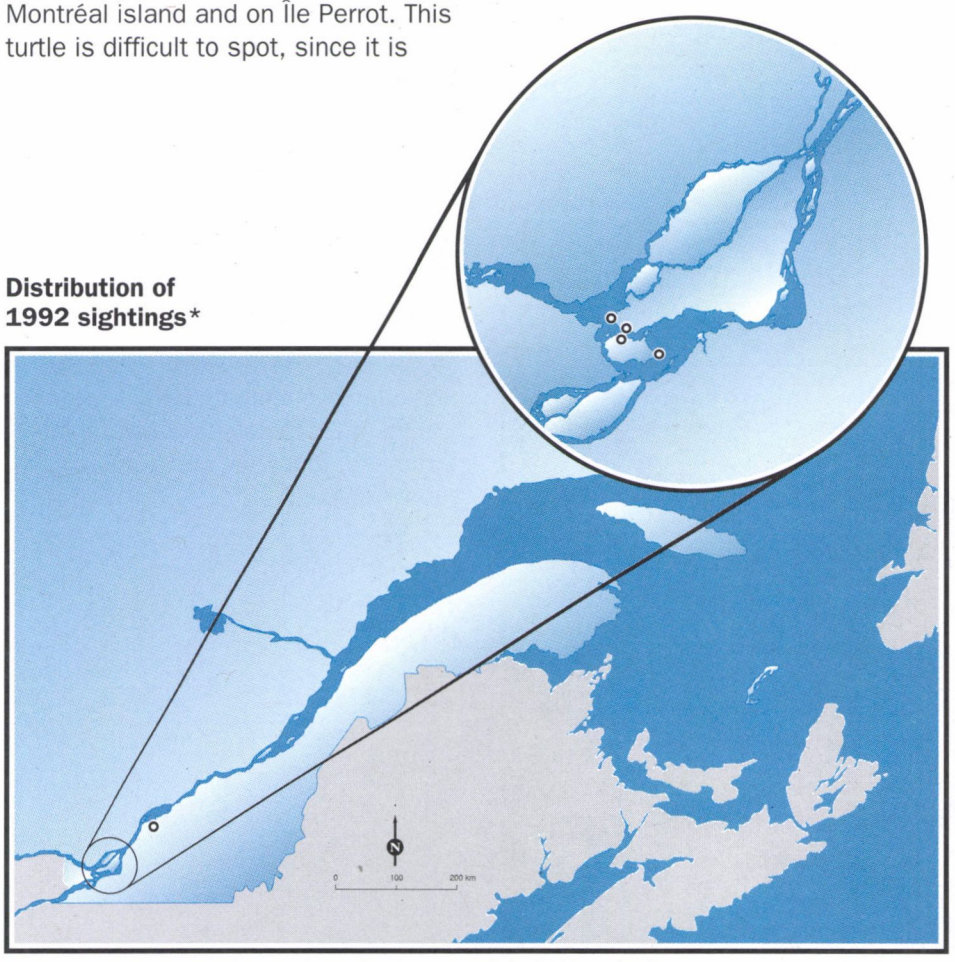
Reptiles



This turtle is found as far as Lake Saint-Pierre in sand or mud banks (Ghanimé *et al.*, 1990). It generally lives in rivers or streams with sand banks (The Audubon Society Pocket Guides, 1988). The 1988 study by Bider recalls that it was frequently sighted in the eastern part of Montréal island and on Île Perrot. This turtle is difficult to spot, since it is generally buried in the sand, with only its head visible. It can be seen skirting rapids and swimming in bays, with its head out of the water (Bider, 1988).

Apart from chemical pollution, the reduction in food supply and predation of nests, loss of habitat through recreational use of banks or their modification by humans are also factors limiting its population (Bonin, 1991a).

**Distribution of 1992 sightings***

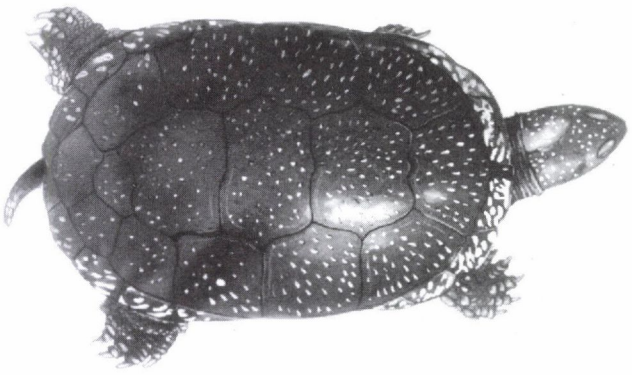



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# BLANDING'S TURTLE

*Emydoidea blandingi*

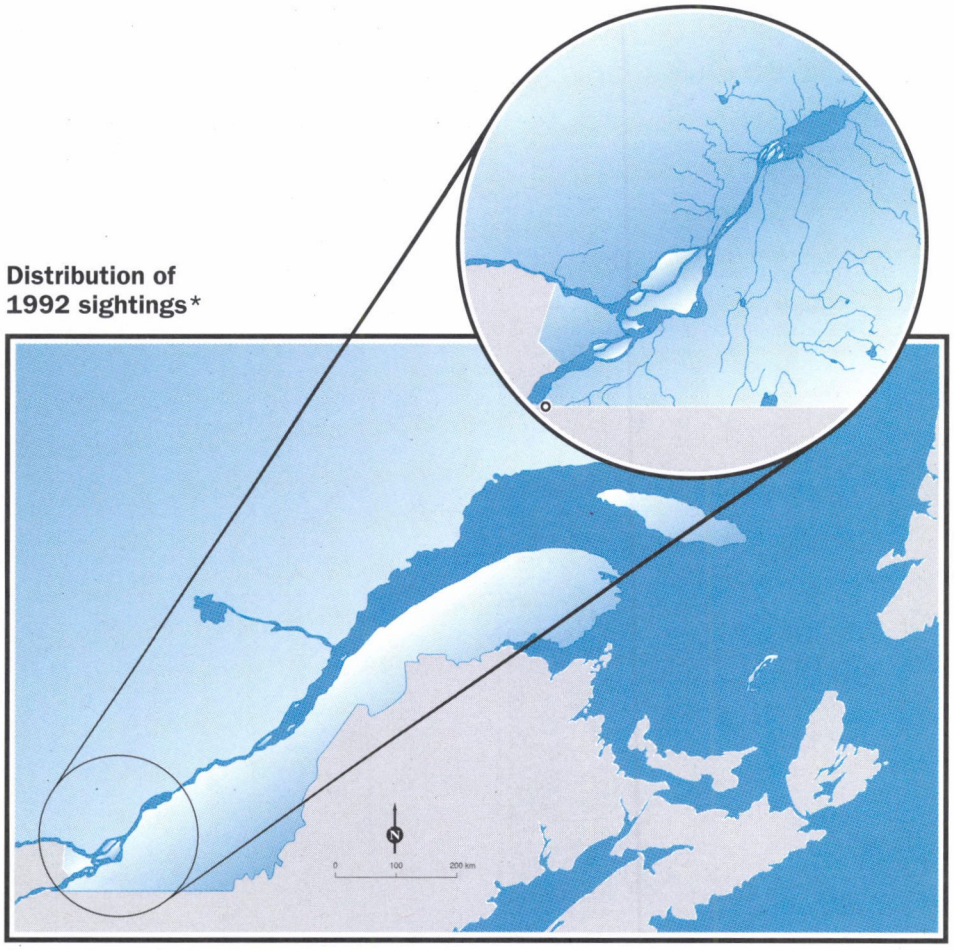
Reptiles



This turtle lives in marshes along the Ottawa River. Bider notes that the largest number of sightings date back to the late 1970s and the 1980s.

The status of threatened species in Québec has been proposed for this turtle, which has adapted well to our winters and probably has no difficulties other than with reproduction (Bider, 1988).

**Distribution of 1992 sightings***

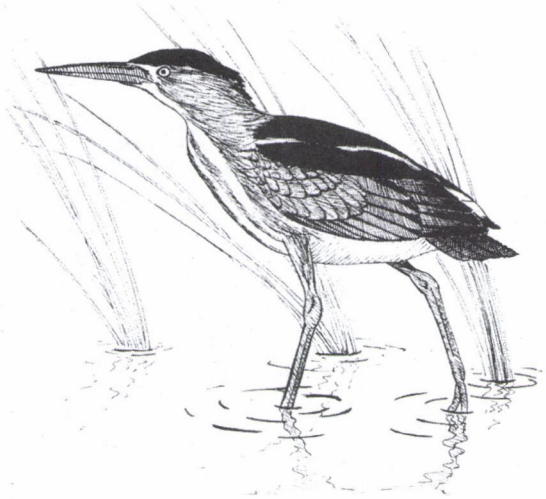



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until November, 1992.

# LEAST BITTERN

*Ixobrychus exilis*

Birds

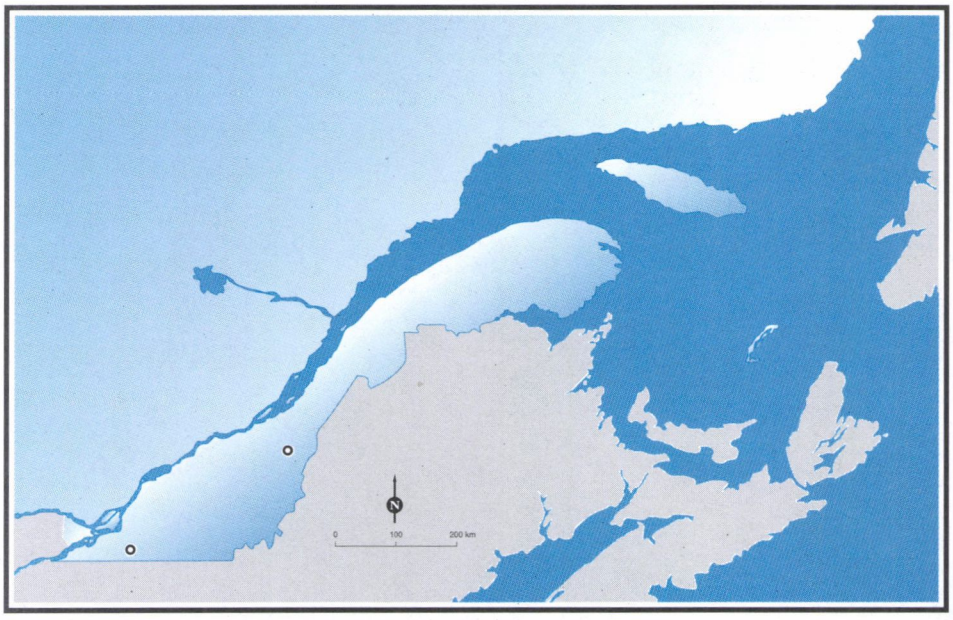


The Least Bittern is part of the Ardeidae family, commonly called herons. In Québec, it nests only in the St. Lawrence Lowlands and south-western Appalachians. It is found in cattail marshes, but also in bulrushes, reed grass, horsetails, sedges and other aquatic plants located on edges of ponds and slow-moving streams (Godfrey, 1986, cited in Robert, 1989). The Québec flock contains less than 40 pairs.

The best-known nesting sites are in the Îles de Boucherville, Lake Saint-Pierre and at Cap-Tourmente.

Loss of habitat is the main factor linked to the decline of this species (Sandilands and Campbell, 1988, cited in Robert, 1989). The destruction of wetlands has led to a considerable decline in nesting sites. These environments have been destroyed by agricultural drainage and landfilling for residential and industrial construction. Moreover, the accumulation of toxic residues in the tissues of Least Bittern is now associated with the decline of this species (Sandilands and Campbell, 1988, cited in Robert, 1989).

**Distribution of 1992 sightings***



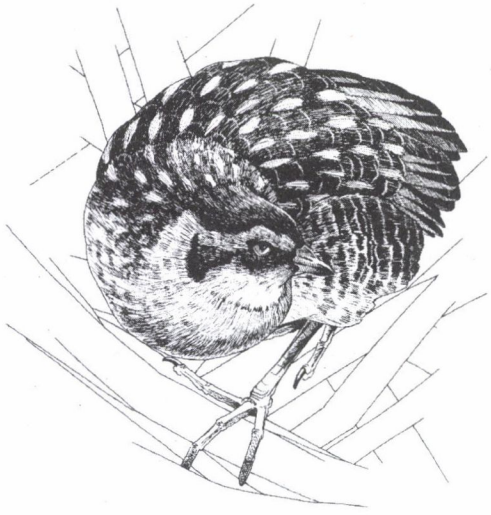

Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

# YELLOW RAIL

*Coturnicops noveboracensis*

Birds

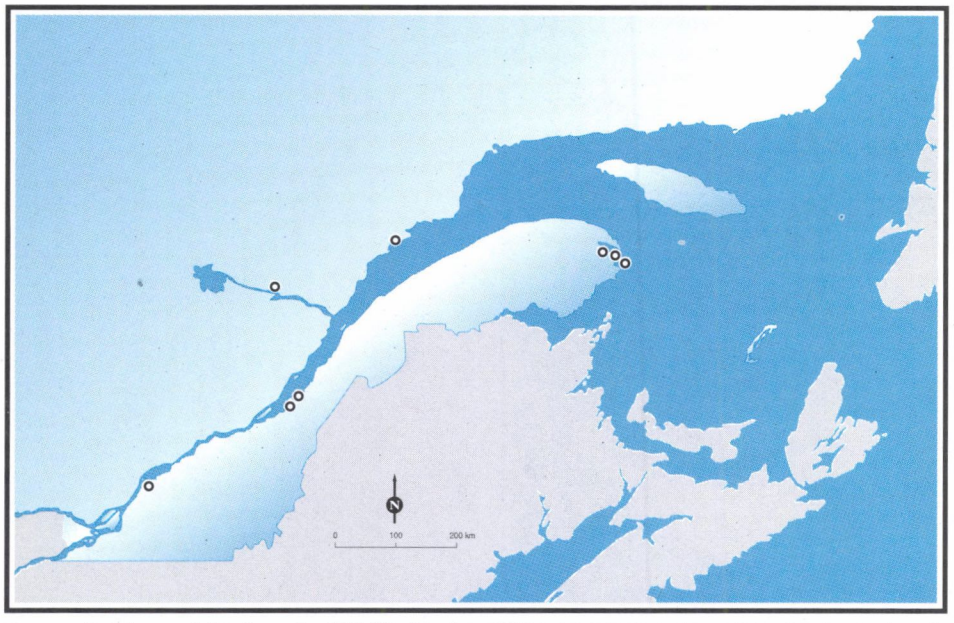


The Yellow Rail is considered a rare breeding migrant in all regions of Québec (David, 1980, cited in Robert, 1989). It has been sighted in summer in the Îles de la Madeleine, the lower St. Lawrence, the Appalachians, the St. Lawrence Lowlands and the Abitibi region (David, 1980, cited in Robert, 1989).

Hay and grain fields, and fresh, brackish or salt water marshes are frequented during the nesting period and used as overwintering grounds (Godfrey, 1986, cited in Robert, 1989).

The Yellow Rail is the type of bird whose numbers, already limited as a result of the drying up of wetlands (Robert, 1989), might drop radically without attracting any attention because it is a very "discreet" bird.

**Distribution of 1992 sightings***




Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

ACTION PLAN PRIORITY SPECIES

# SEDGE WREN

*Cistothorus platensis*

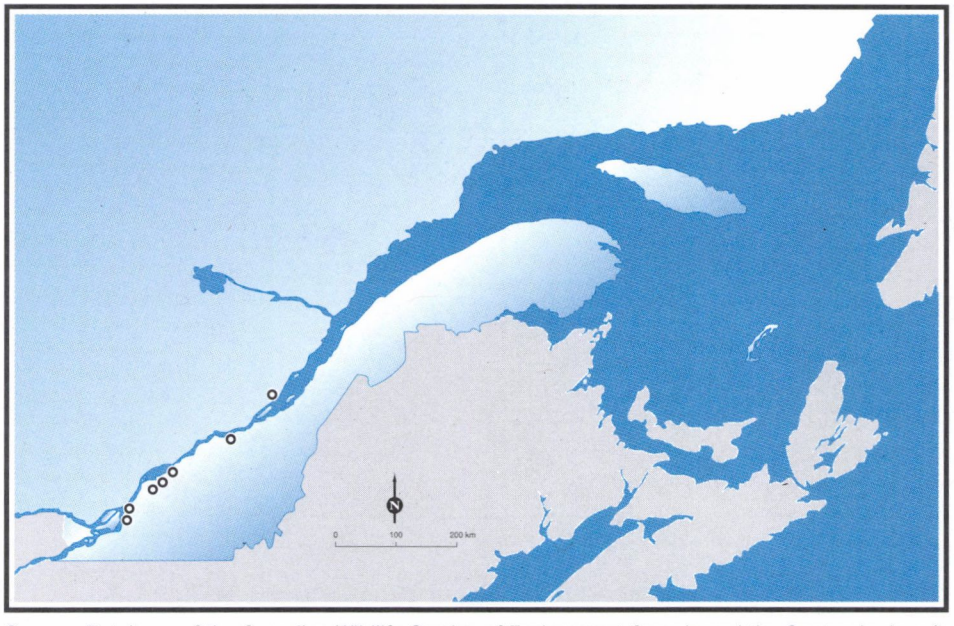
Birds

These birds mainly frequent wet meadows with sedge, where a few scattered bushes, along with marshes, damp fields and peat bogs can be found (Godfrey, 1986; Andrle and Carroll, 1988, cited in Robert, 1989). This species may nest in colonies, but such colonies are often unstable and the birds may disappear from a site for no apparent reason.

The Sedge Wren is known to nest locally in the St. Lawrence Lowlands up to Cap-Tourmente, as well as in the southern Appalachians, the Great Lakes region and the Ontario stretch of the River.

Loss of habitat linked to intensive farming practices and urbanization may be partially responsible for the current situation (Cadman *et al.*, 1987, Andrle and Carroll, 1988, cited in Robert, 1989).

**Distribution of 1992 sightings***




Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

CHAPTER 6

# *Island and Marginal Environments*

**Some islands are classical in appearance, seeming to float on the River: 601 of them have been counted along the length of the corridor. But there are other islands whose status is less clear, such as the wooded islands found in urban areas. Because they are marginal, cliffs too have some of the characteristics of islands. On the whole, however, islands are constituted of environments we have already looked at.**

Like marginal environments, islands offer the peaceful setting required for species reproduction. For birds, water bodies in close proximity are a good source of the food necessary to brooding and the raising of young.

## *Island sanctuaries*

Island sanctuaries are mainly formed by the many islands dotting the St. Lawrence River. Depending on their area and location, islands are most often comprised of one or more of the environments already presented in the preceding chapters. As such, we will not repeat the description of these environments or their representative species.

Based on photographs taken in 1989 by Landsat satellites, islands are thought to occupy 143 000 ha between Cornwall and Tadoussac. Open environments total 74 percent of this surface area, whereas forests and wetlands account for 20 and 6 percent, respectively. The island of Montréal alone occupies one-third of the total surface area of these islands (Létourneau, 1992).

A 1990 study by the firm EAT Environnement counted 261 islands between Cornwall and Lake Saint-Pierre. The results of this study indicate that the islands are preferred nesting areas for waterfowl and colonial nesting birds. There are close to 115 islands in the Estuary and over 225 in the Gulf, if we group them together in consideration of the main archipelagos (St. Lawrence Centre, 1992).

Island sanctuaries are used as breeding grounds by many species of birds, thereby supporting a high nest density. Among the 214 heronries reported in Québec (Bélanger and Tremblay, 1989), those located on islands support the highest densities. Heronries do not present a uniform picture: some are found on clay or granite substrates, others in wooded areas or on farmland. Island environments are diversified, thereby offering maximum protection from predators and even greater protection from harassment (Lemay, 1987).

As for Harbour Seal and Grey Seal, they use the islets and rocky islands of the Gulf as calving grounds.

It should be noted that any isolated habitat can also be considered an island sanctuary; this is the case of wooded pockets in urban areas.

## *Marginal environments*

Along the fluvial corridor, cliffs are located mainly on the Côte-Nord and the Gaspé peninsula. The cliffs and

rocky escarpments formed by cornices are ideal for nesting, particularly for seabirds and birds of prey. These environments provide protection from predators and also provide accessible food since they are located close to the water. The sparse vegetation is composed mainly of herbaceous plants which have adapted to dry conditions (Lemay, 1987).

## *Action Plan priority species*

Sixty-seven species of priority vascular plants have been reported in island or marginal environments in a one kilometre-wide strip along the River; but 23 species were sighted exclusively in marginal riverside environments (table 7). The 44 other species have been sighted in both these environments and in one or another of the wetland, forest and open environments. As for wildlife, a total of six bird species have been designated priority species associated with island and marginal environments. The following pages contain data sheets for some of the plant species and each of the priority animal species associated with these environments.

**Table 7 List of priority vascular plants seen only in the marginal riparian environments of the St. Lawrence**

*Angelica laurentiana*
*Antennaria straminea*
*Arctostaphylos rubra-P09,P11**
*Arnica griscomii ssp. griscomii*
*Astragalus robbinsii var. fernaldii*
*Calamagrostis purpurascens var. purpurascens*
*Carex muhlenbergii*
*Cypripedium calceolus var. planipetalum*
*Cypripedium passerinum var. minganense*
*Draba aurea-P01,09**
*Draba glabella var. pycnosperma*
*Erigeron compositus*
*Erysimum inconspicuum var. coarctatum*
*Gentianella propinqua ssp. propinqua-P09, P11**
*Poa fernaldiana*
*Poa secunda*
*Rosa williamsii*
*Sporobolus asper var. asper*
*Sporobolus heterolepis*
*Taraxacum latilobum*
*Woodsia alpina*
*Woodsia oregana*
*Woodsia scopulina*

Source: Lavoie, 1992.

* The symbol P (population), followed by a figure corresponding to the number of the administrative region after the name of a species, indicates that this species is considered likely to be designated threatened or vulnerable in only this part of its Québec range.
P01: Bas-Saint-Laurent; P09: Côte-Nord; P11: Gaspésie, Îles de la Madeleine.

SLC - Danielle Gingras

# SMALL WHITE LADY'S SLIPPER, var. MINGANIE

*Cypripedium passerinum var. minganense*

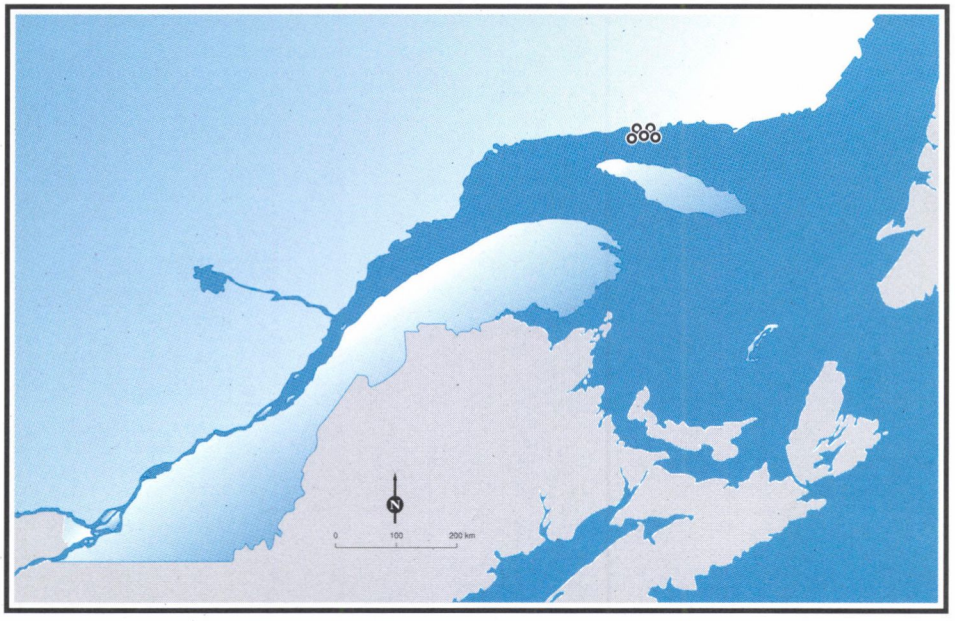
Vascular plant

This plant variety is endemic to the Gulf of St. Lawrence and has only been reported on the heaths and sea-cliffs of five of the Minganie islands.

Plants flower briefly in early July.

This plant has a very small range, a limited habitat and attracts collectors, thus its precarious state and its identification as a priority species under the Action Plan.

**Distribution of 1993 sightings***




Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until March, 1993.

# OREGON WOODSIA

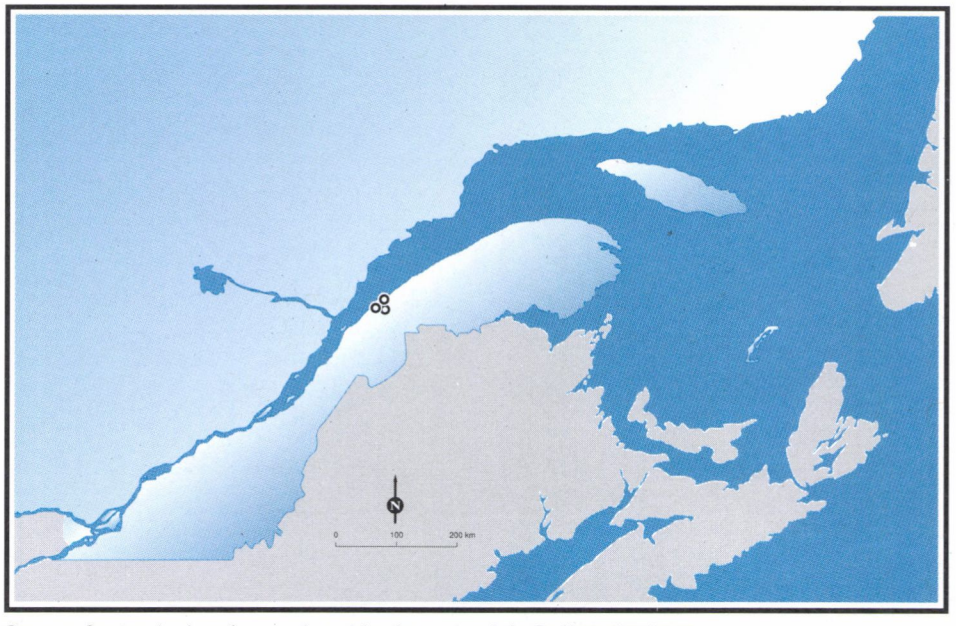
*Woodsia oregana*

Vascular plant

This fern's main range extends from the western Cordilleras to the Pacific, before it is broken up around the Great Lakes, in the Outaouais and the Bic Conservation Park. The Park's population is limited to a few individuals growing in crannies in a limestone cliff.

Specimen overcollection coupled with the plant's highly limited distribution make it a threatened species in Québec.

**Distribution of 1993 sightings***

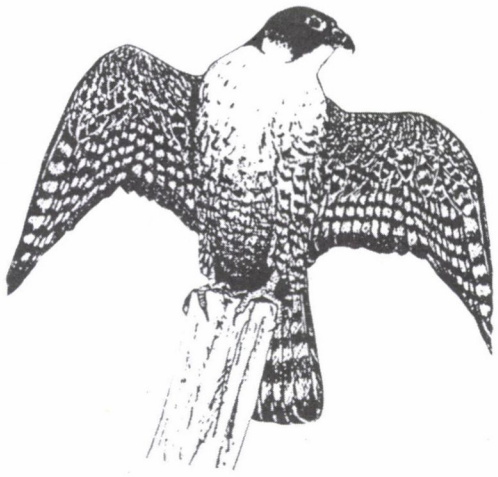



Source: Centre de données sur le patrimoine naturel du Québec database.
* According to data integrated up until March, 1993.

# PEREGRINE FALCON

*Falco peregrinus ssp. anatum*

Birds



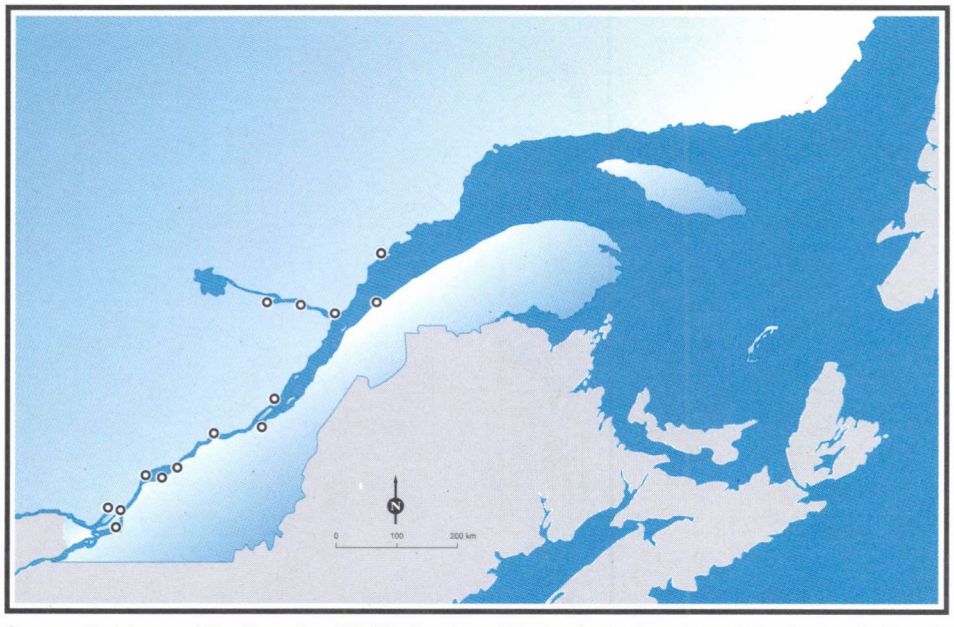
Québec's Peregrine Falcon population counts over 100 breeding pairs. This species does not build nests, but usually nests on cliff cornices. In urban settings, this falcon nests on artificial structures such as skyscrapers and bridges. Several years ago, a couple nested atop the Sun Life Building in the heart of downtown Montréal. They feed mainly on birds which they kill in flight, and often hunt along the coast and waterways where many birds gather. In urban areas, this species feeds mainly on pigeons (Godfrey, 1988, cited in Robert, 1989).

In southern Québec, Peregrine Falcon nests have been reported recently in the Outaouais and in regions of Montréal, the Estrie, Mauricie, Québec, Saguenay and Bas-Saint-Laurent. Of the 11 sites occupied by Peregrine Falcon in southern Québec in 1992, seven were located in the St. Lawrence corridor.

The use of DDTs and other organochlorinated pesticides is today felt to be responsible for the radical drop in populations and the disappearance of the species in southern Québec in the late 1960s. Depending on the concentration of these products in the birds' tissues, when the falcons were not simply poisoned to death, their eggs were often infertile, with shells that broke under the weight of adults (Mackenzie, 1977, cited in Robert, 1989).

In 1970, a recovery program was developed, under which 255 young falcons were released between 1976 and 1992. Birds were released in Hull (66), in the Montréal area (65), in the Trois-Rivières area (2), in the Québec area (35), at Kamouraska (21), at La Pocatière (12), in Jacques-Cartier Park (3), at the Palissades (7), in the Bic Conservation Park (14) and at Forillon (30). This program has promoted the return of the species to these areas, and the objectives of the Québec recovery plan were attained by 1990.

**Distribution of 1992 sightings***



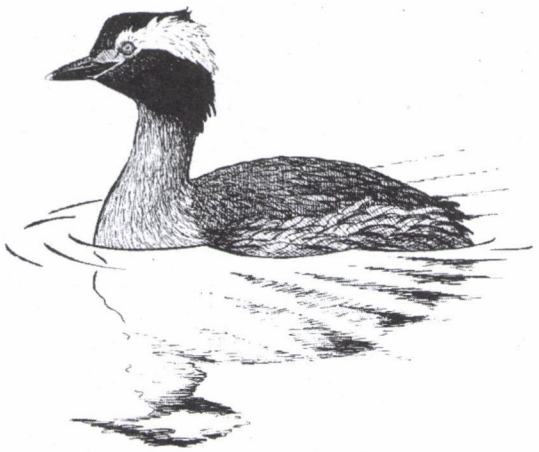

Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

# HORNED GREBE

*Podiceps auritus*

Birds

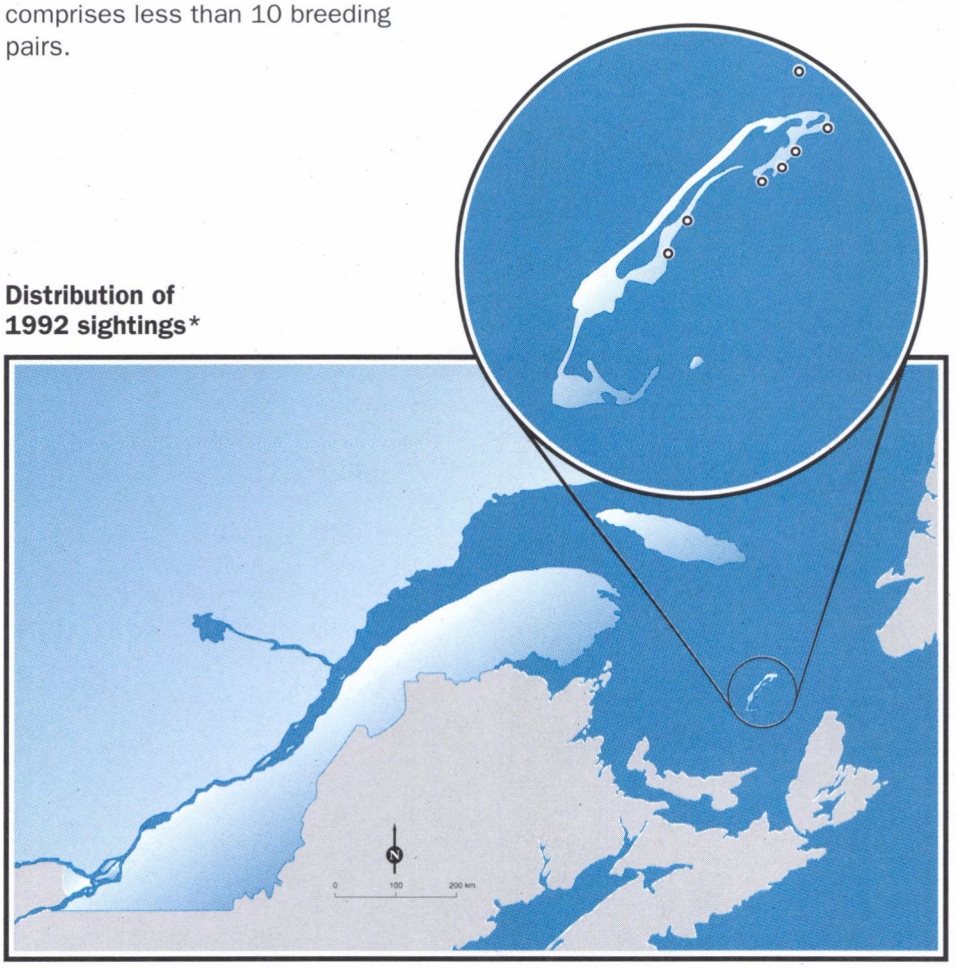


This Grebe is much more common during the migratory season. In fact, although western birds mainly migrate along the Mississippi Valley, Horned Grebe are sighted most especially in the spring and fall in Québec. Québec's Grebe population probably comprises less than 10 breeding pairs.

In Québec, the Horned Grebe appears to nest only in the Îles de la Madeleine. This archipelago is the only site in eastern North America where the species nests regularly (Mousseau, 1976; David, 1980, cited in Robert, 1989).

At the present time, the Îles de la Madeleine are the only part of the province where this species is known to breed. The Horned Grebe is thus considered a vulnerable species in the St. Lawrence corridor (Robert, 1989).

**Distribution of 1992 sightings***



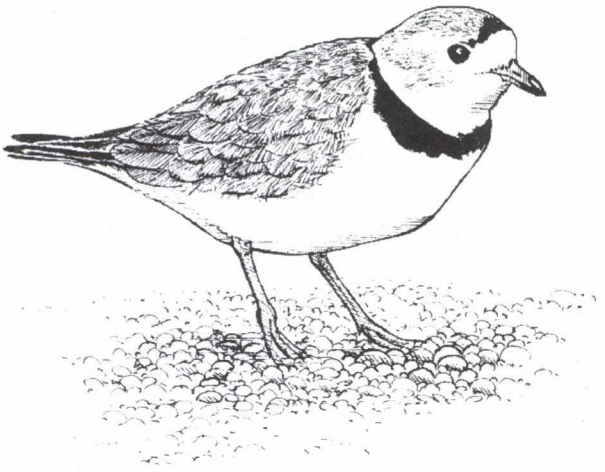

Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

# PIPING PLOVER

*Charadrius melodus*

Birds

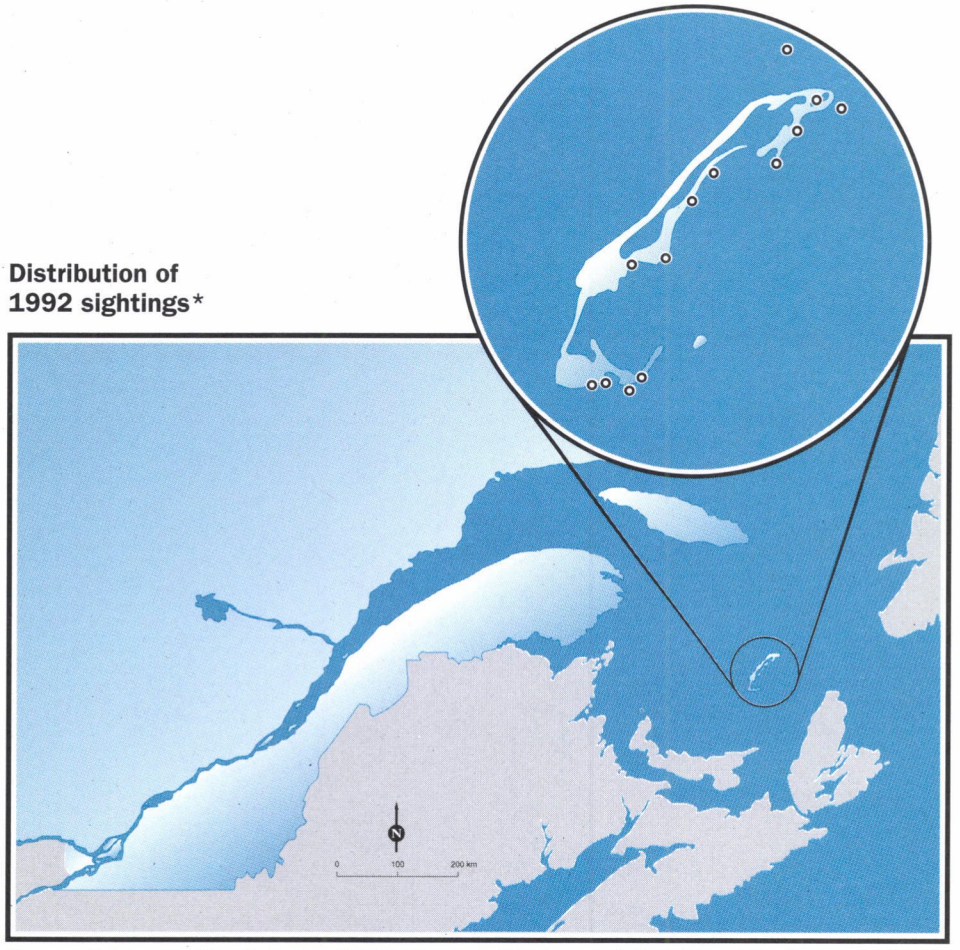


An exhaustive 1987 census found 37 breeding pairs in the Îles de la Madeleine (Robert, 1989).

In Québec, Piping Plover nest only in the Îles de la Madeleine. In the past, these birds nested marginally on the Basse-Côte-Nord and in Gaspésie. They nest on beaches, where the sand is sprinkled with pebbles and shells (Robert, 1989).

Human disturbance is a major threat to Piping Plover in the Îles de la Madeleine. An estimated 9 percent of nests were crushed by motorized vehicles in 1987 (Robert, 1989). Natural factors such as high tides and storms contribute to the destruction of about 17 percent of nests (Robert, 1989). A protection and awareness program was introduced in the Îles de la Madeleine in 1989, and 44 breeding pairs were reported in 1992 (Laporte, 1992).

**Distribution of 1992 sightings***




Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

ACTION PLAN PRIORITY SPECIES

# BALD EAGLE

*Haliaeetus leucocephalus*

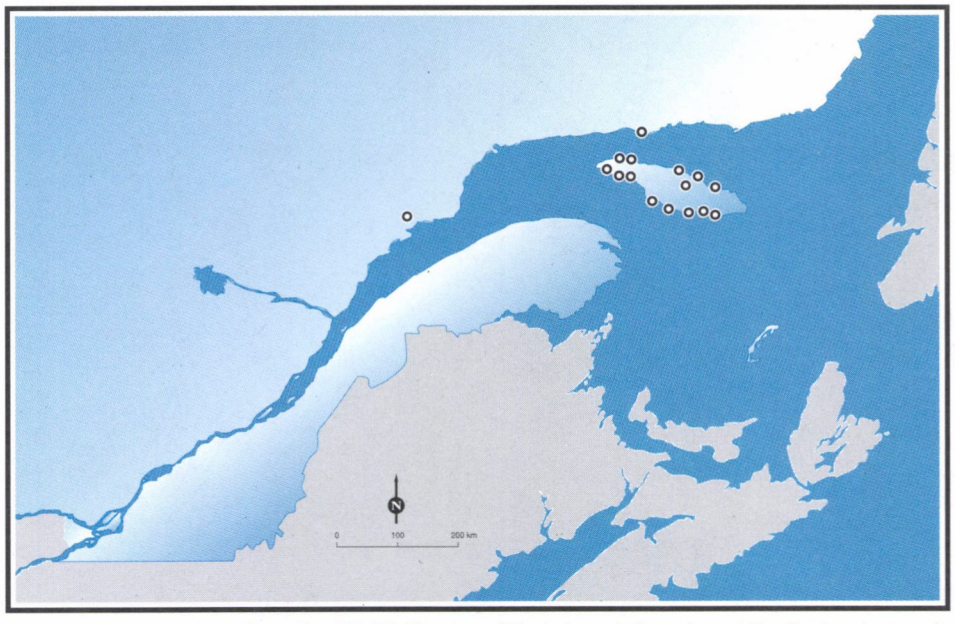
Birds

The Bald Eagle is found all along the Côte-Nord of the St. Lawrence, but most especially on Anticosti Island (David, 1980; Oldham, 1985, cited in Robert, 1989).

Bald Eagles usually nest in tall trees that tower over the surrounding environment and, occasionally, in cornices (Robert, 1989).

The decline of these birds of prey can be traced to the accumulation of organochlorinated pesticides in their tissue, the thinning of eggshells, the premature death of embryos or simply the poisoning of adults (Oldham, 1985, cited in Robert, 1989). A certain number of birds also perish when they collide with electrical wires. In addition, Bald Eagles are often disturbed by nature-lovers, climbing up to their nests.

**Distribution of 1992 sightings***



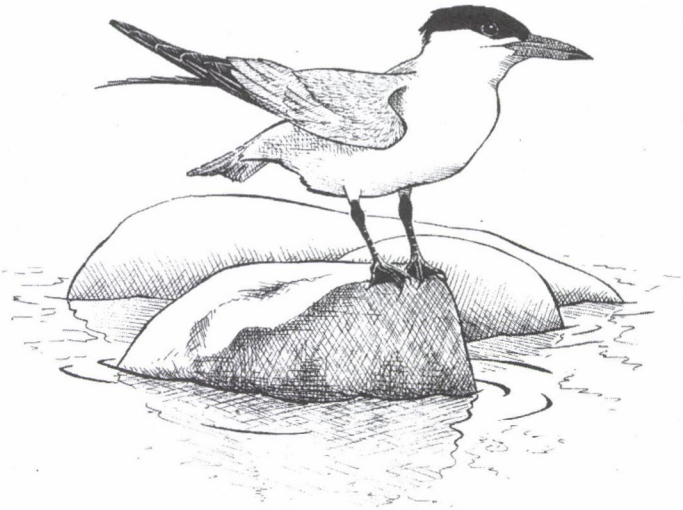

Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

# CASPIAN TERN

*Sterna caspia*

Birds

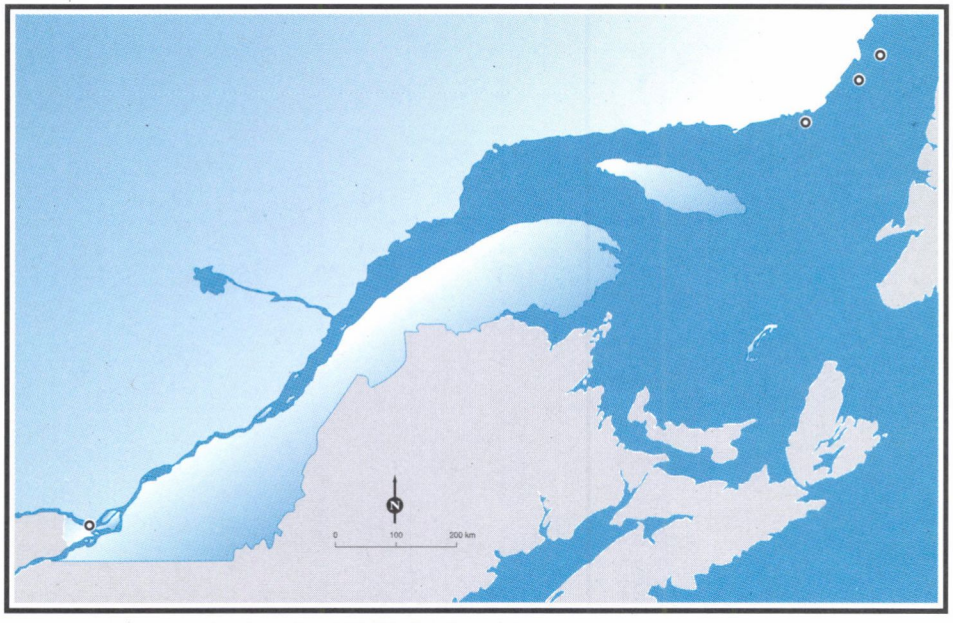


Québec's breeding population currently amounts to only about 30 birds (Robert, 1989). The Caspian Tern feeds exclusively on fish, which it catches by diving.

In Québec, Caspian Terns nest exclusively on Île à la Brume on the Basse-Côte-Nord, an area which they share with other tern and gull species (Robert, 1989). Although Île à la Brume has been a protected area since 1925, the number of Caspian Tern nesting there has declined considerably. These birds may nest elsewhere in the St. Lawrence corridor, but we have no reports of this.

The very small number of birds recorded in recent years suggest it may be becoming extinct. Factors such as egg-collection by humans and disturbance of the birds may be to blame (Robert, 1989).

**Distribution of 1992 sightings***



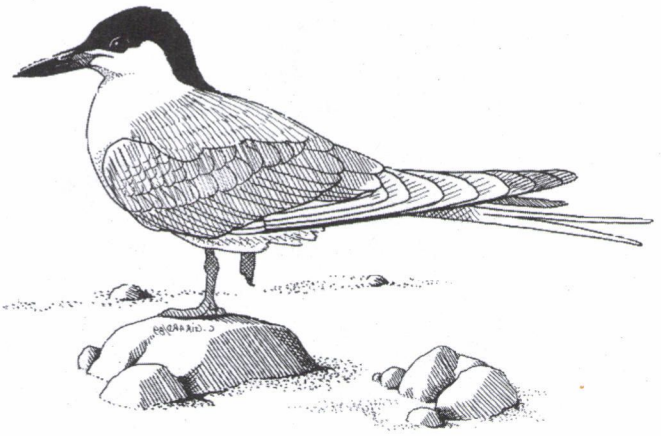

Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

# ROSEATE TERN

*Sterna dougallii*

Birds

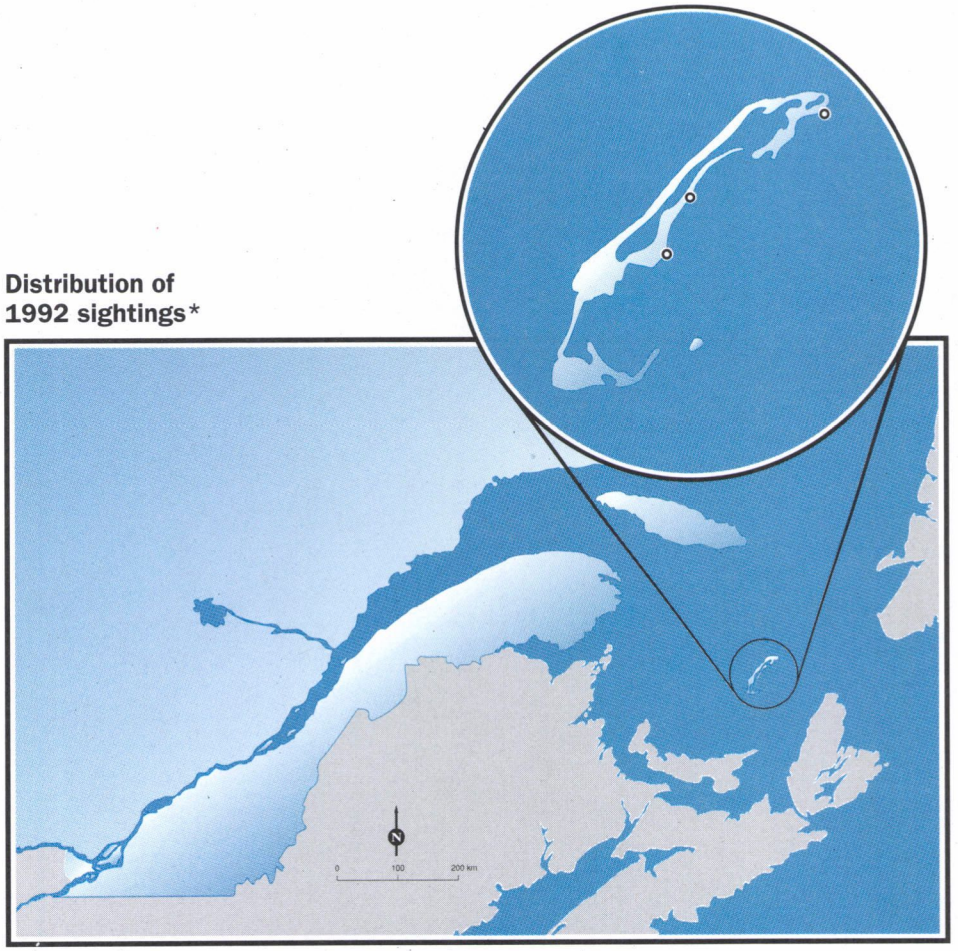


Only five pairs have been counted in the province (Hardy, 1979; Kirkham and Nettleship, 1985, cited in Robert, 1989).

In Québec, the Roseate Tern breeds only in the Îles de la Madeleine.

It is believed that the collection of eggs by humans is responsible for the decline of this species. Other factors, such as the spread of gull populations, also appear to have caused colonies to move. What's more, Roseate Terns are highly selective in their choice of nesting sites (Kirkham and Nettleship, 1985, cited in Robert, 1989).

**Distribution of 1992 sightings***




Source: Database of the Canadian Wildlife Service of Environment Canada and the Centre de données sur le patrimoine naturel du Québec.

* According to data integrated up until November, 1992.

CHAPTER 7

# *Alteration and Modification of Fluvial Corridor Environments*

**Pesticides, waste, toxic materials, noise, hydrocarbons, dams, cottages and recreational activities, wave action, roads, bridges, excavations, landfill operations, dredging... the list of obstacles, harassment and stresses on the plant and animal life of the corridor seems endless. The loss of wetlands and physical changes to fish habitats are significant. More than ever, understanding and conservation are the pillars of any actions aimed at protecting the corridor.**

The natural environment is constantly changing, but certain repercussions follow its use by humans to increase productivity or for development linked to urbanization, agriculture or recreation. Some human activities are detrimental to the natural environments and species of the St. Lawrence. These activities will be dealt with briefly in this chapter.

Each environment in the St. Lawrence corridor will be affected differently, depending on the nature and intensity of the stresses it undergoes. Wastewater, dirty snow, industry and farming, shipping and spills are among the major sources of pollution (Environment Canada, 1991).

Human activities reduce the potential of habitats suited to aquatic and semi-aquatic wildlife species as a result of the chemical (pH, dissolved oxygen, temperature, turbidity), and physical conditions (grain size, nature of substrate, current speed, depth), conditions that are extremely important to the survival of certain species. Artificial variations in water quantity and level, excavation, landfill operations, dredging (particularly to deepen ports) and the widening of canals are all direct threats to natural resources (Lemay, 1987).

Certain chemicals are involved in the deterioration of pelagic environments and permanently flooded wetlands. These substances seem to constitute a major threat to the survival of certain species. Autopsies conducted on Beluga whale carcasses have revealed the presence of Mirex, PAHs and PCBs. These substances could be responsible for certain types of cancer in these marine mammals (Béland and Martineau, 1986).

For species living in urban environments, the disturbance, division and transformation of their territories are the side-effects of residential or commercial development. When disturbances reach extreme levels, survival becomes impossible. Certain bird and mammal species require a minimum of woodland and plant cover to meet their vital requirements.

The use of pesticides has a significant impact on agricultural land; many birds are directly threatened and the food chain disrupted. The Peregrine Falcon is an example of this phenomenon. Because of the use of DDTs, its eggs were no longer hatching and the species was in the process of extinction (Robert, 1989). Other factors have to do with the expansion of farmlands, the use of heavy farm machinery and cultivation activities favouring the introduction of species that tend to overgrow others, thereby reducing the number of less competitive plants (Lemay, 1987).

Forest environments are disrupted by logging operations, agriculture, residential developments and recreational activities. Birds, particulary those species which feed and nest in trees, suffer from the effects of logging. Being very sensitive to noise, birds nesting near logging areas will even abandon or destroy their nests (Lemay, 1987).

## *Human activities*

### Drainage, channelization and dyke construction

Underground drainage, the digging of shipping channels and construction of dykes: these activities reduce the surface area of wetlands and transform them into terrestrial ecosystems. These developments result in flow changes that alter the hydraulic regime and heat balance of certain sectors; they also interfere with the migration of certain fish species and change the structure of fish communities (Environment Canada, 1991).

In addition to sharply increasing the water's turbidity and to stripping banks, these projects generally cause food reserves to decrease or even disappear. They also destroy nesting sites and spawning grounds by affecting wetlands, which are indispensable to the survival of bird and fish species (Sarrazin *et al.*, 1983).

### Landfilling

The most urbanized regions are undoubtedly those where the effects of landfill operations are the most visible. In Montréal, for example, highways that encroach on the River have been built to reach islands or theme parks, while condominiums have replaced the bird sanctuaries of a few years ago (Sarrazin *et al.*, 1983). The case of the La Prairie basin is telling: between 1948 and 1976 – that is, in less than 30 years – 227 ha of habitat (emergent aquatic plant communities, herbaceous vegetation and scrubland) were lost, while there has been an increase of 1 385 ha in the residential zone (Sarrazin *et al.*, 1983).

One characteristic of landfill operations is the ripple effect, where "one encroachment attracts another" (Delisle, 1977, cited in Sarrazin *et al.*, 1983). All sectors are not affected to the same degree, but the overall problem is significant enough to be considered one of the main causes for the deterioration of the St. Lawrence natural environments. The destruction of wetlands leads to the disappearance of wildlife species and, according to Kelley (cited in Sarrazin *et al.*, 1983), animals thus evicted are doomed. Contrary to popular belief, they will not necessarily settle elsewhere, for three main reasons:

- *Territoriality* means that the number of breeding pairs per unit area is relatively constant among several species, especially birds. Those which fail to find room are reduced to celibacy and do not breed

- The *carrying capacity of the environment* is fixed, which means that the number of individuals in a given space cannot increase indefinitely without endangering the group as a whole

- The *homing instinct* is a strong force in many species. It causes breeding individuals to return to their place of birth, no matter how that site may have been disturbed during whatever length of time they were absent.

In addition to the direct effects, indirect effects are also a major problem: loss of soil fertility, increased erosion, lowering of the water table, greater fluctuations in water flows and levels, a remarkable increase in sediment load and turbidity and changes to chemical composition (Darnell *et al.*, 1976, cited in Sarrazin *et al.*, 1983).

The aquatic fauna is most affected by changes to these environments. A striking example is the deterioration of the only coastal wetlands on the Atlantic coast of the United States, which caused annual losses of $86 million to fisheries (in 1977 dollars), simply because of an imbalance in the food chain (World Conservation Union, 1980, cited in Sarrazin *et al.*, 1983).

### Electricity production and transmission

The problems caused by energy production come primarily from the construction of hydro-electric, thermal and nuclear generating stations, (Sarrazin *et al.*, 1983). Neither can the impact of access roads and construction sites in the transformation of habitats be overlooked. As soon as work starts, wildlife habitats are usually lost at the construction site itself. As such, nesting and migration patterns have been altered at the site of hydro-electric generating stations at Beauharnois, Les Cèdres, Rivière-des-Prairies and Carillon. Land flooding often follows, leading to the organic pollution of water and stresses on fish, the destruction of riparian habitats, and the disappearance of vegetation and nesting grounds. Accidental spills of hazardous products are also a problem, one which has even more serious consequences for the environment.

Once the generating plant is completed, the maintenance and construction of energy transmission systems cause other impacts on the environment. There follows extensive use of herbicides to maintain clearance for overhead transmission lines. These herbicides may be carried along by runoff waters and have harmful consequences for the aquatic environment.

Overhead wires also affect birds: birds of prey, waterfowl and passerines are exposed to collisions with overhead power lines and electrocution (Sarrazin *et al.*, 1983). The construction of underwater transmission lines, such as those at Grondines, also has a significant impact on the aquatic environment (turbidity, dissolved oxygen).

### Changes in water flow and quantities

There are many consequences associated with the manipulation of flows and water levels, both for habitats (Hamel and Bhereur, 1977, cited by Sarrazin *et al.*, 1983), wildlife (Dubé and Gravel, 1978, cited in Sarrazin *et al.*, 1983) and for plants (Teskey and Henckley, 1978, cited in Sarrazin *et al.*, 1983).

In the aquatic as in other environments, flora and fauna are subjected to a set of environmental factors to which they attempt to adapt. Variations in water levels and flow are the main factors conditioning plant communities.

The vegetation that grows in uncontrolled water bodies has adapted to natural fluctuations in water levels; successive plant groupings have settled in such locations on the basis of their tolerance for flooding. Water flow manipulation, by modifying the natural water level variation pattern, may expose strictly aquatic species or may flood species which do not tolerate prolonged submersion or such submersion not synchronized to their life-cycle requirements. This stress may slow growth and cause these species to perish (Teskey and Henckley, 1978, cited in Sarrazin *et al.*, 1983). We then witness the impoverishment of floral diversity and quantity and, consequently, of the wildlife species associated with them.

Bank erosion is another phenomenon associated with variations in the flow and level of waters. In addition to altering the environment (vegetation, slope, nature of substrate), it results in increased water turbidity and sediment transport, which may affect water quality, productivity, benthic fauna and spawning grounds (Berkes, 1981, cited in Sarrazin *et al.*, 1983).

Flow manipulation may interfere with the migration of fish, chase breeding individuals from spawning grounds, carry away the young fry (Calvin and Schroeder, 1979, cited in Sarrazin *et al.*, 1983) and flood bird nests. In some cases, manipulation of water flows and levels may turn out to be beneficial for certain species (Sarrazin et al., 1983) as, for example, when water quality is being improved or land developed to increase plant productivity and thus recreate habitats. This type of action by Ducks Unlimited Canada has resulted in the protection of 14 500 ha in Québec since 1976.

### Hazardous waste

Whether industrial, municipal or agricultural, major quantities of waste are found in the River, where they create many environmental problems. The hazardous chemicals in this waste have many and severe repercussions for animal and plant species as well as humans. In fact, many of these substances, such as lead, mercury, cadmium and PCBs, may be accumulated in the food chain (Environment Canada, 1989).

Each type of industry, and each internal manufacturing process, yields varying quantities and types of waste. Québec industries annually discharge some 265 000 tonnes of hazardous liquid chemical waste into the River and its tributaries in the form of oils, greases, solvents, acids, cyanides and metals. Some 190 000 tonnes of this hazardous waste, or over 60 percent, comes from Montréal and the Montérégie (Environment Canada, 1991). This waste may have sudden and very harmful effects on living organisms or cause these effects over time as the toxins accumulate in their tissue. Other effects may also be felt. Solvents, for example, may cause behavioural problems in fish, particularly among predators. All chemicals may have mutagenic effects and cause skeletal deformities (Environment Canada, 1989). Toxic substances such as heavy metals, arsenic, cyanides, hydrocarbons and various chemical products (PCBs, polyvinyl chloride, phenol compounds, etc.) present the greatest danger. They have harmful effects on the physiological functions of living organisms (Ramade, 1989). Suspended solids, which generally come from drainage basins, but also from industrial waste, contain an extensive range of organic and inorganic substances. Organic matter reduces the oxygen available for organisms in the water. Fish requiring considerable oxygen, such as Brown Trout and Atlantic Salmon, then disappear in favour of more tolerant species such as Bullhead catfishes, Northern Pike and Common Carp (Environment Canada, 1989).

Municipalities are influential in this regard because most people live in urban centres. According to the 1991 Canadian census, the Montréal region alone accounts for 45 percent of Québec's population, while the Québec region accounts for 9 percent. About 80 percent of the population of Québec is concentrated in the drainage basin of the St. Lawrence. There are 338 municipalities bordering the River, and in 1990, 302 of them were still without sewage treatment facilities (ministère de l'Environnement du Québec, 1990, cited by St. Lawrence Centre, 1992). These discharges are characterized by high nutrient concentrations (nitrogen [N], phosphorus [P]), organic substances and micro-organisms, which cause eutrophication. Of the 29 municipalities making up the Montréal Urban Community (MUC), 17 are completely or partially served by a treatment plant. The 7 municipalities of the Québec Urban Community (QUC) have been served by two treatment plants since 1992.

And finally, large-scale farming harms the River's water quality, contributing to soil erosion and the inflow of sediments into the St. Lawrence. The extensive use of fertilizers and pesticides pose problems, as does manure disposal. Fertilizer application causes an excessive inflow of nutrients into the water, leading to the proliferation of aquatic plants, which then decompose and reduce the oxygen content. Animal waste contaminates the water with pathogenic micro-organisms. Pesticides and herbicides, even as trace elements, will cause physiological disorders and accumulate in the food chain (Environment Canada, 1991).

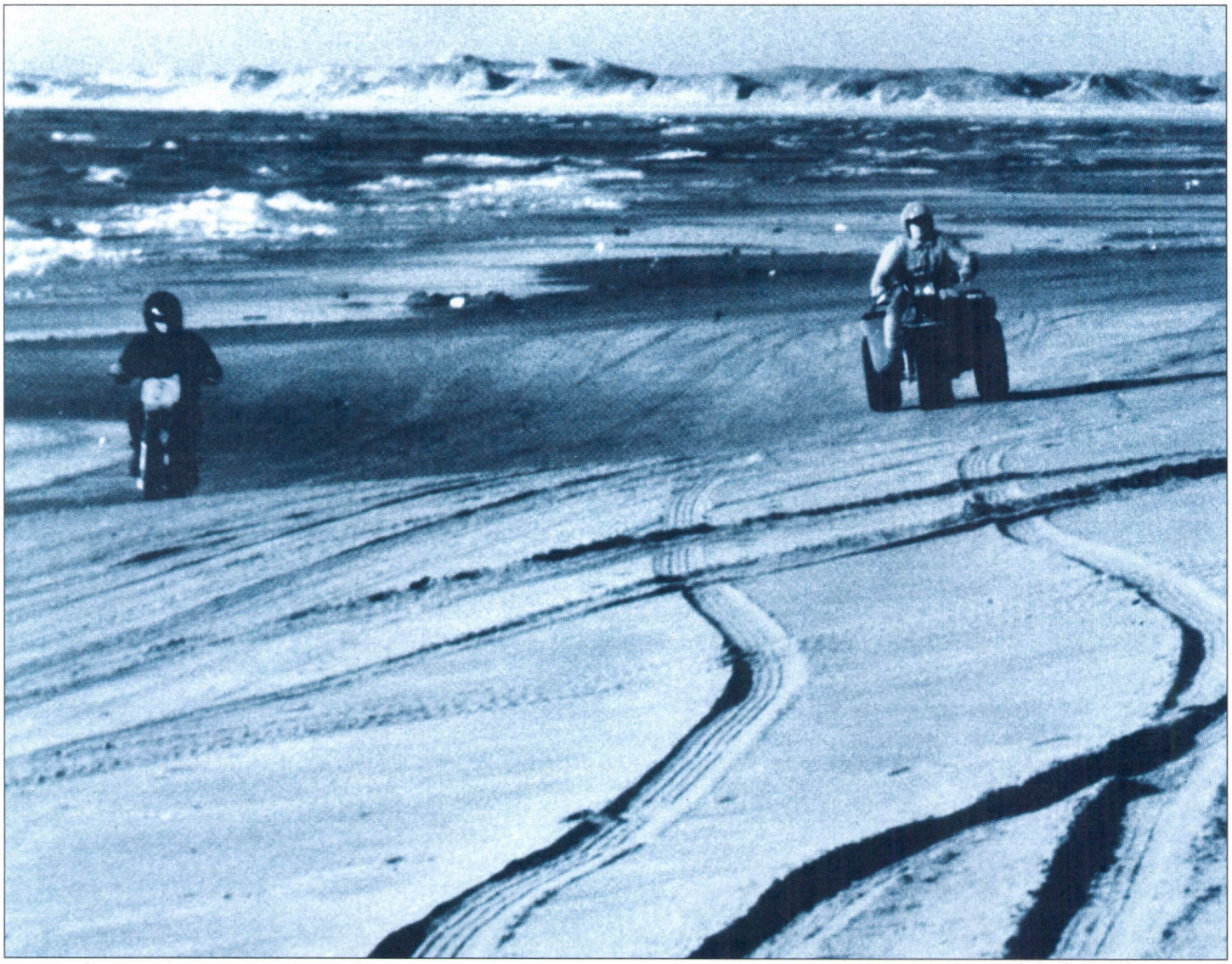
Mention should also be made of the organic material which comes from municipalities (human waste), from agriculture, and from some industries (pulp and paper, textiles, food processing).

The significance of contamination sources varies according to the substance and the body of water or section of the waterway considered.

### Cottages and recreation in a natural environment

"Cottaging" is common on the islands and shores of the St. Lawrence. This activity involves occupying a plot of land through the use of a second home or rustic cabin or cottage. Recreation in the natural environment is any leisure activity, practised alone or in groups, and which sometimes requires certain facilities.

Wildlife habitats may therefore be affected through the destruction of banks and animals may be disturbed by wildlife enthusiasts, particularly in nesting areas. The Piping Plover is seriously affected by the presence of all-terrain vehicles in the sand dunes of the Îles de la Madeleine (Sarrazin *et al.*, 1983). Whale-watching cruises are another example of an activity in the natural environment



CWS - Pierre Laporte

through which animals may be subject to harassment.

Recreational activities such as mountain-climbing and hang-gliding appear to constitute a serious threat to the fauna and flora which colonize marginal environments; Peregrine Falcons and Bald Eagles are two species that are often disturbed during their nesting period.

Pleasure boat and tourism traffic is another disturbance factor that should be considered. Beluga whales have experienced changes to their environment due to the large number of boats and the use of outboard motors. Over the past few years, various measures have been taken by Fisheries and Oceans to combat this phenomenon, most notably through the imposition of a ban on travel in critical habitat areas. In the case of rare flora found in these environments, recreational activities and collection are the main causes of their vulnerability. Birds living in island environments are exposed to a constant habitat decline due to the construction of bridges, along with landfilling operations and the systematic cutting back of plant cover.

Cottaging and recreation in the natural environment are thus responsible for the loss of shoreline integrity, overcrowding in terms of the environment's carrying capacity and the disturbance of wildlife, which is particularly disastrous at certain times of the year (Sarrazin *et al.*, 1983).

### Commercial shipping

Whereas commercial shipping plays an important economic role, its repercussions on the environment are also considerable. To maintain the St. Lawrence Seaway between the Saint-Lambert Locks and the Welland Canal, at the outlet of Lake Ontario, the riverbed must be dredged to a depth of 11 metres. This activity may result in:

- A temporary increase in turbidity
- Bathymetric changes
- A decrease in the dissolved oxygen content
- A possible increase in the organic matter content.

Dredging modifies currents, depths, bottom morphology and water speed. Dredging operations for the maintenance and construction of ports, marinas and wharves may result in the resuspension of contaminated sediments. Poor disposal methods for dredged material on islands and banks and in wetland zones may

constitute a direct attack on wildlife habitats, since the material may contain toxic substances which mix with other components of the environment and are recirculated into the food chain (Environment Canada, 1989).

The depositing of dredged material from the port of Montréal (and especially the Seaway) onto the small islands of the St. Lawrence has contributed to the declining wildlife potential of these islands (Office de planification et de développement du Québec, 1980, cited in Sarrazin *et al.*, 1983). These same deposits have, however, been used to create makeshift wildlife facilities in practically all the archipelagos between Montréal and Trois-Rivières, including the islands of the Petit Bassin de La Prairie, the Île aux Sternes and the Îles de Contrecoeur.

Wave action causes bank erosion and alters aquatic plant communities and spawning grounds, particularly in the narrow parts of the River. The size of a wave depends on the shape of the ship's bottom, its tonnage, speed and water draught, as well as the channel's topography. This problem is especially perceptible in the Sorel delta.

A number of fish species spawn in calm waters, at depths of generally less than one metre: this coastal zone is the very one that is affected by waves. The water's ebb and flow may expose spawning grounds and push eggs and fry out of the water. This wave action may reduce the extent, density and diversity of water plant communities. Birds are also affected by waves through loss of food and flooding of nests (Massé and Mongeau, 1976, cited in Sarrazin *et al.*, 1983).

Undesirable spills that can harm wildlife may occur during ship loading and unloading, cleaning of holds between cargoes, and during the release of ballast waters into the natural environment. The introduction of exotic species such as the Zebra Mussel leads to competition with indigenous species and changes to the food chain.

When spills do occur, hydrocarbons, because of their low solubility and density, form a film on the water surface which creates a physical barrier to oxygen diffusion and interferes with the processes of aeration and photosynthesis (Stickell and Dieter, 1979, cited in Sarrazin *et al.*, 1983). Certain hydrocarbons are toxic for living organisms; studies have shown that a small quantity of oil deposited on the shells of seabird eggs can result in a significant degree of embryo mortality (Dugas, 1980, cited in Sarrazin *et al.*, 1983). The risk of spills cannot be ignored: 641 vessel spills of all types were recorded between January 1, 1971 and December 31, 1988. Human error was to blame in over 60 percent of cases (St. Lawrence Centre, 1990). All these spills have an impact on the River; thankfully, no major ecological catastrophe has yet occurred in the St. Lawrence.

Vigilance and prevention are absolutely essential, in view of the fact that in 1988, the port of Montréal welcomed 201 vessels transporting a total of 7.3 million tonnes of petroleum products, and that some 25 million tonnes of hazardous goods have been handled by St. Lawrence ports (St. Lawrence Centre, 1990). Between 15 000 and 20 000 cargo vessels ply the River every year. As such, adequate regulations are needed and emergency teams must always be on stand-by. Aids to navigation help decrease the risk of accidents and contribute to the protection of the environment. As well, every commercial vessel must take on a pilot, from the Escoumins onward. In 1990, 219 pilots provided this service, thereby contributing to limiting the risk of accidents (St. Lawrence Centre and Université Laval, 1991b). There also exists a network of bird cleaning centres operated by the Canadian Wildlife Service of Environment Canada, in cooperation with various partners.

## *Natural phenomena*

In some cases, the threats posed to species or their habitats are the result of natural phenomena and not human activity. Storms, for example, are a constant threat to the nesting areas of Piping Plovers. These birds build their nests on the beaches of the Îles de la Madeleine, at the high tide mark, where extreme weather conditions become a limiting factor.

Forest fires may not only destroy animal and plant species, they may also be responsible for the replacement of one ecosystem by another; thus a forest may temporarily become a clearing (Ramade, 1989).

Flooding and ice are also among the natural elements that have an impact on riparian and island vegetation.

## *Deterioration and state of some natural environments*

The abundance of literature dealing with wetlands is in itself evidence of their importance. Research by Dryade (1981) overviews the evolution of these environments from 1950 to 1978. Studies completed by Marquis *et al.*, in 1991, and Robitaille *et al.*, in 1988, assessed the physical changes to fish habitats between 1945 and 1984.

### Loss of wetlands

Wetland environments are under a twofold threat because of their half-aquatic, half-terrestrial constitution. The worst threats, and the often permanent ones, are related to physical encroachment, transportation infrastructures, agriculture, cottages, pollution of the aquatic environment and hydro-electric generating stations (for example, Beauharnois, Carillon and Sault-aux-Récollets). These changes radically and often irreversibly modify the environment. Landfill operations have generally been conducted in wetlands throughout Québec. These environments have been taken over for residential construction (the majority of highly populated municipalities are concentrated along the banks of the St. Lawrence or its major tributaries), agriculture or transportation networks. To give just one example, construction of the Beauport highway alone destroyed close to 400 hectares of wetlands (Sarrazin *et al.*, 1983).

Agriculture, with its land-drainage projects, has caused serious damage to wetlands. Between 1950 and 1978, 685 km of coastal marshes along the River disappeared; 40 percent of this land was converted to agricultural use (Lemay, 1987).

Between Cornwall and Matane, 3643 ha were lost between 1950 and 1978, 75 percent prior to 1965 (Environment Canada, 1985). Figure 14 shows how landfill operations and vacant land were responsible for the loss of 1650 ha of wetlands during this period.

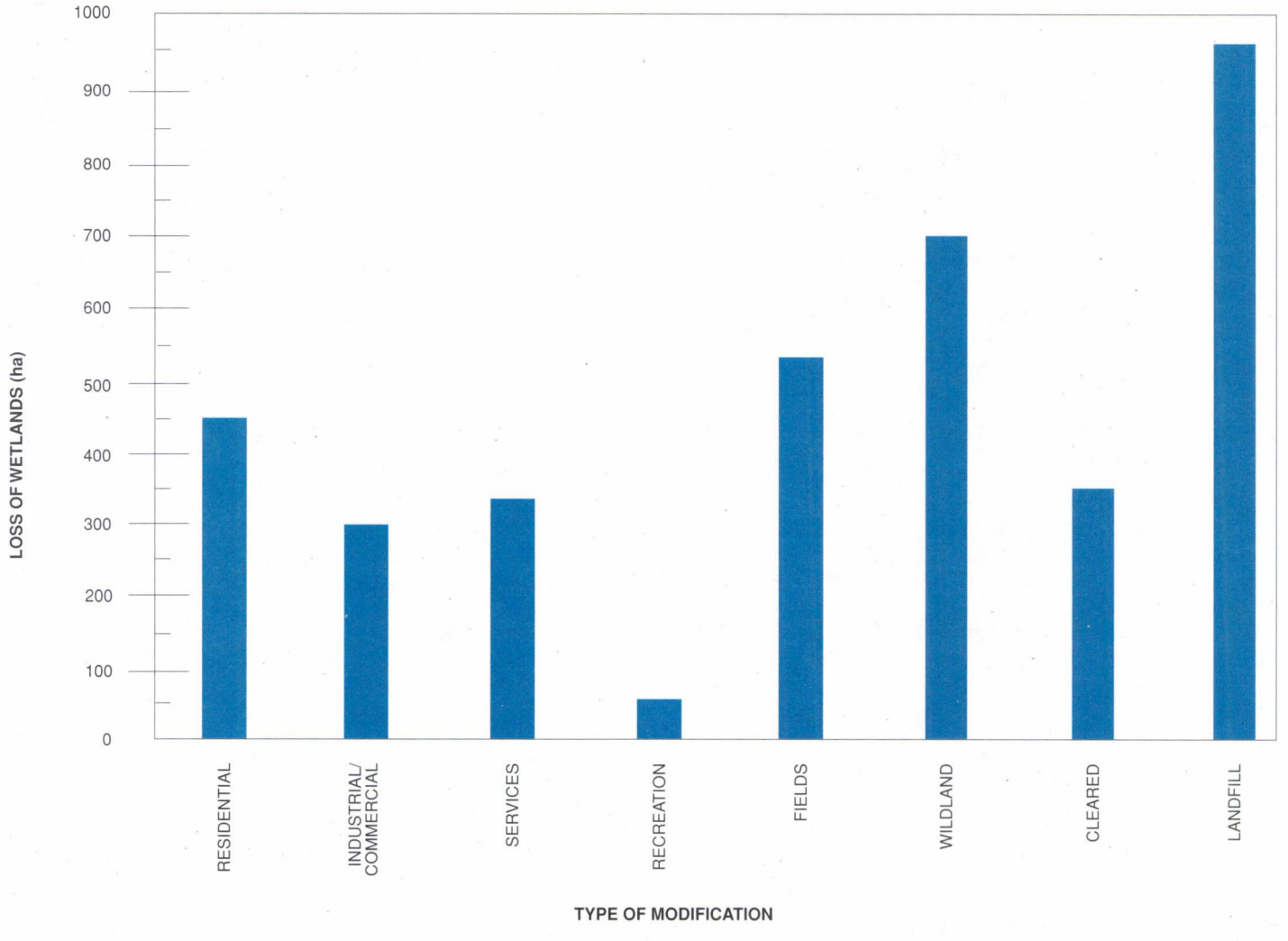
These wetland losses are considered significant because these environments are essential to the maintenance of ecosystems. Since that time, human use of shoreline areas has persisted, and it is likely that the restoration work undertaken has not been sufficient to compensate for losses.

## Physical changes to fish habitats

The data presented in this section draw on atlases from studies by Marquis *et al.* (1991) and Robitaille *et al.* (1988). The maps were digitized by the St. Lawrence Centre of Environment Canada then integrated into a spatial analysis system, thereby enabling us to calculate the areas that had undergone physical changes.

Table 8 is the result of this information processing. We can see that, between 1945 and 1988, fish habitats were affected over an area of 20 856 ha between Cornwall and Havre-Saint-Pierre, including the Îles de la Madeleine. Almost 60 percent of this area, or 12 463 ha, is made up of deep water aquatic habitats in which the substrate cannot be distinguished on aerial photographs. With 2115 and 1960 ha, respectively, the riparian and submerged plant communities are the two other types of fish habitat having undergone the most far-reaching physical changes. In the case of submerged aquatic plant communities, 94 percent of this area is included in the Fluvial Section of the River.

With 15 290 ha affected, 61 percent of which is in the Fluvial Section (between Cornwall and the outlet of




Source: Environment Canada, 1985.

**Figure 14 Loss of wetlands (between 1950 and 1978) by type of human modification to the St. Lawrence shoreline**

**Table 8** **Physical changes to fish habitats between 1945 and 1988: area affected (ha) by type of habitat and river sector**

| | *FLUVIAL SECTION* | | | | *ESTUARY* | | | | | *GULF* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fluvial* | | *Upper* | | *Lower* | | | |
| | A | B | C | D | E | F | G | H | I | J | K | TOTAL |
| Submerged aquatic plant community | 351 | 1 083 | 83 | 334 | 100 | - | 6 | 3 | - | - | - | 1 960 |
| Riparian aquatic plant community | 22 | 338 | 555 | 338 | 340 | 30 | 242 | 250 | - | - | - | 2 115 |
| Deep water | 719 | 1 589 | 163 | 3 526 | 3 950 | 1 134 | 943 | 169 | - | 100 | 170 | 12 463 |
| Swampy scrubland or tree stands | 127 | 14 | - | 99 | 130 | 26 | 4 | - | 10 | - | - | 410 |
| Muddy beach or shoreline | - | - | - | - | 200 | 7 | 1 | 52 | 80 | 300 | - | 640 |
| Sandy beach or shoreline | - | - | - | - | - | - | - | 5 | 130 | 400 | 140 | 675 |
| Rocky beach or shoreline | - | - | - | - | - | - | - | 8 | 110 | 1 000 | - | 1 118 |
| Estuary | - | - | - | - | - | - | - | - | 150 | 400 | - | 550 |
| Lagoon barachois | - | - | - | - | - | - | - | - | - | 100 | 40 | 140 |
| Estuarine barachois | - | - | - | - | - | - | - | - | - | 400 | - | 400 |
| Saltwater plant community | - | - | - | - | 10 | - | - | 3 | 80 | 200 | 70 | 363 |
| Riparian water plant community + deep water | - | 2 | - | - | 20 | - | - | - | - | - | - | 22 |
| TOTAL | 1 219 | 3 026 | 801 | 4 297 | 4 750 | 1 197 | 1 196 | 490 | 560 | 2 900 | 420 | 20 856 |

LEGEND

A = Cornwall to the foot of Lake Saint-Louis
B = Foot of Lake Saint-Louis to Varennes
C = Varennes to Contrecoeur
D = Contrecoeur to the foot of Lake Saint-Pierre
E = Foot of Lake Saint-Pierre to Sainte-Foy
F = Sainte-Foy to Cap-Tourmente
G = Cap-Tourmente to l'Île aux Coudres
H = Île aux Coudres to Tadoussac
I = Tadoussac to Pointe-des-Monts
J = Pointe-des-Monts to Havre-Saint-Pierre
K = Îles de la Madeleine

Freshwater
Brackish water
Saltwater

Lake Saint-Pierre), freshwater habitats have been the most touched by physical changes. In comparison, only 1196 ha of fish habitats were physically altered in brackish waters and 4370 ha in salt waters, including the Îles de la Madeleine. In the saltwater portion, the sector between Pointe-des-Monts and Havre-Saint-Pierre alone accounts for 60 percent of the habitats affected by physical changes.

In the Fluvial Section, and by decreasing order of importance, deep water habitats, submerged aquatic plant communities and riparian aquatic plant communities are those most affected by physical changes. From the outlet of Lake Saint-Pierre to Pointe-des-Monts, deep water habitats (6196 ha), riparian aquatic plant communities (862 ha) and muddy beaches or shorelines (340 ha) are the types of habitat most seriously affected. Beaches and rocky or sandy shores and the Estuary are the most physically altered habitats downstream of Pointe-des-Monts, including the Îles de la Madeleine, with areas of 1000, 540 and 400 ha, respectively. Estuarine barachois (fairly open bays, located at the mouth of a river and protected by sandbars) have been physically altered over 400 ha in the Gulf.

In table 9, we can identify the types of modification that have most affected fish habitats. For the St. Lawrence as a whole, and in decreasing order, dredging, landfill operations, dredged spoil and drainage, respectively, altered 48, 22, 13 and 7 percent of the area of fish habitats.

In the Fluvial Section, dredging affected 4749 ha of fish habitats, while landfilling touched 1825 ha. These modifications alone are responsible for 70 percent of the fish habitat area affected in this portion of the St. Lawrence. In comparison, dredging and dredged spoil respectively modified 4800 and 1255 ha of fish habitats in the Estuary; landfilling was responsible for modifications to over 1008 ha. In the Gulf, the 1740 ha affected by landfill operations, along with the 930 ha lost through encroachment, represent 82 percent of the area affected in this region.

An analysis of the affected areas by type of habitat and type of change (table 10) shows that 74 percent of the affected deep water habitat area (12 463 ha) was damaged by dredging (9236 ha), whereas 18 percent was damaged by dredged spoil. This is the type of habitat that was most affected by physical changes. Riparian and submerged aquatic plant communities follow next, with modified areas of 2115 and 1960 ha, respectively. In the former case, close to 48 percent of the area was affected by landfilling, and 47 percent by drainage; in the latter case, landfill operations account for 38 percent of the area modified, and drainage for 21 percent. We thus see that dredging, landfilling, dredged spoil and drainage are, in decreasing order of importance, the types of modifications that most seriously impact on fish habitats.

We must not forget the impact of various construction projects, including wharves and marinas, along with maintenance work on the shipping channel, which probably had a major impact between Trois-Rivières and Grondines, the very place a number of species, including Striped Bass, American Shad, Atlantic Sturgeon and Rainbow Smelt, once migrated to (Robitaille *et al.*, 1988).

**Table 9** **Physical changes to fish habitats between 1945 and 1988: area affected (ha) by type of change and river sector**

| | *FLUVIAL SECTION* | | | | *ESTUARY* | | | | | *GULF* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fluvial* | | *Upper* | | *Lower* | | | |
| | A | B | C | D | E | F | G | H | I | J | K | TOTAL |
| Landfill operations | 155 | 1 076 | 545 | 49 | 560 | 23 | 13 | 122 | 290 | 1 600 | 140 | 4 573 |
| Drainage | 330 | 369 | 23 | 355 | 80 | 31 | 240 | 193 | 40 | - | - | 1 661 |
| Dredging | 355 | 1 346 | 185 | 2 863 | 3 420 | 784 | 571 | 5 | 20 | 200 | 190 | 9 939 |
| Dredged spoil deposits | 192 | 6 | 6 | 1 030 | 430 | 348 | 372 | 105 | - | 100 | 60 | 2 649 |
| Flow modification | 34 | 79 | 7 | - | - | - | - | - | 160 | - | - | 280 |
| Encroachment | 1 | - | 35 | - | - | - | - | 10 | 30 | 900 | 30 | 1 006 |
| Landfilling and flow modification | 152 | 150 | - | - | 260 | 11 | - | 55 | 20 | 100 | - | 748 |
| TOTAL | 1 219 | 3 026 | 801 | 4 297 | 4 750 | 1 197 | 1 196 | 490 | 560 | 2 900 | 420 | 20 856 |

LEGEND

A = Cornwall to the foot of Lake Saint-Louis
B = Foot of Lake Saint-Louis to Varennes
C = Varennes to Contrecoeur
D = Contrecoeur to the foot of Lake Saint-Pierre
E = Foot of Lake Saint-Pierre to Sainte-Foy
F = Sainte-Foy to Cap-Tourmente
G = Cap-Tourmente to l'Île aux Coudres
H = Île aux Coudres to Tadoussac
I = Tadoussac to Pointe-des-Monts
J = Pointe-des-Monts to Havre-Saint-Pierre
K = Îles de la Madeleine

Freshwater
Brackish water
Saltwater

**Table 10** **Physical changes to fish habitats between 1945 and 1988: area affected (ha) by type of habitat and type of change**

| | Type of habitat | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Type of modification* | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *K* | *L* | *Total* |
| Landfill operation | 742 | 1 007 | 462 | 180 | 276 | 303 | 870 | 180 | 140 | 160 | 253 | 0 | 4 573 |
| Drainage | 415 | 990 | 3 | 223 | 0 | 10 | 0 | 0 | 0 | 0 | 20 | 0 | 1 661 |
| Dredging | 363 | 73 | 9 236 | 7 | 20 | 140 | 10 | 90 | 0 | 0 | 0 | 0 | 9 939 |
| Dredged spoil deposits | 312 | 0 | 2 297 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 2 649 |
| Flow modification | 7 | 3 | 110 | 0 | 20 | 60 | 20 | 60 | 0 | 0 | 0 | 0 | 280 |
| Encroachment | 35 | 0 | 1 | 0 | 200 | 122 | 118 | 220 | 0 | 310 | 0 | 0 | 1 006 |
| Landfilling and flow modification | 86 | 42 | 354 | 0 | 124 | 0 | 100 | 0 | 0 | 0 | 20 | 22 | 748 |
| **TOTAL** | **1 960** | **2 115** | **12 463** | **410** | **640** | **675** | **1 118** | **550** | **140** | **470** | **293** | **22** | **20 856** |

LEGEND
A = Submerged aquatic plant community
B = Riparian water plant community
C = Deep water
D = Swampy scrubland or tree sands
E = Muddy beach or shoreline
F = Sandy beach or shoreline
G = Rocky beach or shoreline
H = Estuary
I = Lagoon barachois
J = Estuarine barachois
K = Saltwater plant community
L = Riparian water plant community + deep water

CHAPTER 8

# A Common Objective: Safeguarding the Natural Environments and Species of the St. Lawrence

**Governments, non-governmental organizations and citizens have all been involved in writing legislation and in proposing concrete solutions. And yet, the feeling of running a race against time persists. From far-reaching international guidelines to direct individual action, many laws, regulations and volunteer projects are trying to reverse the trend by combatting the most flagrant causes for the deterioration of river environments.**

The St. Lawrence River covers a vast area of Québec and, as a result, it falls into the jurisdiction of a number of governments – federal, provincial and municipal. In working to protect and conserve the environments and species of the St. Lawrence corridor, some of these administrations have adopted legal frameworks through which to intervene. This intervention work can consist of direct measures aimed at protecting and conserving a given area, or it can take a broader approach, targeting the protection and conservation of several components of the environment throughout Québec. Other types of stakeholders – environmental groups, private organizations and citizens' groups – place the emphasis on volunteer work. Lastly, by increasing our knowledge of the environment and then disseminating this information, we can contribute to an improved understanding of environmental phenomena, as we obtain decision-making support and increase public participation.

Note that the data in this chapter are not exhaustive; they are instead intended to provide information on the main legislative and regulatory measures and other initiatives relative to protecting the environments and species of the St. Lawrence.

## Direct measures

A number of direct measures have been put forward to safeguard natural environments and species by various levels of government (federal, provincial and municipal), and by conservation groups, private foundations and government agencies. These legislative measures were surveyed and the principal measures are listed in table 11. Other non-legislative activities will also be presented, since they too contribute directly to the protection of the St. Lawrence environment and the species that live there.

### Legislative measures

#### *Federal*

The *Fisheries Act*, administered by Fisheries and Oceans, provides the legal basis for the protection and conservation of fish and their habitats. It promotes awareness of the economic and social benefits Canadians obtain from fish habitats and fishery resources, in addition to protecting the intrinsic nature of these

**Table 11 Inventory of legislative measures providing direct safeguards for species and natural environments**

| *Federal legislation* | *Provincial legislation* |
|---|---|
| *Fisheries Act* | *Act respecting Ecological Reserves* |
| *Canada Wildlife Act* | *Act respecting the Conservation and Development of Wildlife* |
| *Migratory Birds Convention Act* | *Act respecting Threatened or Vulnerable Species* and amending the *Act respecting the Conservation and Development of Wildlife* |
| *National Parks Act* | *Parks Act* |

resources. The *Policy for the Management of Fish Habitats* provides guidance for administering the habitat protection measures contained in the Act.

The *Canada Wildlife Act* and its accompanying regulations, the *Wildlife Area Regulations*, provide the means to create national wildlife areas. The agency responsible for applying these provisions is the Canadian Wildlife Service (CWS) of Environment Canada. This law stipulates that all measures regarding wildlife are also applicable to habitat. In Québec, there are eight national wildlife reserves, which are basically concentrated along the St. Lawrence corridor and cover a total area of 5314 ha (Boucher, 1992).

The *Migratory Birds Convention Act* and its regulations, the *Migratory Birds Sanctuary* Regulations, allow for the establishment of migratory bird sanctuaries and staging areas for waterfowl, on which activities harmful to migrating birds and their habitats would be prohibited. The agency responsible for applying these provisions is again the CWS of Environment Canada. There are a total of 33 migratory bird sanctuaries in Québec (Boucher, 1992), 28 of which are found along the St. Lawrence and cover 47 936 ha; three staging areas for waterfowl can also be found here, covering a total surface area of 8900 ha (fig. 15).

The Canadian Parks Service of Environment Canada is responsible for administering the *National Parks Act*. Three parks are located along the St. Lawrence; that is, two national parks and one national park reserve, for a total area of 114 040 ha (fig. 15). The federal government adopted this law to preserve intact representative natural areas of Canadian interest for present and future generations, and for purposes of recreation, education and nature interpretation.

### *Provincial*

In Québec, natural environments are directly protected by provisions contained in such legislation as the *Act respecting Ecological Reserves*. This act provides for the permanent protection, total conservation and regeneration of various types of species, populations, habitats, biocenoses; and typical, unique, rare or threatened ecosystems which constitute representative or exceptional components of Québec's ecological and biological wealth. The creation of ecological reserves is the responsibility of the ministère de l'Environnement du Québec (MENVIQ). The Québec network includes 38 reserves, four of which border on the St. Lawrence, with a total area of 1563 ha (fig. 16).

The *Act respecting the Conservation and Development of Wildlife*, of the ministère du Loisir, de la Chasse et de la Pêche (MLCP), contains certain provisions for the protection of essential wildlife habitats, and others on wildlife sanctuaries. To complement this law, the MLCP has drawn up a policy statement explaining the context in which wildlife sanctuaries are to be created. In 1992, an initial area of 147 ha was declared a wildlife sanctuary on Grande-Île in Lake Saint-Pierre (fig. 16). The *Act respecting the Conservation and Development of Wildlife* permitted the establishment of two wildlife reserves fronting on the River, with a total area of 6961 ha (fig. 16).

The MENVIQ and the MLCP are responsible for implementing the *Act respecting Threatened or Vulnerable Species* and amending the *Act respecting the Conservation and Development of Wildlife*, in order to preserve plant and animal species and the habitats essential to their survival. The two ministries jointly designate species and determine how the species management programs will be shared: MENVIQ is responsible for plant species and MLCP for animal species.

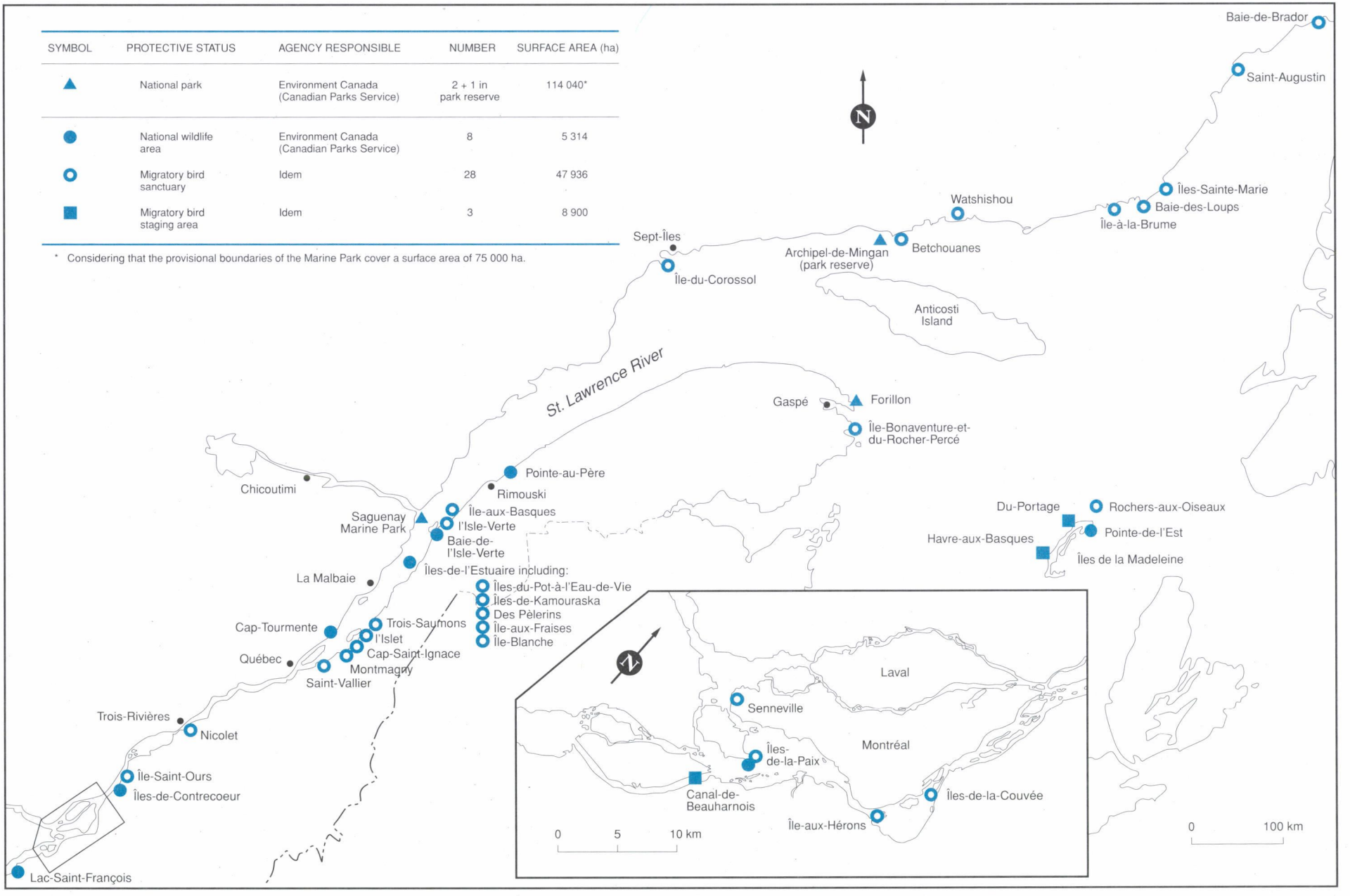
Direct protection of natural environments is also encouraged through the creation of a network of parks. The *Parks Act* under the ministère du Loisir, de la Chasse et de la Pêche (MLCP), governs the administration of the five riverfront parks on the St. Lawrence. These parks include three conservation parks and two recreation parks, for a total area of 3190 ha (fig. 16). Conservation parks serve the purpose of providing permanent protection for areas representative of Québec's natural regions or exceptional natural sites, while making them accessible to the public for educational or recreational ends. Recreation parks are primarily intended to encourage a variety of outdoor activities, while protecting the natural environment.

## Non-legislative measures

In addition to the official legislative measures mentioned previously, other initiatives have resulted from the commitment of conservation groups, government agencies and private foundations along with, at the international level, comprehensive land management plans. Among other things, their aim is to acquire and protect natural environments and to raise public awareness.

| SYMBOL | PROTECTIVE STATUS | AGENCY RESPONSIBLE | NUMBER | SURFACE AREA (ha) |
|---|---|---|---|---|
| ▲ | National park | Environment Canada (Canadian Parks Service) | 2 + 1 in park reserve | 114 040* |
| ● | National wildlife area | Environment Canada (Canadian Parks Service) | 8 | 5 314 |
| ○ | Migratory bird sanctuary | Idem | 28 | 47 936 |
| ■ | Migratory bird staging area | Idem | 3 | 8 900 |

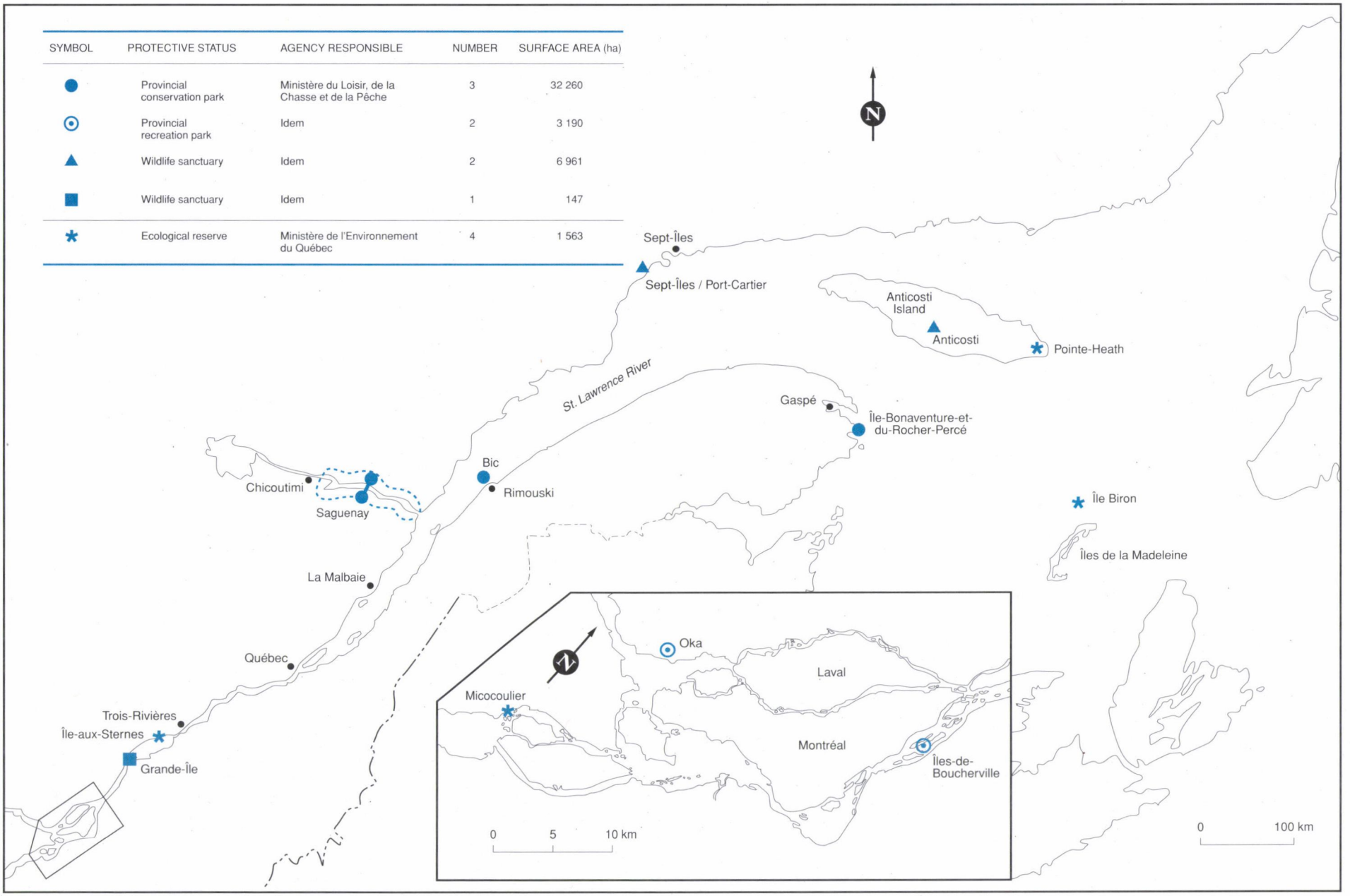
* Considering that the provisional boundaries of the Marine Park cover a surface area of 75 000 ha.




Source: Boucher, 1992.

**Figure 15 Protected areas under federal jurisdiction**

| SYMBOL | PROTECTIVE STATUS | AGENCY RESPONSIBLE | NUMBER | SURFACE AREA (ha) |
|---|---|---|---|---|
| ● | Provincial conservation park | Ministère du Loisir, de la Chasse et de la Pêche | 3 | 32 260 |
| ⊙ | Provincial recreation park | Idem | 2 | 3 190 |
| ▲ | Wildlife sanctuary | Idem | 2 | 6 961 |
| ■ | Wildlife sanctuary | Idem | 1 | 147 |
| ✱ | Ecological reserve | Ministère de l'Environnement du Québec | 4 | 1 563 |




Source: Boucher, 1992.

**Figure 16 Protected areas under provincial jurisdiction**

### *International*

The *Convention on Wetlands of International Importance Especially as Waterfowl Habitat,* (also known as the *RAMSAR Convention*), works to check the gradual encroachment on and disappearance of wetland areas, both in the present and for the future, by promoting the use of wetland areas in ways compatible with their natural properties and by increasing public awareness. Canada became a signatory to the Convention in 1981. The Canadian Wildlife Service of Environment Canada is responsible for Canada's obligations under the Convention. Three RAMSAR sites, covering 6371 ha, have been designated in Québec. These are the national wildlife areas at Lake Saint-François, Cap-Tourmente and L'Isle-Verte, all bordering on the St. Lawrence.

The *Eastern Habitat Joint Venture* (EHJV), created in 1989, is the most comprehensive conservation program for eastern Canadian wetlands (and, by extension, the Atlantic and Mississippi flyways). The EHJV is part of an international program known as the *North American Waterfowl Management Plan*. This agreement was signed in 1986 by Canada and the United States following a decline in seabird populations and the loss of wetlands across the continent. This international effort will allow the acquisition of 2500 ha of important habitats in eastern Canada, including the St. Lawrence corridor region. It also provides protection for 32 800 ha of wetlands by means of long-term agreements and the quality restoration of an additional 1730 ha of marshland.

### *National and provincial*

In recognition of the value of private-sector initiatives in the conservation of natural environments, the federal government created an independent body known as Wildlife Habitat Canada in 1985. This body provides financial assistance for the purchase of lands, which other organizations then accept to manage and develop for use by wildlife. It also promotes research linked to the problems and techniques of habitat conservation and development.

The Fondation de la Faune du Québec (FFQ), a non-profit organization, was formed in 1984 to promote the conservation and increase awareness of Québec's fauna and its habitats. This foundation mounts and funds habitat protection and development projects, in addition to conducting public awareness campaigns and acquiring land. Through the *Five-Year Agreement on Protecting and Managing Wildlife Habitats*, this group, together with five other partners (Canadian Wildlife Service, ministère du Loisir, de la Chasse et de la Pêche, Office de Planification et de Développement du Québec, Wildlife Habitat Canada and Ducks Unlimited Canada) administers the *Eastern Habitat Joint Venture*; the FFQ is in charge of land acquisition.

One of the objectives of the *St. Lawrence Action Plan*, jointly launched by the federal and Québec governments, has to do with habitat protection: the goal is to curb the deterioration and destruction of fragile ecosystems and areas indispensable to the survival of threatened or vulnerable species. More concretely, the Action Plan resulted in the protection of 4905 ha of riparian and island habitats as of January, 1993, either through acquisition, through agreements concluded directly by the Canadian Wildlife Service of Environment Canada, or jointly with provincial partners. The Action Plan also created a Marine Park at the mouth of the Saguenay River, the proposed boundaries of which cover an area of 75 000 ha (fig. 15). The creation of this Marine Park will help implement the *Interdepartmental Action Plan to Favour the Survival of the Beluga Whale*, a program conducted jointly by Fisheries and Oceans and Environment Canada, and administered by the former.

The shipping channel of the St. Lawrence River requires annual maintenance dredging to maintain a depth adequate for deep-draught commercial vessels. As a result, the problem of disposing of dredged spoil has surfaced. A study was jointly undertaken in 1990-1991 by Environment Canada's St. Lawrence Centre and the Canadian Wildlife Service, along with the Canadian Coast Guard, to examine the technical and environmental feasibility of using dredged spoil (especially from Lake Saint-Pierre) for the creation and upgrading of habitats and for building artificial islets. This study proved conclusive, and the project should go forward in the coming years in collaboration with the Action Plan partners.

### *Regional and local*

Incorporated in June 1984, the Société d'Aménagement Récréatif de Conservation de l'Environnement du Lac Saint-Pierre (SARCEL), a non-profit organization, is mainly concerned with the protection and development of the important waterfowl staging area at Baie-du-Febvre, in the Lake Saint-Pierre region. SARCEL owns and manages 500 ha of farmland located in Baie-du-Febvre - Nicolet-Sud, which is currently protected for purposes of habitat conservation.

When land cannot be bought, it may instead be leased. Such is the case for 300 ha of municipally-owned land in the Baie-du-Febvre sector at Lake Saint-Pierre. This land is currently being leased from its farmer owners under a 21-year lease by the Fondation Héritage Faune, a private, non-profit organization, in order to promote the survival of the wildlife that depend on the land.

The main contribution to habitat protection at the municipal level comes in the form of plans by the Montréal Urban Community (MUC) for the development of natural environments on the banks of the St. Lawrence. In all, six regional parks covering a total surface area of 818 ha (Oka, Bois-de-Saraguay, Cap-Saint-Jacques, Bois-de-Liesse, Île-de-la-Visitation, Rivière-des-Prairies and Anse-à-l'Orme) are located along the length of the des Prairies River. These parks hold considerable ecological value for the protection of natural environments, and for recreational and educational purposes.

## *Indirect measures*

Some laws are aimed at the overall protection of the environment. Because of their comprehensive nature, they support the direct measures discussed above, which are primarily aimed at protecting natural environments and species, particularly in the St. Lawrence corridor: the River itself receives the fringe benefits of these measures. In addition to these legislative measures, other initiatives contribute indirectly to safeguarding the resources of the St. Lawrence.

### Legislative measures

#### *Federal*

The *Canadian Environmental Protection Act*, administered by Environment Canada and Health and Welfare Canada, specifically defines the notion of a pollutant that is likely to contaminate the environment and to harm the health of Canadians.

The Environmental Assessment and Review Process (EARP) predetermines the environmental repercussions of a project requiring a federal decision. This is in effect a planning process that makes it possible to anticipate the negative consequences and to determine the measures required to offset them. In this way, it is a tool that promotes the protection of places and species, particularly those of the St. Lawrence corridor. EARP is administered by the Federal Environmental Assessment Review Office (FEARO).

#### *Provincial*

The provisions contained in the *Environment Quality Act* of the ministère de l'Environnement du Québec (MENVIQ) make this a more general law which prohibits in principle all discharges into the environment of any contaminant likely to damage or adversely affect soil quality, plants or wildlife. Under this law, certain projects are subject to the Procedure d'Évaluation et d'Examen des Impacts sur l'Environnement (PÉEIE). The Bureau d'Audiences Publiques sur l'Environnement (BAPE) is responsible for investigating any question submitted to it by the Québec environment minister in relation to quality of the environment, and to provide the minister with its findings. BAPE also holds public hearings when the Minister so requires.

### Non-legislative measures

At the provincial level and under the responsibility of the MENVIQ, the Québec waters cleanup Programme should also be mentioned: it covers the industrial, municipal and agricultural components. Both consulting firms, which often work on government contracts, and industries contribute at the private sector level to information acquisition and to reducing the pollutants that affect fluvial resources.

Universities and research centres are also major stakeholders. They are involved in developing the scientific expertise needed to clean up the River, and in the collection of data.

Finally, both citizens' groups and individuals who use the river resources are drawing increasing attention from political leaders, to the point where they have more influence with governments, through the means they themselves have developed, to see that concrete steps are taken to protect river and island environments.

## *Information in support of action*

Other initiatives contribute to a better understanding of the interaction among all the various environmental components, thereby leading to a greater realization of the importance of St. Lawrence environments. As such, certain newsletters, magazines, brochures etc., are aimed mainly at encouraging the public to act in ways which draw attention to the importance of prevention and to the need for protecting both habitats and the species that depend on them.

More concretely, the Union Québécoise pour la Conservation de la Nature publishes a magazine, the *Franc-Vert,* with the purpose of making information on the environment and nature more accessible. *Le Fleuve*, a newsletter published jointly by the federal and Québec governments, reports on progress toward the achievement of Action Plan objectives and has published a number of articles on the protection and conservation of the species and habitats of the St. Lawrence. The newsletter *Habitats*, published by the Canadian Wildlife Service of Environment Canada, promotes information exchanges among various agencies concerned with habitat protection. The newsletter *Beluga*, published by Fisheries and Oceans, deals specifically with the problems facing the St. Lawrence Beluga and its habitat, as well as actions taken to protect this whale. In 1988, the ministère du Loisir, de la Chasse et de la Pêche (MLCP) published a collection of 15 pamphlets entitled *La Faune du Québec*. Each pamphlet deals with such aspects as habitat, conservation measures and regulations concerning animal species of Québec like the Snow Goose, whose survival is directly linked to the wetlands of the St. Lawrence.

Another project is the production of the *Environmental Atlas of the St. Lawrence*. This atlas, which is the result of an agreement between the St. Lawrence Centre of Environment Canada and Université Laval, deals, among other things, with the natural environments and species of the St. Lawrence. Also within the framework of the Action Plan, the preparation of a report on the state of the St. Lawrence environment, of which this report is part, will help contribute to a better understanding of the River.

The Beluga adoption Programme created in 1988 by the St. Lawrence National Ecotoxicology Institute is aimed at identifying and monitoring the Beluga in the St. Lawrence. It also offers the public an opportunity to become actively involved in better understanding this troubled species.

This sampling of measures illustrates well the myriad actions taken on behalf of the River: they also reflect the public's growing concern for better understanding and protecting the St. Lawrence and all the diverse life forms and environments that find shelter in the River.

# CONCLUSION

CWS - Léo-Guy De Repentigny

No doubt remains as to the importance of the natural environments of the St. Lawrence for maintaining plant and wildlife species. The diversity, distribution and abundance of these environments are some of the elements that make them indispensable for fauna and flora alike. A habitat does not have to be exceptional to be essential; an ordinary-looking site, just as an exceptional location, may play a determining role in the survival of the species it shelters.

Information on some habitats is still quite fragmentary, particularly with respect to the priority species under the St. Lawrence Action Plan. Ongoing efforts to fill in this gap will make it possible to better direct the actions required to protect specific habitats and to anticipate the effects of human activities on these resources.

Losses incurred by wetland environments and fish habitats are relatively well documented. Much less is known about the quality and condition of existing habitats, however: indicators are needed with which to better assess their situations, thereby enabling us to better monitor their spatial and temporal evolution, and to set better protection targets.

Given all the attention being focused on the natural environments of the St. Lawrence, in the form of both government and interest groups, a harmonization of initiatives is necessary. Without any such cooperation, the remaining habitats may be divided up or simply deteriorate, taking with them any opportunities to increase the effectiveness of such measures.

The protection of natural environments and species has benefits for everyone, whether for scientific, economic or cultural reasons. The World Conservation Union mentions three basic reasons to motivate society in the conservation of resources: maintenance of basic ecological balance, rational use of natural resources and the preservation of genetic diversity.

Society must master the sustainable use of river resources, including natural environments, so that we may continue to benefit from them in perpetuity. Each and every one of us must get involved in working to reach this goal. The sustainable use of resources is one of the most highly motivating social goals to which we are called, to ensure that plant, animal and human life can continue to live in harmony in the St. Lawrence corridor.

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