



Navigation on the St. Lawrence Echo of the Past, Path to the Future





1 | Come Take a Voyage

Over the centuries, the mighty St. Lawrence has fostered the creation of a vast world. We invite you to discover it, one page at a time. Let this pamphlet be your compass on a voyage to explore the many facets of commercial shipping and recreational boating on the St. Lawrence.

The St. Lawrence is a universe in itself. It is the main axis of a 3,700-kilometre waterway stretching from Lake Superior to the Atlantic Ocean and draining a quarter of the world's fresh water. The river flows nearly 1,200 kilometres from Kingston, in Eastern Ontario, through Quebec.

The river has three main segments. It begins with the fluvial section that originates in the Great Lakes. From there, it flows into the world's largest estuary (400 kilometres at the mouth), which begins modestly at the eastern tip



of Île d'Orléans, where saltwater meets fresh. The estuary extends to Pointe-des-Monts, on the North Shore, where it finally transforms into an immense gulf that flows into the Atlantic Ocean.

This document on navigation is the outcome of a project initiated by the Navigation Coordination Committee (NCC). It is one of the tangible deliverables of the action plan for the Sustainable Navigation Strategy for the St. Lawrence, originally issued in 2004 and updated in 2014.¹ Overall, this strategy is aimed at adapting the management practices of commercial and recreational navigation stakeholders to the St. Lawrence's environmental (reduction of impacts), economic (promotion of marine transport) and social (harmonization of uses) sustainability imperatives. The NCC was officially established during Phase III of the St. Lawrence Action Plan (1998-2003). The Action Plan is a Canada-Quebec

agreement to foster the conservation and enhancement of the St. Lawrence River.

The NCC is composed of approximately 20 members from various departments of the governments of Canada and Quebec, commercial shipping and recreational boating representatives, environmental groups and members of various organizations related to navigation and the environment. The NCC promotes sustainable commercial and recreational navigation, meaning navigation that meets economic, environmental and social sustainability objectives; ensures sound short- and long-term protection of ecosystems and the quality of human life; and operates in harmony with navigational development. The Committee has come up with several concrete initiatives, including the voluntary reduction of vessel speeds in some segments of the waterway and the establishment of the St. Lawrence Dredging Activities Planning Registry.

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1. *Sustainable Navigation Strategy for the St. Lawrence. 2004–2011 Report Action Plan 2011–2026.*
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2 | The St. Lawrence, Then and Now

Close to 80% of Quebec's population lives near the St. Lawrence River. This physical proximity has played a key role in the area's occupation. Well before the Europeans arrived, the river played an essential economic role for Native American populations, who used it for fishing, farming its watershed lands and transportation. It was through its shores and tributaries that European settlers explored and colonized the continental interior. As docks gradually evolved into ports and sometimes, villages into cities, the scene was being set for a new civilization.

The St. Lawrence Estuary has been inhabited by sailing and fishing families for over three centuries. Old shoreline parishes are still home to families of boat builders, shipowners and navigators, who make their living fishing and transporting goods and passengers.

Coasting, or domestic marine shipping, has long been the main means of transportation between villages along the St. Lawrence River. Travellers, food supplies, animals, timber and other goods were all transported in this way. Post-1850 railway expansion and 20th century road infrastructure improvements nearly put an end to coasting. It almost disappeared in the 1970s, until its cost price and energy performance made it popular again in the early 2000s. Today, about 20% of commercial traffic on the St. Lawrence consists of coasting.²



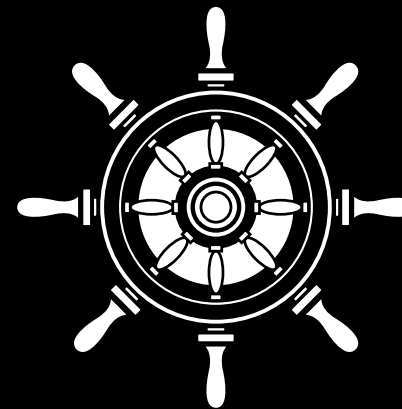
The St. Lawrence is now at the heart of a dynamic national and international marine industry. Its uses are endless: supplying drinking water, transporting people and goods, opening up isolated and remote communities, water recreation, tourism and more.

2. Étude de l'impact économique de l'industrie maritime au Québec, 2012 [Québec Marine Industry Economic Impact Study, 2012].

> *Vignette*

The mission of the Musée maritime du Québec is to preserve the heritage of St. Lawrence mariners. Its extensive collection includes all types of artifacts: an old boathouse (a boat building workshop) where visitors can admire models of traditional vessels, two museum ships, archives and a large reserve of scale models depicting various boats. The Museum is in L'Islet, a small town founded in 1677, and honours the memory of the most famous son of this part of the country, the great Captain Joseph-Elzéar Bernier (1852-1934).³

3. See the Musée maritime du Québec website at <http://www.mmq.qc.ca>.





3 | Navigation: the Heart of a Strong Economy

Open year-round to navigation, the St. Lawrence River downstream from Montréal is a vital trade corridor on which millions of consumers and thousands of businesses depend. The St. Lawrence Seaway extends to the heart of the North American continent and is the shortest route between Europe and the North American heartland, two of the world's most heavily industrialized areas. In Quebec, the commercial port system connects to rail and road networks, which enables it to reach a North American market of over 135 million people within a 1,000-kilometre radius of Montréal.⁴

Commercial, tourist and recreational navigation on the St. Lawrence all contribute significantly to the economic development of Quebec and its regions. In 2015, close to 25,000 direct jobs were linked to Quebec's marine economy. The marine industry is important to the economy of Quebec: it includes about 370 businesses, contributes approximately 2.3 billion dollars to Quebec's gross domestic product and generates about 680 million in tax revenues for the federal and provincial governments.⁵

The industry's importance is not surprising given the many advantages and benefits of marine transportation.



Distance in Kilometres that One Tonne of Cargo Travels on 1 Litre of Fuel



Ship / 312 km



Rail / 181 km

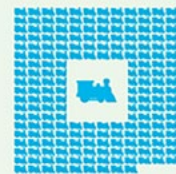


Truck / 75 km

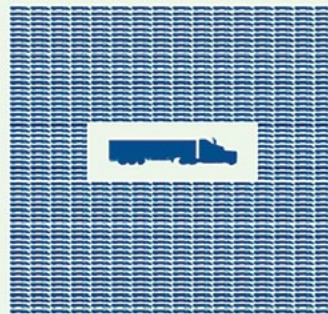
Ships carry tonnes of Cargo...



The carrying capacity of one Seaway-sized laker=



225 rail cars



or 870 trucks

...while reducing congestion to the land.

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4. The Quebec *Maritime Strategy*, 2015, page 5.
5. *Étude de l'impact économique de l'industrie maritime au Québec, 2012* ["Québec Marine Industry Economic Impact Study, 2012"].
6. SODES, <http://www.st-laurent.org/bim/en/get-to-know-the-marine-industry/environment/>



A Multi-faceted Activity

Port Activities

Commercial ports are essential to economic growth and job creation in Quebec. The St. Lawrence has about twenty commercial ports categorized by technical factors (port infrastructure, road and rail access, depth, etc.), economic factors (traffic value and type, zone of influence) and financial factors (self-sufficiency). To give an example of major port activities, the Montréal Port Authority leases its transshipment facilities to private stevedoring companies, and operates its own passenger terminal and a railway network spanning over 100 kilometres.

Shipowners

Shipowners are carriers that engage in commercial shipping on rivers, lakes and oceans. The fleets they operate on the St. Lawrence include all types of craft: cargo ships (containers, Ro-Ro ships, bulk carriers and tankers), tugs, barges, trawlers and others. The Shipping Federation of Canada, (which advocates on behalf of shipowners and international trade shipping agents) and St. Lawrence Shipoperators (an association that represents Canadian shipowners and associated members) are two organizations that promote marine transportation and represent their members in dealings with several authorities to ensure that the marine industry fully contributes to the economy and supports the development of marine transportation in Canada.



Every year, commercial ships transport about 110 million tonnes of goods through St. Lawrence terminals. The average number of ships travelling on the St. Lawrence River is a dozen per day or 5,000 per year. In comparison, an average of 9,000 ships travel on the Rhine in Europe per year. In Asia, nine ships travel on the Yangtze every hour, totalling 80,000 per year. Raw materials such as timber, cereals, hydrocarbons, ore and metals are among the main products shipped. Manufactured goods are also of great economic value, accounting for over 1 million containers transported on the St. Lawrence. In fact, 90% of the goods we consume daily reach us by ship. Lined up end to end, the containers handled annually at the Port of Montréal, would stretch from Montréal to Vancouver and back.

Fishing on the St. Lawrence

The estimated value of commercial fishing on the St. Lawrence is \$200 million.⁷ It is the economic heart of many small communities for which sustainable resource management is critical. Cod has long been the choice catch in the Gulf of St. Lawrence, but deeply declining stocks in the 1990s prompted fish harvesters to turn to crustaceans such as snow crab, lobster and shrimp. Although fishing volumes have fallen in the space of one generation, catch value has appreciated significantly. Commercial fishing in the fluvial section's fresh water focuses on yellow perch, eel and smelt. Aquaculture (mussels, scallops) has also been in existence for a few years. Fishing harbours fall primarily under the governance of Fisheries and Oceans Canada and are managed jointly with local residents.⁸

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7. MAPAQ, <http://www.mapaq.gouv.qc.ca/fr/Pêche/Pêche/Pages/Pêche.aspx>
 8. "La pêche commerciale" ["Commercial Fishing"], SODES and the Ministère des Transports du Québec website (<http://www.lesaint-laurent.com/pages/importance delapechecommerciale surlefleuve.asp>).
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Ferry Services

Approximately 30 municipalities belong to the network formed by the Société des traversiers du Québec (STQ) and private ferries operating on the St. Lawrence. Ferries are vital to traffic between the shores of the St. Lawrence, transporting about 5 million people and 2.5 million vehicles annually.⁹ In addition to the ferries, ships also travel the waters to serve remote locations on the North Shore of the Gulf of St. Lawrence and in Nunavik, their holds filled with food, fuel, staple goods and miscellaneous materials.

International Cruises and Boat Tours

An increasing number of cruise ships travel the waters of the St. Lawrence, calling at ports and generating significant economic benefits. In 2014, the province welcomed 261,000 international cruise passengers and 94,000 crew members. A total of 27 cruise ships sailed the

St. Lawrence and made 348 stopovers.¹⁰ They visited one or more of the nine ports of call along the St. Lawrence, including Montréal, Québec City, and Trois-Rivières, as well as the remaining six ports developed under the Government of Quebec's Stratégie de développement durable et de promotion des croisières internationales sur le Saint-Laurent [strategy for sustainable development and international cruise ship promotion on the St. Lawrence]: Saguenay, Baie-Comeau, Sept-Îles, Havre-Saint-Pierre, Gaspé and Cap-aux-Meules.

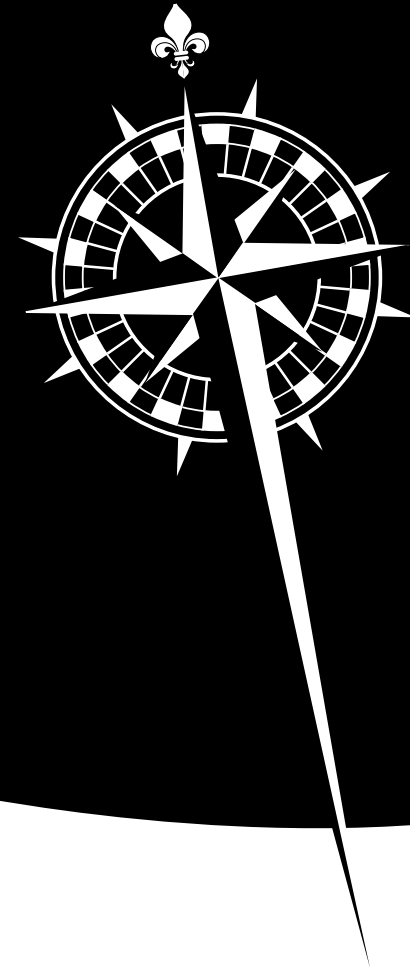
Quebec's tour boat industry also contributes significantly to tourism development in several regions along the St. Lawrence. An estimated 1.2 million passengers per year are transported by the 80 or so tour boat companies in Quebec. Boat tours between two ports and lasting one or more days attracted over 50,000 passengers this same year.¹¹



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9. Société des traversiers du Québec, Rapport annuel de gestion ["Annual Report"] 2014–2015.
 10. Cruise the Saint Lawrence, <http://www.cruisesaintlawrence.com/EN/Press-releases/314/International-cruise-sector-Record-year-for-Destination-Saint-Lawrence.aspx>.
 11. LeSaint-Laurent.com, <http://www.lesaint-laurent.com/pages/croisieresetexcursions tourisme.asp>.
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> *Vignette*

Did you know that there is a rail car ferry? Operating out of Matane, the Georges-Alexandre-Lebel connects the south and north shores with service to Baie-Comeau and Sept-Îles. Built in Vancouver in 1975, this specialized 26-car capacity vessel transports nearly 2,000 cars year-round. The rail-marine link provides an alternative to a detour over land of over 1,000 kilometres, crossing the 50 kilometres separating the St. Lawrence's two shores in no time at all.





Technical Feats

The St. Lawrence Seaway Canals

The St. Lawrence is not a straight, calm and level waterway. River navigation requires the special skills of professional pilots, but even their expertise is challenged when confronted with the many natural barriers present on every stretch of the waterway. Without certain technological solutions, the St. Lawrence would not have evolved into the economic hub that it is today.

The river's numerous rapids and drops in elevation has made moving high-tonnage vessels around the Island of Montréal problematic. Conceived as early as 1680, the Lachine Canal was inaugurated in 1824 and bypasses the Lachine Rapids. It joined the small lock-equipped canals already linking lakes Saint-Louis and Saint-François, upstream from Montréal. To meet the requirements for the steadily increasing ship sizes and volumes of

goods, Canada and the United States inaugurated the St. Lawrence Seaway in 1959. It was the product of a vast and highly advanced engineering effort that extended upstream from Montréal to the Niagara region. Seagoing vessels could now reach the Great Lakes, North America's industrial heartland.

It takes a vessel 45 minutes to pass through a St. Lawrence Seaway lock. Each lock measures about 235 by 25 metres. Nine metres deep, a lock takes ten minutes to fill with about 90 million litres of water. Together, the locks form a complex lifting system. Imagine a giant lifting 25,000-tonne floating containers up 180 metres before setting them back onto the waterway and you'll have a picture of lift operations, which are nothing short of spectacular! Of the Seaway's 15 locks, 7 are located along the St. Lawrence (east of Lake Ontario), and 5 of these are under Canadian jurisdiction.¹²



12. "Locks, Canals and Channels," The St. Lawrence Seaway Management Corporation (<http://www.greatlakes-seaway.com/en/seaway/locks/index.html>).



4 | Safety: a Priority at All Times

Whether commercial or recreational, navigation on the St. Lawrence must comply with numerous strict requirements protecting mariners, passengers and boaters as well as ships, the environment and ecosystems. Transport Canada, the Canadian Coast Guard and Fisheries and Oceans Canada govern marine and river safety with complementary regulations.

Dredging, a Crucial Activity

Ships come in many sizes. To keep afloat and move forward without running aground, a ship requires a given water depth in relation to its weight and shape: this is Archimedes' principle. Since the bottom of waterways is unstable, it is sometimes necessary to shape sections of the corridors navigated by

large vessels. Why is the bottom of the St. Lawrence unstable? A number of factors, including currents and waves, stir up sediment deposited on the river floor, continually shaping and reshaping its topography. This perpetual agitation is random, which explains why sediment is distributed unevenly along the length and width of the river bottom.

There are two types of dredging. The first is maintenance dredging, done to restore river bottoms to their certified chart depths. Maintenance dredging is never done systematically over the entire length of the St. Lawrence. It is used to reopen passages, much like shoveling a path through a snow-covered walkway. An average 76,000 m³ of sediment is dredged every year in the navigable channel between Montréal and Cap Tourmente, located approximately 50 kilometres east of Québec City. By comparison, the Port of New York



removed over 910,000 m³ of sediment in 2013 to make its facilities accessible.

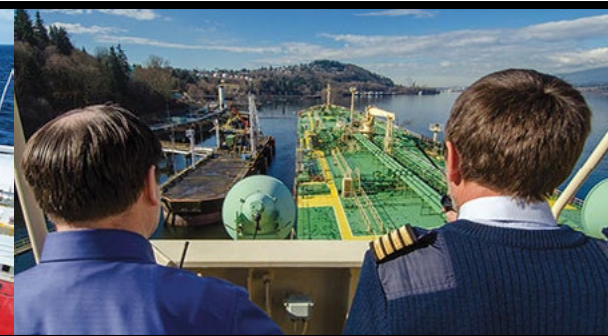
The second type of dredging involves deepening, referred to as capital dredging. It consists of excavating the sea floor or river bed to deepen the navigation corridor. The last capital dredging campaign in the St. Lawrence was in 1999. It increased the depth of the river by 30 centimetres in the section between Montréal and Cap à la Roche, located about 200 kilometres downstream. This type of dredging is uncommon and only performed periodically. In 2013, the Port Authority of New York and New Jersey also conducted capital dredging by removing over 9 million metres³ of sand, clay silt and rock to accommodate larger vessels and be globally competitive.

Dredging in the St. Lawrence is jointly overseen by several federal departments, including Fisheries and Oceans Canada

(through the Canadian Coast Guard), Public Services and Procurement Canada and Environment Canada. These departments are also responsible for removing contamination from dredged sediments, if needed. Note that the commercial shipping industry assumes all dredging and decontamination costs.

Established in 2009 on the initiative of the NCC, the St. Lawrence Dredging Activities Registry has been integrated into the St. Lawrence Action Plan since 2011. It improves the management of dredging and ensures that ecosystems and public health are adequately protected while maintaining and promoting sustainable navigation on the St. Lawrence.¹³

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13. *St. Lawrence Dredging Activities Planning Registry – St. Lawrence Action Plan 2011–2026* (http://planstlaurent.qc.ca/en/uses/dredging_activities.html).
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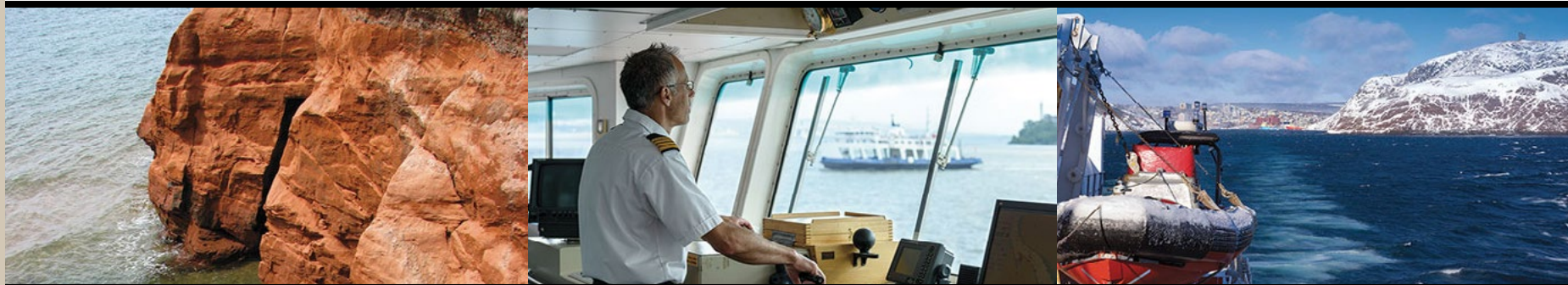


Organization for Safe Navigation

Under the *Pilotage Act* (enforced by Transport Canada), any cargo vessel or cruise ship entering a compulsory pilotage area, as defined by the Act because it is considered riskier for navigation, must entrust its operation to a licensed pilot (and sometimes two pilots), who, independently of the crew, shall exercise his or her professional judgment to ensure safe and eco-friendly navigation. On the St. Lawrence, the area between Les Escoumins and the Saint-Lambert lock, near Montréal, requires compulsory pilotage. The Laurentian Pilotage Authority trains the pilots who take over operation of ships for this specific stretch. The Corporation des pilotes du Saint-Laurent Central (CPSLC) provides pilots for the Montréal–Québec City section, and the Corporation des pilotes du Bas Saint-Laurent (CPBSL) provides

pilots for the Québec City–Les Escoumins section. Anyone who aspires to be a pilot must spend several years at sea as a deck officer before beginning training. Pilot certification requirements are very strict.

Transport Canada's mandate is to promote a safe and secure, efficient and environmentally responsible transportation system in Canada. The Department establishes marine transportation standards and regulations, and ensures compliance through a monitoring system, mainly through inspections. It has also implemented a tanker safety system that includes prevention, preparedness and response, and liability and compensation. The system combines inspection, aerial surveillance and monitoring programs for all tankers with measures to modernize navigation systems, plan area responses, reform the Incident Command System for at-sea incidents, and carry out scientific research on non-conventional



petroleum products. The Government of Canada regularly amends legislation and regulations to increase polluter responsibility and provide increased protection to injured parties.¹⁴

The St. Lawrence River and its tributary the Saguenay River are kept open to commercial shipping in winter through the combined efforts of a number of organizations. The Canadian Coast Guard provides icebreakers to prevent flood-causing ice jams, escort vessels and assist them in distress situations. Through real-time traffic monitoring, Marine Communications and Traffic Services provide information about which routes vessels should take through the ice and ensure the vessels comply.

The Canadian Hydrographic Service also makes an important contribution to marine safety. The Service collects real-time data on the St. Lawrence's water levels at different points, surveys the channel and produces detailed charts; this helps plan the movements of commercial ships, whose loads and speeds mean that there are specific requirements depending on water depth.

14. *World-Class Tanker Safety*, Transport Canada (<https://www.tc.gc.ca/media/documents/marinesafety/world-class-tanker-safety.pdf>).

> *Vignette*

What happens when an oil spill is reported in the St. Lawrence River?

Exceptional marine occurrences management is entrusted to the Canadian Coast Guard and Transport Canada when a vessel is directly involved.

Upon request, the specialists at the Eastern Canada Response Corporation (ECRC), whose centres are located along the St. Lawrence, immediately respond using all of their equipment to assist public authorities, communities and the private sector.





5 | Industry and Recreation: In Tune with Sustainable Development

With its landscapes and vibrant life, the majestic St. Lawrence attracts users from around the world eager to experience this exceptional environment firsthand. Recreational mariners, cruise enthusiasts, divers, recreational fishers, hunters and many others support a dynamic marine industry. Although the challenges to ensuring sustainability are not insignificant, the measures in place are equal to the task.

Boating on the River

Recreational boating forms part of the vast marine industry that includes motorized and human-powered boats, sail boats, kayaks, nautical schools, and countless outfitters, public agencies, associations and federations. Like commercial shipping, boating is an essential component of an economic prosperity that generates local and national benefits.

Boating became popular in Quebec thirty years ago. Many facilities were built following the *Les grands voiliers* [Tall Ships] event in 1984, which celebrated the 450th anniversary of Jacques Cartier's reaching the St. Lawrence. Today, over 140 marinas, yacht clubs, recreational ports and harbours, including nearly 15,000 dock spaces, border the St. Lawrence; this is



in addition to private infrastructure, such as docks and boat launches that grant a wide range of craft access to the river.

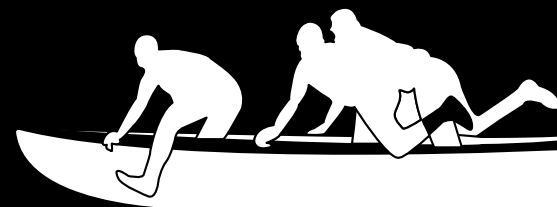
Transport Canada's Office of Boating Safety (OBS) oversees and enforces regulations, standards and policies. It is also responsible for promoting safe water practices and compliance with regulations. The Office manages regulatory programs pertaining to restrictions on craft use, pleasure craft licences and the National Pleasure Craft Operator Competency Program. It also trains law enforcement agencies and raises awareness of marine safety among key partners. The Boating Safety Contribution Program funds various organizations that promote boating safety on Canadian waters.

> *Vignette*

Every winter, an exceptional sport takes place on the St. Lawrence. Ice canoe teams gather in groups at different locations and compete to cross the River as quickly as possible. This has been a Carnaval de Québec tradition since 1955!

From Rimouski to Montréal, racers at L'Isle-aux-Coudres, Sorel, Portneuf and of course Québec City make up nearly 60 teams of five people—

including a dozen women's teams—who carry on this uniquely Quebec tradition. Relying on their strength and teamwork, these masterful athletes sail over the ice and reign victorious over the mighty St. Lawrence River.





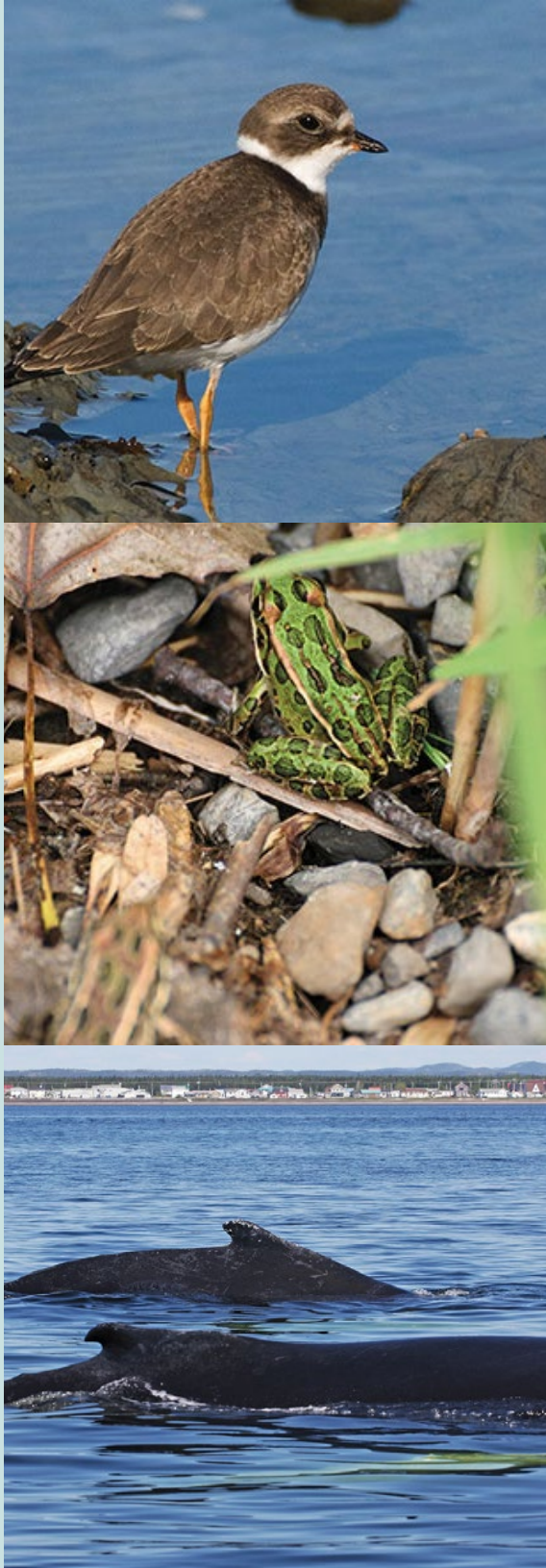


The OBS is committed to establishing and strengthening partnerships with organizations whose goal is to increase navigation safety by educating and raising awareness among boaters and boating enthusiasts. To do this, OBS trains law enforcement partners on regulations, while funds are granted to various organizations under the Boating Safety Contribution Program. OBS can also help local governments find alternative (non-regulatory) measures to resolve waterway conflicts.

The Office of Boating Safety supports the boating community, which includes over 4 million pleasure boats in Canada and over 10 million recreational boaters. Boating injects approximately \$8.9 billion¹⁵ into the Canadian economy every year. OBS's Boating Safety Program aims to reduce the number of boating accident victims, of which there are nearly one hundred throughout the country every year.

Tourisme Québec also supports the marine industry through its programs. In partnership with the magazine *La Presse nautique*, the Association maritime du Québec publishes the annual *Nautiguide*, which contains reminders about boating safety rules.

15. National Marine Manufacturers Association data.



6 | Biodiversity: A Treasure Worth Protecting

The St. Lawrence River is home to biodiversity that is unique in North America. There are more than several thousand invertebrate and plant species. Hundreds of bird species nest on the banks of the St. Lawrence, either permanently or during migration. Several species of fish, land mammals, amphibians, reptiles and marine mammals—including the largest animal in the world, the blue whale—complete the picture.¹⁶

Facing Ongoing Challenges

There are many challenges, including aquatic invasive species, bank erosion, industrial impacts and climate change.

Bank erosion affects all waterways. It deteriorates natural habitats and beaches, damages infrastructure and nearby land, and causes water quality to deteriorate by increasing suspended particles. There are many numbers of natural and human causes for this phenomenon. In the fluvial section, the relative effect of wave action should be considered when assessing erosion. Wave action is the action of waves beating against a waterway's banks, either as a result of natural conditions or because of wakes created by ships and pleasure craft. Wave action magnitude varies according to wave force, winds, vessel size, hull shape, squat and speed, and the features of the navigation channel.¹⁷ The marine



community is working to protect the St. Lawrence in various ways.¹⁸ In 2000, it established instructions for voluntary vessel speed reduction within roughly a 25-kilometre area between Sorel and Varennes in order to mitigate the effects of wave action. A large proportion of boaters comply with these instructions.

The presence of aquatic invasive species results from various activities. These plants, fish, mollusks, crustaceans, algae and tiny bacteria enter aquatic environments to which they are not native and multiply to the point of invading and stifling other species that live there. They enter Quebec's hydrographic network through marine traffic by attaching to ship hulls and getting discharged with ballast tank water. Pleasure boating, aquaculture and aquarium releases also introduce invasive species. Several measures have been implemented to counter the influx of invasive aquatic species. Ocean vessels

must have a Conformity Certificate, a ballast management plan and a logbook that documents all ballast water transfers. Before entering Canadian waters, vessels must keep a minimum distance of 200 nautical miles to conduct offshore ballast water exchanges. Requirements for ballast water management in the Great Lakes-St. Lawrence Seaway System have been among the most stringent in the world since 2006. Year-round, Transport Canada monitors all traffic entering the Gulf of St. Lawrence from outside the Canadian Exclusive Economic Zone and bound for ports in the region or in the Great Lakes-St. Lawrence Seaway System. It examines the contents of ballast tanks. Ships that have not exchanged their ballast water or rinsed their ballast tanks are required to keep ballast water and sediment on board, treat ballast water according to approved, environmentally safe methods, or return to sea to conduct a water exchange.

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16. "La biodiversité" ["Biodiversity"], *Stratégies Saint-Laurent* (<http://www.strategiessl.qc.ca/le-saint-laurent/biodiversite>).
 17. *Stratégie de navigation durable* [Sustainable Navigation Strategy] and "Érosion côtière" ["Coastal Erosion"], *Stratégies Saint-Laurent* (<http://www.strategiessl.qc.ca/dossiers-et-projets/erosion-cotiere>).
 18. *Stratégie de navigation durable* [Sustainable Navigation Strategy].
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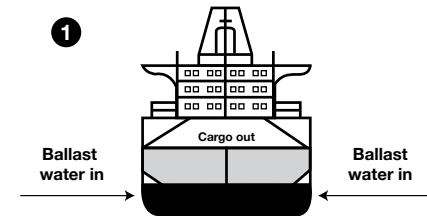
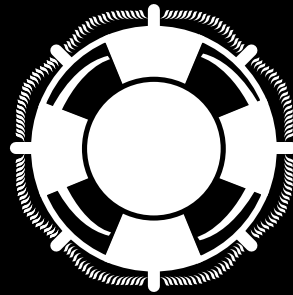
Although the ecological footprint of marine transportation is small when compared with that of other modes of transportation, Canadian shipowners invest large sums of money to modernize their fleets. Installing more energy-efficient engines is one such example. Engine exhaust gas is treated through purification systems, hulls are redesigned to enhance hydrodynamics and antifouling coating is applied to reduce the presence of undesirable species.

The Société des traversiers du Québec (STQ) also practises sustainable development leadership in the marine industry. The STQ decided that its three new vessels would be powered by liquefied natural gas (LNG). LNG is considered to be one of the cleanest ship fuels. Its benefits include: it reduces polluting emissions, improves energy efficiency and is a low risk to the environment in the event of an accident. Thanks to LNG, the three new ferries will emit up to 25% less greenhouse gas (GHG) than equivalent vessels using marine diesel fuel. In addition to reducing the environmental footprint when burned, natural gas reduces noise output and vibrations, which ensures greater respect for marine wildlife.

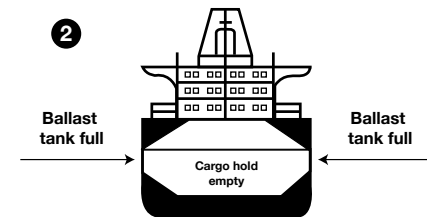


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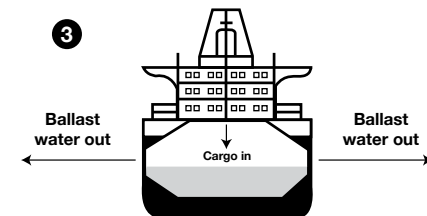
Ballast tanks are used to regulate vessel immersion and stability by pumping water in or out. All ships have ballast tanks. When a vessel loads goods on board, it must partly or fully empty its ballast tanks. When the vessel is fully loaded, it holds no ballast water. Conversely, when a vessel unloads, it must fill its ballast tanks in part or in whole.



1. At source port, unloading cargo, filling with ballast water (ballasting).



2. Voyage empty of cargo, full of ballast water.



3. At destination port, loading cargo, discharging ballast water (deballasting).

Diagram: Courtesy of GloBallast.



In 2007, the North American marine industry adopted an environmental program called Green Marine. This initiative aims to strengthen the environmental performance of shipping companies through a continuous improvement process. Green Marine participants in fact commit to going beyond regulatory compliance. Participants include shipowners, ports, terminals and shipyards. This voluntary environmental certification program promotes sustainable development through 11 performance indicators addressing several environmental issues, such as air emissions (including GHG), aquatic invasive species, waste management and water and soil pollution prevention. Participants have to demonstrate year-over-year improvement in measurable ways to maintain their certification.

Transport Canada inspects vessels on the St. Lawrence River and implements other concrete actions to prevent and detect marine pollution. Under its National Aerial Surveillance Program, Transport Canada operates three aircraft that can detect any trace of marine oil spills. These aircraft are based in Moncton, Vancouver and, depending on the season, Ottawa or Iqaluit, in Nunavut. It also has a joint agreement with Environment Canada to use satellite surveillance. As soon as an image indicates an anomaly on the surface of the ocean or the St. Lawrence River, a reconnaissance aircraft is dispatched. If there is a spill, the aircraft seeks to identify the source and gathers evidence for prosecution.¹⁹



The marine industry also contributes to environmental protection and plays an important role in the Sustainable Navigation Strategy. The Association maritime du Québec has operated its own recreational boating program, Eco-marina, since 2007. This certification program aims to improve the environmental management of marinas and their operations, including boat maintenance and repair, dock management, fueling procedures and sewage pumping stations.

19. "Spill Prevention: National Aerial Surveillance Program", Transport Canada (<http://www.tc.gc.ca/eng/marinesafety/oep-ers-nasp-2195.htm>).

> *Vignette*

Since 2013, voluntary measures to reduce the risk of whale-commercial vessel collisions have been in effect in the St. Lawrence Estuary's risk areas. These voluntary measures target speed reduction at the head of the Laurentian Channel off Tadoussac and the identification of an area to avoid downstream of Les Escoumins. These measures, based on rigorous scientific studies, were jointly adopted by the members of the Working Group on Marine Traffic and Protection of Marine Mammals (G2T3M). Linked to the Navigation Coordination Committee (NCC), the G2T3M,

co-chaired by Fisheries and Oceans Canada and Parks Canada, is made up of representatives from the marine industry, conservation groups, Transport Canada, the Canadian Coast Guard, universities and the Corporation of the Lower St. Lawrence Pilots. Since voluntary measures were implemented, vessel speeds have significantly decreased in these areas, resulting in vastly lower collision risks (up to 40%).

<http://www.qc.dfo-mpo.gc.ca/infoceans/201306/article4-eng.html>





Significant Outreach Efforts

In the spirit of sustainable navigation, St. Lawrence navigation stakeholders are stepping up their efforts to raise boater awareness on the importance of protecting waterways and reduce boating's footprint on ecosystems.²⁰ Transport Canada, for example, has drafted a guide entitled *Protecting Quebec's Waterways – A Boater's Guide* (TP 14761E), which promotes several environmental protection actions, such as eco-friendly product use, blue-green algae prevention, respect for wild animal habitats and waste, wastewater and hydrocarbon management.

The "Route bleue" [blue route] concept is a good example of sustainable boating promotion. The St. Lawrence Water Trail was developed by the Fédération québécoise du canot et du kayak: it is a waterway that runs along the

St. Lawrence River's 2,500-kilometre shoreline and is divided into ten sections, each designated a "Route bleue". This "water trail" was born of a desire to facilitate access to the river for small non-motorized craft such as sea kayaks and canoes; it was also designed to develop eco-friendly boating by promoting boating safety, respect for shoreline property and the protection of fragile aquatic environments. Various facilities (such as boat launches, shelters, rest areas, accommodation and food services, campgrounds) are available to users.

Also of note is the Défi bleu [blue challenge], launched in 2011 by the Jacques-Cartier Priority Intervention Zone (ZIP) committee. The Défi bleu is an awareness campaign held three months per year, encouraging motorized boat users to pro-actively contribute to fighting climate change. The Défi bleu recommends fourteen



simple ways to reduce greenhouse gas emissions. They include:

- Turning off the engine when the boat stops.
- Slowing down and reducing the boat's weight.
- Replacing an old 2-stroke engine with a 4-stroke engine.
- Sorting waste and recycling materials on board.
- Using alternative energy sources to power craft (e.g., a solar panel or small wind turbine).

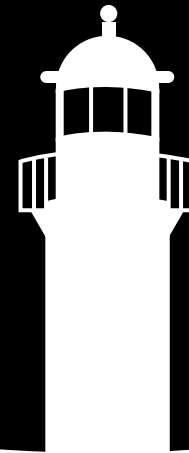
20. https://www.tc.gc.ca/media/documents/quebec-eng/boater's_guide_e.pdf

> *Vignette*

Do you know your ZIP?

Strategies Saint-Laurent is a non-profit organization that brings together Quebec's Priority Intervention Zones (ZIP) committees. Its main mission is to promote, using innovative models, the involvement of shoreline communities in the protection, restoration and enhancement of the St. Lawrence. The composition of ZIP committees varies from one region to another. Generally speaking, municipalities and environmental

groups are well represented. Companies participate in given areas, depending on the issues discussed. ZIP committee members work to reach a consensus on intervention priorities for achieving the results sought by their area's residents.







> *Vignette*

Did you know that throwing live bait, such as baitfish or crayfish, into a lake is one way of introducing invasive aquatic species that can damage the food chain and the local ecosystem?

Don't bring invasive species with you!

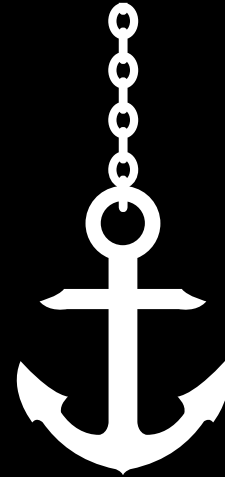
Before leaving a body of water

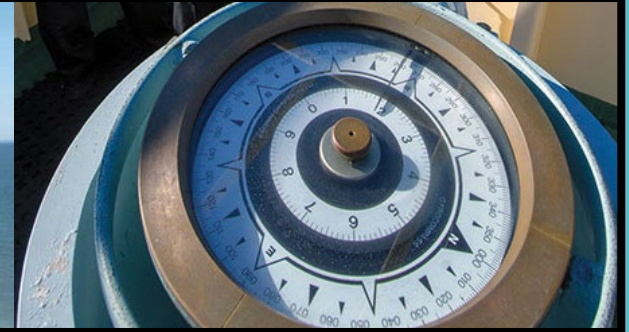
- Carefully inspect your craft, trailer, engine, fishing equipment and all boating equipment such as anchors and oars.
- Remove all aquatic plants, mollusks and crustaceans from your craft and throw them in the trash.

- Empty out water and bilge water in the craft.
- Drain the water from the engine cooling system.
- Do not throw live bait into the water. Throw it in the trash, freeze it or salt it for later use.

After leaving a body of water

- Remove any invasive species too small to be seen with the naked eye by rinsing your craft, trailer and the rest of your equipment with hot water (over 40° C) using a high pressure water jet where possible.
- Leave the craft and equipment to sun dry for at least five days before entering another waterway.





Conclusion

This exploratory voyage on the St. Lawrence River is drawing to an end. The time has come to anchor and reflect on the discoveries made along the way.

From the economic and geographic heart of the continent, the vital course of the St. Lawrence artery sustains prosperity and the very existence of a vast population. Its highly complex system of canals and locks, developed over centuries, is the most ingenious component and the most remarkable symbol of its role as North America's economic corridor. But even issues of major economic importance cannot overshadow safety considerations. The formidable challenges posed by the St. Lawrence's unique channel features, the huge scale of its estuary and gulf, and variations in weather have been met with the appropriate response:

the mobilization and organization of stakeholders and resources.

Safety and protection go hand in hand. The protection the St. Lawrence's biodiversity, unique in the world, benefits from the commitment of stakeholders from all walks of life. Their efforts are not wasted: the waterway's health is continuously improving. A vast number of recreational boaters benefit from the outcomes of these initiatives, which many contribute to, in accordance with their means.

Aware of the interests and benefits generated by the promotion of the principles and practices of sustainable navigation in the St. Lawrence corridor, the Navigation Coordination Committee keeps constant watch. These principles and practices will ensure that the St. Lawrence remains



the economic and symbolic hub it has become over the centuries.

By bringing ships into the waters of the Atlantic and the Great Lakes, the majestic St. Lawrence River is also carrying Quebec and Canada towards the future.

Report a Problem

If you accidentally pollute the water or if you witness a spill, immediately call the Canada Coast Guard Alert and Warning Network at **1-800-363-4735**.

> *Vignette*

The Maritime Strategy will enable Québec, in collaboration with the marine sector's various stakeholders, to fully, sustainably build on its know-how and marine assets. Ecological and environmental issues form part of the key policy directions of this strategy, one of which is focused on protecting the maritime territory and its ecosystems. The St. Lawrence River supplies drinking water for nearly 40% of Québec's population and provides a habitat for dazzling flora and fauna. The protection of the ecosystems in the maritime territory is, consequently, a key component of the Maritime Strategy. To this end, the government has adopted three strategic priorities

that will directly affect the quality and sustainability of marine resources and the safety and health of the population:

- Protect the biodiversity of freshwater and seawater ecosystems.
- Improve risk management related to maritime transport.
- Contribute to the fight against climate change.

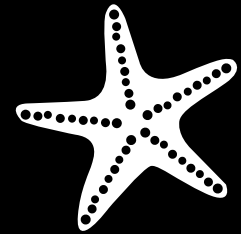




Photo Credits

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This document is the outcome of a project initiated by the Navigation Coordination Committee, whose mission is to promote sustainable commercial and recreational navigation, meaning navigation that meets economic, environmental and social sustainability objectives.

This guide was created through the collaboration of the following organizations:

Co-chairs

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Transport Canada

Members

Association maritime du Québec

Canadian Coast Guard

Canadian Power and Sail Squadrons

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