Appendix 1:

Protected territories

The UNESCO World Heritage List

"Heritage is our legacy from the past, what we live with today, and what we pass on to future generations."
Source: Convention concerning the Protection of the World Cultural and Natural Heritage, UNESCO, 1972.

UNESCO World Heritage flag
Source: Wikipedia / Henrik Sendelbach

In 1972, the **United Nations Educational, Scientific and Cultural Organization** (UNESCO) adopted a treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage. Since then, 186 countries have signed the treaty, committing to protecting the heritage sites recognized by UNESCO.

The sites, which were first proposed by signatory countries and then approved by a panel of experts, are inscribed on **UNESCO's World Heritage List**. In 2010, the list included 689 cultural sites, 176 natural sites and 25 mixed sites.

UNESCO's objective in creating the list was to encourage countries and local populations to protect their heritage. In addition to recognizing the sites and giving them greater international visibility, UNESCO provides signatory countries with assistance and training, especially in emergency situations.

UNESCO considers the following to be World **Natural** Heritage:
- natural monuments that have exceptional and universal aesthetic or scientific value
- natural sites and zones that form the habitat of threatened animal and plant species and that have exceptional and universal scientific and conservation value.

UNESCO considers the following to be World **Cultural** Heritage:
- monuments and groups of buildings or sites that have historical, aesthetic, archaeological, scientific, etc. value.

For a complete description of UNESCO's programme: http://whc.unesco.org/en/about/
To view the World Heritage List: http://whc.unesco.org/en/list/

Glossary:
Heritage: all the elements of a certain value that are passed on from one generation to the next. Examples: natural heritage, architectural heritage, family heritage, etc.

Shark Bay National Park

Shark Bay National Park is located at the most westerly point of the Australian continent, hundreds of kilometres from major cities. The park's **vast expanse** stretches out over 23 000 km^2, a third of which is **marine territory**. It is one of the largest **marine reserves** in the world and has been on **UNESCO's World Heritage List** since 1991. The region has a population of only 1000 and is visited by approximately 100 000 people annually.

Source: Flickr / Jason Means

Shark Bay's remarkable natural environment is unique in the world. Its warm and shallow waters are home to 323 species of fish, a population of dolphins and 10 000 dugongs, a rare and vulnerable species of marine mammal. This area is also a safe haven for approximately 230 species of birds and 26 protected species of mammals.

A very large number of **seagrass** species thrive in the bay and cover vast areas such as the Wooramel Seagrass Bank—the largest **seagrass bank** in the world—which extends over 1030 km^2.

Stromatolites

Source: Flickr / Paul J. Morris

The park is also a refuge for colonies of **stromatolites**—limestone formations built by bacteria—which are now rare in the world.

A dugong

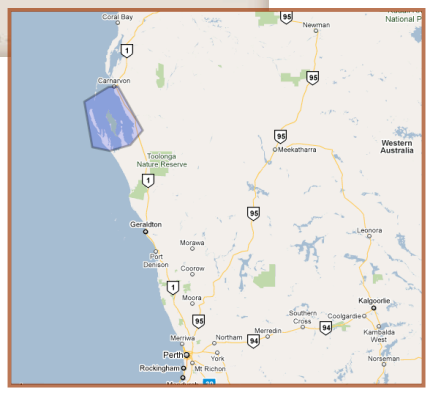
Source: Flickr / Wylnok

Throughout history, **humans** have introduced **foreign animal species** into the park's environment, which put **various native species at risk** and ultimately led some of these to extinction. Project Eden, which has been actively involved in protecting the park since 1995, has succeeded in eradicating foreign species and reintroducing native species.

Shark Bay's **remarkable ecosystems**, its many rare or **threatened species** and the great scientific interest it holds convinced UNESCO officials to add it to the World Heritage List.

Shark Bay: Location

Source: Collegial Centre for Educational Materials Development (CCDMD)



Source: Google maps

Glossary

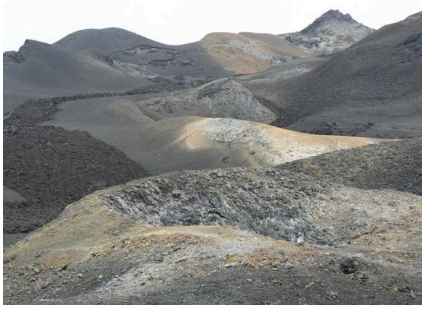
Limestone formations: natural structures made of limestone, a type of sedimentary rock. Sedimentary rocks are made of hardened sediment deposits. Stromatolites, karsts, stalactites and stalagmites are examples of limestone formations.

Ecosystem: a community of organisms (plants, trees, animals, insects) and natural elements (water, soil, rocks, wind, light) that interact within a given area.

The Galápagos Islands

Source: Flickr / Ucumari

The **Galápagos archipelago** is located approximately 1000 km off the coast of **Ecuador**, its home country, and comprises 19 islands and over 40 volcanic islets. Four of its largest islands are inhabited by some 20 000 people who rely primarily on tourism and fishing. Every year, approximately 150 000 people visit the islands.



Source: Flickr / Ucumari

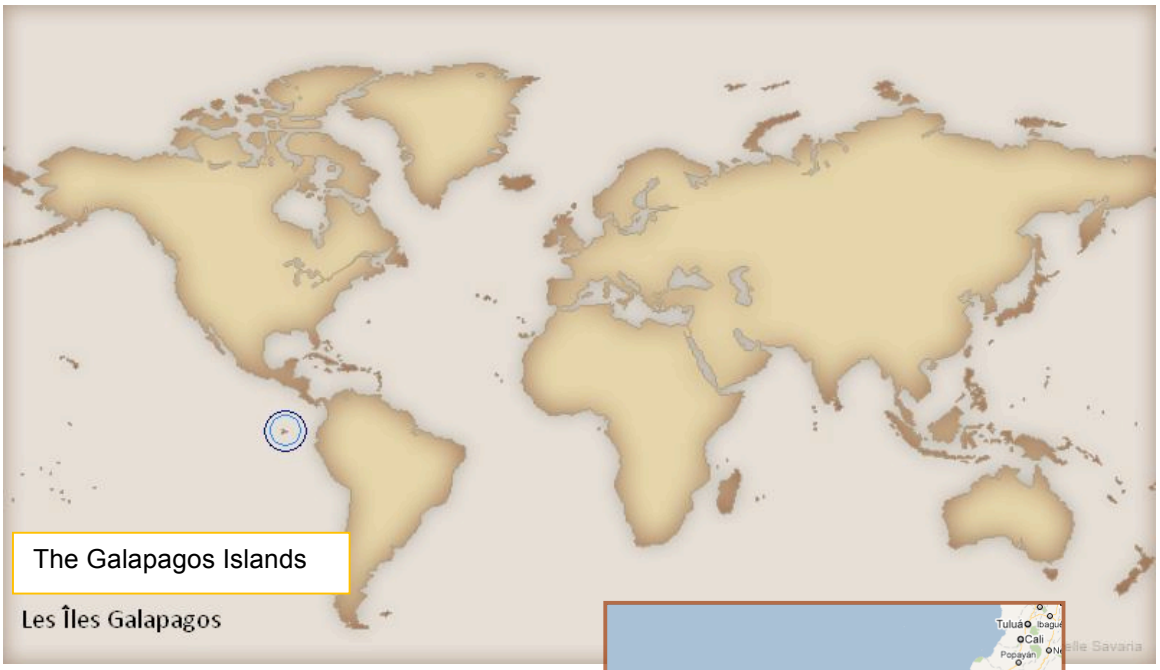
The Galápagos islands are a true **living museum of natural** history. Their geographical location has fostered the emergence and conservation of unique animal and plant life that has witnessed the **evolution of species** over millions of years. A trip to these islands in 1831 inspired a young **Charles Darwin** to develop his famous theory of the **origin of species**, which upset religious beliefs of the 19th century.

Strict regulations protect the islands' hundreds of rare animal and plant species that attract tourists and scientists. Featured are birds, marine mammals, crustaceans, fish, insects and reptiles, including the famous **giant tortoises**. Indeed, dozens of animal and plant species are found only on the Galápagos. The islands also host various **volcanic and geological phenomena** within the park's protective boundaries.

Source: Flickr / Peri Apex

The Galápagos islands were the first territory to be inscribed on UNESCO's World Heritage list in 1978. They were also included on its List of World Heritage in Danger in 2007, as a result of the **pressure** caused by **tourism** and **immigration**, but were removed from this list in 2010. **El Niño**, a climatic phenomenon beyond human control, also has a devastating effect on the island's fauna.

Galápagos Islands : Location



Source: Collegial Centre for Educational Materials Development (CCDMD)

Source: Google maps

Glossary

Charles Darwin: 19th century English naturalist. His work on the evolution of the species, which he began after a five-year research expedition around the world, had a great impact on the scientific community.

Theory on the origin of species: published in 1859 by Charles Darwin, this theory states that all living species have a common origin and have evolved through a process of natural selection.

El Niño: a climatic phenomenon that alters the direction of certain ocean currents in the eastern Pacific Ocean causing a significant increase in water temperature. The warm waters cause large schools of fish to leave the area, which disrupts fishing activities. When the El Niño phenomenon occurs (approximately every five years), the climate of the North American continent is also affected: some dry regions receive an abundance of rain while other regions, which are generally humid, experience a dry season.

Ha Long Bay

Ha Long bay is located in Northeast **Vietnam**, in a **densely population region** (more than 5 million inhabitants) some 170 km from Hanoi, the country's capital. It was first inscribed on UNESCO's **World Heritage List** in 1994, for the beauty of its **landscape** and its **biological diversity**, and a second time, in 2000, for the **geomorphological value** of its **karst formations**. The bay is one of Vietnam's most popular **tourist destinations**. It attracts more than 1.7 million visitors each year.

Source: Flickr / Xuanxu

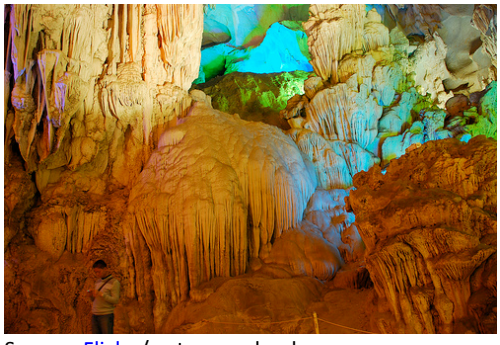
Source: Flickr / Alessio.zz

The bay has an area of 1500 km^2 and is dotted with more than **1600 steep-sided islands and islets** that are covered with what often is pristine vegetation. **Caves** and inlets that are difficult to navigate have been carved into this mountainous area. Although **karst formations** do occur worldwide, the karst landscape of Ha Long Bay is truly **spectacular** and well-preserved. Some of the caves have been made accessible to visitors, allowing them to discover impressive **limestone formations.**

The bay teems with fish; approximately 2000 people who rely on fishing live in small floating villages. The islets' flora and the bay's salt water fauna also attract **tourists and scientists** visiting the area.

Since Ha Long Bay was recognized by UNESCO, the number of visitors drawn to the site's attractions has increased significantly. Paradoxically, **urban development** now poses a threat to the bay, whose **banks** are encroached upon by tourist infrastructures.

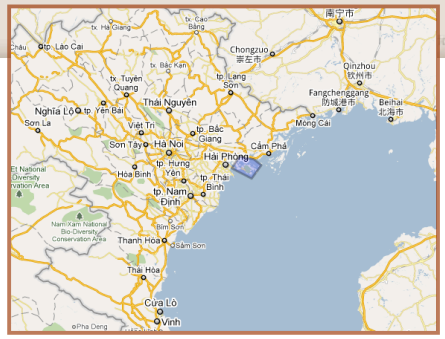
Since 1995, Ha Long Bay's management department has taken on the task of implementing and enforcing strict **regulations** to protect the site.



Source: Flickr / ostergaardanders

Ha Long Bay: Location

Source: Source: Collegial Centre for Educational Materials Development (CCDMD)



Source: Google maps

Glossary

Geomorphology: the scientific study of landforms (topography, landscapes, deposits) on the Earth's surface.

Karst formation: naturally-occurring element in a landscape composed of sedimentary rock sculpted by water. As the water slowly dissolves the rock, it carves out holes, caves and distinctive, often spectacular, shapes.

Limestone formations: natural structures made of limestone, a type of sedimentary rock. Sedimentary rocks are composed of hardened sediment deposits. Stromatolites, karsts, stalactites and stalagmites are examples of limestone formations.

Sediment: very fine matter resulting from rock and soil erosion. Water and wind are two of the strongest agents of erosion. The force of these elements slowly degrades soil and rocks over time. The fine matter resulting from this continuous process ends up in waterways, then in lakes, seas and oceans, where it is deposited in successive layers.

Fact sheet sources:

http://www.wikipedia.org

http://whc.unesco.org

http://www.unep-wcmc.org

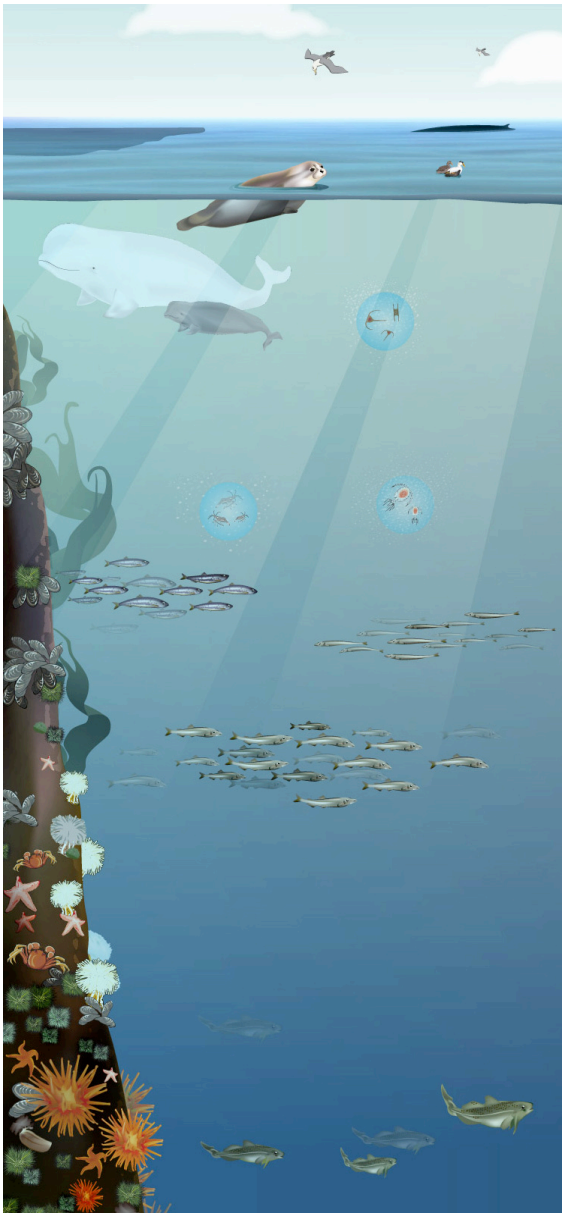
http://www.sharkbay.org/

http://www.tv5.org/TV5Site/dotclear/index.php/Vietnam-baie-d-ha-long
(FRENCH WEB SITE)

Appendix 2:

The protected territory of the Saguenay-St. Lawrence Marine Park

An exceptional water column



Source: Parks Canada

At the confluence of the Saguenay River and St. Lawrence Estuary, the waters mix in an unusual way to create an environment that is particularly hospitable to a wide variety of marine animals. The village of Tadoussac, which today is renowned for its whale watching activities, was founded in this area.

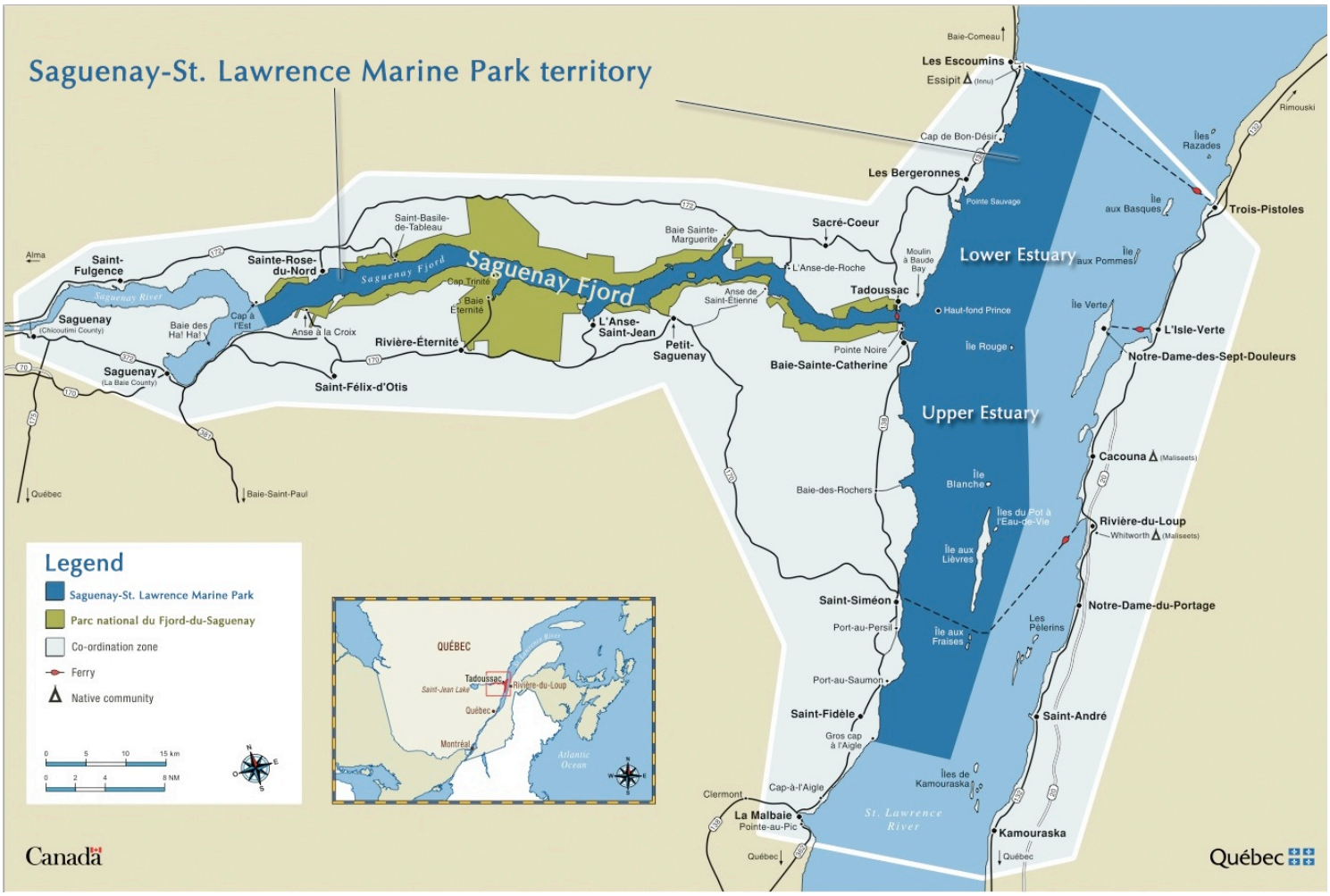
The saltwater of the Atlantic Ocean enters the Gulf and the St. Lawrence Estuary through the Laurentian Channel, a 1200-km canyon that ends at the mouth of the Saguenay. In the Estuary, a surface-layer current conveys freshwater to the ocean, whereas a deep-layer current draws the saltwater of the Atlantic Ocean upstream. Freshwater and salt water mix at the confluence of the Saguenay and the St. Lawrence.

This environment promotes the proliferation of krill and plankton, small organisms that various fish and whales species feed on.

To study this phenomenon, we will use the concept of the water column. We will analyze the marine environment layer by layer directly underneath a selected location. The visual compilation of the results will allow for a simple and quick understanding of a marine ecosystem.

The Saguenay-St. Lawrence Marine Park was created in 1998, after several years of pressure from the regional community. The marine park was created jointly by the Canadian and Québec governments under the St. Lawrence Action Plan. The establishment of the Marine Park is a tribute to the considerable significance of its territory.

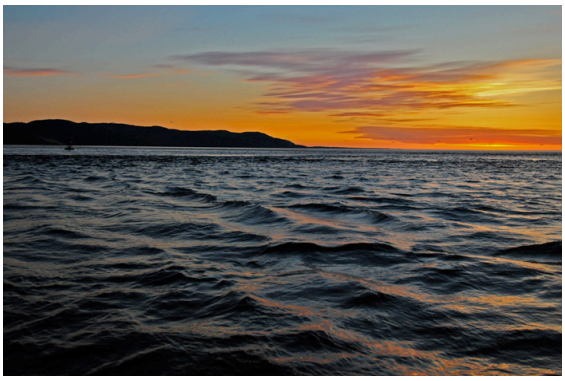
Map of The protected territory



Glossary

Fjord: Norwegian word describing a very deep glacial valley flooded by the sea.

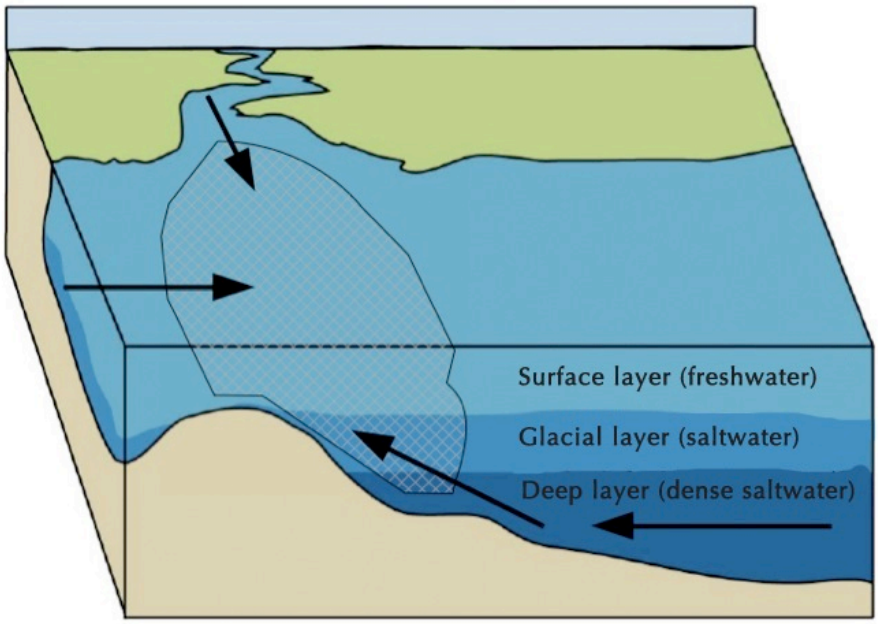
The confluence area



Source: Parks Canada / J.L. Provencher

The confluence of the St. Lawrence Estuary and the Saguenay River, where the waters of the Great lakes, the Saguenay basin and the Atlantic Ocean meet, is recognized as an ecologically exceptional region. The upwelling of cold water previously described is one of the distinctive oceanographic conditions of the confluence area.

This area is home to richly diverse **marine life**. The mingling waters foster the proliferation of huge shoals of plankton, which are a source of food for fish, seals and whales. The **richness** of the **fauna** and **flora** of the Saguenay-St. Lawrence Marine Park is due in large part to the **favourable environment** the head of the Laurentian Channel creates for living organisms.



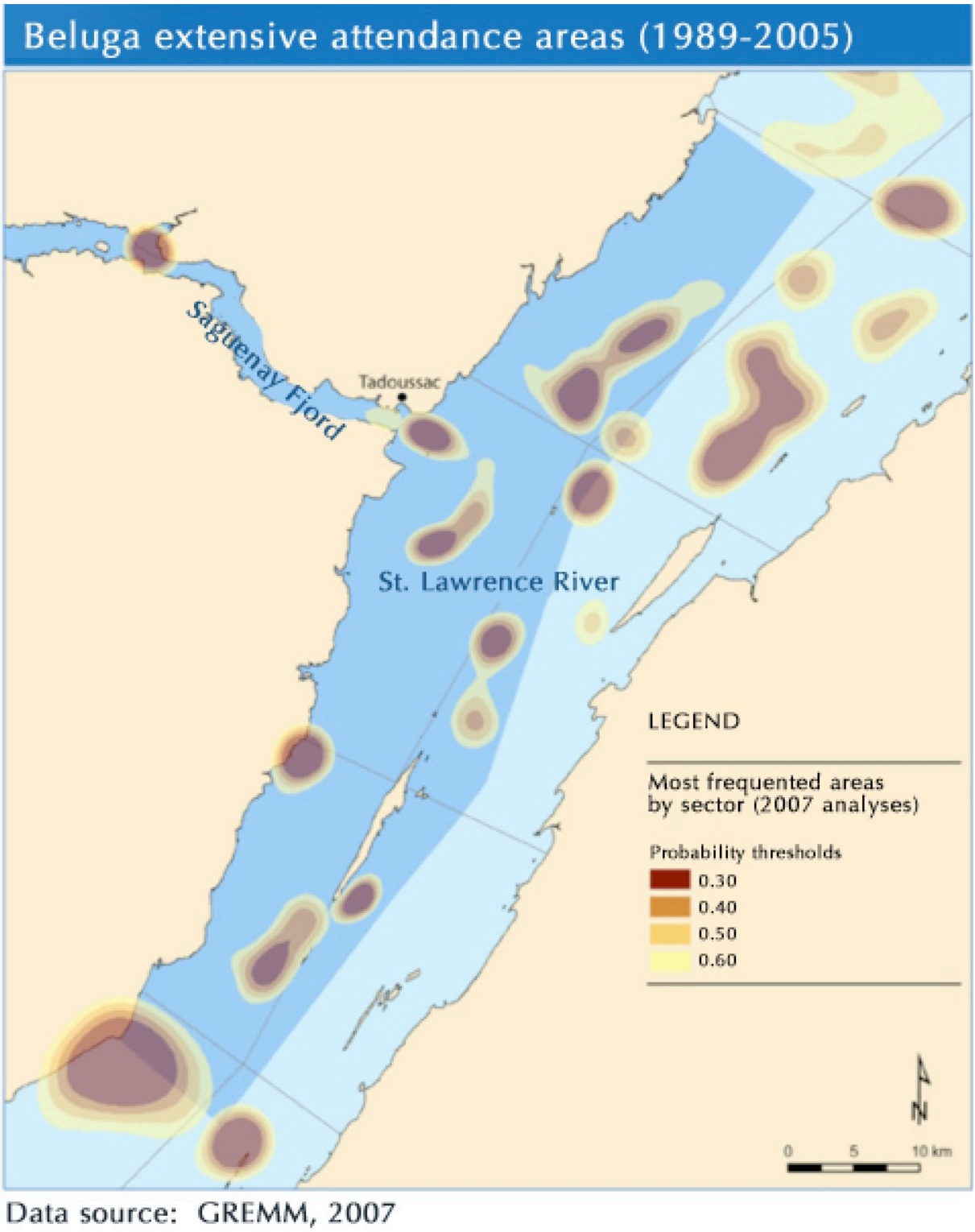
Source: Government of Canada and the Institut des sciences de la mer de Rimouski video document "The St. Lawrence Estuary, Beyond the Surface."

The St. Lawrence beluga

Source: Parks Canada / J.-L. Provencher

Animal species	Mammal
Population	Most belugas live in arctic waters. However, approximately 1000 of them live in the St. Lawrence, the species' southernmost habitat.
Status	Threatened species: The population of the St. Lawrence Estuary
Habitat	The Estuary and the Gulf of St. Lawrence, at various depths. In summer, most belugas can be found in the Saguenay-St. Lawrence Marine Park. They gather in the Upper and Lower Estuary and in the Saguenay fjord. Belugas are gregarious, meaning that they live and travel in groups.
Natural predators	Killer whales and sharks
Diet	Fish and marine invertebrates
Threat	Intensive beluga hunting in the past greatly reduced the species' population. Hunting has been banned since 1979. Habitat degradation caused by human activity (pollution flowing in from the Great Lakes, local pollution, vessel noise and traffic).

Source: Parks Canada



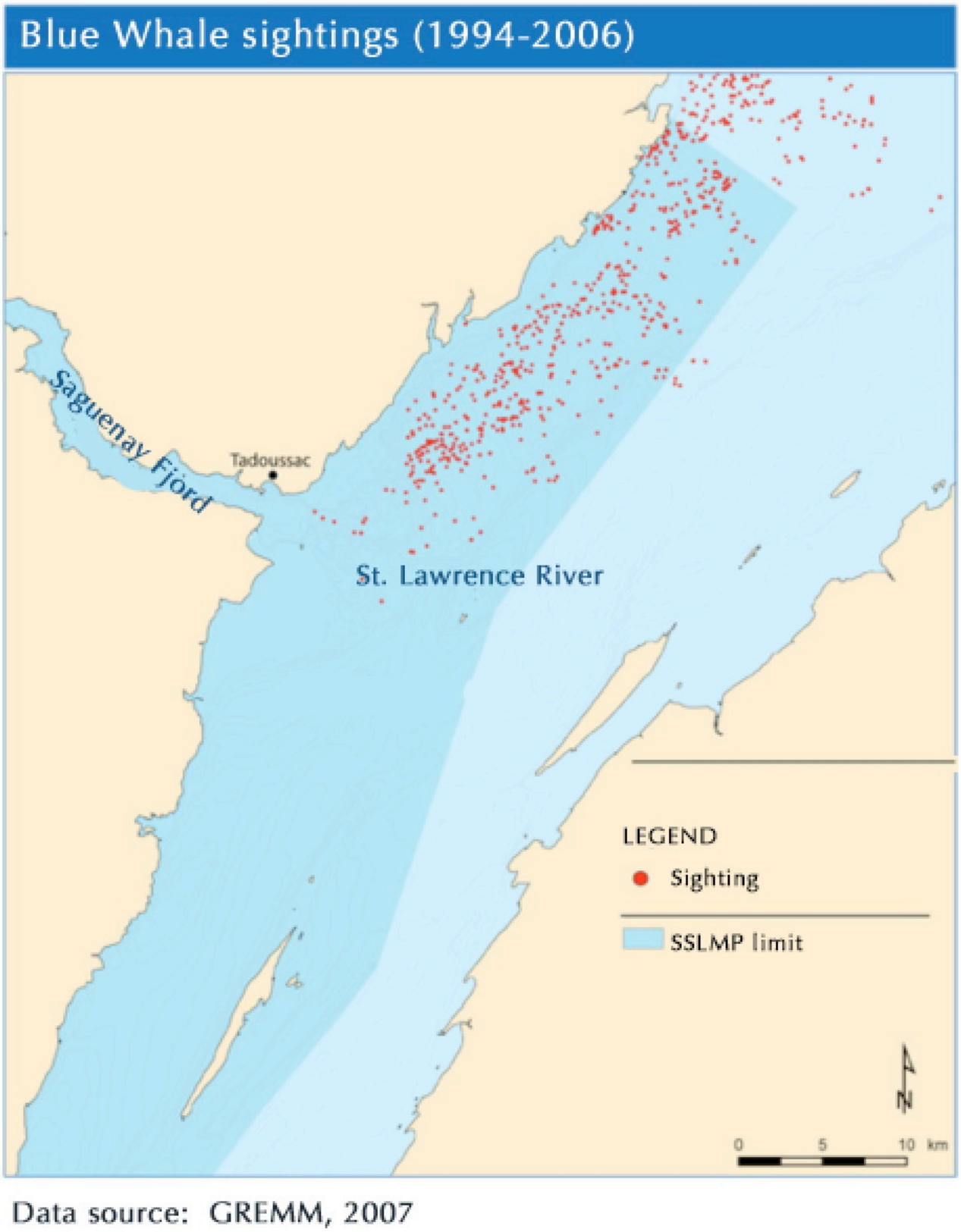
Source: Parks Canada

Blue whale, Atlantic population

Source: Parks Canada / J.-L. Provencher

Animal species	Mammal
Population	Indeterminate, lack of information, 400 individuals have been photo-identified
Status	Endangered species
Habitat	Atlantic Ocean, The Estuary and Gulf of St. Lawrence
Natural predators	None
Diet	Krill and other zooplankton
Threat (some can only be considered potential threats, since their impact has not been proven)	Commercial fishing is responsible for the decrease in population. Habitat degradation is caused by human activity (local and neighbouring pollution, vessel traffic, noise, incidental capture in fishing gear). Climate change may have an impact on the availability of its prey.

Source: Parks Canada



Source: Parks Canada

Fin Whale, Atlantic population

Source: Parks Canada / J.-L. Provencher

Animal species	Mammal
Population	Estimated at 3000 individuals
Status	Special concern
Habitat	Atlantic Ocean, The Estuary and the Gulf of St. Lawrence
Natural predators	None
Diet	Crustaceans and small fish such as herring
Threat (some can only be considered potential threats, since their impact has not been proven)	Commercial fishing is responsible for the decline in the population Habitat degradation is caused by human activity (local and neighbouring pollution, vessel traffic, noise, incidental capture in fishing gear).

Source: Parks Canada

Harbour Seal, Atlantic subspecies

Source: Parks Canada / J.-L. Provencher

Animal species	Mammal
Population	Between 1000 and 1500 individuals
Status	Not at risk
Habitat	St. Lawrence Estuary, shallow waters, bays and rocky shores
Natural predators	Killer whales and sharks
Diet	Fish and marine invertebrates
Threat (some can only be considered potential threats, since their impact has not been proven)	Habitat degradation is caused by human activity (pollution and vessel traffic).

Source: Parks Canada

Krill

Source: Parks Canada / J.-L. Provencher

Animal species	Invertebrate, crustacean
Population	Large swarms 100 km long and 1 to 7 km wide
Status	Not assessed
Habitat	In cold saltwater, closer to the surface at night; in the water column, at a depth of approximately 100 m during the day; very abundant at the head of the Laurentian Channel
Natural predator	Blue whales, other whales, fish and birds
Diet	Microscopic algae and copepods, depending on the species
Threat (some can only be considered potential threats, since their impact has not been proven)	Climate change can lead to variations in water temperature, making the environment less favourable to the krill's survival.

Source: Parks Canada

Atlantic herring

Source: Flickr / arnybo

Animal species	Fish (there are 70 species of fish in the marine park)
Population	Travel in schools
Status	Not at risk
Habitat	The coast of Newfoundland, the Estuary and the Gulf of St. Lawrence. Far from the coast and in deep waters during the day (200 m)
Natural predators	Belugas, minke whales, fin whales, humpback whales, seals, cod and other fish
Diet	Krill and other zooplankton
Threat	Overfishing. Fishing quotas were established to protect the Atlantic herring.

Sources: Parks Canada and Encyclopêche.com

Atlantic cod

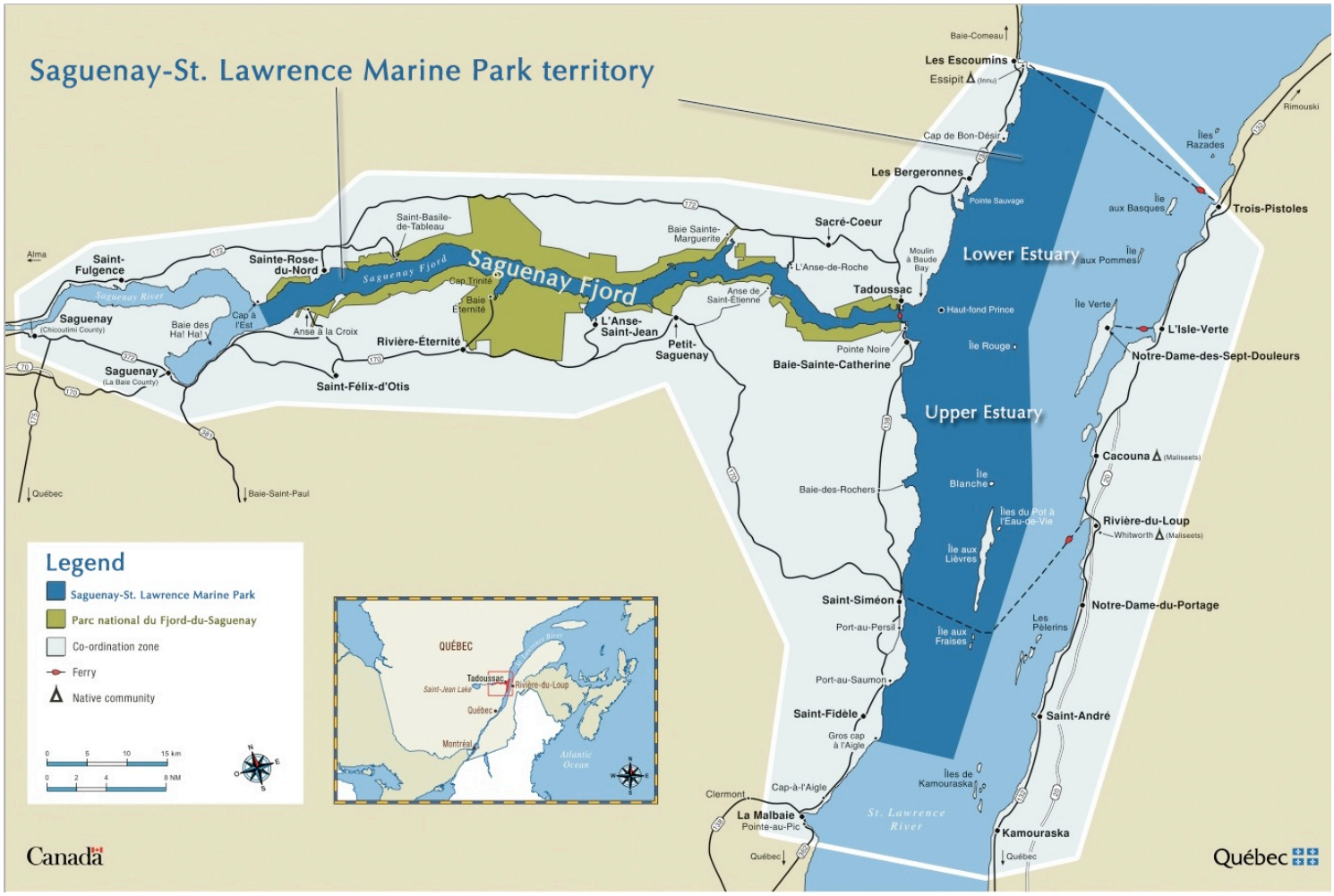
Source: Flickr / Hello, I am Bruce

Animal species	Fish
Population	Stocks estimated at 36 000 tons (down from 400 000 tons in 1950)
Status	Threatened species
Habitat	Near the bottom of the cold waters of the ocean and Estuary
Natural predators	Seals
Diet	Young codfish feed on invertebrates and shrimp. Adult codfish eat crustaceans and small fish (such as capelin and herring).
Threat (some can only be considered potential threats, since their impact has not been proven)	Intensive commercial fishing—especially during the 20th century—sports fishing today, predation and changes affecting its habitat and prey.

Sources: Parks Canada and GREMM

Appendix 3:

Human presence in the park



Source: Parks Canada

Source: Parks Canada / M. Loiselle

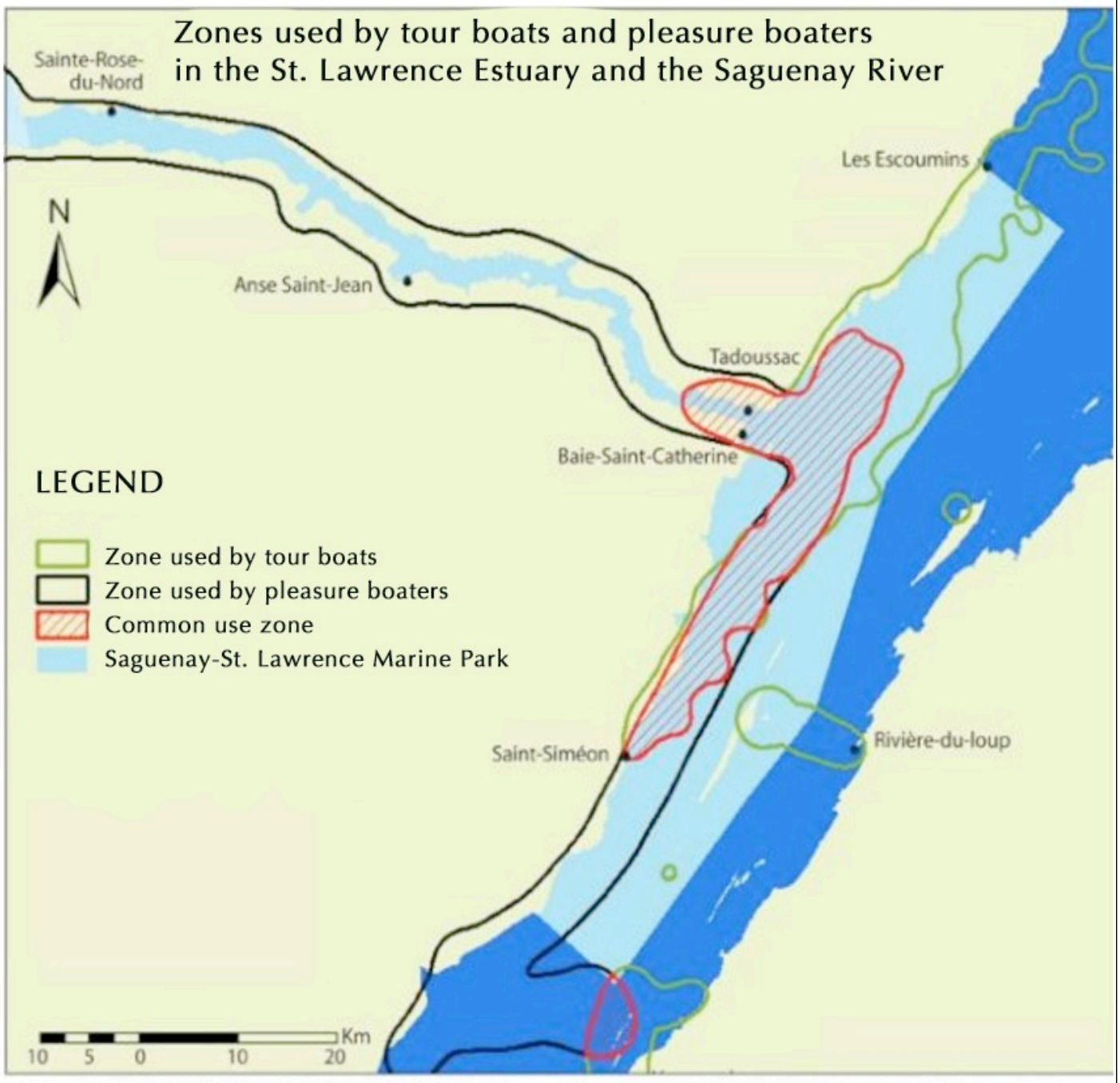
Motorized marine traffic

Source: Parks Canada / N. Boisvert

"According to statistics from various sources, motorized marine traffic represents approximately 91 000 crossings or outings per year in the Marine Park, of which 42,000 are attributable to ferries (between Baie-Sainte-Catherine and Tadoussac). Marine traffic is more intense in the summer, the period in which most wildlife species converge on the Marine Park to feed and reproduce. [...] It includes the carriage of goods by sea, passenger transport (ferries), sea tours, cruises, pleasure boating and sea kayaking."

Source : Nadia Ménard *et al*., *State of the Saguenay-St. Lawrence Marine Park Report 2007*, Parks Canada and Parcs Québec, 2007, p.35.

Pleasure boating



Source: Parks Canada

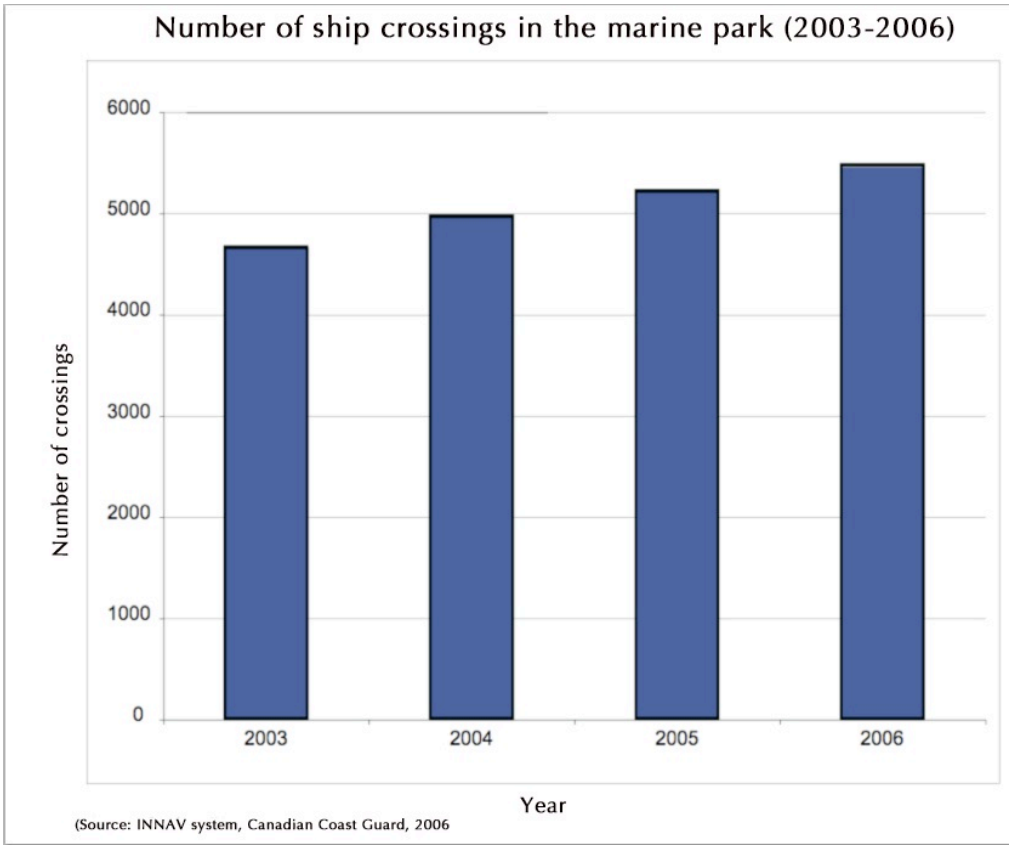
Various types of pleasure crafts, such as yachts, sailboats and ocean kayaks, ply the waters of the marine park during the summer season. These crafts, which are piloted by individuals and sometimes found in great numbers, are subject to the same regulations as cruise ships. It should be noted that the confluence of the Saguenay and St. Lawrence rivers is known for being one of the most dangerous and unpredictable navigation areas in the country. Pilots who navigate these waters must possess good navigational skills and exercise extreme caution.

Carriage of goods

Source: Parks Canada / J.-L. Provencher

Each year, some 6000 ships navigate the St. Lawrence River transporting 110 million tons of goods. Three quarters of these goods are international import or export products. The main product imported into Canada through the St. Lawrence River is crude oil. Iron is Canada's largest export product transported on the St. Lawrence River.

Source: Industrie maritime du Québec/Transport Québec, on www.lesaint-laurent.com, consulted June 14 2010.



Whale-watching trends: Québec's position in 2009

Source: Parks Canada / J.-L. Provencher

"Whale watching is still the fastest growing sector of general wildlife tourism worldwide and this is important for Québec, since marine tourism is a lucrative activity. According to a recent report, 13 million people went whale watching in 119 countries in 2008, compared to 9 million in 87 countries in 1998 […] **Québec ranks second** in total expenditures, generating an average of $142.55 per whale watcher, with international clients making up about 20% of the market." **Whale watching in Québec generates more than $80 000 000 in expenditure.**

Statistics indicate that approximately **284 000 visitors** in the region of the Saguenay-St. Lawrence Marine Park **have gone whale watching in a commercial vessel, for a total of 19 000 outings**, while kayakers number approximately 35 000 each year.

Sources: Julianna Priskin, "Whale-watching trends: Québec's position in 2009," *Le réseau de veille en tourisme*, available at http://tourismintelligence.ca/2009/11/06/whale-watching-trends-quebec%e2%80%99s-position-in-2009/, visited January 18 2010. Nadia Ménard *et al.*, *State of the Saguenay-St. Lawrence Marine Park,* Parks Canada and Parcs Québec, 2007, 69 p.

Sediment conditions

Source: Collegial Centre for Educational Materials Development (CCDMD)/ Photo: Michel Neveu

Pollutants	Persistent organic pollutants: PCBs, DDT, PAHs, PBDEs, heavy metals (e.g. herbicides, insecticides, flame retardants, smoke particles)
Location	The different temperatures and salinity levels of the Estuary's waters favour the precipitation of contaminated sediments towards the ocean floor. The head of the Laurentian Channel (located between Les Escoumins and Tadoussac) is a particularly favourable area for deep-water accumulation of contaminants.
Source	Two main sources: industrial areas upstream from the Estuary (Great Lakes, Montréal, Québec, etc.); residential and agricultural areas, upstream or in neighbouring areas.
Impact on the fauna and flora	Contaminant build-up in all organisms. Higher concentrations are found in animals at the top of the food chain since they accumulate the contaminants found in their prey. These contaminants make some animals such as belugas more susceptible to infections and diseases, including cancer.
Additional information	Although many contaminants are now banned, they are still found in living organisms, since they accumulated on the ocean floor over a long period of time. Other products still in use today, such as flame retardants used in electronic products, cars and household items, contaminate the St. Lawrence.

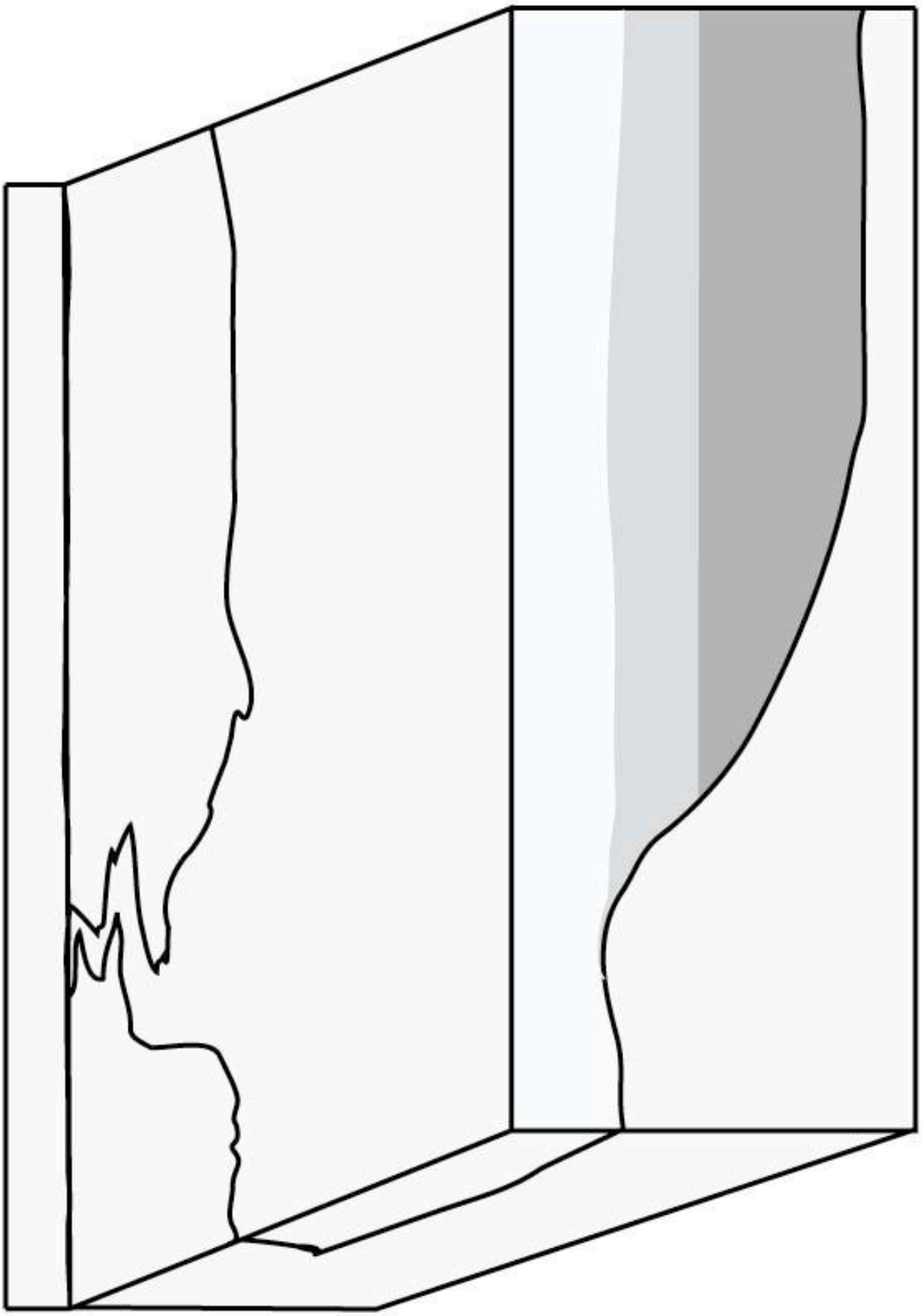
Source: Parks Canada

State of water

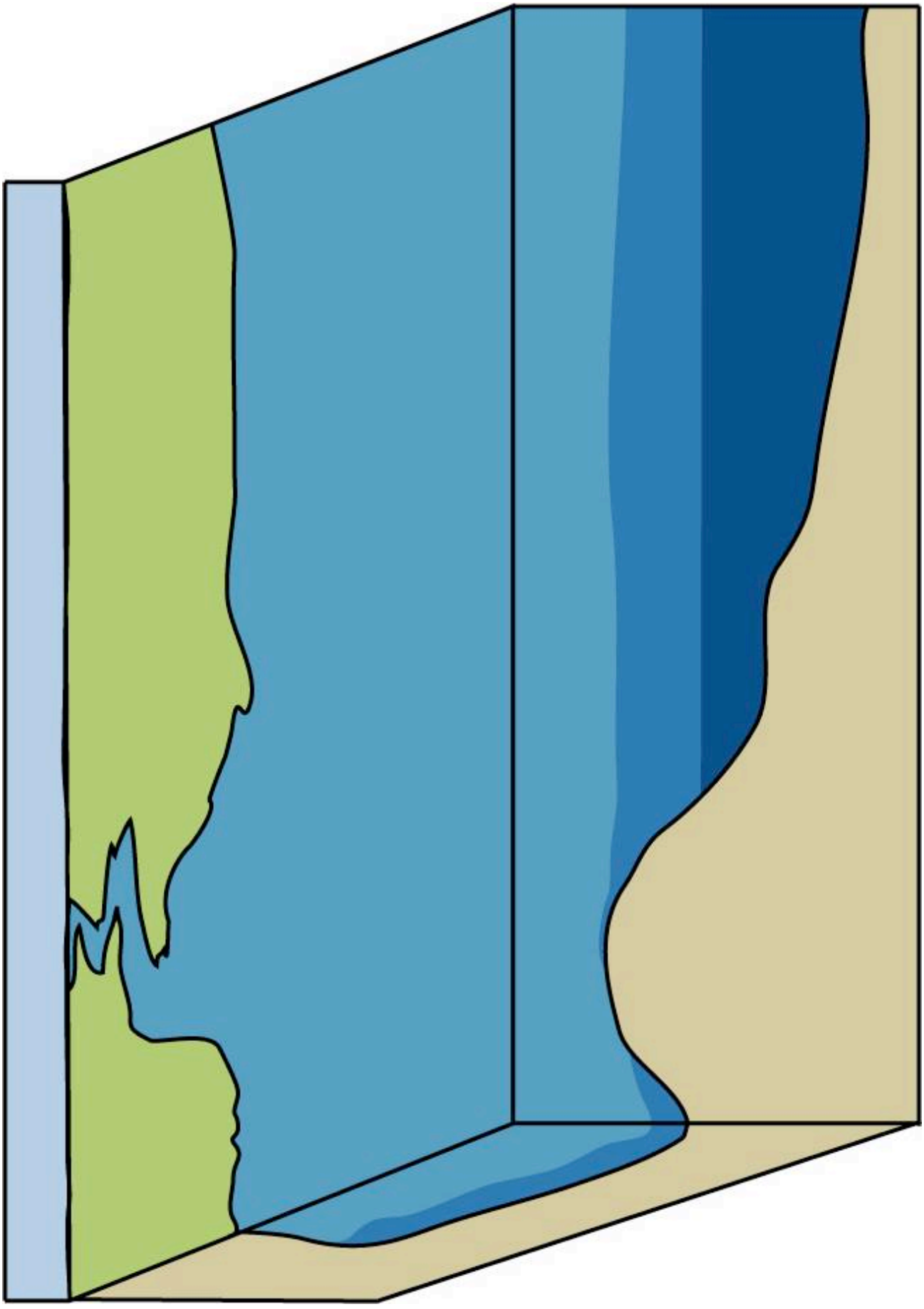
Source: Flickr / Thoth, God of Knowledge – Lake Michigan

Pollutants	Pesticides, pharmaceutical products, hydrocarbons, heavy metals
Location	Particularly around busy ports and other locations, depending on the type of pollutant. For example, greater quantities of pesticides can be found at the mouths of rivers.
Source	Local industries and farms, wastewater from local municipalities located upstream
Impact on the fauna and flora	The impact of these pollutants is difficult to assess. They are believed to increase cancer rates and the number of malformations and fertility problems in animals. Indeed, some pollutants have been known to have these effects.

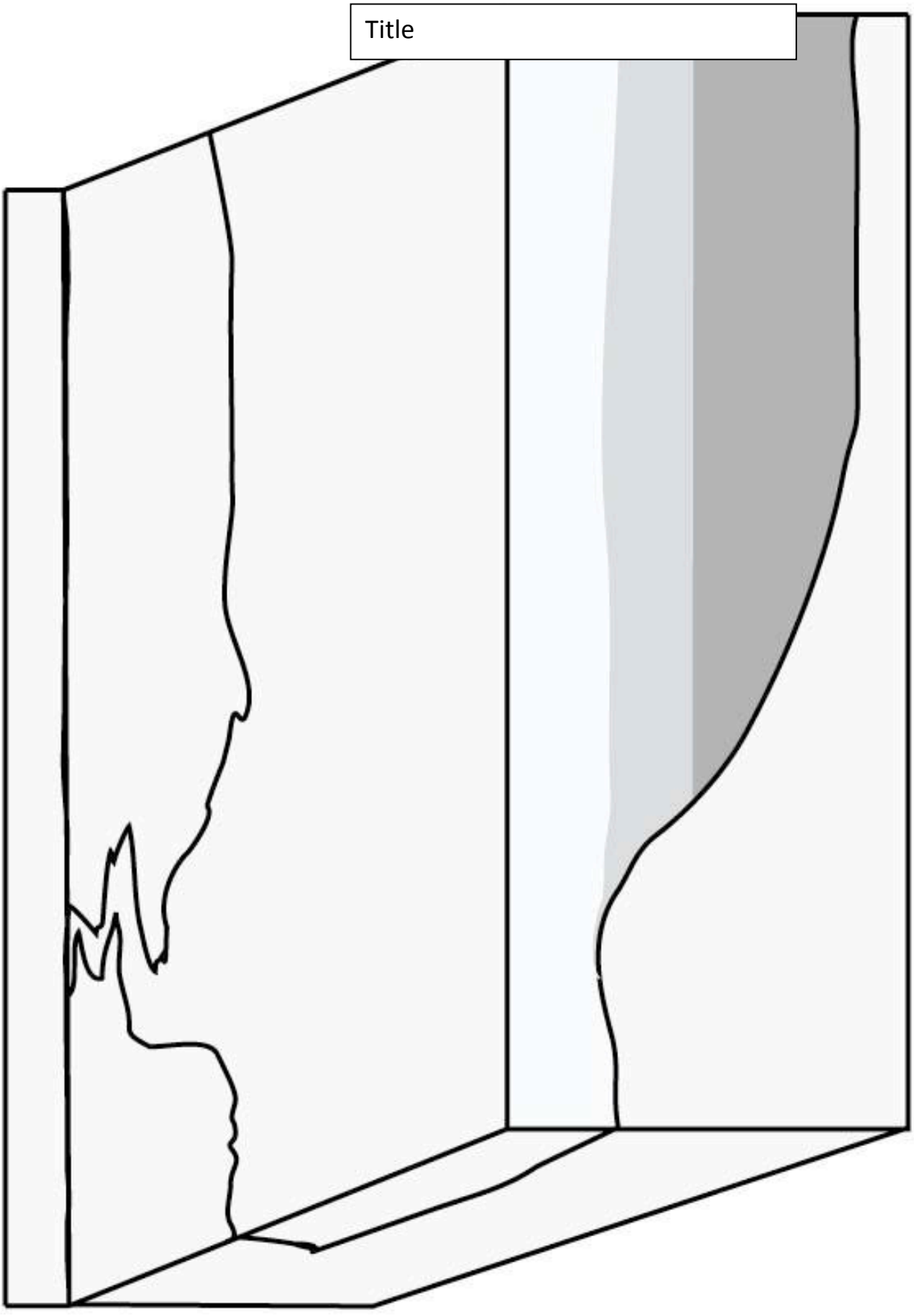
Source: Parks Canada



Outline sketch – Saguenay-St. Lawrence Marine Park

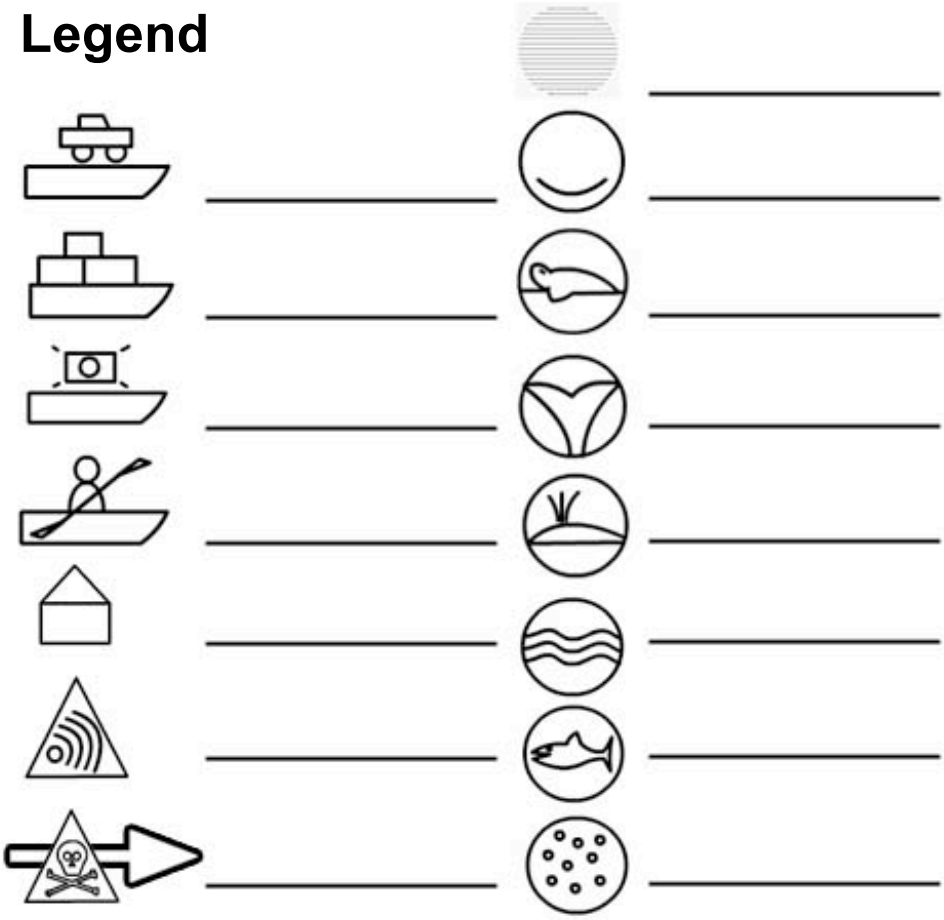


Outline sketch – Saguenay-St. Lawrence Marine Park



Titree?

Legend



Icon Bank

Natural elements

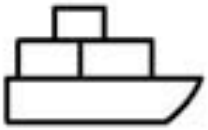
Herring
Atlantic cod
Seal
Krill
Fin whale
Blue whale
Beluga
Confluence

Human elements

City
Carriage of goods
Ferry
Sea tours
Pollutants
Noise
Kayak

Legend


Ferry


Carriage of goods


Sea tours


Kayak


Municipality


Noise


Pollutants


Confluence


Beluga


Harbour seal

Blue whale


Fin whale

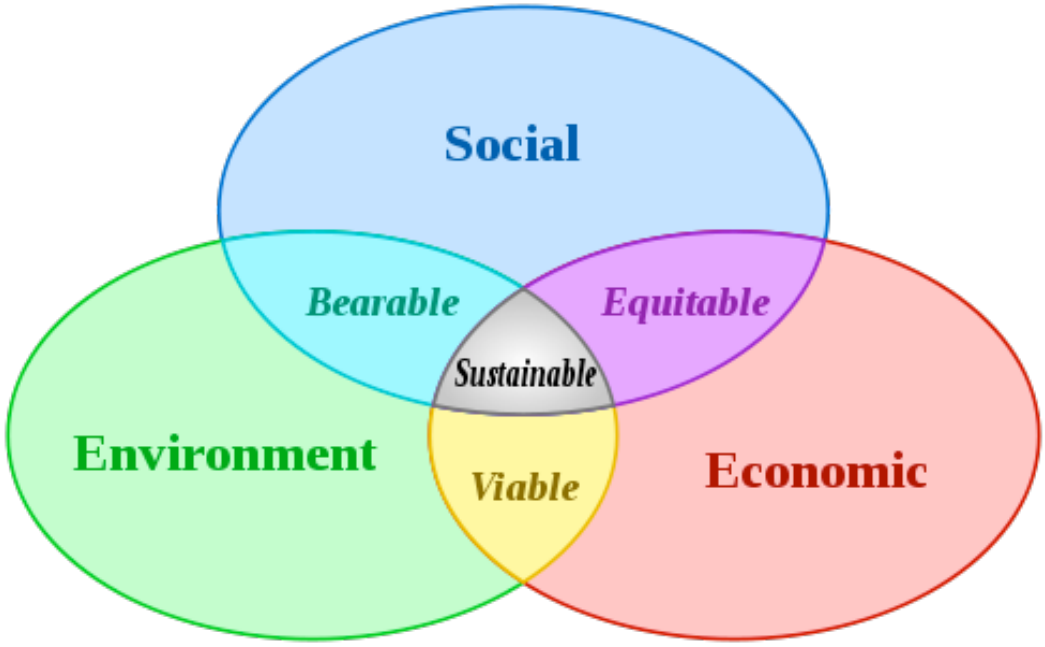

Atlantic herring


Atlantic cod


Krill

General glossary of the LES

Sustainable development: is development that adequately meets the needs of present generations without compromising the ability of future generations to meet their own needs. It is a positive form of development that takes place without harming future generations, upcoming or distant.



Source: Wikimedia Commons / Vigneron