

Examining the Feasibility of Implementing Marine Mammal Oil Spill Response in Canada

By

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## **List of Abbreviations**

**ALERT-** Atlantic Emergency Response Team

**ALWTRP-** Atlantic Large Whale Take Reduction Plan

**AWI-** Atlantic Wildlife Institute

**BCMMRN-** British Columbia Marine mammal Response Network

**BV-** Bequest value

**C & P-** Conservation and Protection (DFO)

**CBD-** United Nations Convention on the Conservation of Biological Diversity

**CCG-** Canadian Coast Guard

**CMARN-** Canadian Marine Animal Response Network

**CRA-** Commercial, recreational, and Aboriginal fisheries

**DFO-** Fisheries and Oceans Canada

**DUV-** Direct use value

**ECCC-** Environment and Climate Change Canada

**ECRC-** Eastern Canada Response Corporation

**EDA-** Environmental Damage Assessment

**EEZ-** Exclusive Economic Zone

**ERI-** Environmental Risk Index

**ESA-** Endangered Species Act

**EV-** Existence value

**GREMM-** Groupe de Recherche et d'Éducation sur les Mammifères Marins/ Research and Education Group on Marine Mammals

**ICS-** Incident command system

**IDUV-** Indirect use value

**IPIECA-** International Petroleum Industry Petroleum Environmental Conservation Association

**JUS**- Justice Department

**MMARN**- Maritime Marine Animal Response Network

**MMPA**- Marine Mammal Protection Act

**MMRP**- Marine Mammal Response Program

**MMWG**- Marine Mammal Working Group

**Nm**- Nautical mile

**NOAA**- National Oceanic and Atmospheric Administration

**NUV**- Non-use value

**PCO**- Privy Council Office

**PCO-OIC**- Privy Council Office Orders in Council

**PESTLE**- Political, Economic, Socio-cultural, Technological, Legal, and Environmental analysis

**PTMS**-Point Tupper Marine Services

**RO**- Response Organization

**RP**- Responsible Party

**RQUMM**- Réseau Québécois d'urgences pour les Mammifères Marins/Quebec Marine Mammal Emergency Response Network

**SARA**- Species at Risk Act

**SMS**- Spill management system

**SOPF**- Ship Source Oil Pollution Fund

**SWOT**- Strengths, Weaknesses, Opportunities, and Threats analysis

**TBS-RAS**- Treasury Board of Canada Secretariat's Regulatory Affairs Sector

**TC**- Transport Canada

**TEV**- Total economic value

**UV**- Use value

**WCMRC**- Western Canada Marine Response Corporation

## Glossary of Terms

**Area of environmental sensitivities-** “An area containing threatened, vulnerable or endangered species or locations of cultural or high-socio-economic significance” (*Response Organizations and Oil Handling Facilities Regulations*)

**Environmental Emergency Science Table-** replaced Regional Environmental Emergency Team in order to provide consolidated advice to the Lead Agency for consideration by the RP.

**Recovery strategy-** A planning document used by the Species at Risk department in Fisheries and Oceans Canada. Strategies are developed after a species receives an endangered, threatened, or extirpated designation under the *Species at Risk Act*. The strategy includes information on threats to recovery, critical habitat, and goals for the recovery of the species.

**Oil tanker-** “A vessel constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes a combination carrier (a vessel designed to carry oil or solid cargoes in bulk), an NLS (noxious liquid substances) tanker and a gas carrier that is carrying a cargo or part cargo of oil in bulk.” (*Environmental Response Arrangements Regulations*)

**Spill management system-** A form of Incident Command System (ICS) that is utilized by the oil industry in order to effectively control and coordinate response efforts during an oil spill.



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## **Abstract**

The coastal waters surrounding Canada are home to diverse ecosystems that provide rich feeding grounds and critical habitat for many marine species. Marine mammals face numerous anthropogenic threats to their recovery and preservation. They are physically exposed to oil through direct deposition, ingestion, or inhalation of toxic vapours at the water-air interface. The adverse effects of oil exposure are dependent on the type of oil encountered and the amount and means of exposure. There are several activities that take place in Canada's Exclusive Economic Zone that have the potential to harm marine mammals by leaking toxic substances into the water-column. There are real, perceived, and potential risks, in addition to transboundary agreements and federal obligations to protect marine resources that warrant the development of federal marine mammal oil spill response. In an effort to meet national and international obligations, the development and implementation of a marine mammal oil spill response protocol is a relatively low cost endeavour that can mitigate high risk scenarios and should be integrated into wider Spill Management Systems for marine oil spills. Through the utilization of the current marine mammal response network, Fisheries and Oceans Canada (DFO) can provide training to responders that could be funded through the Marine Mammal Response Program. Response will be most feasible and effective if DFO works with Transport Canada to amend the *Response Organization's and Oil Handling Facilities Regulations* to include marine mammal response and rehabilitation, as the polluter would have to cover costs associated with response as opposed to the government.

**Keywords:** marine mammals, oil spill, response, rehabilitation, Canada, response organizations

## Introduction

### *Marine Mammals in Canada*

The coastal waters surrounding Canada are home to diverse ecosystems that provide rich feeding grounds and habitat for many marine species. Cetaceans are an order of marine mammals that include toothed whales (Odontocetes) such as dolphins (Delphinidae) and porpoises (Phocoenidae), and baleen whales (Mysticetes). Pinnipeds are comprised of seals (Phocidae), sea lions (Otariidae), and walruses (Odobenidae). Sea otters (*Enhydra lutris*) are the only marine species of Mustelidae found in Canadian waters.

There are many human activities that take place in Canada's oceans that have the ability to harm marine mammal health through a range of pressures including entanglements in fishing gear and marine debris, ship collisions, noise pollution, and chemical pollution by leaking toxic substances into the water-column. There are a few prominent areas where industry activities and marine mammal critical habitats overlap at high rates, such as the Bay of Fundy and the Juan de Fuca Strait, both of which have high rates of fishing and shipping (Marty & Potter, 2014). The high rates of human activity in marine mammal critical habitats can lead to environmental incidents, such as oil spills. Major spills such as those of the *Exxon Valdez* (Alaska, 1989) and *Deepwater Horizon* (Gulf of Mexico, 2010), as well as small incidents and chronic oil slicks highlight the need for national preparedness and response plans.

### *Rationale*

There are several perceived, real, and potential risks that warrant the creation of a federal marine mammal oil spill response protocol. Presently, more than 80 million tonnes of oil are

shipped along Canada's east and west coasts (Transport Canada, 2015) and this number is expected to increase significantly. Increases in marine shipping increase the risk of oil spills (Woolgar, 2008). There are several on-going initiatives related to conservation and oil spill preparedness that present the opportunity to maximize benefits and cooperation across agencies in order to employ threat based mitigation as opposed to species specific or driver specific mitigation. If Fisheries and Oceans Canada explores a national marine mammal oil spill response as opposed to species specific plans that result from Species at Risk Act-listed marine mammals the benefits include lower operating costs, improved resilience of the system, and decreased economic losses following a disaster (Beamish, 2001; Gundlach & Hayes, 1978; Mendonca *et al.*, 2001).

Marty and Potter (2014) conducted a risk assessment of marine spills from shipping vessels in Canadian waters. They concluded that small and medium sized oil spills (between  $10\text{m}^3$  -  $999.9\text{m}^3$ ) occur frequently on the Pacific and Atlantic coasts, and that they can cause severe damage to the environment and aquatic species. The report identified four areas that exhibit the highest risk of oil spills due to increased shipping traffic coupled with severity of potential impacts to living resources and sensitive habitat, resulting in a high score on the environmental risk index (ERI): 1) southern portion of British Columbia, including Vancouver harbour; 2) St. Lawrence River (Montréal to Anticosti Island), Québec; 3) Port Hawkesbury and the Strait of Canso, Nova Scotia; and 4) Saint John and the Bay of Fundy, New Brunswick. These four areas will serve as a pilot project for area response planning, where government agencies, Response Organizations, Aboriginal groups, and coastal communities will work together to develop response plans.

In a report drafted for Transport Canada, the Tanker Safety Panel Secretariat (2013) provided a review of the ship-source oil spill preparedness and response regime. The Panel identified that DFO needs to provide scientific information to the Environmental Emergency Science Table on significant marine mammal areas and their susceptibility to oil in order to create environmental sensitivity mapping. The review concluded that there are two areas that are “particularly lacking” in response planning, one of them being oiled wildlife. The report goes on to state that the responsibility for oiled wildlife rests with the Responsible Party. This may be true, but legislation does not exist so that oiled wildlife response is required in the clean-up effort by the Responsible Party or the Response Organization. Recommendation 14, “Environment and Climate Change Canada and Fisheries and Oceans Canada should develop and implement a strategy to provide aid to wildlife and incorporate the results of this strategy into the Area Response Planning model.” (Tanker Safety Panel Secretariat, 2013), identifies the lack of a comprehensive national framework for marine mammal response as a significant gap in planning that hinders oil spill response.

Canada is responsible for transboundary joint planning with the United States for management of contiguous marine and freshwater bodies. The Canada-United States Joint Marine Pollution Contingency Plan (JCP) was established to provide a coordinated system to implement countermeasures in the event that harmful substances are released into Canada-U.S. contiguous marine areas. Under the JCP, harmful substances are those that create hazards to human health, harm living resources and marine life, threaten legitimate water uses, and are subject to Canadian and/or United States regulations or federal laws. The JCP is comprised of five geographic annexes covering the Great Lakes, Pacific coast, Atlantic coast, Beaufort Sea, and the Dixon entrance: CANUSLAK, CANUSPAC, CANUSLANT, CANUSNORTH and

CANUSDIX. In the agreements within the geographic annexes each party is supposed to include wildlife response plans in the case of marine pollution and toxic substance incidents. These five areas are found throughout contiguous zones along Canada's Pacific, Atlantic, and Arctic waters; the creation of a national marine mammal response plan can be augmented by wildlife response plans that are required under JCP.

The Species at Risk Act (SARA, 2002) was implemented to fulfill Canada's obligations to the United Nations Convention on Biological Diversity by taking proactive steps towards protecting species at risk and overall biodiversity, as agreed to when Canada ratified the Convention on Biological Diversity. SARA was also meant to function as a framework on clear policy and action by developing monitoring indicators, evaluation programs, recovery strategies, and management plans for Canada's at risk wildlife. SARA Recovery Strategies and Action Plans states current threats to marine mammals (Table 1). The creation of national marine mammal oil spill response guidelines can be used for internal reporting on the implementation of Recovery Strategies and Action Plans for several marine mammals, and to avoid litigation for not completing recovery objectives within the allotted timeframe.

Fisheries and Oceans Canada (DFO) is responsible for the management and protection of commercial, recreational, and Aboriginal (CRA) fisheries and is guided by the *Fisheries Act*, *Oceans Act*, *Species at Risk Act*, *Canada Shipping Act, 2001*, and the *Coastal Fisheries Protection Act*. One of DFO's three Strategic Outcomes is to achieve sustainable aquatic ecosystems through the protection of species, oceans, and fish habitats. Marine mammals are included under commercial and Aboriginal fisheries and thus should be afforded protection from threats to fisheries, such as pollution. In addition, the *Emergency Management Act* stipulates that ministers identify risks within their agency and responsibility and prepare emergency

management plans to mitigate identified risks. In the case of DFO, oil spills do present a risk to marine mammals and necessitate a management/response plan under the *Emergency Management Act*. There are several initiatives under Transport Canada, Canadian Coast Guard, and DFO that either suggest or require the development of wildlife response planning. Integrating the efforts and knowledge from these initiatives will decrease administrative effort, cost, and barriers to developing federal marine mammal oil spill response guidelines.

### *Objective*

This report will provide an overview of the effects of oil on marine mammals, an examination of Canada's existing capacity to respond to distressed marine wildlife, and provide the rationale and recommendations for creating national response guidelines. The objective of the report is to initiate the development and implementation of a national marine mammal oil spill response protocol, by DFO and TC, which will become part of the wider Spill Management System. This is intended to promote conservation measures that could reduce marine mammal mortality from direct exposure to oil, allow for an effective and timely response in the event of an oil spill, and standardize reporting mechanisms that foster appropriate compensation. Recommendations for the best approach to implement a response plan, with reference to funding options, strategic considerations and timelines are provided. This document will be suitable for reference by policy and decision-makers, environmental non-governmental organizations (ENGOs), industry, and other interested stakeholders that wish to integrate wildlife response into wider oil spill response efforts.

## *Scope*

The recommendations are national in scope, but flexible by region. Recommendations are offered to the six administrative Regions (Figure 1) in an attempt to create the least amount of adjustments if the project moves forward. The Marine Mammal Response Program (MMRP) is administered by the Regions, which encompass more than a single Province or Territory, and managed at the national level. The review does focus largely on SARA-listed marine mammals due to the fact that SARA Action Plans, where mitigation measures such as creating oil spill response plans can be found, are required by law and the MMRP focuses resources on SARA-listed marine mammals, but response is still offered to non-listed marine mammals and sea turtles. Recommendations are intended to mitigate oil pollution from ship-sourced oil spills including recreational, commercial, and mystery spills, and persistent slicks that occur within Canada's Territorial Sea (0 to 12 nautical miles), Contiguous Zone (12 to 24 nm), Exclusive Economic Zone (EEZ) (0 to 200 nm), and Continental Shelf (12 to 200 nm, or further under certain circumstances).

## *Marine Mammals and Oil*

Oil pollution in the marine environment can have varied negative effects on marine mammals as they physically encounter oil through direct deposition, ingestion, or by breathing in toxic vapours (Geraci & St. Aubin, 1990). Most hydrocarbons found in petroleum products are lighter than water causing them to float to the surface, creating problems for marine mammals that rely on breathing air when they surface and become exposed to toxic substances at the water-air interface (Vos et. al, 2003). Toxicity will depend on the type of oil encountered, amount of exposure, means of exposure (inhalation, ingestion, absorption into mucous membranes, or external attachment), and biophysical traits of the species (NOAA, 2010; Gilardi



& Mazet, 1999). Marine mammals, namely pinnipeds, may also be exposed to harsh oil compounds from contact with oiled shorelines due to their ability to utilize terrestrial land, and may also come into contact with fouled marine habitats and food sources.

The type and amount of oil encountered determine the effects and severity of oiling, but marine mammal species characteristics also impacts the likelihood and degree of oiling. Life histories, growth and maturation, diet and feeding tactics, habitat use, and social behaviour influence marine mammals' susceptibility to oiling.

Cetaceans are divided into two suborders: mysticetes and odontocetes. Mysticetes are baleen whales that are typically large and use baleen to filter-feed. Odontocetes are toothed cetaceans that comprise a diverse taxonomic group including porpoises, dolphins, and some whales. Despite having a global distribution, both sub-orders tend to occupy local habitats and use well-documented migration routes (Wursig, 1988). Pelagic species, such as sperm whales (*Physeter macrocephalus*) and beaked whales (*Ziphiidae*) are less likely to encounter oil than inshore cetaceans, such as Northeast Pacific Southern Resident killer whales (*Orcinus Orca*). Habitat use and site fidelity for coastal cetaceans increase the chance of oiling due to restricted movements in areas such as bays, inlets, and coastal shallows, which is further exacerbated by industry activities in these areas. Wursig (1988) found that killer whales, belugas, and porpoises are at greater risk for encountering oil pollution. Baleen whales exhibit a loose group structure, while odontocetes commonly form large gregarious groups creating a larger threat to odontocetes, as witnessed in the aftermath of the *Exxon Valdez* spill where killer whales experienced population-level impacts as 41% of a population was lost within one year of the spill (Matkin *et al.*, 2008). Cetaceans do not have fur to trap oil, which reduces their chance of external attachment, but they are susceptible to inhalation, ingestion, and absorption of oil at the

water-air interface that can cause skin irritation and eye and mouth damage. Baleen whales are most likely to be externally affected by oil through fouling of their baleen plates while feeding, and mucous membrane deterioration is a concern for both mysticetes and odontocetes.

Deterrence and data collection are essential components for cetacean response, which could provide the basis of response efforts in a national plan.

The sea otter is the smallest marine mammal and can be found throughout the North Pacific. Sea otters typically inhabit a small range and exhibit strong site fidelity, which pose threats at the population level as an environmental incident could affect large groups. Sea otters' predisposition to oil exposure is enhanced by their behaviour of spending the majority of their time at the surface and in kelp beds that accumulate oil during spills, their constant need to feed, and the need to continually groom their fur. Sea otters have a high metabolic rate, twice that of terrestrial mammals of similar size, and must consume food up to one third of their body weight daily (Geraci & St. Aubin, 1990). They rely heavily on their dense fur for thermoregulation as they have little fat deposits, and when otters become oiled the water repellent nature of their fur is disrupted and they lose insulation that usually results in hypothermia (Williams et al., 1988). Once their fur becomes oiled the animals groom themselves and ingest contaminants that damage internal organs and interrupt their feeding schedule. A well-documented case of the effects of oil spills on sea otters can be seen in the case of the *Exxon Valdez* spill in Prince William Sound, 1989, where the oil tanker spilled over 42 million litres of crude oil and crews recovered nearly 1000 sea otter carcasses with mortality estimates ranging from 2, 650 to 3, 905; the population has not recovered to pre-spill numbers (Fisheries and Oceans Canada, 2014A). Sea otters are the most vulnerable marine mammals to threats from oil spills, but the

development of best practices in washing techniques have allowed for successful rehabilitation efforts.

Pinnipeds are comprised of three main families: Phocidae, known as true seals; Otariidae, which include fur seals and sea lions; and Odobenidae, which is comprised of walruses. Overall, the risks of oiling for phocids and otariids are much greater than the risk of oiling for cetaceans, mainly due to oil attachment to fur and the reliance on terrestrial land or ice for breeding and moulting. Pinnipeds can ingest oil when it becomes attached to their fur, which will most likely occur when mothers groom their offspring, but the greater problem lies with difficulty in regulating body temperature when fur is oiled; difficulties with regulation increases with increasing fur density. Juvenile individuals are greatly affected by oiling as they have not built up sufficient insulating fat reserves and have difficulty regulating body temperature. There have been documented reports of harbour seals, gray seals, and harp seals coming into contact with oil in Canadian waters. Following the *Arrow* tanker incident in Chedabucto Bay, Nova Scotia in 1970 and the *Kurdistan* tanker incident in Cabot Strait, Nova Scotia in 1979, hundreds of harbour and gray seals were observed to be coated in oil. In 1969, a storage tank in Cape Tormentine, New Brunswick discharged 4,000 gallons of oil into the Gulf of St. Lawrence that resulted in reports of 10,000-15,000 harp seals being contaminated, which did not significantly deplete the population at the time (Geraci & St. Aubin, 1990). Pinnipeds have broad distributions along coastal areas but do rely on specific locations for breeding and moulting; these areas are at greater risk for oiling events during breeding and moulting cycles. It is reasonable to assume that the majority of response and rehabilitation will be directed towards pinnipeds and mustelids as they are at greater risks for adverse effects of oiling and their size, unlike cetaceans, allows for capture for rehabilitation.

It will be important for marine managers to prioritize response for species, especially for marine mammals protected under the *Species at Risk Act* (SARA). During the response triage stage marine managers must keep priority species in mind and have the knowledge and training to risk manage the situation, as oiling events may present varying challenges with having to respond to numerous priority species, while keeping in mind non-SARA species and vulnerable populations such as young pinnipeds.

Many marine mammals found around Canada are coastal animals and utilize areas that are shared with the fishing and shipping industry, increasing the risk of contact with oil pollutants. The *Arrow* and *Kurdistan* tanker incidents represent the two major spills in Canadian waters, but low level discharge and chronic spills remain frequent in Canadian waters (O'Hara et al., 2009). From 2006-2011, Response Organizations (ROs) responded to 161 Tier I, which is the lowest level of oil released equating to <150 tonnes of spillage, around Nova Scotia. These numbers of spills are more than double that of the 79 oil spills reported on the West coast. Given that pinnipeds and cetaceans do not avoid areas affected by oil spills (Geraci & St. Aubin, 1982) it is important to understand how to best respond to affected marine life in the case of an emergency, which will be facilitated through national guidelines.

Current oil spill response programs focus on mitigation to minimize threats to human safety, the environment, and resources. Some of these programs include the National Oil Spill Preparedness and Response Regime (Transport Canada), Marine Oil Spill Preparedness and Response Regime (Transport Canada), National Aerial Surveillance Program (Transport Canada), Environmental Response Program (Canadian Coast Guard), and the Marine Mammal Response Program (DFO). The Marine Mammal Response Program page on Fisheries and Oceans website (MMRP, 2015) states that they work with external partners in order to “Track

and respond to marine mammal entanglements, strandings (dead & alive), ship strikes, contaminated animals (oiled), and other threats”. The Department claims responsibility for oiled response without having a strategy in place. In 2014, the Marine Mammal Working Group (the governing group for the Marine Mammal Response Program) met to discuss shortcomings in the program and to identify priorities for the coming year. One of the priorities included the development of national and regional response guidelines for marine mammals affected by oil spills (Melissa Landry, DFO 2015, personal communication).

In order to minimize the acute and chronic effects on oiled marine mammals it is essential to provide a timely and organized response. Canada lacks clear national and regional protocols for responding to marine mammals that have been affected by oil spill incidents. The creation of guidelines for responding to marine mammals after an oil spill can be used as a decision support tool by managers and responders to provide the best available care for affected wildlife.

## Methodology

### *Methods and Sub-Questions*

Research consisted of a primary literature review that identified five sub-themes of animal welfare, care and rehabilitation, oil spill response plans, contingency planning and risk management, and wildlife conservation. Animal care and rehabilitation literature covers toxicology and the effects of oil on marine mammals. The literature provided an overview of marine mammal species and unique effects of oiling faced by different families. Methods for deterrence, capture, and rehabilitation of marine mammals were reviewed and incorporated into key features of planning. The rationale behind contingency planning and its associated benefits

were examined, along with the value of wildlife in order to portray the economic benefits of responding to distressed marine mammals.

Next, a policy analysis of Canadian and international legislation related to toxic spills was undertaken in order to identify prominent stakeholders and provide an overview of the present situation in Canada. In addition to Canadian legislation, international legislation was identified to produce a comparison between the United States and Canadian protection afforded to marine mammals. A review of international oiled marine mammal response plans provided insight into the key features that should be included in a response plan and provided information on how other countries and industry leaders have successfully incorporated wildlife oil spill response into wider oil spill response plans.

A Political, Economic, Socio-cultural, Technological, Legal, and Environmental (PESTLE) analysis was undertaken to reveal factors that are either benefitting or inhibiting the creation and implementation of a national marine mammal oil spill response protocol. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis of DFO's Marine Mammal Response Program was undertaken to determine if use of the program is a suitable option for oiled marine mammal response.

## Literature Review

### *Roles and Responsibilities for Marine Oil Spill Stakeholders and Authorities*

The following sectors do not represent an exhaustive list of stakeholders, but constitute some of the key stakeholders that would be involved with the implementation of a marine mammal oil spill response protocol.

### *Transport Canada*

Transport Canada (TC) is the lead regulatory agency responsible for managing the National Oil Spill Preparedness and Response Regime. The Department is responsible for developing and enforcing regulations that pertain to Response Organizations and Oil Handling Facilities as well as certifying Response Organizations. TC is the lead representative for the International Maritime Organization Oil Pollution Preparedness, Response and Cooperation/Hazardous Noxious Substances Technical Group (Transport Canada, 2015).

### *Responsible Party*

In Canada, the Responsible Party (RP) is the owner of the vessel and is known as the “polluter”. The RP is responsible for damages caused by a ship-sourced oil spill. In the case of marine transportation, charter and oil companies are not legally responsible for costs associated with remediation or compensation. The liability rests with the owner of the tanker.

During the Emergency Period after an oil spill, the polluter has to deal with four critical challenges: Causality, Community, Corporate, and Clean-up. The RP delegates clean-up to the Response Organization (RO), where managers from the operations sections from both the RO and RP will confer on clean-up tactics, including wildlife recovery and rehabilitation, as outlined in their Spill Management System (SMS) (Friendly, 1999).

### *Response Organization*

Response Organizations are companies that respond to oil spills from ships that travel through Canadian waters. ROs are governed and certified by TC under subsection 169(1) of the *Canada Shipping Act, 2001* and must adhere to the *Response Organizations and Oil Handling Facilities Regulations*. ROs receive annual fees from ships and oil handling facilities, which

allow them to remain prepared in the event of a spill. TC has certified four response organizations that operate in specific geographic response areas: Western Canada Marine Response Cooperation (WCMRC), Eastern Canada Response Cooperation (ECRC), Point Tupper Marine Services Ltd., and Atlantic Emergency Response Team (ALERT) (Figure 2). In the event of an oil spill, the RO will report to the Responsible Party's (RP) Operations Section. The coordination of the clean-up phase requires substantial management effort, where regulated marine mammal response would help alleviate confusion and lead to quicker response efforts.

The RO provides technical suggestions to the polluter on operational decisions for clean-up efforts, including wildlife. Currently in the regulations that ROs are legally bound by, the definition of wildlife only constitutes birds. Under Section 3 (2)(k), the RO must provide a list of available hazing equipment, “3 (2)(k) a list of the equipment for scaring off birds from an oil spill location and of the measures available in support of the wildlife rehabilitation activities of other parties”. Since marine mammals are not included in the responsibilities of an RO under the *Response Organizations and Oil Handling Facilities Regulations*, marine mammal response is not offered as an option during the clean-up phase.

#### *Fisheries and Ocean Canada*

DFO is the regulatory authority responsible for protecting aquatic resources and marine mammals in Canada. DFO is responsible for the protection of aquatic species at risk that are not governed by the Department of Environment and Parks Canada. During a marine oil spill DFO acts in a support role and provides scientific, environmental, and wildlife advice to the Environmental Emergencies Science Table, a mechanism governed by Environment and Climate Change Canada; in the event that a Science Table is not utilized, DFO can provide advice to the Lead Agency and Federal Monitoring Officer. Despite DFO not being the lead agency in marine



oil spill response, they are the agency responsible for implementing the Marine Mammal Response Program, which states that they will respond to oiled animals. If marine mammal oil response is required in the future, most likely due to media coverage of oiled wildlife, the department would face criticism for not having guidelines in place.

#### *Canadian Coast Guard (DFO)*

The Canadian Coast Guard is an operating agency of DFO that provides services such as maritime safety and protection of marine and freshwater environments. CCG is the lead federal agency for response to ship-source oil spills and ship-source pollution. CCG governs the Environmental Response Program, which ensures that Canada maintains a suitable level of response capabilities for ship-source and mystery-source oil spills. The CCG Federal Monitoring Officer will liaise with the Responsible Party and advise them of their legal responsibilities or act as the On-scene Commander for mystery spills. The CCG is also responsible for transboundary planning, which includes developing wildlife response protocols for the five geographic annexes CANUSLAK, CANUSPAC, CANUSLANT, CANUSNORTH and CANUSDIX.

#### *Marine Mammal Response Program (DFO)*

The responsibility of responding to marine mammal incidents falls to DFO. The MMRP is the coordinating mechanism that works with conservation groups, NGOs, and other Department branches, such as Conservation and Protection Fishery Officers, across all Regions to provide assistance for marine mammals in distress. The program works with external partners through varying networks to provide on-scene response to a multitude of human activities that impact marine mammals, with a special emphasis on response for Species at Risk listed marine mammals; the MMRP is used as an implementation tool for the SARA whereby listed marine mammals must be afforded legal protection and identified threats mitigated when possible. Since

its initiation in 2009, members from Regional networks within the MMRP have provided emergency response for SARA-listed and non-listed marine mammals and have helped, “Track and respond to marine mammal entanglements, strandings (dead & live), ship strikes, contaminated animals (oiled), and other threats; Quantify threats affecting marine mammal species, with a special focus on species at risk; Provide data and information to support species at risk recovery planning initiatives, mitigation options, and policy development; and Support Conservation and Protection (C&P) investigations in enforcement cases” (DFO website, 2014). The MMRP provides training for C&P Fishery Officers so that they may provide primary or secondary response and assistance depending on the incident. The MMRP receives \$300, 000 annually to provide training and response activities where funds are distributed based on the needs of the Region, which is further supplemented by contributions from external network partners.

#### *Species at Risk (DFO)*

The Minister of Fisheries and Oceans Canada acts as the competent minister for aquatic species at risk. The Minister is responsible for the creation and implementation of federal recovery strategies for aquatic species that are granted designation under Schedule 1 of the Act listed as threatened, extirpated, endangered, or special concern. An examination of marine mammals listed under Schedule 1 provides a compilation of species that are affected by toxic spills, pollution, and contaminants related to oil (Table 1), which will help marine managers build a proposal to develop marine mammal oil spill response guidelines. There are currently 17 SARA-listed populations of marine mammals (out of 20) in Canada that identify oil spills and oil pollution as a threat to recovery. Contained within SARA recovery strategies and management plans are severities of oil spills to certain marine mammals. A compilation of the extent,

occurrence, frequency, causal certainty, severity, and in some cases mitigation are provided (Table 2; Table 3).

Risk assessments of threats to recovery of marine mammals have been conducted for SARA-listed species. 85% of Recovery Strategies list oil spills as a threat to recovery with the severity of oil spills ranging from low to high, the threat occurrence ranging from current to anticipated, and the frequency of threat ranges from ongoing/recurrent to continuous and seasonal. SARA Recovery Strategies and Actions Plans vary based on the author; everything down to the citation can be different, which accounts for the difference in the amount of information listed pertaining to risk and threats. The compilation of Oil Spill Risk Factors and Mitigation Measures for SARA-Listed Marine Mammals (Table 3), where 41% of SARA-listed marine mammal Recovery Strategies and Action Plans explicitly state that oil spill planning and response needs to be incorporated into planning, further supports the argument for creating national marine mammal oil spill response protocols.

#### *Canada- United States Marine Mammal Protection Comparison*

The United States utilizes the *Endangered Species Act* as the national vehicle to provide legal protection to endangered or threatened species. Endangered and threatened marine mammals fall under the jurisdiction of the National Marine Fisheries Service (NMFS) division of the National Oceanic and Atmospheric Administration (NOAA). Since the majority of Canada's marine mammal distribution ranges are found in both Canadian and U.S. waters it is important to review the protection afforded by each country (Table 4). The discrepancies between the management measures of shared marine mammal populations between Canada and the United States highlights the need for more effective and consistent approaches.

## *Canada's Approach to Marine Oil Pollution*

The three major elements of Canada's marine oil spill response focus on prevention, preparedness and response, and liability and compensation. The prevention regime consists of legislation that directs vessel safety, preparedness and response measures are implemented by TC and CCG, and compensation is delivered through national legislation that is administered by TC, and international conventions and funds.

### *Compensation*

Canada adopts a four-tiered approach to liability and compensation for marine oil pollution damage. Each tier of the compensation regime has a limited amount of funding available for clean-up measures and compensation claims; Tier 1- *Civil Liability Convention*; Tier 2- *1992 International Oil Pollution Compensation (IOPC) Fund Convention*; Tier 3- *IOPC Supplementary Fund*; and Tier 4- *Ship-Source Oil Pollution Fund*. In 2010, the total approximate compensation available through all four tiers was \$1.33 billion Canadian dollars (CAD) (Boulton & Sandborn, 2010).

The *Civil Liability Convention* (Tier 1) places liability for oil damage on the ship owner. Ships up to 5, 000 tonnage units are liable for up to 4, 510, 000 special drawing units (SDR), which can be converted to Canadian dollars based on daily market exchange rate calculations. Ships larger than 5, 000 tonnage units are liable for an additional 631 SDR per tonnage unit over 5, 000, up to 89, 770, 000 SDR, equalling \$165, 648, 700 CAD<sup>1</sup>. The 1992 IOPC Fund (Tier 2) provides additional funding up to 113, 230, 000 SDR on top of Tier 1 liability. If Tier 2 compensation becomes exhausted, then the IOPC Supplementary Fund (Tier 3) can offer

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<sup>1</sup> SDR conversion to CAD on November 14, 2015 using conversion calculator from [www.coinmill.com](http://www.coinmill.com)

compensation up to 547, 000, 000 SDR. Tier 3 compensation can only be accessed once Tier 2 compensation is depleted.

The *Ship-Source Oil Pollution Fund* (SOPF) (Tier 4) is Canada's national oil pollution fund. It was created in 1989 and is governed by the *Marine Liability Act*. The SOPF is the national fund that pays for marine oil pollution damage and costs incurred during clean-up efforts. The *Canadian Shipping Act* was amended to better deal with marine shipping accidents, such as the 1970 *Arrow* incident where the tanker ran aground in Nova Scotia, and amendments acted as the precursor to the creation of the SOPF. The *Arrow* incident highlighted numerous gaps in Canada's compensation regime, which was remedied by the creation of the SOPF. From 1971-1989, levies were collected from tankers transiting national waters, oil companies, pulp and paper manufacturers, and power producing establishments that contributed to the Maritime Pollution Claims Fund (MPCF), which later turned into the SOPF (Mac Innis, 2005). There are three classes of claims that the SOPF is liable for compensation: 1) oil pollution damage costs; 2) oil spill clean-up, preventative measures, and monitoring costs; 3) mystery spill oil pollution damage and clean-up costs where it cannot be proven that damage was not caused by a ship (Mac Innis, 2005). The commercial, recreational, and Aboriginal (CRA) fishers may also claim compensation for loss of income.

## Capacity Overview

### *Response Networks*

#### *Canadian Marine Animal Rescue Network*

The Canadian Marine Animal Rescue Network (CMARN) is comprised of several regional networks and organizations from across Canada that provide response to distressed

marine animals through funds provided by DFO's Marine Mammal Response Program, ENGOS and academic institutions, as well as in-kind donations from dedicated professionals within the network. A majority of members in the CMARN will need to receive training on how to respond to oiled marine animals in order to effectively and safely carry out the operational steps that are involved in response efforts, such as developing a response strategy, preparing tactical plans to complete the strategy, defining communication needs within the response team and between the team and RO, and assigning duties related to supervising field operations (Friendly, 1999). Best practices have been developed by several countries and organizations that should be incorporated into Canada's response planning, including a training component for responders in the marine mammal response network.

Morgan *et al.* (2014) identified barriers to oiled wildlife response as well as characteristics of an effective response regime:

“A lack of planning for Oiled Wildlife Response (OWR) was identified as a contributing factor exacerbating the impact of a spill on wildlife and for resourcing a response. Inadequacies within operator and government contingency planning, to prepare for and sustain a wildlife response for extended periods, can be overcome by using a mobilisation model that integrates wildlife carer networks, government regulatory agencies and operator resourcing via an independent coordinating organisation consisting of a small group of personnel highly experienced and trained in maritime operations and marine science with access to a network of persons with experience in responding to wildlife and their handling, treatment and rehabilitation.”

Canada's current state of oiled marine mammal response demonstrates a lack of contingency planning. Canada's Marine Animal Rescue Network fits Morgan *et al.* (2014) mobilization model where highly trained professionals in the Marine Mammal Response Network work with regulatory agencies such as DFO, to deliver the Marine Mammal Response Program. Individuals within the network are world-renowned for marine mammal responses including

disentanglement, strandings, and toxicology. Providing marine mammal oil spill response training for responders will enhance Canada's network while allowing for response to current oil pollution risks and meeting national and international obligations.

In areas that are isolated or difficult to access, namely places north of 60°, response or rehabilitation may not be an option. In these situations, marine managers and spill responders will need to risk manage the situation. The marine mammal oil spill response guidelines would still be applicable and can add value through gathering consistent data on oiled marine mammals. It is possible that communities can file a claim with the SOPF for oil pollution loss or damage. These claims would be bolstered by standardized federal data collection processes. Data collection is a valuable tool that will improve marine oil spill literature and can guide future iterations of wildlife response planning.

#### *Key Features of an Effective Oiled Wildlife Response*

There are several marine mammal and wildlife oil spill response guidelines available that could guide the development of a national plan for Canada (Johnson & Ziccardi, 2006; Department of Parks and Wildlife Government of Western Australia & Australian Marine Oil Spill Centre, 2014; State of Washington Department of Fish and Game Office of Spill Prevention and Response, 2014; Ziccardi *et al.*, 2014). NOAA's Marine Mammal Oil Spill Response Guidelines (Johnson & Ziccardi, 2006) is considered the gold standard for marine mammal oil spill response by marine mammal experts such as the National Marine Mammal Science Advisor and the National Marine Mammal Coordinator for DFO. In addition to having professional endorsement, NOAA's federal guidelines are a robust document that has undergone review and will be adapted based on knowledge gained from catastrophic events, such as the BP *Deepwater Horizon* oil spill that took place in the Gulf of Mexico in 2010 (Ziccardi *et al.*, 2014). States

along the Pacific coast of the United States have well-regarded wildlife response plans by marine managers, perhaps due to their cultural values and respect for wildlife that is echoed in legislation. State oil spill response plans for Washington and California were examined to provide relevant sections that should be incorporated into Canada's marine mammal oil spill response guidelines. Western Australia's oiled wildlife response plan (Department of Parks and Wildlife Government of Western Australia & Australian Marine Oil Spill Centre, 2014) and International Petroleum Industry Environmental Conservation Association's guide to wildlife response planning (IPIECA, 2004) were examined so that they may offer insight into response practices shared around the world. The shared characteristics of these response plans should be integrated into the development of national and regional marine mammal oil spill response plans in Canada (Table 5).

Ziccardi et al. (2014) outlined several categories of stranding networks, personnel networks, and an organizational structure that provide insight into how Canada can approach developing a response plan. Stranding networks are managed by a Regional Stranding Coordinator, which are akin to MMRP networks that coordinate with Marine Mammal Coordinators in each of the Regions. The authors list five categories of stranding networks: Primary Care Organization/Facility, Secondary Care Organization/Facility, Processing Organization/Facility, Field Collection Organization, and Personnel Organizations. Primary Care Organizations maintain permits and capacity to provide rehabilitation, containment, and disposal of oiled marine mammals. Secondary Care Organizations have the required permits to care for cleaned animals; they are not certified to deal with oiled hazardous waste. Processing Organizations are approved to provide field sampling and necropsy services at the site of an oil spill (they would form part of the field team) or at another facility. Field Collection



Organizations possess permits to collect live or dead oiled animals from an oil spill site and transport them to the Primary, Secondary, or processing Organization. Lastly, there are Personnel Organizations that are further divided into classifications based on requirements and responsibilities.

Ziccardi et al. (2014) outline six categories for Personnel Organizations that would be listed in the Operations and Duties section under organizational Structure. There is the Group Supervisor, Task Force Leader, Area Coordinator, Area Staff, Technical Specialists, and Volunteers. The Group Supervisor is the manager of a key response unit (Deterrence, Recovery, Care and Processing). Task Force Leaders are in charge of specific tasks, such as triage processes. Area Coordinators are in charge of Area Staff, which can include Technical Specialists. Volunteers fall into either the category of spontaneous, who are members of the general public that do not have affiliations with the network, and paraprofessionals, who have training and are affiliated with the network.

The components in Table 5 display the basic elements which should be included in a national response plan based on common features found in internationally recognized wildlife response guidelines. If DFO would like to proceed with the development of a national response plan the features in the table of contents should account for the basic elements of an effective plan that can be expanded upon.

### *Response Network Members*

Regions need to include the name and contact information of response organizations in their regional marine mammal oil spill response plans. Below is not an exhaustive list of contacts

for most regions, but the information can act as the starting point for developing contact lists.

Contact information in regional plans should be updated on a biennial basis.

## **National & International**

### **Departments, Branches, and Organizations**

|                                     |   |
|-------------------------------------|---|
| Fisheries and Oceans Canada (DFO)   | Oiled Wildlife Care Network (California)* |
| World Wildlife Fund (WWF)           | Sea Alarm (European Union)*               |
| Canadian Wildlife Federation (CWF)  | Tri-State Bird Rescue and Research        |
| Species at Risk (SAR) (ECCC)        | DFO Science                               |
| Marine Mammal Working Group (MMWG)  | DFO Fisheries Resource Management         |
| DFO Conservation & Protection (C&P) | DFO National Marine Mammal Coordinator    |

## **Pacific**

### **Organizations and Key Contacts**

|   | <b>Sector</b>    |
|---|------------------|
| Cetus Society- Research and Conservation Society  | NGO              |
| British Columbia Marine Mammal Response Network   | NGO              |
| Vancouver Aquarium                                | Aquarium         |
| Focus Wildlife British Columbia                   | Private Business |
| B.C. Society for Prevention of Cruelty to Animals | NGO              |
| Oiled Wildlife Society of B.C.                    | NGO              |
| Wildlife Rehabilitator's Network of B.C.          | NGO              |
| Wildlife Rescue Association of B.C.               | NGO              |
| DFO Regional Marine Mammal Coordinator            | DFO              |

## **Central & Arctic**

### **Organizations and Key Contacts**

|                                    | <b>Sector</b> |
|------------------------------------|---------------|
| Regional Marine Mammal Coordinator | DFO           |

## **Québec**

### **Organizations and Key Contacts**

|  | <b>Sector</b> |
|--|---------------|
| Groupe de recherche et d'éducation sur les mammifères marins (GREMM) | NGO           |
| Réseau Québécois d'urgences pour les Mammifères Marins (RQUMM)       | NGO           |
| Amphibia-Nature  | NGO           |
| Aquarium des Îles de la Madeleine                                    | NGO           |

|   |                       |
|---|-----------------------|
| Centre d'étude et de recherche de Sept-Îles (CERSI)   |                       |
| Centre Québécois pour la santé des animaux sauvages (CQSAS)   | NGO                   |
| Exploramer  | NGO                   |
| Québec-Labrador Foundation  | NGO                   |
| St. Lawrence National Institute of Ecotoxicology (SLNIE)  | NGO                   |
| Réseau d'observation des mammifères marins (ROMM)   | NGO                   |
| Mingan Island Cetacean Study (MICS)   | NGO                   |
| Zoo sauvage de Saint-Félicien   | NGO                   |
| Biodôme de Montréal   | Municipal Government  |
| DFO Science   | DFO                   |
| DFO Fisheries Resource Management   | DFO                   |
| DFO Conservation & Protection   | DFO                   |
| DFO Regional Marine Mammal Coordinator  | DFO                   |
| Parks Canada Conservation Division (Saguenay- St. Lawrence Marine Park, Mingan Archipelago National Park Reserve of Canada, Forillon National Park) | Parks Canada          |
| Ministry of Sustainable Development, Environment, Wildlife and Parks)   | Provincial Government |
| Aquarium de Québec (SÉPAQ)  | Provincial Government |

## **Gulf**

### **Organizations and Key Contacts**

### **Sector**

|  |            |
|--|------------|
| Marine Animal Response Society (MARS)  | MGO        |
| Campobello Whale Rescue Team (CWRT)  | NGO        |
| Canadian Wildlife Health Cooperative (CWHC)- Atlantic Veterinary College, UPEI | NGO        |
| DFO Conservation & Protection  | Government |
| DFO Regional Marine Mammal Coordinator   | Government |

## **Maritimes**

### **Organizations and Key Contacts**

### **Sector**

|  |     |
|--|-----|
| Maritime Marine Animal Response Network  | NGO |
| Marine Animal Response Society (MARS)  | NGO |
| Campobello Whale Rescue Team (CWRT)  | NGO |
| Canadian Wildlife Health Cooperative (CWHC)- Atlantic Veterinary College, UPEI | NGO |
| Canadian Sea Turtle Network (CSTN)   | NGO |
| Hope for Wildlife Centre (HFW)   | NGO |
| Cobequid Wildlife Rehabilitation Centre*                                       | NGO |
| Atlantic Wildlife Institute (AWI)*   | NGO |
| Grand Manan Whale and Seabird Research Station                                 | NGO |

(GMWSRS)

|   |            |
|---|------------|
| New Brunswick Museum                          | NGO        |
| NS Department of Fisheries & Aquaculture      | Government |
| PEI Department of Fish, Forestry and Wildlife | Government |
| DFO Regional Marine Mammal Coordinator        | Government |
| Point Tupper Marine Services                  | RO         |
| Atlantic Emergency Response Team              | RO         |

Note: Organizations with an asterisk (\*) beside the name are not included in the current CMARN and/or partner organization of the MMRP, but should be considered for inclusion.

## **Newfoundland**

### **Organizations and Key Contacts**

### **Sector**

|   |            |
|---|------------|
| Tangly Whales Inc. (Whale Release and Strandings Group) | NGO        |
| DFO Regional Marine Mammal Coordinator                  | Government |

## **Analysis**

### *Environmental Scan*

An environmental scan is a useful business analysis technique that can be utilized as part of an organization's business strategy. There are several variations of environmental scans that examine external factors that could potentially have an impact on the environment in which an organization operates and the organization's internal capabilities, which often lead to the identification of areas of strengths and weaknesses. Environmental scans may be applied at any time during which an organization operates as the business environment is constantly evolving, therefore organizations must be able to effectively adapt to meet new needs and standards.

Through a political, economic, socio-cultural, technological, legal, and environmental (PESTLE) analysis of issues surrounding marine mammal oil spill response in Canada and a strengths, weaknesses, opportunities, and threats (SWOT) analysis of utilizing the MMRP for response, recommendations will be formed.

## *PESTLE Analysis of Marine Mammal Oil Spill Response in Canada*

### *Political*

The development of a national marine mammal oil spill response plan requires political endorsement. There could be a large political push to implement a federal response given the recent actions of the United States, where they used the political environment to drive change in the biophysical environment. On January 5, 2015, the United States Court of International Trade ruled that the U.S. government must espouse new rules that comply with amendments to the Atlantic Large Whale Take Reduction Program (ALWTRP), which are regulations under the Marine Mammal Protection Act (MMPA). The amendments highlighted the need for international countries to align conservation measures with regards to fishing in order to reduce large whale mortality as set out under provisions of section 101(a)(2) of the MMPA. The provisions will serve to ban the imports of fish and seafood products from international fisheries that record higher marine mammal by-catch rates than the United States (Office of Information and Regulatory Affairs, 2015).

Canada was identified as having inadequate marine mammal conservation measures (Smith *et al.*, 2014) compared to the United States and has been included in the trade ban. This could result in serious economic losses for Canada as 78% of landed lobster was exported to the United States in 2014 (DFO Lobster Statistics, 2015). Not only does this ruling affect international trade, but it will also affect U.S. businesses, particularly those in the food services and hospitality industry, leading to the conclusion that the United States highly values species conservation.

Imports bans are not the only avenue where the United States can use political pressure in order to improve marine mammal conservation. There are other areas where the United States

exhibit superior marine mammal conservation measures when compared to Canada. One such misalignment of conservation measures is apparent in Canada's lack of marine mammal response during oil spills. NOAA has developed a world-class marine mammal oil spill response document (Johnson & Ziccardi, 2006) in order to minimize injuries to wildlife and provide the best available care. Considering that in 2014, 97% of Canada's estimated crude oil exports were destined for the United States (National Energy Board, 2014) (Table 6) it would be reasonable for the U.S. to declare oil trade bans as a means to further improve marine mammal conservation as a means to garner compliance because it would be simpler for Canada to improve conservation measures than it would be to lose economics profits. As the United States has identified Canada as a country with sub-standard bycatch mitigation, there is the possibility that they could identify Canada as having inadequate oiled wildlife response due to the transboundary nature of North American marine mammals and lack of a federal response plan.

### *Economic*

#### *Forms of Values*

Wildlife and biodiversity are treated as assets and provide a wealth of ecosystem goods and services (Daily *et al.*, 2000). Total economic values (TEV) for marine mammals can be calculated by examining their Use values (UV). Marine-based tourism and marine mammal resources with commercial value fall under Direct use values (DUV). The integral role that marine mammals play in maintaining ecosystem functions fall under Indirect use value (IDUV), which are called non-consumptive uses. Option use values are active use values that place importance on preserving a species for future DUVs and IDUVs. Non-use values (NUV), also known as passive use values, are comprised of Bequest values (BV), which is the value of preserving a species for future generations to enjoy, and Existence values (EV), which embodies

the value that people obtain from knowing that a species is not extinct, regardless of its potential use (Nunes *et al.*, 2005). These components are used in economic assessments of marine benefits that can be useful in costs-benefits analyses. Nunes *et al.* (2005) provides insight into suitable valuation techniques for such assessments.

### *Seal Industry*

Canada could have a viable sealing industry that could provide benefits to coastal communities. Oil spills could negatively impact participants in the industry if oil incidents occur in sealing areas and spoil viable resources.

### *Tourism*

Marine-based tourism provides economic benefits to coastal communities. The livelihoods of coastal residents and communities can rely on marine life, which has the potential to be adversely impacted by oil spills. Whale watching and other forms of marine based ecotourism contributed \$3.1 billion to Canada's coastal tourism industry in 2006 (Pinfold, 2009), which may suffer significant economic losses in the event of an oil spill. Not only will direct economic benefits suffer, but also secondary benefits derived from associated expenses in the food and hospitality industry will be negatively impacted (Garza-Gil *et al.*, 2006; Loureiro *et al.*, 2006; Zhang *et al.*, 2009). Tourism is the fifth fastest growing industry globally, but Canada has experienced a decrease in tourist gains from 2002-2013 (Tourism Industry Association of Canada, 2015), but it still provides a source of income for many coastal communities. Mitigation measures provided by contingency planning can offer solutions to help alleviate negative socio-economic effects of an environmental disaster (Ritchie, 2004; Zhang *et al.*, 2009) making it reasonable to argue that the coastal tourism will benefit from marine mammal oil spill response.

### *Socio-cultural*

Canadians possess an inherent appreciation of nature. It can be linked to our heritage and the formation of our country as the exploitation of beaver pelts for the European fur trade helped catalyze the settlement of new colonies and provided a means of livelihood (Innis, 1999). Marine mammals play an important role in Canadian culture and this sentiment is echoed throughout arts and literature (Office of the Auditor General, 2013). Marine mammals hold special place in general societal values, particularly for Aboriginal groups.

Marine mammals play an integral role in Aboriginal culture. Marine mammals are evident in the foundation of Aboriginal culture, which is reflected by their use in ceremonies, narratives, medicine, diet, art, and material (Garibaldi & Turner, 2004). Aside from being iconic and keystone species, marine mammals form part of traditional food systems and contribute to food security, which are already affected by poverty, climate change, and ecological degradation due to events like oil spills (Power, 2008). Oiled marine mammals pose a threat to food security in Aboriginal communities and can create health and human safety hazards from consumption of sub-standard or toxic meat. Vulnerable northern communities would benefit from the implementation of marine mammal oil spill response as it would allow for the documentation and possible remuneration for spoiled marine mammals that could otherwise be utilized.

### *Technological*

As outlined in the *Response Organizations and Oil Handling Facilities Regulations* (2015), ROs must maintain a list of bird scaring equipment. The four ROs have varying amounts and types of hazing equipment including canons, buoys, nets, cages, and exclusion devices. Currently, ROs do not need to maintain hazing or pre-emptive capture equipment for marine mammals, nor do they need to provide wildlife response. In the cases where wildlife response is



necessary (for birds), ROs generally do not have adequate rehabilitation equipment and procure wildlife response from trusted organizations that do maintain the necessary equipment; for example, ALERT works with the Atlantic Wildlife Institute (AWI) for avian rehabilitation (Barry Rothfuss, AWI, 2015, personal communication; Bob Totten, ALERT, 2015, personal communication) and ECRC contracts Tri-State Rescue & Research, Newark, Delaware, for avian and marine mammal rehabilitation.

### *Legal*

There are various pieces of legislation that apply to different stakeholders with regards to marine oil spills and marine mammal response.

### *Fisheries Act/ Marine Mammal Regulations*

The Act is comprised of 89 sections relating to the preservation of commercial, recreational, and Aboriginal (CRA) fisheries, fish species, and fish habitats. The Act also provides an avenue to apply Environmental Damage Assessments (EDA) in order to quantify environmental damage costs and socio-economic impacts caused by environmentally destructive events (Mac Innis, 2005). Marine mammals are classified as “fish” under the Act and should be afforded protection from threats. The *Marine Mammal Regulations* under the *Fisheries Act*, list cetaceans, walrus, and seals as fishing resources, which should result in DFO creating provisions to protect fisheries resources from toxic pollutants.

### *Marine Liability Act*

The *Marine Liability Act* (2001) is comprised of 142 sections pertaining to the liability for maritime claims, liability and compensation for pollution, and the international, supplementary, and ship-source oil pollution fund.

*Canada Shipping Act, 2001/ Response Organizations and Oil Handling Facilities Regulations*

The *Canada Shipping Act* (2001) contains 334 sections that govern shipping responsibilities. The Act is administered by TC, except for Part V- Navigation Services, which is administered by DFO. The *Response Organizations and Oil Handling Facilities Regulations* (2015) enact section 657(1) (f) of the *Canada Shipping Act, 2001*. It outlines the provisions that handling facilities and response organizations must adhere to during oil pollution incidents and provides requirements for procedures, planning, equipment, command, and resources. The only provision related to wildlife states that the RO must maintain a list of bird scaring equipment to deter them from becoming oiled and measures available in support of bird rehabilitation activities of other parties.

*Species at Risk Act*

The SARA was introduced on December 12, 2002 in Canada as a means of protecting wildlife in order to meet commitments under the United Nations Convention on the Conservation of Biological Diversity (CBD). The act aims to protect wildlife from becoming extinct and to provide recovery strategies for species that are designated as threatened, extirpated, or endangered due to anthropogenic factors. The act also implements measures to better manage species that are designated as special concern, in order to prevent them from becoming at risk. Lastly, the SARA aims to engage all Canadians in conservation efforts as nature forms part of our national identity, history, and values.

## *Environmental*

Marine mammals add value through increasing biodiversity, maintaining ecosystem services, and acting as indicators of environmental quality. As the majority of marine mammals are apex predators, they play an important role in ecosystem structures and have a large effect on trophic levels and ecosystem dynamics (Morissette *et al.*, 2006). The unsustainable removal of marine mammals can have negative direct and indirect consequences on ecosystem functions (Myers *et al.*, 2007). When sea otters are removed from populations, as was the case after the *Exxon Valdez* spill, it disrupts ecosystem equilibrium and affects sea kelp communities that become decimated from over-grazing by sea urchins (Bowen, 1997). For endangered marine mammals, such as the North Atlantic right whale or Northeast Pacific Southern Resident Killer whales, the removal of a few individuals could jeopardize not only the entire population, but in turn have ecosystem-wide ramifications (Office of the Auditor General, 2013). Increased biodiversity is linked to healthy ecosystems, which in turn provide benefits to human health and the economy (Mosquin *et al.*, 1995).

## *MMRP SWOT Analysis*

An examination of the strengths and weaknesses within the Marine Mammal Response Program and available opportunities and external threats posed to the program will elucidate whether utilization of the MMRP is the best avenue for implementing marine mammal oil spill response by DFO Canada (Table 7).

## Program Development Recommendations

### *Recommendations to Fisheries and Oceans Canada*

1. Work with Transport Canada to amend the *Response Organizations and Oil Handling Facilities Regulations* to include marine mammal response and rehabilitation. Fisheries and Oceans Canada develop national guidelines and implement in a phased approach.
2. Do not amend legislation. Fisheries and Oceans Canada develop a formal marine mammal oil spill response protocol.
3. No response required

### *Strategic and Operational Considerations*

If recommendation 1 is selected, the following steps and timelines (Table 8) should be considered during the regulatory amendment process. If option 2 is selected, the following steps and timelines (Table 9) should be considered when developing a national Fisheries and Oceans marine mammal oil spill response protocol. If option 3 is selected, no response is required and does not present strategic and operational considerations.

### *Funding Options*

Recommendations 1 and 2 involve the development of marine mammal oil spill response guidelines and require response training. The development of response guidelines will most likely involve hiring a contractor; the document could be produced for under \$10, 000 CAD, which is viewed as a small project based on past DFO expenses and discussions with marine managers, making funding more feasible. The development of marine mammal oil spill response guidelines could be funded by:

- i. Resource Management (DFO);
- ii. Species at Risk (ECCC); or
- iii. Resource Management (DFO) and Species at Risk (DFO) split costs in a manner deemed acceptable to both parties

Training for responders, whether it is delivered to individuals in the current network or external groups could be funded through the following mechanisms:

- I. Resource Management (DFO);
- II. Species at Risk (ECCC);
- III. Resource Management (DFO) and Species at Risk (DFO) split costs in a manner deemed acceptable to both parties; or
- IV. Utilize allocated funds from the MMRP budget and supplement costs with contributions from Resource Management (DFO), Species at Risk (ECCC), and ENGOS

#### *Response Expenditures*

Costs will be incurred if DFO decides to provide response to oiled marine mammals. If Recommendation 1 is selected and DFO works with Transport Canada to seek regulatory amendments to gain final approval, publication, and registration, response to oil spilled from tankers of 150 tonnes and greater and all ships 400 tonnes and greater would be contracted through Response Organizations. If Recommendation 1 or 2 is selected, marine mammal response to oil pollution from tankers below 150 tonnes, ships below 400 tonnes, and persistent slicks would be paid for by DFO through the MMRP budget. If Recommendation 1 or 2 is

selected, response to ship-source mystery spills may be claimed under the Ship-Source Oil Pollution Fund.

## Discussion

The nature of marine mammal oil spill response will vary based on the affected species. There have been cases in the past, such as the *Arrow* incident, that may lead people to believe that oil spills do not have a negative impact on marine mammals, but there is counter-evidence arising from spills such as the *Exxon Valdez* and *Deepwater Horizon* incidents; in any case, lack of scientific certainty does not equate to inaction. At the very least, it will be important to have formal monitoring and consistent data collection during and post-incident. For any oil spill response, whether it is through the MMRP or another mechanism, SARA-listed species should receive priority for response over non-listed species, as they are at greater risk for extinction. For any response activities, females and juveniles should receive priority for response efforts because they can help replenish the affected population and are more vulnerable to becoming oiled. The types of response that can be offered will also vary by species group, where cetaceans cannot be captured, leaving response options such as deterrence, data collection and monitoring, and euthanasia. Pinnipeds and sea otters have more options due to their smaller size which allows for capture, deterrence or relocation, data collection and monitoring, rehabilitation, or euthanasia; data collection and monitoring may be more difficult for these groups compared to cetaceans, as pinniped and sea otter cataloguing is not as advanced and due to their nature of aggregating in very large groups. Sea otters are the most vulnerable to the effects of oiling and should be given priority for capture and rehabilitation in the Pacific. The majority of SARA-listed marine mammals are cetaceans, which should result in the most prevalent form of response being data collection, monitoring and deterrence for all Regions.

There are several departmental, legal, and international agreements that necessitate the development of marine mammal oil spill response in Canada. DFO is the lead federal department responsible for assisting marine mammals in distress, which is fulfilled through the MMRP and external partners. One of three strategic outcomes for the Department is to “contribute to the conservation, protection, and sustainability of Canada’s aquatic ecosystems through the management of risks that affect species, oceans, and fish habitats...which provide sustainable resources to Canadians” (Fisheries and Oceans Canada DFO website, 2016). DFO has a dual mandate to protect resources as well as aid conservation efforts by monitoring the status of aquatic species at risk to prevent further declines in their numbers by setting recovery objectives, which both support the argument for developing federal marine mammal oil spill response. The SARA division within DFO is responsible for the latter, where they must mitigate risks for listed SAR. Currently, 17 out of 20 SARA-listed marine mammals list that oil spills are a threat to recovery, with seven out of the 17 explicitly calling for the development of population specific mitigation plans. As SARA-listed species are distributed throughout the Regions, instead of composing seven separate documents that will have a high degree of overlapping information, it would be more efficient to take a Regional approach and develop plans that can be applied to all marine mammals within a Region, and place emphasis on SARA-listed marine mammal response. Focussing on SARA-listed marine mammals would align with the current operational procedures of the MMRP, which is funded by SAR (DFO), but would still serve to provide response to non-listed marine mammals when feasible. Creating a federal response plan would satisfy internal DFO obligations and strategic outcomes, be less onerous than composing seven population-specific documents, the number of which could increase as new species are listed,

would be more economically efficient, and would suffice legal obligations for fulfilling mitigation measures found in Action Plans and Recovery Strategies.

The CCG (DFO) has agreements with international partners, such as the United States Coast Guard, to provide response oiled marine mammals in contiguous waters. In the event of a spill that affects marine mammals in shared areas, the U.S. has a formal plan in place for marine mammal response, which Canada would be lacking. Developing a federal response plan could create a regulatory alignment (if regulatory amendments are sought), which would be positive for both Canada and the United States.

Given the possibility that response plans may be flexible by Region in order to effectively address the diverse needs and response options available, guidelines for minimum acceptable content should be developed by DFO National Headquarters. These requirements may include, but are not limited to: introduction to the area; marine mammal species profiles and identification guides; emergency contact information; response network contact information; ecologically or biologically significant areas (EBSAs) and/or critical habitat maps relevant to marine mammals; distribution; priority species; emergency checklists; and the inclusion of sea turtles (if applicable). This information should be readily available in most Regions but requires compilation in order to be integrated into national response guidelines.

Rather than have all regions submit plans at the same time, a phased approach to the development and implementation of marine mammal response plans would create the least amount of administrative work. Transboundary agreements with the United States (CANUSPAC & CANUSLANT) require the development wildlife response plans and Transport Canada has identified four areas that have a high ERI: 1) Southern Portion of British Columbia, including Vancouver harbour; 2) St. Lawrence River (Montréal to Anticosti Island), Québec; 3) Port



Hawkesbury and the Strait of Canso, Nova Scotia; and 4) Saint John and the Bay of Fundy, New Brunswick, which are slated to act as pilot projects for area response planning and overlap with CANUSLANT and CANUSLAK areas. It is suggested that these four areas serve as pilots for developing priority area marine mammal oil spill response guidelines that will be used in marine mammal oil spill regional response guidelines. Within a Region there can be great diversity of species and environmental composition as well as risks, and as such, there may be several geographical components that contribute to a Region's overall response plan; for example, the Bay of Fundy and Port Hawkesbury have different requirements and oil spill risks than the rest of the Maritimes Region.

The following can be used as an introduction to a response plan for the Bay of Fundy. The most common cetaceans found along coastal areas of Nova Scotia include the Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Harbour porpoise (*Phocoena phocoena*), Minke whale (*Balaenoptera acutorostrata*), Sei whale (*Balaenoptera borealis*), Humpback whale (*Megaptera novaeangliae*), Northern Atlantic Right whale (*Eubalaena glacialis*), and Fin whale (*Balaenoptera physalus*). Of the pinnipeds, only phocids are present in Nova Scotia. The most commonly sighted seals include the Harbour seal (*Phoca vitulina*) and Grey seal (*Halichoerus grypus*), and in late winter, Harp seal (*Pagophilus groenlandicus*), and Hooded seal (*Cystophora cristata*) (Fontaine, 1998). Perhaps best known for having the highest tides in the world, Fundy's 270-kilometer-long bay plays host to a variety of migrating marine mammals and seabirds, along with resident marine life (Tove, 2000). Animals are drawn to the bay because it is a productive marine environment, which is the result of prominent oceanographic features in an area where cold and warm waters mix. The warm Gulf Stream travels northeast towards the North Atlantic, where it mixes with the cold and nutrient rich Labrador Current near the Grand Banks; the mixed

water flows to the southwest, along the Scotian Shelf into the Gulf of Maine and Bay of Fundy. Tidal mixing in the Bay of Fundy increases primary productivity, which creates high concentrations of zooplankton and phytoplankton that support a vast ecosystem and are important components in the diets of fish and squid, which are in turn major components in the diet of marine mammals (Pierotti, 1988). In addition to marine mammals occupying these coastal waters there is a strong presence from industry activities, such as oil and gas, shipping traffic, and recreational users.

There is currently limited capacity in regards to rehabilitation centres across Canada. In the Pacific Region, the Vancouver Aquarium's Marine Mammal Rescue Centre provides rescue, rehabilitation, and release services to over 100 distressed marine mammals throughout the year (Vancouver Aquarium, 2015). Although the rescue centre has the capacity to provide year-round rescue and rehabilitation, space is limited and mobile response facilities will be required in the event of a catastrophic oiling event. On the east coast, rehabilitation can be provided for small-scale oil spills or a limited number of oiled marine mammals. Academic institutions, such as the University of Prince Edward Island's Atlantic Veterinary College, and wildlife response providers such as the Atlantic Wildlife Institute can house limited numbers of small marine mammals for rehabilitation. Overall, some capacity for housing rehabilitation services exists throughout Canada that can be useful for minor oiling incidents, but if a large-scale oil spill were to occur, mobile response units from international response agencies would be required. These can be provided through Tri-State Bird Rescue & Research Inc. and Focus Wildlife (Appendix I), who currently work with ROs to provide other wildlife equipment and response.

There may be instances where rehabilitation may not be an option. In these cases it is best to collect information on oiled individuals and provide euthanasia for animals when deemed

appropriate by the leading veterinarian on site. Euthanasia may be viewed as an extreme response method that could elicit strong emotional public response, but sometimes it is the most humane response approach. Including euthanasia in national guidelines as a response technique will end the suffering for distressed marine mammals, and can be included in the media communications plan in order to address public concerns. Leading marine mammal veterinarians have developed best practices for euthanizing large and small marine mammals (Daoust & Ortenburger, 2015; CCAC, 2010; Warneke, 1986). Currently, marine mammals protected under the *Species at Risk Act* are not allowed to be euthanized under the General Prohibitions of Section 32(1) “No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species” (SARA, 2002). It may be in the best interest of injured SARA-listed animals to allow for euthanasia, therefore changes in legal wording to the SARA will need to be resolved. Euthanasia is not used as a means to save money on rehabilitation and response costs, but is employed when it is viewed as the best option to alleviate excessive pain and suffering when the animal has no perceived chance of survival.

The PESTLE analysis provided a general environmental scan of issues surrounding the development and implementation of marine mammal oil spill response guidelines. The development of a national marine mammal oil spill response plan requires political endorsement. Approval to begin the development of a response plan would be the first hurdle to overcome in this process and the contents of this study can be used towards an argument in favour of creating a response plan. There may be international pressure to increase conservation measures, especially from the U.S. who have already caused Canada to pursue regulatory alignment for cetacean conservation measures in order to maintain seafood trade, which could be further

extended to affect other areas of trade such as oil; the U.S. has identified Canada as having inadequate marine mammal conservation measures. Changes to the political environment will have an increasing effect on changes to the biological environment.

Wildlife and biodiversity are commonly treated as assets and provide a wealth of ecosystem goods and services to Canadians. Marine mammals are used in a variety of consumptive, non-consumptive, active, and passive uses including DUV, IDUV, NUV, BV, and EV. Many Canadians rely on marine mammals for economic purposes through the seal industry, which has gained highly publicized political support from the new Liberal government, and marine-based tourism. In order to safeguard coastal tourism, livelihoods, and the associated expenditures garnered by the tourism industry it is crucial to protect the natural resources that drive tourism. Marine mammals play an important role in socio-cultural values, especially for Aboriginal groups. The creation of a response plan could help maintain the resilience of Aboriginal communities by strengthening food security and maintaining the livelihoods of individuals that utilize marine mammals. Response in northern communities would primarily entail data collection and monitoring, which can be used to file claims for compensation as oiled animals cannot be consumed or utilized.

If ROs were obligated to respond to marine mammals, the maintenance of additional equipment would not be required. Since ROs contract external organizations for bird rehabilitation, the majority of these organizations could also be used for marine mammal response, for example Tri-State Rescue & Research offers both avian and marine mammal oil spill response services. It is unlikely that ROs will contract organizations for oiled marine mammal response unless changes are made to the *Response Organizations and Oil Handling Facilities Regulations*, which are part of the *Canada Shipping Act*. The *Marine Mammal*

*Regulations* under the *Fisheries Act* and the *Species at Risk Act* provide legal requirements for the development of marine mammal oil spill response. The *Marine Liability Act* could provide an avenue for compensation through the ship-source oil pollution fund. If regulations are not amended to include marine mammal oil spill response the cost of activities will fall to DFO, where it is in their best interest to seek regulatory amendments that would reinforce the polluter pays principle.

The SWOT analysis of utilizing the MMRP to deliver response to oiled marine mammals provides evidence that the MMRP is a favourable option. The weaknesses of utilizing the MMRP for marine mammal oil spill response can be transformed into strengths. Expenses incurred by the implementation of the MMRP vary by year, where some years the budget is exhausted, but it is common for regions such as Central and Arctic to have remaining funds at the end of the fiscal year; remaining funds can be put towards oil spill response training where finances can be restructured, prior to the implementation year, to reflect expected Regional expenses and include an Emergency Fund section as well as dedicated funds for training. The greatest weakness of utilizing the MMRP for marine mammal oil spill response is the lack of insurance for response partners. In order to protect responders and DFO, insurance should be required. This issue has been raised in a Canadian Marine Animal Emergency Response Workshop, March 25<sup>th</sup> and 26<sup>th</sup>, 2013 (MARS, 2013), and acquiring liability insurance was identified as a priority action for the network. The opportunities presented by utilizing the current MMRP regime for marine mammal oil spill response outweigh external threats to the program, but most of the threats can be alleviated or turned into strengths. If ROs become legislated to provide response to oiled marine mammals in the future, the geographical boundaries of their response efforts, which do not operate north of 60°N create a response gap.

Currently, ROs are not legally bound to provide oiled marine mammal response, and their operational limits do not affect the implementation of the MMRP. A response gap north of 60°N is common, even in critical programs such as search and rescue, meaning that response for Central and Arctic will look very different from response activities elsewhere; response for Central and Arctic would primarily consist of data collection and monitoring, with possible deterrence if equipment caches are available and easily transferrable to the incident site. There is limited marine mammal response capacity north of 60°N, but Regional guidelines will include instructions on risk management and response activities given available resources.

Offering euthanasia as a response technique runs into barriers when SARA animals are involved, but the Department is aware of this limitation and is working with Species at Risk to find an appropriate solution. A majority of the members in CMARN and the MMRP do not have training to offer response to oiled marine mammals and require training. There are several funding options that may be explored to provide training, which are discussed in a later section (Funding Options). Overall, the ability to turn weaknesses into strengths, mitigate threats, and seize opportunities demonstrate the positive attributes of utilizing the current MMRP, resulting in it being the best option for implementing marine mammal oil spill response in Canada.

The SWOT analysis revealed that utilizing the current MMRP to implement oiled marine mammal response is the optimal option. The MMRP draws on knowledgeable professionals throughout the Canadian Marine Animal Rescue Network and has a dedicated federal funding source. There is a knowledge gap with respect to responding to oiled marine mammals, but this can be easily overcome by offering training to MMRP partner organizations. Not all partners of the MMRP require training; e.g., Vancouver Aquarium offers response and rehabilitation to oiled marine mammals. The greatest barrier that requires attention is the lack of liability insurance for

external partners. This issue has been raised by both government and NGO partners and will need to be resolved before oil spill response options can progress. For oil spill response, the issues with liability can be resolved through two avenues; individual MMRP partner organizations 1) acquire their own liability insurance, or 2) contract external organizations that do have liability insurance, such as Atlantic Wildlife Institute or Tri-State Rescue & Research, who then sub-contract partner organizations of the MMRP for response. The second option would be the better choice as external organizations have the appropriate insurance, have working relationships with Response Organizations, and maintain sufficient response and rehabilitation equipment. Canada's current MMRP regime fits Morgan *et al.* (2014) mobilization model where experienced members of CMARN work with DFO through the MMRP. Given the low to medium risk of oiling events coupled with low to high impacts of oiling for marine mammals, it would be most beneficial to train responders in the MMRP network and supplement response by the use of mobile crisis units for areas that do not have the capacity or equipment to respond to oiled marine mammals on an ad hoc basis. Mobile response units can be contracted from wildlife response organizations such as Tri-State Rescue & Research and Focus Wildlife (Appendix I).

There should be special considerations for each of the elements that would comprise a national response plan. Under Legal Considerations and Permits, each Region should provide permit templates for activities associated with response, which may include permits for capture, rehabilitation, and release. Legal Considerations is especially important when dealing with SARA-listed species, which would be the main focus of a national response plan, as all actions need to be in compliance with regulations under the Act. As all of the Endangered or Threatened SARA-listed marine mammals are cetaceans, capture or rehabilitation is not an option, leaving

deterrence, monitoring, and necropsy as response options. Deterrence and monitoring operations of SARA-listed cetaceans need to ensure that proper measures are in place not to harass or disturb the animals beyond what is necessary and could cause further detriment to the animal; for example, viewing distances and restrictions would still remain in place (which differ by Region). SARA Recovery Strategies and Action Plans state that necropsies must be undertaken whenever possible; it is important to necropsy cetaceans immediately following an environmental incident as well as post-incident in order to properly estimate damage and add to the scientific knowledge on the effects of oil on marine mammals. Monitoring will play an important role in damage estimation as marine mammals can be identified and catalogued, which can later be connected to necropsied carcasses. The low number of carcasses usually retrieved after an environmental incident, some estimates as low as 2% (Williams *et al.*, 2011) further exemplifies the need for diligent monitoring during and after an environmental incident, and the monitoring section of a plan that feed into Data Collection and Reconnaissance should be detailed, well thought-out and provide blank templates to ensure that consistent information is collected. There are currently no permits for euthanasia of SARA-listed species, and this cannot be a viable option until regulatory amendments are made to the Act. As with all euthanasia decisions, an expert veterinary must be present to verify that the animal will not recover from injuries and euthanasia is the best available option. The Response Networks and Rehabilitation Facilities components will differ by Region, but the remainder of the plan that covers topics from Human Health and Safety down to Communications Plan can be based on best practices utilized by plans such NOAA's Guidelines (Johnson & Ziccardi, 2006).

Defining what response entails for each Region should be discussed with the MMRP coordinators and their external partners. Emulating the U.S. structure of marine mammal oil spill



response does not fit the needs of a Canadian program; though Canada does experience several significant spills, which are classified as spills over 1, 113 litres (7 barrels) by ECCCC, there have not been a significant number of oiled marine mammal reports. There is still the need for formal response though because of legal obligations through the SARA, DFO obligations, and international agreements that require response. The U.S. has networks of oil spill care facilities that are comprised of Primary and Secondary Care Facilities, and Processing Facilities, Field Collection Organizations, and Personnel Organizations; Canada simply lacks the infrastructure and resources to maintain this structure. Several MMRP external partners provide services that are offered in the U.S. networks, but it would be most feasible for the MMRP to provide services similar to Secondary Care Organizations and Processing Organizations; oiled hazardous waste would fall to the responsibility of Oil Handling Facilities. Rehabilitation and long-term care for several individuals would not be an option, which would be the primary difference between the U.S. model and the Canadian model.

Amending the *Response Organizations and Oil Handling Facilities Regulations* and developing national marine mammal response guidelines (Recommendation 1) will afford the most protection and efficient response to oiled marine mammals. This option will reinforce the polluter pays principle as the financial burden of response and rehabilitation will fall on the polluter. This option does present some barriers, mainly that Transport Canada is responsible for the administration of the *Response Organizations and Oil Handling Facilities Regulations* and they would be responsible for amending the regulations. On a positive note, Transport Canada has identified that there is a lack of oiled wildlife response and should work with Fisheries and Oceans Canada to resolve this problem, which is best addressed through legal means. Collaboration between Transport Canada and Fisheries and Oceans Canada occurs frequently

due to the interdisciplinary nature of marine issues; e.g., the *Canada Shipping Act, 2001* is administered by Transport Canada except for Part V- Navigation Services, which is administered by Fisheries and Oceans Canada. This recommendation also increases the timeline of the project and administrative tasks, keeping in mind that any new project will result in additional tasks, for Transport Canada and Fisheries and Oceans Canada. Despite the increased workload, the benefits of enforcing the polluter pays principle through regulatory amendments to Section 3 (2)(k) of the *Response Organizations and Oil Handling Facilities Regulations* to include marine mammal rehabilitation will decrease costs associated with response for Fisheries and Oceans Canada. It is therefore advised that Fisheries and Oceans Canada select Recommendation 1.

If DFO does not wish to seek regulatory amendments but still produces national marine mammal oil spill response guidelines (Recommendation 2), the selection creates a situation where the costs of response will be borne by DFO when the onus should fall to the Responsible Party. Selecting Recommendation 2 will still allow for response but could create large financial expenditures. In the event of catastrophic events such as large tanker spills, the development of guidelines results in public expectations of complete responsibility for response, which may not be financially feasible. This option could be effective if an oil trust were initiated, similar to the California Oil Spill Response Trust Fund, but Canada's low risk of large oil spills makes this an unlikely venture.

Recommendation 3 elicits no response. Fisheries and Oceans Canada's internal obligations to provide response to distressed marine mammals, provide protection of resources, implement *Species at Risk Act* recovery strategies and management plans, and transboundary planning obligations suggest that this is not a suitable selection.

Costs associated with developing marine mammal oil spill response guidelines mainly consist of hiring a contractor for report production. DFO should be able to hire a contractor for under \$10, 000 (amount based on previous scoping exercises), which is viewed as a small project. There are numerous options that may be explored for funding contractor expenses; Option iii- Fisheries and Oceans Resource Management and Species at Risk split costs in a manner deemed acceptable to both parties, may receive the least amount of resistance and is a viable funding option for the development of guidelines.

Training responders throughout the Marine Mammal Response Program and Canadian Marine Animal Response Network in techniques for response and rehabilitation of oiled wildlife will cost between \$2000-\$4000 (Tri-State Rescue & Research, personal communication, August, 2015). Training rates will vary based on the number of training sessions required and training location. These costs can be covered by similar options available for funding a contractor to develop response guidelines. The development of national guidelines and execution of training are manageable tasks as the options proposed aim to minimize impacts and maximize benefits through the utilization of the current response regime, while creating minimal administrative burden.

The author has limited working knowledge of the Marine Mammal Response Program, but gained insight into the program during an internship with Fisheries and Oceans Canada in the National Fisheries Policy bureau from May to August, 2015. This feasibility study would be more robust if financial information, such as MMRP Regional expenditures and comments on the state of the budget at the end of the fiscal year were available, but due to the protected nature of funding allocations this could not be included in the study. There are on-going projects taking place that align with improvements to the implementation of the MMRP, but information is not

publicly available at this time and could not be cited in the study. Given the complexity of issues and multiple jurisdictions over response surrounding marine oil spill response, time to gather all the necessary information was a limiting factor.

## Conclusion

Oil pollution has been shown to have negative effects on marine mammals and it has been identified as being a threat to recovery for 85% of SARA-listed marine mammals. Although many strides have been taken to improve tanker safety there remains the possibility of human error that could result in environmental incidents. Oil spills not only originate from tankers, but can come from any sea-going vessels, which pose a risk to marine mammals and those that utilize and derive benefit from them as resources. It is indeed beneficial to enhance preventative oil spill measures, but at the same time it is crucial to explore feasible mitigation measures to reduce negative impacts if a spill occurs. Canada has the necessary infrastructure to implement marine mammal oil spill response through the MMRP. Training will be required for responders throughout the network, which will strengthen Canadian response capacity. It is feasible for Canada to implement marine mammal oil spill response through building upon the current capacity of the MMRP and developing federal guidelines for response activities that reinforce the polluter pays principle.

Table 1

Compilation of Recovery Strategies and Management Plans that list oil spills as a threat to recovery for SARA-listed marine mammals

| Species & Population  | SARA Status                 | Recovery Strategy or Management Plan   | Threat                            |
|---|-----------------------------|--|-----------------------------------|
| Beluga St. Lawrence Estuary<br>( <i>Delphinapterus leucas</i> )             | Schedule 1, Threatened      | Recovery Strategy for the Beluga<br>( <i>Delphinapterus leucas</i> ) St. Lawrence<br>Estuary Population in Canada (DFO, 2012)  | Toxic Spills- Oil                 |
| Blue whale Northwest<br>Atlantic ( <i>Balaenoptera<br/>musculus</i> )       | Schedule 1, Endangered      | Recovery Strategy for the Blue Whale<br>( <i>Balaenoptera musculus</i> ), Northwest<br>Atlantic Population, in<br>Canada (Beauchamp et al., 2009)  | Toxic Spills- Oil                 |
| Blue whale Pacific<br>( <i>Balaenoptera musculus</i> )                      | Schedule 1, Endangered      | Recovery Strategy for Blue, Fin, and Sei<br>Whales ( <i>Balaenoptera musculus</i> , <i>B.<br/>physalus</i> , and <i>B. borealis</i> ) in Pacific<br>Canadian Waters (Gregs et al., 2006) | Pollution- Toxic<br>Spills        |
| Bowhead whale ( <i>Balaena<br/>mysticetes</i> ) Bering-Chukchi-<br>Beaufort | Schedule 1, Special Concern | Management Plan for the Bering-Chukchi-<br>Beaufort population of Bowhead Whale<br>( <i>Balaena mysticetus</i> ) in Canada   | Toxins (Pollution)-<br>Oil spills |
| Fin whale Pacific<br>( <i>Balaenoptera physalus</i> )                       | Schedule 1, Threatened      | Recovery Strategy for Blue, Fin, and Sei<br>Whales ( <i>Balaenoptera musculus</i> , <i>B.<br/>physalus</i> , and <i>B. borealis</i> ) in Pacific<br>Canadian Waters (Gregs et al., 2006) | Pollution- Toxic<br>Spills        |
| Grey Whale Eastern North<br>Pacific ( <i>Eschrichtius</i> )                 | Schedule 1, Special Concern | Management Plan for the Eastern Pacific<br>Grey Whale ( <i>Eschrichtius robustus</i> ) in<br>Canada (Fisheries and Oceans Canada,  | Toxic Spills- Oil                 |

|  |                             |   |                          |
|--|-----------------------------|---|--------------------------|
| <i>robustus</i> )  |                             | 2010)   |                          |
| Harbour Porpoise ( <i>Phocoena phocoena</i> ) Pacific                    | Schedule 1, Special Concern | Management Plan for the Pacific Harbour Porpoise ( <i>Phocoena phocoena</i> ) in Canada   | Toxic Spills- Oil        |
| Humpback whale North Pacific (Baleoptera novaeangliae)                   | Schedule 1, Threatened      | Recovery Strategy for the North Pacific Humpback Whale ( <i>Megaptera novaeangliae</i> ) in Canada (Fisheries and Oceans Canada, 2013)              | Toxic Spills- Oil        |
| Killer whale North East Pacific Transient ( <i>Orcinus orca</i> )        | Schedule 1, Threatened      | Recovery Strategy for the Transient Killer Whale ( <i>Orcinus orca</i> ) in Canada (Fisheries and Oceans Canada, 2007)                              | Toxic Spills- Oil        |
| Killer whale Northeast Pacific Northern Resident ( <i>Orcinus orca</i> ) | Schedule 1, Threatened      | Recovery Strategy for the Northern and Southern Resident Killer Whales ( <i>Orcinus orca</i> ) in Canada (Fisheries and Oceans Canada, 2011)        | Toxic Spills- Oil        |
| Killer whale Northeast Pacific Southern Resident ( <i>Orcinus Orca</i> ) | Schedule 1, Endangered      | Recovery Strategy for the Northern and Southern Resident Killer Whales ( <i>Orcinus orca</i> ) in Canada (2011)                                     | Toxic Spills- Oil        |
| Killer whale Northeast Pacific Offshore ( <i>Orcinus orca</i> )          | Schedule 1, Threatened      | Management Plan for the Offshore Killer Whale ( <i>Orcinus orca</i> ) in Canada (2009)  | Toxic Spills- Oil        |
| North Atlantic Right whale ( <i>Eubalaena glacialis</i> )                | Schedule 1, Endangered      | Recovery Strategy for the North Atlantic Right Whale ( <i>Eubalaena glacialis</i> ) in Atlantic Canadian Waters (Fisheries and Oceans Canada, 2014) | Contaminants- Oil Spills |
| North Pacific Right whale ( <i>Eubalaena japonica</i> )                  | Schedule 1, Endangered      | Recovery Strategy for the North Pacific Right Whale ( <i>Eubalaena japonica</i> ) in  | Contaminants- Oil Spills |

|  |                             |  |                              |
|--|-----------------------------|--|------------------------------|
|  |                             | Pacific Canadian Waters (Fisheries and Oceans Canada, 2011)  |                              |
| Northern Bottlenose whale Scotian Shelf ( <i>Hyperoodon ampullatus</i> ) | Schedule 1, Endangered      | Recovery Strategy for the Northern Bottlenose Whale ( <i>Hyperoodon ampullatus</i> ), Scotian Shelf population, in Atlantic Canadian Waters (DFO, 2010)                        | Pollution- Oils Spills       |
| Sea Otter ( <i>Enhydra lutris</i> )                                      | Schedule 1, Special Concern | Management Plan for the Sea Otter ( <i>Enhydra lutris</i> ) in Canada (Fisheries and Oceans Canada, 2014A)   | Pollution- Oil Spills        |
| Sei whale Pacific  | Schedule 1, Endangered      | Recovery Strategy for Blue, Fin, and Sei Whales ( <i>Balaenoptera musculus</i> , <i>B. physalus</i> , and <i>B. borealis</i> ) in Pacific Canadian Waters (Gregr et al., 2006) | Pollution- Toxic Spills- Oil |

Table 2

Glossary of terms for identifying threats to species (For use in Table 3) (Adapted from EC, 2007; DFO, 2013)

| <b>Terms</b>                              | <b>Level of Effect</b> | <b>Definitions</b>  |
|---|------------------------|---|
| Causal Certainty of Effect<br>(of Threat) | Plausible              | Negative effect on individual survival or reproduction, population viability, or habitat is possible or plausible   |
|   | Expected               | Effect is correlated with reduced individual survival or reproduction, reduced population viability or reduced quality of habitat   |
|   | Demonstrated           | Effect is causally linked with reduced individual survival or reproduction, reduced population viability, reduced quality of habitat and failure to meet recovery objectives  |
|   | Unlikely               | Given current information on the threat and population size, effect is considered unlikely (on its own) to negatively impact population viability or habitat  |
| Extent of the Threat                      | Negligible             | Minor proportion of range is impacted   |
|   | Localized              | Stress relates to a specific site or narrow portion of the range  |
|   | Widespread             | Stress relates to the entire distribution of the species, or all of Area  |
|   | Unknown                | Available information is insufficient to gauge the degree to which the activity may affect species  |
| Occurrence (of the Activity)              | Historic               | Activity is no longer practised   |
|   | Anticipated            | Activity is anticipated to affect marine mammals or habitat in 10 years   |
|   | Imminent               | Activity is anticipated to affect marine mammals or habitat in 5 year   |
|   | Current                | Activity is currently practised and affects marine mammals or habitat   |
|   | Rare                   | Activity is expected to occur rarely or mitigations in place result in an effect rarely occurring even though activity is occurring   |
|   | Unknown                | Available information is insufficient to gauge the degree to which the activity may affect species  |
| Severity (of the Activity)                | Negligible             | Activities typically do not affect individuals or habitat, or do not occur at this time; Activities are considered to have negligible effect at the current time  |
|   | Low                    | Extent of activities may be localized and occurrence seasonal or infrequent. A low risk rating may indicate some unknown residual effects, or minimal effects to lifespan, reproductive output or habitat; There is minimal risk of negative effects at this time |
|   | Moderate               | These activities may have chronic effects on individuals or habitat, occurrence or  |



|                           |            |   |
|---------------------------|------------|---|
|                           |            | effects may range from rare to continuous, and/or effects may negatively impact lifespan or reproductive output; There is moderate risk of negative effects at this time  |
|                           | High       | These activities may have widespread effects and currently occur on a continuous basis and/or lethal effects are likely; There is a substantial risk of negative effects on species recovery at this time                                 |
|                           | Unknown    | Further study is required to understand residual effects on individuals or habitat; There is a substantial risk of negative effects on species recovery at this time  |
| Frequency (of the Stress) | One-time   | Stress is expected to be acute, affecting species only once   |
|                           | Recurrent  | Stress occurs infrequently and unpredictably, not on an annual or seasonal basis  |
|                           | Regular    | Stress occurs somewhat regularly, possibly unpredictably, not on an annual or seasonal basis  |
|                           | Seasonal   | Stress occurs only at certain times of the year, or species migrates away from stress   |
|                           | Continuous | Stress is on-going throughout the year  |
|                           | Unknown    | Available information is insufficient to gauge the frequency with which the stress may affect the species   |
| Severity (of the Effect)  | Negligible | No effects have been detected   |
|                           | Low        | Effects of the stress are sub-lethal, potentially leading to short-term behavioural changes or transient degradation to habitat, unlikely to affect population viability  |
|                           | Moderate   | Effects of the stress result in chronic physiological and/or behavioural changes (e.g., potential for long-term displacement from habitat), or significant degradation of habitat; may have some effect on long-term population viability |
|                           | High       | Effects of the stress are lethal, affect population viability   |
|                           | Unknown    | Available information is insufficient to gauge the degree to which the stress may affect individuals, population or habitat   |

Table 3

## Summary of Oil Spill Risk Factors and Mitigation Measures for SARA-Listed Marine Mammals

|                            |   |
|----------------------------|---|
| Species:                   | Beluga St. Lawrence Estuary ( <i>Delphinapterus leucas</i> )  |
| Threat Category:           | Toxic Spills  |
| General Activity:          | Marine Transportation   |
| Extent of threat:          | Widespread  |
| Occurrence of threat:      | Anticipated   |
| Frequency of threat:       | Recurrent   |
| Causal Certainty:          | Medium  |
| Severity of threat:        | Low to High   |
| Level of Concern/Priority: | Medium  |
| Mitigation:                | Prepare Emergency Plan in case of toxic spill   |
| Species:                   | Blue whale Northwest Atlantic ( <i>Baleanoptera musculus</i> )  |
| Threat Category:           | Pollution- Toxic Spills   |
| General Activity:          | Marine Transportation   |
| Extent of threat:          | Generalized   |
| Occurrence of threat:      | Anticipated   |
| Frequency of threat:       | Recurrent   |
| Causal Certainty:          | Medium  |
| Severity of threat:        | Low to Moderate   |
| Level of Concern/Priority: | Low   |
| Mitigation:                | None Listed   |
| Species:                   | Blue whale Pacific ( <i>Baleanoptera musculus</i> ), Sei whale Pacific ( <i>B. physalus</i> ), and Fin whale Pacific ( <i>B. borealis</i> ) |
| Threat Category:           | Pollution- Toxic Spills   |
| General Activity:          | Marine Transportation   |
| Level of Concern/Priority: | High  |

|                            |  |
|----------------------------|--|
| Mitigation:                | Contingency Plans in case of oil spills that include the presence of balaenopterids in oil spill response plan(s) to prevent individuals from being oiled in the event of an oil spill   |
| Species:                   | Humpback whale North Pacific ( <i>Baleanoptera novaeangliae</i> )  |
| Threat Category:           | Toxic Spill  |
| General Activity:          | Marine Transportation  |
| Extent of threat:          | Widespread but concentrated in localized areas   |
| Occurrence of threat:      | Low  |
| Frequency of threat:       | Continuous and Seasonal  |
| Causal Certainty:          | Significant (unknown but expected) (individual basis); Unlikely to Plausible (population level)  |
| Severity of threat:        | Low to High  |
| Level of Concern/Priority: | Low to Moderate  |
| Mitigation:                | Further research is required. In the meantime, utilize adaptive management using best available knowledge  |
| Species:                   | Gray whale Pacific ( <i>Eschrichtius robustus</i> )  |
| Threat Category:           | Toxic Spill  |
| General Activity:          | Marine Transportation  |
| Severity of threat:        | High, dependent on spill location and season   |
| Level of Concern/Priority: | Low to High  |
| Mitigation:                | Develop comprehensive toxic spill response to mitigate or avoid impacts to Grey Whales or feeding habitat in Canada. This action is also listed in other DFO Pacific Region marine mammal SARA documents. Develop emergency response plan to include marine mammal expertise into spill response initiatives in order to produce an effective, coordinated response for toxic spills affecting marine mammals; and develop a Marine mammal-specific operational manual in order to produce an effective, coordinated step-wise response to toxic spills and standardized data collection |
| Species:                   | Killer whale North East Pacific Transient ( <i>Orcinus orca</i> )  |
| Threat Category:           | Toxic Spill  |
| General Activity:          | Marine Transportation  |
| Extent of threat:          | Localized  |
| Occurrence of threat:      | Anticipated  |

|                            |  |
|----------------------------|--|
| Frequency of threat:       | Recurrent  |
| Causal Certainty:          | Demonstrated   |
| Severity of threat:        | Low to Medium  |
| Level of Concern/Priority: | High   |
| Mitigation:                | Despite having a high priority, this threat is not addressed in the plan   |
| Species:                   | Killer whale Northeast Pacific Northern and Southern Resident population ( <i>Orcinus orca</i> )   |
| Threat Category:           | Environmental Contaminants- Oil Spills   |
| General Activity:          | Marine Transportation  |
| Extent of threat:          | Localized  |
| Occurrence of threat:      | Anticipated  |
| Severity of threat:        | Low  |
| Level of Concern/Priority: | Low to High  |
| Mitigation:                | Develop and incorporate into existing oil spill response plans measures specific to killer whales  |
| Species:                   | Killer whale Northeast Pacific Offshore ( <i>Orcinus orca</i> )  |
| Threat Category:           | Toxic Spills   |
| General Activity:          | Marine Transportation  |
| Severity of threat:        | High, dependent on location  |
| Level of Concern/Priority: | High   |
| Mitigation:                | Develop emergency response plan to include marine mammal expertise into spill response initiative and<br>Develop a marine mammal specific operational manual   |
| Species:                   | North Atlantic Right whale ( <i>Eubalaena glacialis</i> )  |
| Threat Category:           | Pollution- Oil   |
| General Activity:          | Oil & gas activities   |
| Mitigation:                | Evaluate and reduce the harmful impacts of dangerous substances on right whale habitat including both natural and human-induced sources. Both chronic and acute sources of contamination (e.g., oil spills, vessel discharges, and coastal sources) should be addressed. |
| Species:                   | North Pacific Right whale ( <i>Eubalaena japonica</i> )  |
| Threat Category:           | Pollution- Oil   |

|                            |  |
|----------------------------|--|
| General Activity:          | Oil & gas activities   |
| Mitigation:                | Take immediate steps to minimize impacts of threats when threats are identified through research or circumstance.  |
| Species:                   | Northern Bottlenose whale Scotian Shelf ( <i>Hyperoodon ampullatus</i> )   |
| Threat Category:           | Disturbance/ Pollution   |
| General Activity:          | Oil & Gas exploration (including spills and increased shipping traffic)  |
| Extent of threat:          | Range-wide   |
| Occurrence of threat:      | Current  |
| Frequency of threat:       | Ongoing/Recurrent  |
| Causal Certainty:          | Low  |
| Severity of threat:        | Unknown  |
| Level of Concern/Priority: | Low to Medium  |
| Mitigation:                | Ensure that appropriate mitigation measures are in place for exploration and development activities.   |
| Species:                   | Sea Otter ( <i>Enhydra lutris</i> )  |
| Threat Category:           | Pollution  |
| General Activity:          | Marine Transportation  |
| Extent of threat:          | Widespread   |
| Occurrence of threat:      | Anticipated  |
| Frequency of threat:       | Recurrent  |
| Causal Certainty:          | High   |
| Severity of threat:        | High   |
| Level of Concern/Priority: | High   |
| Mitigation:                | Develop Sea Otter-specific measures for inclusion into catastrophic spill response programs, such as the Oiled Wildlife Regulatory Agency Working Group by 2018. |

Table 4

Comparison of marine mammals listed under the United States' Endangered Species Act (ESA) and Canada's Species at Risk Act (SARA)

## Legend

SC Special Concern

T Threatened

E Endangered

N/A The species is not found within the country's jurisdiction, or is rarely observed and does not require legal protection

NIL The species is found in the country but no protection is afforded to the species as a whole and/or to certain populations

| Species            | US Population Protected       | US (ESA Designation) <sup>1</sup> | Canada Population Protected         | Canada (SARA Designation) | Shared Range (Can-US) (Y/N) |
|--------------------|-------------------------------|-----------------------------------|-------------------------------------|---------------------------|-----------------------------|
| <b>ODONTOCETES</b> |                               |                                   |                                     |                           |                             |
| Beluga Whale       | Cook Inlet                    | E                                 | N/A <sup>2</sup>                    | N/A <sup>2</sup>          | N                           |
|                    | N/A                           | N/A                               | St. Lawrence Estuary                | T                         | N                           |
| Killer Whale       | N/A                           | N/A                               | Northeast Pacific Transient         | T                         | N                           |
|                    | N/A                           | N/A                               | Northeast Pacific Northern Resident | T                         | N                           |
|                    | Southern Resident             | E                                 | Northeast Pacific Southern Resident | E                         | Y                           |
| Sperm Whale        | Entire                        | E                                 | NIL <sup>3</sup> (Entire)           | NIL <sup>3</sup>          | Y                           |
| False Killer Whale | Main Hawaiian Islands Insular | E                                 | N/A <sup>2</sup>                    | N/A <sup>2</sup>          | N                           |

|                           |                    |     |                             |                  |   |
|---------------------------|--------------------|-----|-----------------------------|------------------|---|
|                           | Entire             | NIL | NIL <sup>3</sup> (Entire)   | NIL <sup>3</sup> | Y |
| Northern Bottlenose Whale | N/A                | N/A | Scotian Shelf               | E                | N |
| MYSTICETES                |                    |     |                             |                  |   |
| Blue Whale                | Entire             | E   | Northwest Atlantic          | E                | Y |
|                           |                    |     | Pacific                     | E                | Y |
| Bowhead Whale             | Entire             | E   | Bering-Chukchi-Beaufort     | SC               | Y |
| Fin Whale (Finback)       | Entire             | E   | NIL <sup>3</sup> (Atlantic) | NIL <sup>3</sup> | Y |
|                           |                    |     | Pacific                     | T                | Y |
| Grey Whale                | Pacific            | NIL | Pacific                     | SC               | Y |
| Humpback Whale            | Entire             | E   | NIL <sup>3</sup> (Atlantic) | NIL <sup>3</sup> | Y |
|                           |                    |     | North Pacific               | T                | Y |
| Right Whale               | Entire             | E   | North Atlantic              | E                | Y |
|                           |                    |     | North Pacific               | E                | Y |
| Sei Whale                 | Entire             | E   | NIL <sup>3</sup> (Atlantic) | NIL <sup>3</sup> | Y |
|                           |                    |     | Pacific                     | E                | Y |
| PHOCIDS                   |                    |     |                             |                  |   |
| Bearded Seal              | Okhotsk            | T   | NIL <sup>3</sup>            | NIL <sup>3</sup> | Y |
| Ringed Seal               | Baltic subspecies  | T   | N/A <sup>2</sup>            | N/A <sup>2</sup> | N |
|                           | Arctic subspecies  | T   | NIL <sup>3</sup> (Arctic)   | NIL <sup>3</sup> | Y |
|                           | Ladoga subspecies  | E   | N/A <sup>2</sup>            | N/A <sup>2</sup> | N |
|                           | Okhotsk subspecies | T   | N/A <sup>2</sup>            | N/A <sup>2</sup> | N |
| Guadalupe Fur Seal        | Entire             | T   | N/A <sup>2</sup>            | N/A <sup>2</sup> | N |

|                      |          |   |                  |                  |   |
|----------------------|----------|---|------------------|------------------|---|
| Hawaiian Monk Seal   | Entire   | E | N/A <sup>2</sup> | N/A <sup>2</sup> | N |
| Spotted Seal         | Southern | T | N/A <sup>2</sup> | N/A <sup>2</sup> | N |
| OTARIIDS             |          |   |                  |                  |   |
| Steller Sea Lion     | Western  | E | Pacific          | SC               | Y |
| MUSTELIDS            |          |   |                  |                  |   |
| Otter (Northern Sea) | Entire   | T | Pacific          | SC               | Y |
| Otter (Southern Sea) | Entire   | T | N/A <sup>2</sup> | N/A <sup>2</sup> | N |

<sup>1</sup> National Marine Fisheries Service, 2015 Endangered and Threatened Marine Species under National Marine Fisheries Service’s Jurisdiction

<sup>2</sup> N/A: The species is not found within Canada’s jurisdiction, or is rarely observed and does not require legal protection.

<sup>3</sup>NIL: The species is found in the country but no protection is afforded to the species as a whole (Entire) and/or to certain populations (“Population”).



Table 5

Key Features that should be incorporated into Canada's marine mammal oil spill response guidelines presented as a table of contents

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Table of Contents

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List of Abbreviations

Glossary of Terms

1. Introduction
    - 1.1 Overview of the Effects of Oil on Marine Mammals
  2. Scope
  3. Management Objectives
  4. Organizational Structure
    - 4.1 Spill Management System
    - 4.2 Operations and Duties
  5. Legal Considerations and Permits
  6. Response Networks
    - 6.1 Trained Personnel
  7. Rehabilitation Facilities
  8. Oiled Wildlife Response Equipment
    - 8.1 Response Network Equipment
    - 8.2 Response Organization Equipment
    - 8.3 Response Agency Equipment (on-call)
    - 8.4 Government Agency Response Resources
  9. Data Collection
    - 9.1 Forms
    - 9.2 Reporting Structure
  10. Human Health and Safety
    - 10.1 Required Training & Schedule
    - 10.2 Personal Protective Equipment
    - 10.3 Hazardous Materials
  11. Reconnaissance
-

- 
- 12. Deterrence Methods
  - 13. Marine Mammal Recovery
    - 13.1 Capture Methods
  - 14. Triage Procedures
    - 14.1 Intake Procedures
    - 14.2 Euthanasia
  - 15. Marine Mammal Transportation
  - 16. Marine Mammal Care and Processing
    - 16.1 Stabilization
    - 16.2 Washing and Recovery
    - 16.3 Pre-Release Care, Release, & Post-Release Monitoring
    - 16.4 Continued Care & Monitoring
    - 16.5 Nutritional Requirements
  - 17. Euthanasia
  - 18. Disposal of Carcasses
    - 16.1 Transport
    - 16.2 Necropsy
    - 16.3 Waste Management
  - 19. Communications Plan
    - 17.1 Communication between RO & RP
    - 17.2 Communication between RO & Response Team
    - 17.3 Communication between Response Team and Government Agencies
    - 17.4 Communication with Media
  - 20. Regional Response Planning
    - 18.1 Pacific
    - 18.2 Central & Arctic
    - 18.3 Quebec
    - 18.4 Gulf
    - 18.5 Maritimes
    - 18.6 Newfoundland and Labrador
-

Table 6

Canadian Oil Exports by Destination in 2014 (Estimated)

|         | Volume* Exported to United States | Volume Exported to Other Countries | Total        | % Exported to US |
|---------|-----------------------------------|------------------------------------|--------------|------------------|
| Q1      | 3,120,223.40                      | 107,430.20                         | 3,227,653.60 | 97               |
| Q2      | 3,089,048.60                      | 136,553.90                         | 3,225,602.60 | 95.77            |
| Q3      | 3,307,350.30                      | 90,376.20                          | 3,397,726.60 | 97.34            |
| Q4      | 3,331,959.60                      | 35,747.60                          | 3,367,707.20 | 98.94            |
| Average |                                   |                                    |              | <b>97%</b>       |

\*Volume= m<sup>3</sup>/day or barrels/day

Table 7

SWOT analysis for utilizing the MMRP for marine mammal oil spill response

|  |   |
|--|---|
| <p style="text-align: center;"><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>• Effective existing marine mammal response network</li> <li>• Marine Mammal Response Program receives approved annual funding</li> <li>• Project will not require change to the existing structure</li> </ul>  | <p style="text-align: center;"><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>• MMRP implementation expenses vary by year based on the number of marine mammals requiring response, which has an effect on budget consumption</li> <li>• Several response partners lack appropriate insurance for response efforts</li> </ul>   |
| <p style="text-align: center;"><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>• Develop threat based mitigation that forms part of several current initiatives across agencies</li> <li>• Fulfill DFO’s responsibilities to protect resources, as outlined in their mandate and regulated by the <i>Fisheries Act</i></li> <li>• Fulfill transboundary planning obligations</li> <li>• Fulfill SARA recovery objectives</li> <li>• Align conservation and response practices with those of the United States</li> <li>• Enhance preparedness and response capacity for MMRP and CMARN</li> <li>• Enhance Canada’s Ship-Source Oil Spill Preparedness and Response Regime</li> </ul> | <p style="text-align: center;"><b>THREATS</b></p> <ul style="list-style-type: none"> <li>• ROs do not operate north of 60°N creating a gap in oil spill response for Central &amp; Arctic region</li> <li>• Euthanasia is a response option but there are regulatory barriers regarding SARA species, which requires amending legal wording in the SARA</li> <li>• Response capacity gap, there will need to be training for marine mammal oil spill response and rehabilitation</li> </ul> |

Table 8

Strategic considerations during the amendment process of Section 3 (2)(k) of the *Response Organizations and Oil Handling Facilities Regulations* to include marine mammal rehabilitation

| Step | Activity Description  | Departments Involved | Required Approvals             | Proposed Timeline | Can be found in section/ Notes   |
|------|---|----------------------|--------------------------------|-------------------|--|
| 1    | Complete triage statement<br><br>Provide information on background, issue, objectives, description, key stakeholders, benefits, justification, costs to government, industry or consumers, distributional issues, stakeholder support, regulatory coordination and cooperation, international agreements, | TC, DFO, & TBS-RAS   | TC Director                    | Q1 2016           | Exemption from pre-publication will not be sought<br><br>Rationale, Stakeholders |
| 2    | Complete Regulatory Impact Analysis Statement (RIAS)  | TC & TBS-RAS         | --                             | Q1 2016           | PESTLE Analysis  |
| 3    | Draft regulation amendment  | TC, DFO, &JUS        | TC Director General            | Q1 2016           | Discussion   |
| 4    | Review draft regulation and RIAS<br><br>Obtain stamped copies   | JUS                  | --                             | Q2 2016           | --   |
| 5    | Submit signed regulatory submission to PCO-OIC <sup>3</sup>   | TC & PCO-OIC         | TC Minister must sign proposal | Q2 2016           | --   |

|   |   |   |   |           |    |
|---|---|---|---|-----------|----|
| 6   | Treasury Board reviews regulatory submission to determine if it is suitable for pre-publication               | Treasury Board, TBS-RAS, & PCO-OIC                        | Treasury Board must approve pre-publication                                 | Q2 2016   | -- |
| 7   | Proposed regulations get pre-published in Canada Gazette, Part I  | --  | --  | Q3-4 2016 | -- |
| 8   | Comment period  | --  | --  | Q3-4 2016 | -- |
| The following steps must be completed in order to gain final approval, publication, and registration of the proposed amendment to the <i>Response Organizations and Oil Handling Facilities Regulations</i> |   |   |   |           |    |
| 9   | Review comments received during pre-publication<br>Revise proposed amendment based on feedback<br>Update RIAS | TC & TBS-RAS  | --  | Q1 2017   | -- |
| 10  | Review updated amendment proposal and RIAS<br>Issue stamped copies  | JUS   | --  | Q1 2017   | -- |
| 11  | Submit final amendment submission to PCO-OIC  | TC & PCO-OIC  | TC Minister must sign final amendment submission                            | Q1 2017   | -- |
| 12  | Governor General reviews submission   | Governor General, GIC, Treasury Board, TBS-RAS, & PCO-OIC | The GIC will accept or deny the regulation for registration and publication | Q2 2017   | -- |

|    |   |                          |    |         |    |
|----|---|--------------------------|----|---------|----|
| 13 | If accepted, the regulation will be registered and published in Canada Gazette, Part II | PCO-OIC & PWGSC          | -- | Q2 2017 | -- |
| 14 | Review for Scrutiny of Regulations  | Standing Joint Committee | -- | Q2 2017 | -- |

Table 9

Operational considerations during Fisheries and Oceans Canada development of marine mammal oil spill response protocol

| Step | Activity Description  | Departments Involved | Required Approvals             | Proposed Timeline | Can be found in section/ Notes   |
|------|---|----------------------|--------------------------------|-------------------|--|
| 1    | Draft Memorandum to gain support for project.   | DFO                  | Senior management              | Q1 2016           | Rationale<br>PESTLE Analysis   |
| 2    | Determine funding source  | DFO & SAR            | --                             | Q1 2016           | Funding Options  |
| 3    | Commission a contractor to develop national protocol <ul style="list-style-type: none"> <li>○ Review existing best practices and apply to Canadian context</li> </ul> | DFO                  | --                             | Q1 2016           | The contractor can utilize information from sections:<br><br>Marine Mammals and Oil; Rationale; Key Features of an Effective Oiled Wildlife Response |
| 4    | Review protocol   | DFO, SAR, MMWG       | --                             | Q2 2016           | --   |
| 5    | Edit protocol with input from review group  | Contractor           | --                             | Q2/Q3 2016        | --   |
| 6    | Review and approve final draft  | DFO                  | Senior management and Minister | Q3/Q4 2016        | --   |
| 7    | Publish final document  | DFO                  | Communications                 | Q1 2017           | --   |





Figure 1: Fisheries and Oceans Canada's six administrative regions

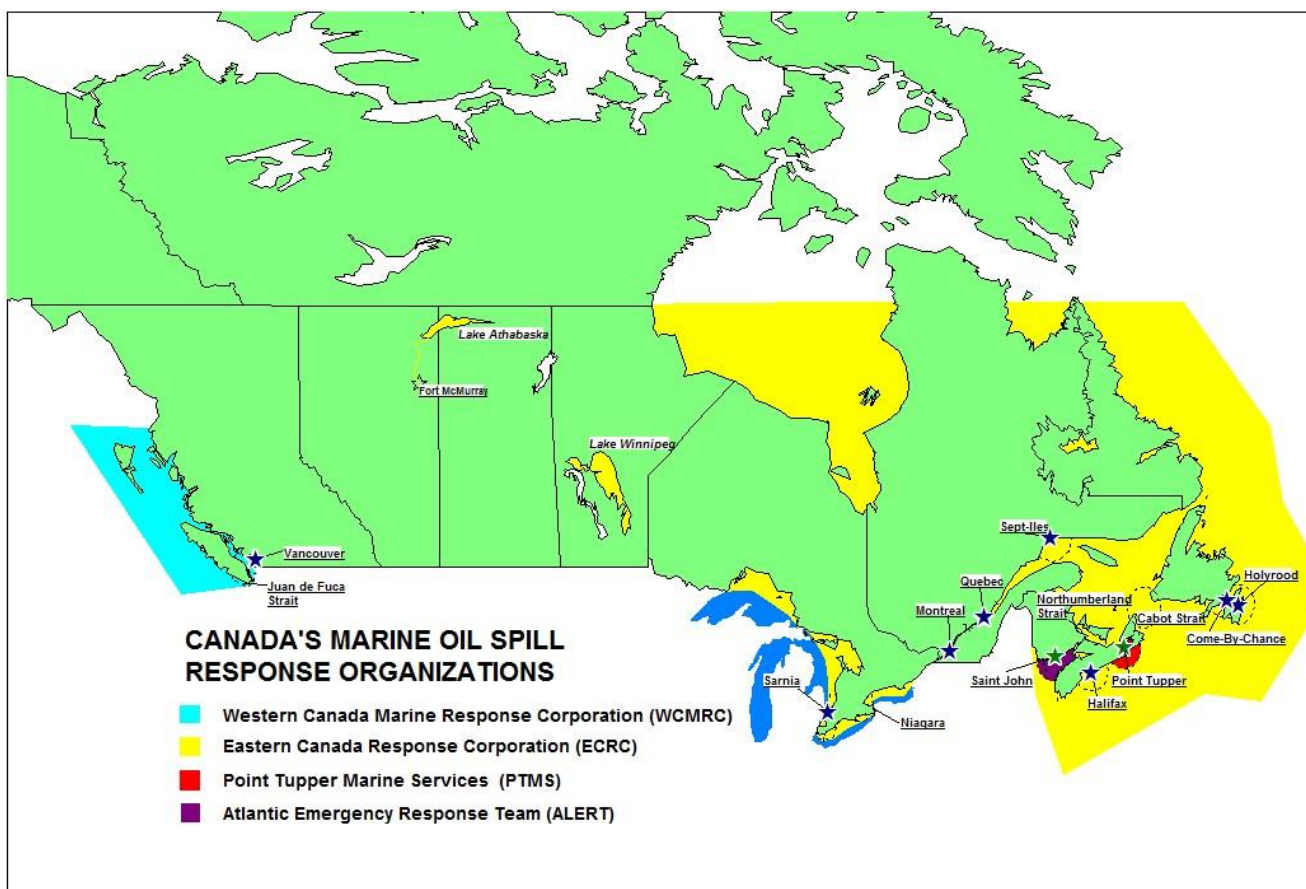


Figure 2: Four Response Organizations operate across Canada. WCMRC operates in Southern British Columbia; ECRC operates in Alberta, Saskatchewan, Manitoba, Ontario, Québec, and the Atlantic provinces; PTMS services Port Hawkesbury, and ALERT services the Bay of Fundy (Image source: Transport Canada, 2015).

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## Figure Sources

Figure 1: DFO Regions. Retrieved June 13, 2015 from <http://www.dfo-mpo.gc.ca/regions/index-eng.htm>

Figure 2: TC Response Organizations. Retrieved November 8, 2015 from [http://www.tc.gc.ca/media/images/marinesafety/tp14539e\\_1.jpg](http://www.tc.gc.ca/media/images/marinesafety/tp14539e_1.jpg)

Appendix I

Contact information for International Response Organizations that can provide training to the Canadian Marine Response Network

| <b>Company</b>              | <b>Telephone Number</b> | <b>Email</b>                 | <b>Mailing Address</b>  |
|-----------------------------|-------------------------|------------------------------|---|
| Tri-State Rescue & Research | (302) 737-9543          | oilprograms@tristatebird.org | 170 Possum Hollow Road, Newark, DE 19711  |
| Focus Wildlife              | 1-800-578-3048          | info@focuswildlife.org       | Canada- 4555 Stonehaven Ave North Vancouver, BC, V7G 1E7<br>US- PO Box 944 Anacortes, Wa 98221  |
| Oiled Wildlife Care Network | (530) 752-4167          | owcn@ucdavis.edu             | Oiled Wildlife Care Network<br>Wildlife Health Center<br>School of Veterinary Medicine<br>University of California, Davis<br>One Shields Avenue<br>Davis, CA 95616<br>USA |