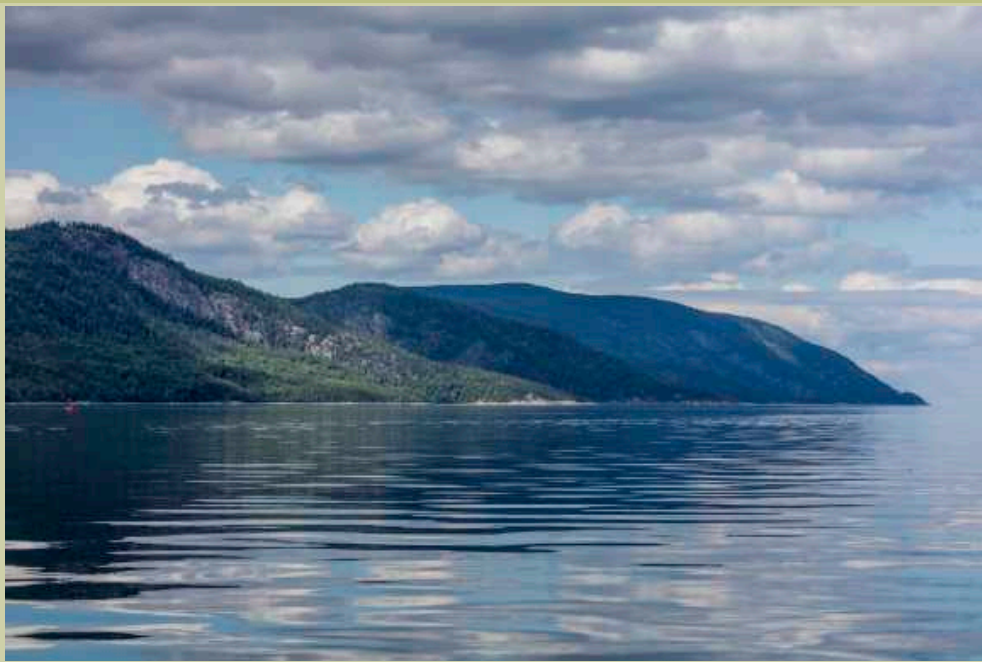


Action Plan to Reduce the Impact of Noise on the Beluga Whale (*Delphinapterus leucas*) and Other Marine Mammals at Risk in the St. Lawrence Estuary

St. Lawrence Estuary



2019

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For copies of the Action Plan, or for additional information on species at risk, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, recovery strategies and other related recovery documents, please visit the [Species at Risk Public Registry](#).

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Preface

Under the [Accord for the Protection of Species at Risk \(1996\)](#), federal, provincial, and territorial government signatories agreed to establish complementary legislation and programs that will ensure the effective protection of species at risk in Canada. Under the *Species at Risk Act* (S.C. 2002, c. 29) (SARA), the competent federal ministers are responsible for preparing action plans for species listed as extirpated, endangered, or threatened and for which recovery has been deemed feasible. They are also required to report on progress five years after the final document's publication on the Species at Risk Public Registry.

The Minister of Fisheries, Oceans and the Canadian Coast Guard is the competent minister under the *Species at Risk Act* (SARA) for the Beluga Whale, St. Lawrence Estuary population; the Blue Whale, Northwest Atlantic population; the Fin Whale, Atlantic population; and the North Atlantic Right Whale. He has prepared this Action Plan, pursuant to section 47 of SARA, to address a common threat mentioned in the recovery documents for these species. In preparing this Action Plan, the Minister has considered, as per section 38 of SARA, the commitment of the Government of Canada to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to the listed species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty. This Action Plan, in accordance with section 48(1) of SARA, has been prepared in cooperation with numerous stakeholders, including the Parks Canada Agency, marine transportation industry representatives and marine mammal watching excursionists. The complete list of stakeholders is provided in Appendix B.

As stated in the preamble to SARA, the success of this Action Plan depends on the commitment and cooperation of the parties that will be involved in implementing the directions and measures set out in this document. Fisheries and Oceans Canada, or any other jurisdiction, cannot succeed alone. The cost of conserving species at risk is shared amongst different government authorities and organizations. All Canadians are invited to support and implement this Action Plan, for the benefit of the Beluga and other marine mammals at risk in the St. Lawrence Estuary and also for Canadian society as a whole.

This Action Plan was prepared and approved by all participatory stakeholders prior to completion of the [Review of the Effectiveness of Recovery Measures for St. Lawrence Estuary Beluga](#) published in 2017. The Action Plan provides implementation measures for the recovery of the Beluga and other marine mammals at risk in the St. Lawrence Estuary, specifically for reducing impacts associated with anthropogenic noise. The science review reports similar, but more specific measures as those identified in this Plan to address this threat, for example, implementing innovations and technical solutions to reduce ship noise and adding conservation and protection measures for marine mammals at risk. Many of the measures identified in the Action Plan will contribute to achieving the same outcomes intended by the more specific measures reported in the science review. However, the science review also provides different recommendations and measures related to other threats (contaminants, availability and quality of prey, etc.).

An action plan proposes measures for the implementation of recovery strategies, including those addressing threats to species survival and those aimed at achieving the population and distribution objectives. Since this Action Plan details measures aimed at reducing a specific common threat to several species, it is considered to be partial. Subsequent action plans will be developed to meet the requirements of section 49 of SARA. Implementation of this Action Plan is subject to the appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Acknowledgements

Fisheries and Oceans Canada would like to thank Hugues Bouchard, Marie-Michèle Bourassa, Andréanne Demers, Audrey Fournier, Diego Munoz, Stéphane Plamondon and Virginie Christopherson, who prepared this document. The Department would also like to thank Gilles Fortin for creating the maps, and all of the Fisheries and Oceans Canada and Parks Canada Agency employees who provided feedback on the document as it was being developed.

The Department would like to thank the Parks Canada Agency, the Maritime Simulation and Resource Centre and the Société des traversiers du Québec, who helped organize the meetings; the people who attended the meetings to discuss the measures contained in this Plan; and all those who provided feedback during the various stages of the drafting process.

Summary

Four species of marine mammals listed in Schedule 1 of the *Species at Risk Act* are found in the waters of the St. Lawrence Estuary: the Beluga Whale (*Delphinapterus leucas*), St. Lawrence Estuary population; the Blue Whale (*Balaenoptera musculus*), Northwest Atlantic population; the Fin Whale (*Balaenoptera physalus*), Atlantic population; and the North Atlantic Right Whale (*Eubalaena glacialis*).

The St. Lawrence Estuary is a distinctive, dynamic marine ecosystem, partly because of its topography, the influence of tides and currents, and the seasonal presence of ice. Its geographical position also makes it economically important. The Estuary is a busy waterway, a hotspot for boating and whale watching, and it contains coastal and offshore development projects. As a result, one of the common threats to marine mammals in this area is the level of ambient noise these activities cause. Anthropogenic noise can mask the sounds marine mammals emit to communicate, orient themselves and find their prey, altering their behaviour or causing temporary or permanent hearing loss. Belugas are particularly sensitive to such noise in the St. Lawrence Estuary because they reside there permanently.

This Action Plan aims to reduce the impact of noise on marine mammals at risk in the St. Lawrence Estuary and in the Saguenay Fjord, a site regularly frequented by Belugas in the summer.

The document proposes measures to learn more about the various sources of noise and to mitigate its impacts to contribute to the recovery of marine mammals at risk in the St. Lawrence Estuary.

The measures to be taken are organized into four broad strategies:

1. Research and data acquisition
2. Threat management
3. Communication and outreach
4. Coordination and monitoring

The Action Plan also discusses the socio-economic costs and benefits of its implementation and performance indicators to monitor the effectiveness of the measures.

This Action Plan is one in a series of linked documents that should be taken into consideration as a group, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports and recovery documents.

Table of Contents

| | |
|--|-----|
| Preface | i |
| Acknowledgements | ii |
| Summary | iii |
| 1. Recovery Actions | 1 |
| 1.1 Context and Scope of the Action Plan | 1 |
| 1.1.1 Description of the Geographic Area | 3 |
| 1.1.2 Marine Mammals at Risk in the Estuary | 5 |
| 1.1.3 Noise: A Common Threat for Marine Mammals at Risk..... | 8 |
| 1.2 Measures to Be Taken and Implementation Schedule..... | 10 |
| 2. Critical Habitat | 16 |
| 2.1 General Description of the Species' Critical Habitat..... | 16 |
| 2.2 Activities Likely to Destroy Critical Habitat | 17 |
| 2.3 Proposed Measures to Protect the Beluga Whale's and Right Whale's Critical Habitat | 17 |
| 3. Evaluation of Socio-economic Costs and of Benefits | 17 |
| 3.1 Stakeholder Profiles | 18 |
| 3.2 Socio-economic Costs of Implementing this Action Plan | 20 |
| 3.3 Benefits of Implementing this Action Plan..... | 22 |
| 3.4 Distributional Impacts | 23 |
| 4. Measuring Progress | 23 |
| 5. References..... | 25 |
| Appendix A: Effects on the Environment and Other Species Not Targeted | 29 |
| Appendix B: Record of Cooperation and Consultation..... | 30 |

1. Recovery Actions

1.1 Context and Scope of the Action Plan

Under section 47 of SARA, the competent minister must prepare one or more action plans based on the recovery strategy. Consequently, action planning for species at risk recovery is an iterative process. The Implementation Schedule in this Action Plan may be modified in the future depending on the progress towards recovery.

This multi-species Action Plan is focused on addressing needs that are shared by four marine mammals species in the St. Lawrence Estuary. The species primarily targeted by this Action Plan is the Beluga, since the St. Lawrence Estuary population resides there permanently. Since 2017, this population has been designated as endangered under the *Species at Risk Act* (SARA). The other marine mammals listed in Schedule 1 of SARA that are present in the St. Lawrence Estuary will also benefit from the implementation of this Action Plan. They include two seasonal visitors—the Blue Whale, Northwest Atlantic population, and the Fin Whale, Atlantic population—and an occasional visitor to the Estuary, the North Atlantic Right Whale.

An action plan provides the detailed recovery planning that supports the strategic directions set out in recovery strategies, in order to facilitate their implementation. This Action Plan is part of a series of documents on marine mammals at risk in the St. Lawrence Estuary, including COSEWIC status reports (COSEWIC 2005, 2012, 2013, 2014) and various recovery documents produced under SARA: the Recovery Strategy for the Beluga Whale (*Delphinapterus leucas*) St. Lawrence Estuary Population in Canada (DFO 2012); the Recovery Strategy for the Blue Whale (*Balaenoptera musculus*), Northwest Atlantic Population, in Canada (DFO 2009); the Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters (DFO 2014a); and the Management Plan for the Fin Whale (*Balaenoptera physalus*), Atlantic Population in Canada (DFO 2017a). A recovery strategy also provides background information on the species and its threats and critical habitat information. The objective of all these documents is to plan and implement strategies, approaches and measures that support recovery.

This document deals with a common threat to the four targeted marine mammals, namely disturbances caused by anthropogenic noise (noise from human activities). The main goal of this Action Plan is to reduce the impact of noise on the Beluga and on the other marine mammals at risk in the St. Lawrence Estuary. Other threats to these species will be addressed in separate action plans.

The stakeholders consulted and the potential partners for the implementation of the Action Plan are those conducting activities in the St. Lawrence Estuary and the Saguenay Fjord or those with an interest in protecting the marine mammal populations in these environments. Although the scope of the measures covers the entire St. Lawrence Estuary, the geographic area targeted by this Action Plan is the heart of the St. Lawrence Estuary, which extends from Isle-aux-Coudres to Forestville on the north shore, and from Saint-Jean-Port-Joli to Rimouski on the south shore. This specific geographic area, which also includes the Saguenay Fjord, allows us

to focus our efforts on a significant portion of the Beluga's range (Figure 1) and identify concrete measures to facilitate the Plan's implementation.

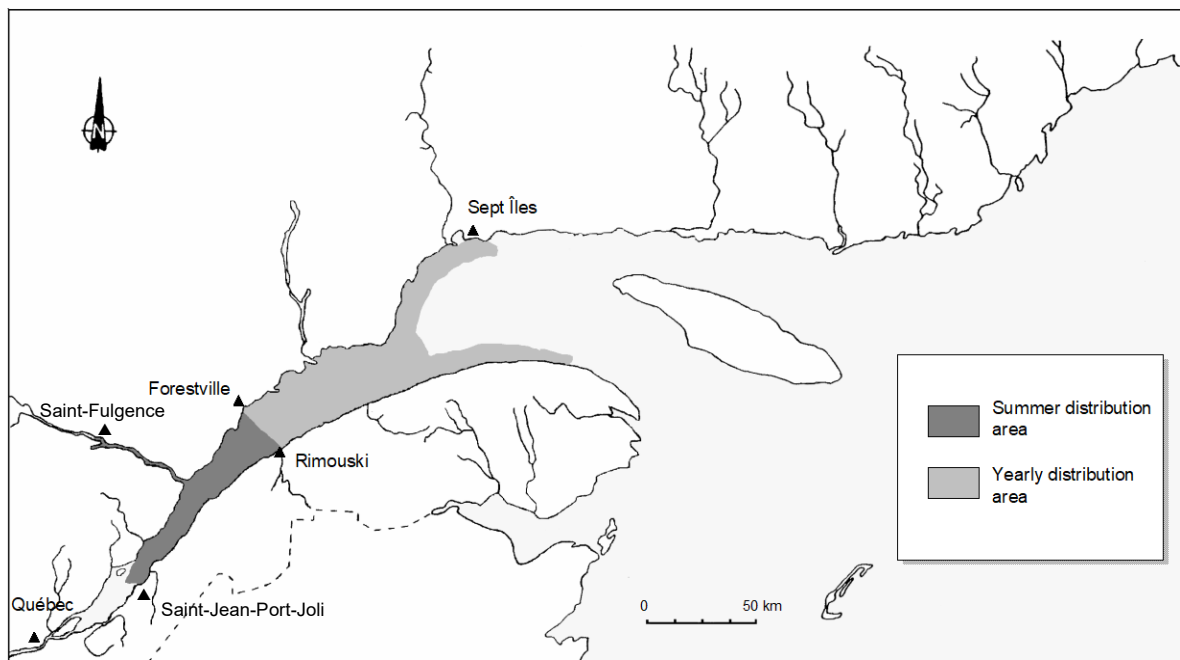


Figure 1. Present distribution area of the St. Lawrence Beluga (taken from the *Recovery Strategy for the Beluga* (*Delphinapterus leucas*) *St. Lawrence Estuary Population in Canada*, 2012)

The Maritime Strategy announced in June 2015 by the Government of Quebec could facilitate the implementation of this Action Plan, as it seeks to promote the sustainable development of maritime Quebec by ensuring a healthy coexistence between environmental protection (including for species at risk) and economic development.

[Canada's Oceans Protection Plan \(OPP\)](#), an initiative announced by the Government of Canada on November 7, 2016, could contribute to the implementation of measures suggested in this Action Plan. One of the objectives of the OPP is to mitigate threats to marine mammals by, among other things, exploring ways to reduce the impact of noise generated by marine transportation.

Also, under the Whales Initiative, the Government of Canada is committed to taking actions to protect marine mammal populations across Canada, including the St. Lawrence Estuary Belugas. Investments in scientific research will further increase our knowledge about the locations, movement and abundance of these whales and target:

- Expanding the use of existing technologies and approaches to monitor and track whales in Canadian waters as well as developing, testing, and implementing new ones.
- Increasing research on contaminants and studying their impacts on these whales. This will include monitoring contaminant levels in whales and in their main prey.

- Expanding monitoring and tracking systems for whales to inform vessel slowdown measures and to support fisheries management measures.
- Assessing other measures for marine mammal avoidance such as modifications in fisheries, seasons or locations.
- Expanding research activities to better understand prey availability and whale foraging success.

Finally, the Marine Mammals Regulations have been recently amended to increase the approach distance to 400 meters the distance between vessels and the St. Lawrence Estuary Belugas.

Thus far, some measures have had an impact on the noise level in the estuary and the Saguenay Fjord even though they were not specifically targeting noise. For example, the Government of Quebec has prohibited gas and oil exploration and exploitation in the St. Lawrence Estuary between Île d'Orléans and the western tip of Anticosti; Parks Canada has restricted the number of whale-watching boats under the *Marine Activities in the Saguenay–St. Lawrence Marine Park Regulations* and has prohibited the use of certain important areas for Belugas, such as Saint-Marguerite Bay in the Saguenay Fjord; the Société des traversiers du Québec takes noise emission into account in the design of new ferries; and, for its part, Fisheries and Oceans Canada recommended traveling in the northern channel of the Estuary to prevent increased noise in south of Île Rouge, an area frequently occupied by herds of Belugas composed of females and young Belugas (DFO 2017b).

1.1.1 Description of the Geographic Area

Downstream from Québec, the St. Lawrence River widens considerably to form a large estuary, where the influence of tides, ice, currents and tributaries creates a dynamic ecosystem frequented by a number of marine mammals. The portion of the Estuary covered by this Action Plan includes the Upper Estuary and the Lower Estuary. The topography, bathymetry and influence of water masses differ between these two sections—the Upper Estuary, dotted with islands, is generally warmer and shallower than the Lower Estuary, notably its northern sector.

The Estuary contains communities of zooplankton (small crustacean species) and fish that are eaten by marine mammals such as Belugas, Harbour Porpoises, Minke Whales, Humpback Whales, Fin Whales, Blue Whales, and some species of seals. The Lower Estuary, particularly at the head of the Laurentian Channel, is also conducive to the aggregation of zooplankton, which is part of the diet of baleen whales (Blue and Fin Whales), and small pelagic fish species that serve as prey for Belugas and Fin Whales.

In addition to the Estuary, the Saguenay Fjord, located between Saint-Fulgence and Tadoussac, is also targeted by this Action Plan because a section of about 30 kilometres from its mouth is part of the Beluga's critical habitat (see Section 2). The fjord is distinguished by great variation in depth and salinity, and steep rock faces.

A wide range of human activities take place in the St. Lawrence Estuary and the Saguenay Fjord (Figure 2). A particular sector at the confluence of the Fjord and the River, the Saguenay–St. Lawrence Marine Park, is the only park in Quebec to preserve and develop an exclusively marine environment. This park is managed jointly by the governments of Canada (Parks Canada) and Quebec (Ministère des Forêts, de la Faune et des Parcs).

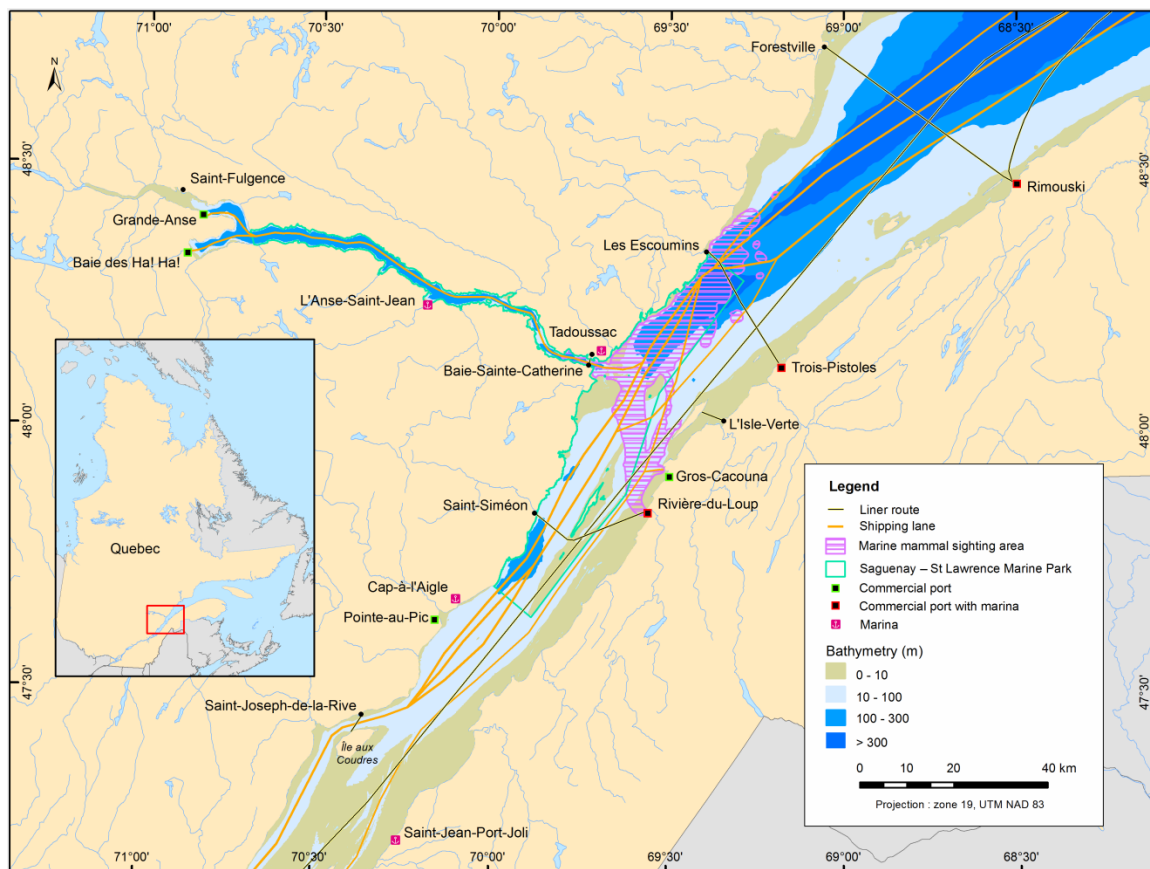


Figure 2. Map of the St. Lawrence Estuary and the Saguenay Fjord as well as the areas where the main human activities occur¹

The St. Lawrence Estuary is a major commercial transportation hub and is used by the merchant shipping fleet, a large fleet that includes several types of vessels such as multi-purpose cargo ships, container ships, bulk carriers and oil tankers. The St. Lawrence Estuary is also used by other fleets, including service vessels (tugboats, pilot boats, icebreakers, rescue and scientific research vessels, etc.), passenger vessels (ferries, excursion or cruise vessels), and recreational and fishing vessels. There are also ports and marinas along the entire length of the navigable waterway of the Estuary and the Saguenay Fjord.

Merchant shipping uses the navigable route of the Estuary, and its traffic over the course of a day corresponds to the passage of one ship every 1 hour 20 minutes between May and

¹ Shipping lanes are extracted from Parks Canada's Automatic Identification System (AIS) data at the Saguenay – St. Lawrence Marine Park (PMSSL), from Chion *et al.* 2017. The marine mammal observation area comes from the PMSSL and illustrates the sector used for this activity.

November and every 3 hours 20 minutes in winter (McQuinn *et al.* 2011). Ferries add to the daily maritime traffic and provide connections between the southern and northern shores of the Estuary and between islands. The ferry between the municipalities of Baie-Sainte-Catherine and Tadoussac, separated by the Saguenay Fjord, accounted for almost half of the total crossings in the Estuary in 2015-2016 (STQ 2016). The Saguenay–St. Lawrence Marine Park hosts a large fleet of tour boats, which offer several types of excursions, mainly for whale watching. In the summer, some 40 tour boats offer several departures per day (DFO 2014b). Excursion vessels also frequent an area outside the park on the south shore of the Estuary, particularly between Kamouraska and Cacouna. This activity requires several hours of travel and observation in a single area, which is thus subject to a greater frequency of navigation activities than the adjoining sectors (Chion *et al.* 2009). The Estuary is also very popular with recreational boaters using various types of sailboats, motor boats, personal watercraft and kayaks.

In addition to navigation-related activities, recurrent or one-time coastal and offshore development projects are carried out annually within the limits of the Estuary. They fall into five categories: dredging, repair work, construction work, seismic surveys and geotechnical surveys.

1.1.2 Marine Mammals at Risk in the Estuary

This section briefly describes the status of and main threats to each species. Table 1 presents their SARA listing information and the recovery documents available on the Species at Risk Public Registry.

Table 1. Information on the listing of the marine mammal species at risk under SARA

| Species | Listed Status Under SARA | Recovery Documents (Year) |
|---|--------------------------|---------------------------|
| Beluga Whale, St. Lawrence Estuary population | Endangered (2017) | Recovery Strategy (2012) |
| Blue Whale, Northwest Atlantic population | Endangered (2005) | Recovery Strategy (2009) |
| Fin Whale, Atlantic population | Special Concern (2006) | Management Plan (2017) |
| Right Whale, North Atlantic population | Endangered (2005) | Recovery Strategy (2014) |

Beluga Whale, St. Lawrence Estuary population

The Beluga is an odontocete (toothed whale) that lives mainly in the Arctic waters of the Northern Hemisphere. The St. Lawrence Estuary population is geographically isolated from other populations in the Canadian Arctic and lives exclusively in the Estuary and the Gulf of St. Lawrence. It experienced a significant decline due to excessive hunting, which was banned in 1979. After hunting stopped, until the early 2000s, this population was stable or growing slowly, with about 1000 individuals in 2002. However, a decline in abundance of about 1% per

year has been observed since then; in 2012, the population was estimated to be just under 900 individuals (DFO 2014c). Presently, the main threats to the recovery of the St. Lawrence Estuary Beluga population are contaminants, human disturbances (including noise), reduced prey availability and quality, and other habitat disturbances and degradation. A viability analysis of the St. Lawrence Estuary Beluga population was conducted in 2016 to assess the various threats that may have an impact on its demographic parameters (Williams *et al.* 2016). This analysis concluded that the three main threats, noise, contaminants and reduced prey availability, had to be mitigated in order for the population to return to a positive growth rate. It also determined that achieving the population target of 7070 individuals in 2100, as defined in the Recovery Strategy, is not feasible even in the most optimistic scenarios.



Photo: Fanny Gandolphe, Réseau d'observation de mammifères marins

Blue Whale, Northwest Atlantic population

The Blue Whale is the largest animal ever to exist on Earth. This mysticete (baleen whale) is found in the Pacific and Atlantic oceans and feeds exclusively on krill (zooplankton composed of small crustaceans). The Northwest Atlantic population frequents the Estuary and the Gulf of St. Lawrence, where many individuals regularly go to feed between May and December. The size of the population is unknown but is estimated to be only a few hundred individuals (Sears and Calambokidis 2002). It was decimated by commercial hunting, which is now internationally banned. At present, the main threats to this population are anthropogenic noise and changes in prey availability (DFO 2009).



Photo: Véronique Lesage, Fisheries and Oceans Canada

Fin Whale, Atlantic population

The Fin Whale is a mysticete that feeds on zooplankton and small-bodied fish. The Fin Whale is found in all of the world's oceans, and the Atlantic population frequents the Estuary and the Gulf of St. Lawrence, especially to feed in the summer. This population dropped due to hunting practices through much of the 20th century, which have been banned in Canada since 1971. The population estimate from a complete survey achieved in 2007 is approximately 900 individuals for the Newfoundland and Labrador regions, and 450 for the Gulf of St. Lawrence and the Scotian Shelf (Lawson and Gosselin 2009). Ramp *et al.* (2014) estimated the Fin Whale abundance in the north-west of the Gulf and the Estuary at approximately 330 individuals. The threat with the highest level of concern to Fin Whale conservation is anthropogenic noise from a variety of sources including shipping, seismic exploration, military sonar and coastal and offshore development (DFO 2017a).



Photo: Véronique Lesage, Fisheries and Oceans Canada

North Atlantic Right Whale

The Right Whale is a mysticete that feeds mainly on zooplankton and frequents the waters off the East coast of North America. Individuals are sometimes observed in the St. Lawrence Estuary in the summer, specifically at the head of the Laurentian Channel. The population was decimated by hunting, and is currently estimated at 411 individuals (Pettis *et al.* 2018). The main threats to population recovery are collisions with ships and entanglement in fishing gear, as well as the various activities that produce acoustic disturbances (DFO 2014a).



Photo: Jolinne Surette

1.1.3 Noise: A Common Threat for Marine Mammals at Risk

The recovery strategies for the four marine mammal species covered by this Action Plan indicate that increased global marine traffic and industrial and military activities are responsible for the higher levels of low-frequency underwater noise measured in recent decades. This marked increase in anthropogenic noise affects marine mammals, and studies are underway to better understand those effects.

Ambient noise in marine ecosystems includes natural noise along with all other sources of noise. Natural noise comes from waves, precipitation, earthquakes and ice. Biological sounds come from aquatic animal species, including marine mammals, fish and crustaceans. The sources of anthropogenic noise are varied and include navigation, seismic and hydrographic surveys, exploration and exploitation of hydrocarbon deposits, dredging, construction and repair of ports and other associated activities such as vibratory driving, driving of stakes and piles and drilling.

Noise sources have various negative impacts on marine mammals depending on the characteristics of the noise sources (duration, frequency and intensity) and the environmental components that influence its propagation (substrate, water depth, temperature and salinity). The impact on marine mammals also depends on whether sources emit continuous noise (e.g., machinery on board vessels and cavitation by the propeller) or pulsing noise (e.g., pile driving, compressed air cannons), on the distance of an individual from the source, and on whether there are multiple sources. Marine mammals react differently to sounds depending on their perception of the noise. The perceived frequencies differ according to the sensory cells and the auditory apparatus of a given species. When anthropogenic noise exceeds certain thresholds or remains constant, it can be considered a kind of pollution altering the quality of the habitat.

This noise has a direct impact on marine mammals. At various critical thresholds, noise can cause damage to the hearing tissue, reduce hearing sensitivity and cause temporary or permanent hearing loss. In some cases it can inflict physical damage, including internal injuries that can lead to death. The increase in underwater noise can also cause marine mammals to have problems with perception by masking important signals. Anthropogenic noise can have indirect effects by interfering with the sounds emitted by marine mammals and reducing their ability to perceive their environment, locate prey, or detect other individuals of the same species. It can stimulate stress hormone production and induce behavioural changes, including altered social interactions, reduced mating, altered swim trajectories and the temporary or permanent avoidance of important habitat. These effects can interfere with the vital functions of individuals (feeding, reproduction, parental care, etc.) and with population recovery (demographic structure, growth rate, migration, etc.). Tissue damage and physical injury are measurable consequences that can be related to different intensities, frequencies and durations of noise. Behavioural disturbances, however, are difficult to quantify. Species and individuals of the same species respond to noise exposure in very different ways, which demands greater research efforts.

Belugas use sounds to navigate, avoid obstacles, recognize each other and establish social cohesion, as well as to locate and identify their prey. The frequency range of whistles used for communication extends from about 100 Hz to over 10 kHz, while sounds used for echolocation, such as clicks and pulsed tones, are emitted at higher frequencies, sometimes exceeding 100 kHz (Au and Hastings 2008). Baleen whales like the Blue Whale produce sounds at very low frequencies, below 200 Hz, but the precise functions of these sounds are not well understood (Ketten 1998; Mellinger and Clark 2003; Bertchok *et al.* 2006; McDonald *et al.* 2006; Au and Hastings 2008). For the Beluga, according to various studies reviewed in Erbe *et al.* (2016), the range of auditory acuity is between 40 Hz and 160 kHz. For baleen whales, such as Blue and Fin Whales, it is thought to be between 7 Hz and 22 kHz (Ketten *et al.* 2007; Southall *et al.* 2007), although no hearing range data is available.

A large proportion of the anthropogenic noises in the St. Lawrence Estuary come from vessel traffic. The intensities and frequencies of the noises emitted by different types of vessels are highly variable. These parameters form a unique acoustic signature for each vessel, and studying those acoustic signatures makes it possible to identify each vessel's contribution to the overall noise level. McQuinn *et al.* (2011) compared the hearing sensitivity of Belugas to the acoustic signatures of the two main types of vessels travelling in the Saguenay–St. Lawrence Marine Park; merchant vessels (container ships) and rigid hull inflatable boats used for whale-watching excursions. The results indicated that the acoustic signature of container ships is in a low frequency band, where Belugas have poor hearing. However, the acoustic signature of excursion boats is at medium frequencies, where Belugas hear clearly. The authors concluded that, for the study area, rigid hull inflatable boats with outboard motors are the dominant source of noise impacting Beluga due to their prevalence, their proximity to habitats and their acoustic signature. However, the presence of service and merchant shipping vessels significantly increase the level of ambient noise. Their number, the amount of noise they generate and their regular presence in the Estuary, particularly in periods when Belugas are in the area, contribute to masking the echolocation and communication sounds emitted by Belugas and other marine

mammals at risk. Compared to merchant shipping vessels that travel the Estuary from one end to the other, ferries generate noise along narrow corridors. However, their crossings can have an impact on the behaviour of Belugas—Lesage *et al.* (1999) reported a more persistent change in the vocal behaviour of Belugas in response to a ferry moving slowly than to an outboard motor boat moving rapidly and erratically. Commercial fishing vessels also contribute to ambient noise, but since a medium-sized merchant shipping vessel is likely to produce a noise intensity that is 100 to over 1000 times higher than a fishing vessel's (NRC 2003), their contribution is significantly less. Furthermore, given that fishing vessels are relatively small, and fishing activities are present for a short period of time and occur primarily outside the Beluga's critical habitat, the commercial fishing industry will not be specifically targeted in this Action Plan.

Development projects are also carried out in the St. Lawrence Estuary and the Saguenay Fjord and along their banks, and are likely to cause continuous or pulsating noise. The impacts of these projects are evaluated pursuant to the *Fisheries Act* and the *Species at Risk Act*. Where work is likely to produce significant underwater noise, measures for reducing noise and protecting marine mammals may be required in permitting for projects carried out in the habitat of a species at risk. These measures are intended to ensure that species can perform their vital functions (e.g., calving, suckling, rearing, feeding) and ensure that the recovery of species at risk is not compromised. A commonly applied mitigation measure is to limit work to times when a species at risk is absent or times that do not interfere with its vital functions.

1.2 Measures to Be Taken and Implementation Schedule

Reducing the impact of noise on marine mammals at risk in the St. Lawrence Estuary will require commitment and cooperation from those who wish to take part to the implementation of measures established in the Action Plan.

Implementing this Action Plan will depend on a collaborative approach, in which Fisheries and Oceans Canada is a partner in recovery efforts. Fisheries and Oceans Canada strongly encourages other jurisdictions and organizations, as well as all Canadians, to participate in the recovery of marine mammals at risk in the St. Lawrence Estuary. If your organization is interested in participating in one of these measures, please contact DFO, Species at Risk Management Division (lep-sara-qc@dfo-mpo.gc.ca). Implementation of this Action Plan is subject to the appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

This Action Plan includes measures that provide the best chance to address the anthropogenic noise that threatens marine mammals at risk in the St. Lawrence Estuary. Table 2 presents all of the measures meant to reduce noise and its impacts on marine mammals at risk. They are grouped into four broad strategies, two of which are subdivided into different approaches:

➤ **Broad strategy 1: Research and data acquisition**

- Approach 1-1: Characterization of the various noise sources in the St. Lawrence Estuary

- Approach 1-2: Acquisition of knowledge on marine mammals at risk and the impact of noise
- Approach 1-3: Evaluation of potential measures for threat management
- **Broad strategy 2: Threat management**
 - Approach 2-1: Measures to reduce noise at the source or the overall noise level in the St. Lawrence Estuary
 - Approach 2-2: Conservation and protection measures for marine mammals at risk in the St. Lawrence Estuary
- **Broad strategy 3: Communication and outreach**
- **Broad strategy 4: Coordination and monitoring**

Priority levels (low, medium or high) reflect the degree to which the measure directly contributes to achieving the Action Plan's goal: reducing the impact of noise on marine mammals at risk in the St. Lawrence Estuary. High-priority measures will directly contribute to the reduction of noise or its impact on marine mammals at risk or are the essential pre-requisite measures for other high priority measures. Medium priority measures will be important, but will contribute less to the reduction of noise and its impacts. Low-priority measures will have an indirect impact on noise reduction and will have a low impact on threat management. These priority levels do not take into account the budgetary constraints of participating jurisdictions and organizations, but can help stakeholders make informed decisions about funding, activities, and departmental and conservation priorities.

Some measures are new ways to decrease the threat of noise in the Estuary, whereas others are measures that are already in place. Measures are divided into three time frames depending on the time required to implement them: short term (less than 5 years), medium term (5-10 years) and long term (more than 10 years). Knowledge about noise sources and their impact on marine mammals is always evolving and requires an adaptive management strategy; the time frames and protocols required will be adjusted as measures are implemented.

The measures listed will be undertaken by stakeholders from a variety of backgrounds. However, the list of stakeholders set out in Table 2 is not definitive, and all other jurisdictions, organizations and individuals are encouraged to cooperate in the implementation of this Action Plan. Due to the nature of its mandate and expertise, Fisheries and Oceans Canada will be required to take part in the majority of these measures. Several organizations contributed to the development of the Action Plan (Appendix B) and were asked to participate in the implementation. The order in which stakeholders are listed in the table is unrelated to their contribution or the degree of their involvement. Each stakeholder's participation will be defined in the processes leading to measure implementation and may vary greatly—for example, contribution in kind (vessel time, human resources, etc.), financial contribution, development of research capacity or implementation of noise reduction measures. Later steps will establish each stakeholder's role as well as the approach and protocols for the measures in question.

Table 2. Measures to be Undertaken by Fisheries and Oceans Canada and/or Other Stakeholders

(A list of acronyms is provided at the end of the Table)

| # | Recovery Measures | # Broad Strategy and Approach | Priority | Time Frame | Stakeholders |
|---|--|---|----------|-----------------------|---|
| 1 | Update the overview of marine traffic, including tour companies and recreational boaters, in order to characterize traffic volume and seasonality. | 1-1 | High | Underway - Short | DFO, PC, TC, academia |
| 2 | Document the level of ambient noise in different areas of the St. Lawrence Estuary at different times of the year. | 1-1 | Medium | Underway - Short | DFO, TC, academia |
| 3 | Complete the analysis of the data collected on the acoustic signature of various commercial vessels transiting the St. Lawrence Estuary. | 1-1 | High | Underway - Short | DFO |
| 4 | Measure the acoustic signature of all fleets navigating the St. Lawrence Estuary. | 1-1 | High | Underway - Medium | DFO, PC, TC, academia |
| 5 | Analyze vessel components and operational procedures and practices to identify the main sources of noise. | 1-1 | High | New - Medium | DFO, PC, TC, academia, NGO, merchant shipping, service vessels, ferries and excursionists |
| 6 | Perform acoustic mapping using modeling in areas of high use for Belugas and feeding areas for Blue and Fin Whales. | 1-1 | High | Underway - Medium | DFO, PC, academia |
| 7 | Evaluate the intensity, frequency and propagation of noise emitted by coastal and offshore projects. | 1-1 | High | Continuously - Medium | DFO, NGO, ports, promoters and consulting firms |
| 8 | Continue surveys and monitoring of marine mammals at risk to determine their distribution in the St. Lawrence Estuary. | 1-2 | High | Continuously - Short | DFO, PC, FN, NGO |
| 9 | Analyze the behaviour of marine mammals at risk in order to assess the conditions under which exposure to noise creates a risk of physiological injury or behavioural effects. | 1-2 | Medium | Underway - Medium | DFO, FN, NGO, academia |

| # | Recovery Measures | # Broad Strategy and Approach | Priority | Time Frame | Stakeholders |
|----|--|---|----------|-------------------|---|
| 10 | Determine, in the critical habitat, the proportion of Belugas exposed to various levels of noise and exposure times per individual to assess the impact of masking. | 1-2 | High | Underway - Medium | DFO, PC, FN, academia, NGO |
| 11 | Examine the potential impacts of noise on the prey of marine mammals at risk in the St. Lawrence Estuary. | 1-2 | Low | New - Long | FN, academia |
| 12 | Study the various navigation operational procedures and practices that are known to reduce noise and their technical and economic feasibility in the St. Lawrence Estuary. | 1-3 | High | New - Short | DFO, PC, TC, CPBSL, NGO, merchant shipping, service vessels, ferries and excursionists |
| 13 | Inventory innovations and technical solutions that are known to reduce noise in the shipping sector and study their technical and economic feasibility in the St. Lawrence Estuary. | 1-3 | High | New - Short | DFO, PC, TC, academia, NGO, merchant shipping, service vessels, ferries and excursionists |
| 14 | Conduct a strategic review of all activities contributing to ambient noise in areas that are heavily frequented by marine mammals at risk in order to document their cumulative effects. | 1-3 | High | Underway - Medium | DFO, PC, TC, academia, NGO |
| 15 | Develop modeling tools to explore different beneficial management scenarios to reduce the impact of noise on marine mammals at risk. | 1-3 | High | Underway - Medium | DFO, PC, TC, academia, NGO, consultation firms |
| 16 | Quantify noise reduction following the application of measures put in place to reduce interactions between vessels and marine mammals. | 1-3 | Low | New - Medium | DFO, PC, TC, academia, NGO |
| 17 | Establish better operational procedures and practices adapted to the various fleets. | 2-1 | High | New - Medium | TC, CPBSL, merchant shipping, service vessels, ferries and excursionists |

| # | Recovery Measures | # Broad Strategy and Approach | Priority | Time Frame | Stakeholders |
|----|---|---|----------|--------------|--|
| 18 | Implement appropriate modifications or technical innovations for the various fleets. | 2-1 | High | New - Long | TC, merchant shipping, service vessels, ferries and excursionists |
| 19 | Assess and introduce other management measures to reduce the overall noise level from shipping. | 2-1 | High | New - Long | DFO, PC, TC, CPBSL, NGO, merchant shipping, service vessels, ferries and excursionists |
| 20 | Identify and apply innovations to improve mitigation measures to reduce the noise from coastal and offshore projects. | 2-1 | High | New - Medium | DFO, NGO, ports, promoters and consulting firms |
| 21 | Adjust shipping lanes according to areas that are highly frequented by marine mammals at risk, while taking into account navigational constraints. | 2-2 | High | New - Short | DFO, PC, TC, CPBSL |
| 22 | Delimit spatial and temporal zones to reduce the Beluga's exposure to noise within its critical habitat while taking into account navigational constraints. | 2-2 | High | New - Short | DFO, PC, TC, academia, NGO |
| 23 | Review the zoning of the Saguenay–St. Lawrence Marine Park in order to reduce the impact of noise. | 2-2 | High | New - Medium | PC, CPBSL, academia, merchant shipping, service vessels, ferries and excursionists, NGO, ports |
| 24 | Introduce other management measures to reduce the exposure of marine mammals at risk to noise in highly frequented areas. | 2-2 | High | New - Long | DFO, PC, TC, NGO |
| 25 | Develop informational and awareness-raising tools for the various fleets, in order to demonstrate best practices for noise reduction. | 3 | Medium | New - Short | DFO, PC, FN, NGO |

| # | Recovery Measures | # Broad Strategy and Approach | Priority | Time Frame | Stakeholders |
|----|---|---|----------|------------------|--|
| 26 | Promote modernization and implementation of technologies that are known to reduce noise when designing, repairing, refurbishing or building ships for the various fleets. | 3 | Medium | New - Long | TC, NGO |
| 27 | Develop and promote recognition programs or incentives for improvements to reduce noise. | 3 | High | New - Medium | DFO, PC, TC, NGO, ports, merchant shipping |
| 28 | Develop educational tools concerning noise disturbance and the importance of sound for marine mammals, as well as on eco-responsible practices for stakeholders involved in whale-watching activities to adopt. | 3 | Medium | New - Short | DFO, PC, NGO |
| 29 | Make promoters of coastal and offshore projects aware of best practices to reduce noise and of periods of high use by marine mammals at risk. | 3 | Low | New - Short | DFO, NGO |
| 30 | Establish a process to support and coordinate the implementation of measures. | 4 | High | Underway - Short | DFO, PC, TC |
| 31 | Disseminate and update the knowledge and create working groups around common measures. | 4 | High | New - Short | All jurisdictions and organizations |
| 32 | Determine, within working groups, the means and solutions needed to implement concrete measures to reduce noise and its impacts on marine mammals at risk. | 4 | High | New - Long | All jurisdictions and organizations |

List of Acronyms:

CPBSL: Corporation of the Lower St. Lawrence Pilots

DFO: Fisheries and Oceans Canada

NGO: Non-governmental organizations

PC: Parks Canada

FN: First Nations

TC: Transport Canada

2. Critical Habitat

2.1 General Description of the Species' Critical Habitat

Critical habitat is defined in the *Species at Risk Act* as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in a recovery strategy or in an action plan for the species” [s. 2(1)]. SARA also defines habitat for aquatic species as “... spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced” [s. 2(1)].

The critical habitat for the St. Lawrence Estuary Beluga is defined in section 2.4 of the Recovery Strategy (DFO 2012). It corresponds to the summer distribution of groups made up of adults and new-born calves and juveniles, i.e. the Upper Estuary, from Battures aux Loups Marins to the Saguenay Fjord, and the southern portion of the Lower Estuary. It encompasses the habitat components that allow the Beluga to carry out the vital functions necessary for survival or recovery. The components of the critical habitat, listed in Table 4 of section 2.4 of the Recovery Strategy, ensure that functions such as calving, suckling, feeding, rearing, socialization and migration are supported.

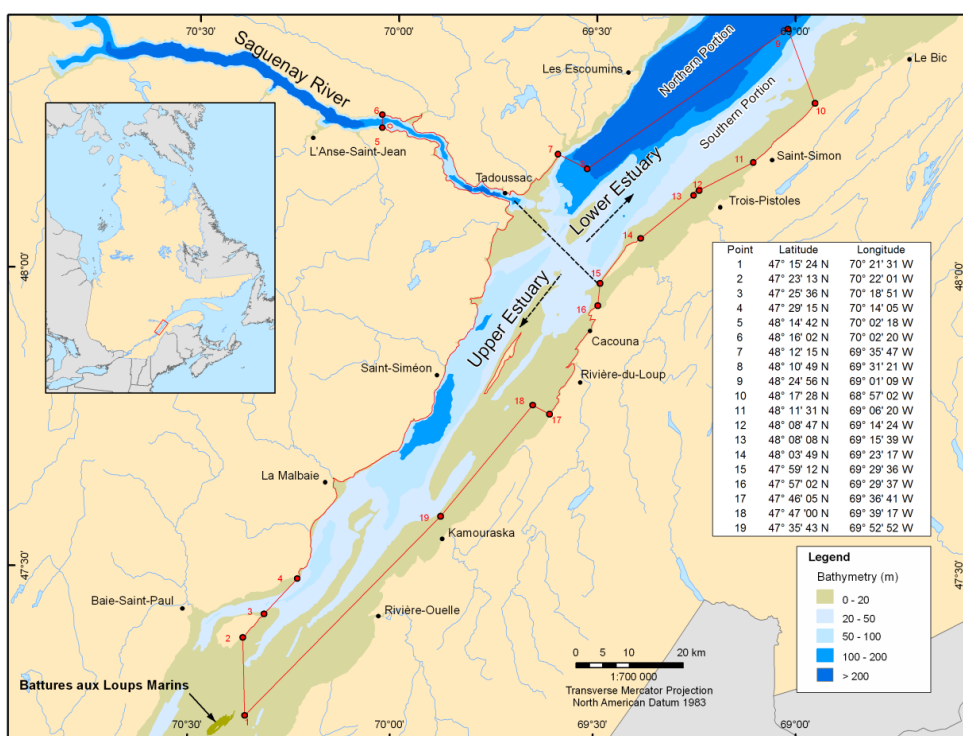


Figure 3. Critical habitat of the St. Lawrence Beluga (map taken from the *Recovery Strategy for the Beluga Whale* (*Delphinapterus leucas*) *St. Lawrence Estuary Population in Canada*, 2012).

The critical habitat of the North Atlantic Right Whale is defined in section 1.9 of the Recovery Strategy (DFO 2014a). It is located in the Grand Manan Basin (Bay of Fundy) and in the Roseway Basin on the Scotian Shelf. The Recovery Strategy contains important critical habitat information, including its geographical location, as well as its functions, features and attributes.

A schedule of studies necessary to identify the Blue Whale's critical habitat was published in the Recovery Strategy (DFO 2009). A review of new information acquired since 2009 was conducted to determine important habitat for the Blue Whale in eastern Canada (DFO 2018). Critical habitat for the Blue Whale will be identified in a revision of that strategy following the results of this review.

The Fin Whale has no designated critical habitat because it is a species of special concern under SARA, which does not require such a designation.

2.2 Activities Likely to Destroy Critical Habitat

Examples of activities likely to destroy critical habitat are listed in section 2.4.4. of the Recovery Strategy for the Beluga Whale (*Delphinapterus leucas*), St. Lawrence Estuary Population in Canada (DFO 2012), as well as in section 1.9.5 of the Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters (DFO 2014a). Some of these anthropogenic activities can cause underwater noise, and excessive noise pollution can prevent marine mammals from carrying out their vital functions and result in the destruction of critical habitat.

2.3 Proposed Measures to Protect the Beluga Whale's and Right Whale's Critical Habitat

Under SARA, any element of critical habitat must be legally protected against destruction within 180 days of being identified in a recovery strategy or action plan. For the critical habitat of the St. Lawrence Beluga and the North Atlantic Right Whale, [Ministerial Orders respecting the protection of the critical habitat](#) were adopted under subsections 58(4) and 58(5) of SARA, which trigger the prohibition, under subsection 58(1), against destroying any critical habitat of those species (Part II of the *Canada Gazette*).

3. Evaluation of Socio-economic Costs and of Benefits

The *Species at Risk Act* requires that an action plan include an evaluation of its socio-economic costs and the benefits of its implementation (SARA 49[1][e], 2003). This evaluation addresses only the incremental socio-economic costs of implementing this Action Plan from a national perspective, as well as the social and environmental benefits that would occur if the Action Plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species

recovery in general, nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the Action Plan by partners.

Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the [Accord for the Protection of Species at Risk](#). The specific costs and benefits associated with this Action Plan are described below.

Firstly, this evaluation will identify the main stakeholders that may be affected by implementation of the recovery measures set out in Table 2 or that would be able to participate in it. Next, section 3.2 looks at whether implementation of these measures could entail additional costs for stakeholders. Lastly, section 3.3 looks at the benefits of implementing the Action Plan and section 3.4 looks at the distributive effects of these benefits.

3.1 Stakeholder Profiles

Implementing measures to reduce the impact of noise on the Beluga and other marine mammals at risk in the St. Lawrence Estuary will require the cooperation of stakeholders from various sectors.

Private Sector Stakeholders

The marine industry plays an important role in Quebec's economy and supports many jobs in the provincial transportation industry and related sectors.

Every year, particularly between late March and late December, the St. Lawrence becomes a veritable marine highway.

While it is difficult to obtain a complete picture of all the vessels transiting the St. Lawrence (especially small ships, which are not always required to report their movements), the existing vessel traffic management and monitoring systems track the movements of merchant vessels effectively.

Cargo ships account for a large proportion of the vessel traffic in the Estuary, as the St. Lawrence is a major gateway to North America's industrial, commercial and agricultural heartland. According to data collected by the Canadian Coast Guard's (CCG's) INNAV system, these ships accounted for 5,014 movements in the Estuary in 2017 (most of them direct trips^[2] made by bulk carriers, tankers and container ships). International cruises, which have grown in popularity in recent years, generated 440 movements in 2017.

² The boundaries used are as follows: on the west, near Saint-François-de-l'Île-d'Orléans (longitude -70.8), and on the east, near Les Méchins (longitude -67.0), and close to the mouth of the Saguenay Fjord (longitude -69.73).

The contribution of ferries to vessel traffic must also be considered, even if these ships are primarily used for short trips in the Estuary. The Société des traversiers du Québec (STQ) reported that the ferries connecting Tadoussac and Baie-Sainte-Catherine and providing a link to Highway 138 generated some 44,281 movements/crossings between April 2017 and March 2018.

According to the most recent estimates provided by the Saguenay–St. Lawrence Marine Park^[3], tourism businesses that offer summer boat excursions in the Estuary, mainly for whale watching, generated 7,317 movements in 2017. A number of tour operators, Parks Canada, Parcs Québec and the Group for Research and Education on Marine Mammals (GREMM) are working with the Eco-Whale Alliance to ensure that whale watching activities in the marine park are carried out in a responsible and sustainable manner.

The infrastructure required by the marine industry consists of numerous coastal and offshore facilities, including ports, shipyards, and towing and dredging equipment. In general, marine transportation on both the Great Lakes and the St. Lawrence, together with the associated infrastructure and operations, generates significant revenue. Although only some of these facilities and operations are located within the Beluga's range, the Estuary is used by commercial ships transporting goods between Canada and many foreign countries. Therefore, the private stakeholders called on to support the implementation of this Action Plan include all the proponents, consulting firms and port authorities involved in managing or carrying out coastal and offshore development projects.

Founded in 2007, Green Marine is a voluntary initiative involving a number of associations representing the marine industry in Canada and the United States. Its participants include ship owners, ports, seaway corporations, terminals and shipyards. This environmental certification program aims to improve the environmental performance of its members' fleets and operations. The program includes performance indicators to evaluate the participants' progress toward reducing underwater noise from ships and port facilities. Green Marine will therefore act as a key partner in the implementation of the Action Plan.

Government Stakeholders

Parks Canada and Transport Canada are the main government departments that will cooperate with Fisheries and Oceans Canada (DFO) to implement this Action Plan. The Canadian Coast Guard, a Special Operating Agency within DFO, will have a role to play because, in addition to ensuring safe and accessible waterways, it operates a fleet of service vessels (icebreakers, rescue vessels and scientific research vessels). Several sectors of DFO will be involved in implementing the Action Plan: Science, Communications, Small Craft Harbours and Ecosystem Management. Since Parks Canada co-manages the Saguenay–St. Lawrence Marine Park, operates service vessels and acts on behalf of the federal government, it will support all of the Action Plan strategies by participating in research, helping to implement new noise-reduction

³ Based on data collected under the *Marine Activities in the Saguenay–St. Lawrence Marine Park Regulations*, SOR/2002-76.

measures and conservation and protection measures for marine mammals at risk, and carrying out awareness and educational activities. Transport Canada oversees and regulates the St. Lawrence River transportation corridor and plays an important role in ensuring adherence to traffic regulations and compliance of vessels. It also owns port facilities where it carries out maintenance and construction work that can generate underwater noise. Recently, Transport Canada published a report aimed at understanding anthropogenic underwater noise (Nolet 2017). Transport Canada will participate in this Action Plan through Canada's Oceans Protection Plan and the Whales Initiative.

Non-governmental Stakeholders

First Nations, academia and non-governmental organizations (NGOs) that have expertise suited to any of the strategies in the Action Plan, particularly knowledge acquisition, research into noise mitigation and raising awareness, will have a significant role to play in its successful implementation.

3.2 Socio-economic Costs of Implementing this Action Plan

Some of the measures outlined in this Plan are ongoing initiatives by the federal government and its partners, while others are new. The additional socio-economic effects of these measures cannot be precisely quantified at this stage without more information. Their impact could also depend on the extent of their implementation and the stakeholders involved.

Research and Data Acquisition

Under this Plan, research and data acquisition are divided into 16 measures, which in turn fall under three approaches. The approaches are: the characterization of the various noise sources in the St. Lawrence Estuary, the acquisition of knowledge on marine mammals at risk and the impact of noise, and the evaluation of potential measures for threat management. Various measures will likely have cost implications for federal and non-government entities.

The characterization of the various noise sources would entail costs for DFO, other federal departments and academia (e.g., costs to install hydrophones in the St. Lawrence Estuary and analyze the data). Those navigation stakeholders who participate in research activities will likely provide fleets of vessels for data acquisition, which will require vessel time and staff participation. Several research projects conducted by DFO's Science Sector and certain NGOs focus on marine mammals at risk, especially on Belugas, and aim to acquire knowledge about species, including their abundance and distribution in the St. Lawrence Estuary. The potential impact of noise will be added to current research themes to assess the impact of this threat on marine mammals at risk. The study of potential mitigation measures to reduce noise and impacts on marine mammals at risk will be undertaken by federal departments, academia and NGOs. The various noise management scenarios will be shared with the relevant private-sector stakeholders, who will also provide the information to assess whether changes in operational practices, procedures and technical innovations are feasible.

Potential funding sources for all of the measures include federal government programs (e.g. the Oceans Protection Plan), private investment or funding from funding agencies.

Threat Management

Threat management is addressed in eight measures divided into two approaches. They include measures to reduce noise at the source or the overall noise level in the St. Lawrence Estuary, and measures for the conservation and protection of marine mammals at risk in the St. Lawrence Estuary. The measures listed are new initiatives and will require the participation of various stakeholders from the private sector, relevant federal departments, academia and NGOs.

All stakeholders working in the shipping industry are likely to be affected by the implementation of noise-reduction measures, including new operational procedures and practices and the introduction of technical innovations. Stakeholders in the maritime sector have expressed interest in becoming involved but note that the costs associated with changes in operations and the introduction of innovations will require additional investment, such as during ship building or repair.

Innovative measures for noise reduction could be developed and implemented as part of coastal and offshore development projects. However, it is not possible to quantify the corresponding socio-economic impacts at this stage.

Implementation of various measures for the conservation and protection of marine mammals at risk, such as the addition of zones to reduce noise exposure and the optimization of shipping lanes, will also likely affect navigation activities. It should be noted that voluntary measures to reduce the risk of collisions with whales and minimize the impact of noise on Belugas came into force in 2013 in the Laurentian Channel (DFO 2017b). Resources will be required from various government bodies to ensure their implementation and monitor conservation measures for marine mammals.

Implementation of other mitigation measures that have not yet been identified or fully analyzed could result in costs and impacts for users.

Communication and Outreach

Five communication and outreach measures are set out in the Action Plan. The impact of noise on marine mammals at risk is a new element to be aware of, one that stakeholders could integrate into their activities. Communication with shipping sector stakeholders and coastal and offshore project promoters is required to develop and implement best practices for noise reduction, and public awareness can be raised, especially through responsible ecotourism activities.

Awareness-raising and education for the various stakeholders would entail costs for disseminating information. These costs would mainly be related to the time spent by organizations and enterprises in the creation and production of outreach tools. Promoting noise-

reducing technologies would result in costs for the work hours spent communicating the information. Establishing recognition or financial incentive programs to add value to all noise reduction practices in the marine industry will also require investment from stakeholders.

Coordination and Monitoring

Three measures will ensure that activities proceed smoothly. Coordination of the implementation of the measures, led by Fisheries and Oceans Canada and Parks Canada, would not result in additional costs, other than the human resources required. All jurisdictions and organizations should contribute to the development of methods to reduce noise and impacts on marine mammals at risk and to exchange and disseminate knowledge. Representatives of marine and conservation organizations, including members of the Working Group on Marine Traffic and Protection of Marine Mammals (G2T3M), will also be key actors in ensuring the success of this Action Plan.

Following the creation of the St. Lawrence Action Plan by the federal and provincial governments in 1988, the Navigation Coordination Committee (NCC), comprised of representatives from the marine industry, environmental stakeholders and governments, was established. As the protection of marine mammals falls within its mandate, this committee supports the Action Plan and several of its members will participate in implementing the measures.

3.3 Benefits of Implementing this Action Plan

Implementing these measures will contribute in a positive way to the long-term goal of recovery for the Beluga and other marine mammals at risk in the St. Lawrence Estuary.

The benefits of recovery for the Beluga and other marine mammals at risk in the St. Lawrence Estuary are difficult to quantify. Protection and recovery of species at risk can have repercussions. However, the *Species at Risk Act* recognizes that “wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons” (SARA 2003). Healthy and self-sufficient ecosystems that support a diverse range of species, including species at risk, contribute positively to the livelihoods and quality of life of all Canadians. A review of the literature confirms that Canadians care about species preservation and conservation in its own right. The measures taken to preserve a species, like protecting and reclaiming habitat, are also important. Furthermore, the more a measure contributes to a species’ recovery, the more the public values it (Loomis and White 1996; DFO 2007).

More specifically, a study on the estimated economic benefits of recovery for marine mammals at risk in the St. Lawrence Estuary revealed that Canadians would be prepared to pay \$229 per household each year for a multi-species recovery strategy that would result in a measurable improvement in the species at risk status of several marine mammals, including the Beluga (Boxall *et al.* 2012).

Implementing the Action Plan should also generate benefits beyond Beluga recovery. The other marine mammals at risk in the St. Lawrence Estuary, namely the Blue Whale, the Fin Whale and, to a lesser degree, the Right Whale, would also benefit from the measures taken through this Plan. The results of the research and the implementation of the measures resulting from this Plan could benefit other regions where marine mammals at risk are threatened by anthropogenic underwater noise.

Wildlife watching is a popular pastime and is a source of revenue. The presence of Belugas and other marine mammals in the St. Lawrence Estuary increases tourism revenue from Quebec and elsewhere in Canada, as well as from abroad.

Finally, technologies or practices aimed at noise reduction could lead to energy savings and thus reduce operating costs for the businesses concerned. However, this benefit is not quantifiable at this time.

3.4 Distributional Impacts

A number of parties involved would participate in implementing measures set out in this Plan and would incur costs that would vary based on their involvement. However, the benefits of adopting this Action Plan will extend to all Canadians, given the economic value that the Canadian population places on species recovery and habitat protection.

4. Measuring Progress

Pursuant to section 55 of SARA, five years after the final version of the Action Plan is published in the Species at Risk Public Registry, the competent minister must monitor implementation of the Action Plan and progress toward achieving its objectives. To this end, various performance indicators provide a way to define and measure progress toward the Action Plan's implementation. A list of these indicators is presented below, but more may be added while developing processes to initiate or continue further measures:

- Developing tools to better illustrate and understand the sources and propagation of noise;
- Determining the vessel components and operational procedures and practices that produce the most noise and the noisiest vessels;
- Implementing measures to reduce exposure of marine mammals to anthropogenic underwater noise;
- Characterizing the level of ambient noise and the number of days exceeding this level;
- Introducing measures to reduce navigation noise from various fleets (operational procedures and practices, technological innovations, etc.);
- Decreasing the level of underwater noise (intensity, frequency and duration) in certain areas of the St. Lawrence Estuary;
- Recommending thresholds to minimize the risks associated with noise in marine mammals at risk in the St. Lawrence Estuary;

- Implementing conservation and protection measures for marine mammals at risk;
- Rolling out new noise mitigation measures for coastal and offshore projects;
- Creating tools and implementing awareness-raising campaigns on the issue of noise;
- Developing communication strategies to help implement measures as efficiently and effectively as possible;
- Holding meetings regularly to plan the implementation of the measures.

Fisheries and Oceans Canada is committed to producing an implementation report five years after the publication of the Action Plan, particularly on its environmental and socio-economic impacts. This report will aid in monitoring the effectiveness of the measures taken to reduce the impact of noise on marine mammals at risk.

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Appendix A: Effects on the Environment and Other Species Not Targeted

In accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#) (2010), SARA recovery planning documents incorporate strategic environmental assessment (SEA) considerations throughout the document. The purpose of an SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or the achievement of any of the [Federal Sustainable Development Strategy](#)'s goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process is based on national guidelines and directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the Strategic Environmental Assessment are incorporated directly into the action plan itself but are also summarized in the following paragraph.

Reducing the impact of noise should have a positive impact on the ecosystem in the St. Lawrence Estuary, as a number of marine organisms use sound to carry out their vital functions. A less noisy habitat or preservation of areas that are sheltered from anthropogenic noise should benefit other marine mammals, as well as fish and possibly even invertebrates living in the St. Lawrence Estuary.

Appendix B: Record of Cooperation and Consultation

Action plans are to be prepared in cooperation with the other affected jurisdictions, organizations, parties or individuals, as outlined in section 48 of the *Species at Risk Act*. DFO has sought the participation of various stakeholders in developing the Action Plan.

The stakeholders that contributed to the Action Plan are listed below. They have been grouped by area of activity and have been called upon to participate at various stages. All comments received were taken into consideration when writing the Action Plan.

| Area of Activity | Organization Represented |
|--|--|
| Federal departments | Fisheries and Oceans Canada (Canadian Coast Guard) |
| | Parks Canada |
| | Transport Canada |
| Academia | Université du Québec en Outaouais |
| Stakeholders from the commercial shipping sector | St. Lawrence Ship Operators |
| | St. Lawrence Economic Development Council |
| | Canada Steamship Lines |
| | Shipping Federation of Canada |
| | Transport Desgagnés Inc. |
| | Fednav Ltd. |
| | Nunavik and Nunavut Eastern Arctic Shipping (NEAS) |
| | Corporation of Lower St. Lawrence Pilots |
| | Green Alliance |
| Ferries and tour companies | Société des traversiers du Québec |
| | Compagnie de navigation des Basques (Ferry service for Trois-Pistoles–Les Escoumins) |
| | Croisières AML |
| | Croisières Essipit Inc. |
| | Accès Plongée Saguenay |
| | Voile Mercator |
| | Damacha Yachting Inc. |
| | Société Duvetnor Ltée. |
| Stakeholders in the coastal and offshore projects sector | Saguenay Port Authority |
| Organizations with various responsibilities: | Innovation Maritime |
| | Technopole maritime |
| | Group for Research and Education on Marine Mammals |
| | Mériscope |
| | Merinov |
| | Working Group on Marine Traffic and Protection of Marine Mammals (G2T3M) |

In order to develop the Action Plan, three meetings were organized in the spring and summer of 2016 with the various primary stakeholders to discuss potential measures. An initial version of the table of potential recovery measures was sent to all stakeholders in fall 2016 to get their feedback. In January 2017, a consolidated draft of the Action Plan was sent for feedback to all stakeholders, as well as to the sectors involved at Headquarters and the DFO regional branches in Quebec. At the request of several stakeholders, another meeting was held in February 2017 to validate the contents of the table of recovery measures. All feedback received was considered and a new, improved version of the Plan was prepared. Subsequently, a consultation on the completed draft Action Plan was held in spring 2017 with the Government of Canada (Parks Canada, Transport Canada and Environment and Climate Change Canada), the Government of Quebec (ministère des Transports, de la Mobilité durable et de l'Électrification des transports; Secrétariat aux affaires maritimes; ministère des Forêts, de la Faune et des Parcs; and the ministère du Développement durable, de l'Environnement et de la Lutte aux changements climatiques) and First Nations (Essipit Innu First Nation Council, Huron-Wendat Nation Council, the Viger Maliseet community, Innu Council of Pessamit and the First Nations of Quebec and Labrador Sustainable Development Institute). Public participation and the participation of additional stakeholders will be solicited when the proposed Action Plan is posted on the Species at Risk Public Registry, for a 60-day comment period. Comments received will inform the final document.