Monitoring and Evaluation of Canada's *Oceans Act* Marine Protected Areas: Recommendations for Governance, Socio-cultural and Socio-economic Indicators

By

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Abstract

Marine protected areas are becoming an increasingly popular tool in marine resource management but often monitoring programs are overlooked or are last minute additions opposed to being integral components of the management process. Monitoring and evaluation can help optimize the effectiveness of marine protected areas (MPAs) in achieving their goals and objectives. Currently within Canada, the indicators being monitored within *Oceans Act* MPAs are predominantly ecological in nature and are site-specific, which can pose challenges when reporting on multiple-site success to the public. This study proposes19 governance, six socio-cultural and three socio-economic indicators for *Oceans Act* MPAs; some relevant to all MPAs governed by the Department of Fisheries and Oceans, others that are site-specific. Indicators in these non-ecological areas provide a more complete picture of the successes and challenges facing Canada's MPAs. Furthermore, common indicators make national successes clearer and simplify reporting to Canadians and the international community. A literature review, a comparative case study analyses and consultation with Department of Fisheries and Oceans staff all contributed to the results of this study: an indicator toolkit and a monitoring plan template for use by *Oceans Act* MPA practitioners. The two international case studies assessed, the United States Marine Sanctuaries Program, and the New South Wales Marine Parks Program provided guidance for the content of the monitoring plan template and information that should accompany the recommended indicators.

Keywords: marine protected areas; monitoring and evaluation; indicators; Canada; *Oceans Act*

List of Abbreviations Used

AIA	Administered Intertidal Area
AOI	Area of Interest
CBD	Convention on Biological Diversity
CSAS	Canadian Science Advisory Secretariat
DFO	Department of Fisheries and Oceans
EPLPC	Eastport Peninsula Lobster Protection Committee
IUCN	International Union for Conservation of Nature
METT	Management Effectiveness Tracking Tool
MPA	Marine Protected Area
MOU	Memorandum of Understanding
NMCA	National Marine Conservation Area
NSW	New South Wales
OAP	*Oceans Act*ion Plan
OPMS	Oceans Program Management Strategy
PEI	Prince Edward Island
RAPPAM	Rapid Assessment and Prioritization of Protected Area Management
SWiM	System-wide monitoring
U.S	United States
WCPA	World Commission Protected Area
WWF	World Wildlife Fund

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CHAPTER 1: INTRODUCTION

The coastal and marine ecosystems are experiencing extreme degradation and change. With 44% of the world's population residing along the coast (UN Atlas of the Oceans, 2010) and an increasing percentage of that population being dependent on marine resources and habitat, the conservation of marine resources and environment for future generations is an increasing concern. More than half of the world's fisheries stocks are fully exploited, producing catches at or near to their maximum sustainable limits. Furthermore, more than 25% of fisheries are overexploited, depleted or recovering from depletion (FAO, 2006 as cited by Laffoley, White & Kilarski, 2008). One study found that over 90% of the predatory fishes have been lost in the world's oceans (Myers & Worm, 2003). In addition, many researchers believe that direct and indirect human pressure on the environment has resulted in either entering or already being in the sixth planetary mass extinction. In 2007, there were 41, 415 species on the IUCN Red List: 16, 306 threatened with extinction and 785 already extinct (Lafrance, Lourie, Marsden & Vincent, 2002 as cited by Wake & Vrendenburg, 2008). Changes in biodiversity are attributed to direct anthropogenic pressures, including exploitation, pollution, habitat destruction and fragmentation, as well as indirect pressures such as climate change (Wake & Vredenburg, 2008). Marine protected areas are one tool utilized in the sustainable development of the marine environment and resources through the limitation of anthropogenic activities in designated marine and coastal areas. Sustainable development is defined as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Bruntland, 1987).

MPAs cannot operate optimally if monitoring and evaluation is not an essential component of the management cycle. Monitoring is the "process of repeated observation for specified purposes of one or more elements of the environment according to prearranged schedules in space and time, and using comparable data collection methods" (Meijers 1986 as cited by Hockings, Stolton & Dudley, 2000). Evaluation is the assessment of actions and their ability to produce desired outcomes. Indicators measure the effectiveness of achieving goals and objectives specific to individual MPAs. Effectiveness is a multi-faceted concept therefore a multitude of different indicators should be utilized in the interdisciplinary evaluation process (Pomeroy, Parks & Watson, 2004).

1.1 Marine Protected Areas

A marine protected area (MPA) is defined as "any area of intertidal or subtidal terrain, together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN, 1999). The principle purposes of MPAs are: maintaining ecological processes, preserving biodiversity, the sustainable use of marine resources, education and research, and social and economic benefits (Salm & Clark, 2000).

The terms marine protected area, marine reserve, marine sanctuary, and marine park, while often used interchangeably in the literature, have different meanings in different organizations and various parts of the world. This is because marine protected areas are really a spectrum of strategies ranging from no-take areas which are fully protected from extractive activities to multiple-use areas which place limits and restrictions on the activities within the designated site (Laffoley et al., 2008).To aid in

the differentiation between the terms and the objectives of different marine conservation areas, the World Conservation Union classifies MPAs in six categories (IUCN, 1994 as cited by Laffoley et al., 2008) as follows:

Category Ia protected areas are created to protect biodiversity and geological/geomorphological features. Human visitation, use and impacts are strictly controlled and limited. These sites are used to conserve regionally, nationally or globally outstanding ecosystems, species and/or geodiversity features which would be degraded and destroyed by anything more than "light" anthropogenic impact.

Category Ib protected areas are conserved to protect the long-term ecological integrity of natural areas that are undisturbed by significant human activity. These protected areas are defined as usually be large mostly unmodified areas retaining their natural character and influence.

Category II protected areas are generally large, created to protect large-scale ecological processes and provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities. The primary objective of these protected areas is the protection of natural biodiversity while promoting education and recreation.

Category III are generally small with high visitor value due to their objective of protection a specific natural monument.

Category IV protected areas aim to maintain, conserve and restore species and habitats therefore many require regular interventions to address the requirements of particular species or maintenance of their habitats.

Category V are sites with have significant ecological, biological, cultural and scenic value due to the interaction of people and nature over time. The objective of these protected areas is to sustain important landscapes and seascapes created through traditional management practices. **Category VI** are to protect natural ecosystems and use natural resources in a sustainable manner. These sites are generally large where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources are compatible with nature conservation. It should be noted that these categories were initially created for terrestrial protected areas and have since been applied to the marine environment. This can be challenging and has led to the IUCN creating guidelines to aid in the application of the categories to marine conservation sites.

While there is variance within the literature, the majority of experts suggest that 20-30% of the world's oceans should be no-take MPAs (Stark & Ladell, 2008). Currently 1.8% of the world's oceans are protected with 1.09% in no-take areas (MPATLAS, n.d.) but as of 2009, less than 0.5% of Canadian oceans were within federal MPAs (Stark & Ladell, 2008), therefore Canada has a long way to go in protecting its oceans.

1.2 Monitoring and Evaluation

In 2003, the Fifth World Parks Congress recognized "the importance of monitoring and evaluation of management effectiveness as a basis for improved protected area management and more transparent and accountable reporting" (Leverington, Hockings & Costa, 2008a). Research has shown that without proper governance, MPAs are unable to effectively conserve marine resources and biodiversity (Jentoft, van Son &

Bjorkan 2007; Stewart, Cote, Kaiser, Lester, Bayliss, Mengersen & Pullin, 2008; O'Boyle, 2010 as cited by Koropatnick, 2009) and monitoring and evaluation is needed to ensure that governance efforts are optimally effective.

There is a clear relationship among goals, objectives, indicators, monitoring and evaluation which is illustrated in Figure 1. A goal is "a specific statement detailing a desired impact of a project." Some qualities of a good goal are: measurable, impact oriented, directly linked to targets, time-limited, and specific. An objective is "a specific statement detailing accomplishment or outcome of a project." Qualities of a good objective are similar to goals: measurable, outcome oriented, time-limited, specific, and practical. Together, goals and objectives relate specific threats and opportunities to the desired outcomes of the environmental strategy being implemented (Beale, 2007).

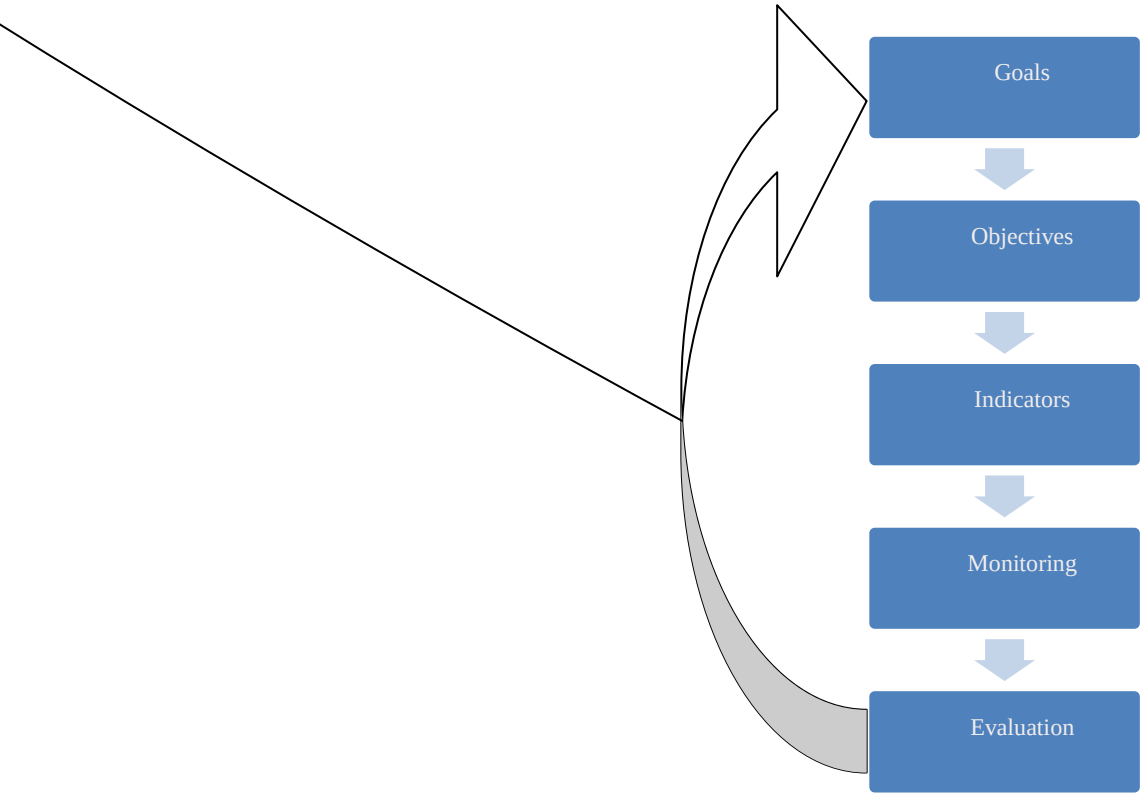

Figure 1: Simplified diagram of relationship between essential components for monitoring and evaluation

There are many definitions and types of indicators. An indicator is "a parameter or a value derived from parameters, which provides information about a phenomenon" (OECD, 1993 as cited by Belfiore et al., 2003). The information provided by an indicator is often otherwise imperceptible (Hammond et al., 1995 as cited by Niemeijer & de Groot, 2008). Indicator is also defined as "the function of observations or the outputs of a model that indicates the present state and/or dynamics of the system of interest in relation to scientific questions or management objectives" (Beliaeff & Pelletier, 2011). Indicators often function by simplifying complex messages often coming from multiple sources (Jackson et al., 2000 as cited by Niemeijer & de Groot, 2008). Environmental indicators highlight trends in the state of the environment while also displaying progress towards environmental goals by policy measures. On the other hand, performance indicators compare actual and desired conditions, and in the case of management effectiveness, can result in organizations being accountable for their successful actions (Belfiore et al., 2003).

MPAs require a range of interdisciplinary areas (physical, biological, social, and economic) in their design, planning, implementation, management, monitoring and evaluation. Thus, an effective set of indicators need to cover this disciplinary range.

Socio-economic, governance and ecological indicators are needed to evaluate the effectiveness of MPA management in a comprehensive manner (Pomeroy et al., 2004; Wilson & Tsang, 2007 as cited by Koropatnick, 2009). Some argue that the social, cultural, economic and political components have greater influence on the development, management and performance of marine protected areas than biophysical factors (Pomeroy et al., 2003 as cited by Pike et al., 2010), and thus, it is important to monitor

socio-economic and socio-cultural indicators for conservation efforts. Another reason is that marine protected areas can provide socio-economic benefits, and if this is an objective of a particular site strategy, it should be monitored in order to ensure that the objective is achieved. Numerous journal articles have proposed ecological indicators, but there are fewer publications focused on social and governance indicators (Beliaeff & Pelletier, 2011). There have been numerous requests for the development of a comprehensive evaluation system specifically for marine protected areas, and although a few agencies have implemented such systems (i.e. World Bank, WWF,IUCN, etc.) there is no generally accepted methodology (Hockings et al., 2000).

Management effectiveness evaluation is the "assessment of how well protected areas are being managed. Primarily, this is a determination of the extent to which management is protecting values and achieving goals and objectives (Hockings, Stolton, Leverington, Dudley & Courrau, 2006). The four principle purposes of management effectiveness are: adaptive management, effective resource allocation, increased accountability and transparency, and increased public participation and awareness (Hockings et al., 2006).

Adaptive management is "an inductive approach, relying on comparative studies that blend ecological theories with observation and with the design of planned interventions in nature and with the understanding of human response processes" (Gunderson, Holling & Light, 1995). There are two components to an adaptive management system: a monitoring system to measure indicators and a response system that allows for modification of indicators (Hilborn & Sibert, 1988). More information pertaining to the monitoring and evaluation of protected areas can be found in Chapter 4.

1.3 Purpose and Rationale of the Study

The purpose of this research is to develop a monitoring plan template for obtaining the requisite information for evaluating the effectiveness of *Oceans Act* MPAs that is nationally consistent for MPA reporting and yet, leaves room for adaptation to the specific objectives of each individual site. This project is focused on the development of relevant governance, socio-economic, and socio-cultural indicators because ecological indicators are already being designed by the Canadian Science Advisory Secretariat (CSAS).

All *Oceans Act* MPAs are designated and managed under the same legislation and policies, this provides a strong rationale to establish common indicators relevant to all sites, these will allow for reporting to DFO National Headquarters and the public. The monitoring plan template will be a tool for regional staff to monitor management effectiveness at the site level as numerous *Oceans Act* MPAs have been dedicated in the last decade and no consistent method of monitoring management effectiveness is in place. Consistency in assessing the effectiveness of MPAs is critical to ensure that Canada's objectives for achieving marine conservation priorities are met.

This research will begin with a description of the present state of monitoring and evaluation occurring for *Oceans Act* MPAs, and then explore the current guidance available and strategies being employed in the selection of governance, socio-economic and socio-cultural indicators. Global governance, socio-cultural and socio-economic indicators will be reviewed, analyzed, and selected to determine their relevance to all *Oceans Act* MPAs for the monitoring plan framework template. Two monitoring programs will be selected for an in-depth review and compared to determine if there are lessons that are applicable to *Oceans Act MPAs*. In addition, the results of this study, a

toolkit of indicators and a monitoring plan template will be presented. Finally, recommendations will be made for improving monitoring and evaluation of *Oceans Act* MPAs.

CHAPTER 2: CANADA'S MARINE CONSERVATION STRATEGY

2.1 Canada's Marine Conservation Strategy

The Canadian coast touches all three oceans and is the longest in the world; therefore the oceans and ocean management are a significant component of Canadian culture and society. The *Oceans Act* was implemented in January of 1997 making Canada the first country with comprehensive oceans legislation. The *Oceans Act* is "a framework for current and future ocean management initiatives." To support the *Oceans Act*, in 2002, the Government of Canada created a new policy: "Canada's Oceans Strategy" that "defines the vision, principles, and policy objectives for a modern oceans management regime." Canada's Oceans Strategy is based on three principles: integrated management, sustainable development and the precautionary approach. In 2005, the *Oceans Act*ion Plan (OAP) was created to support the implementation of Canada's Oceans Strategy. The OAP contains four components: International Leadership Sovereignty and Security; Integrated Oceans Management for Sustainable Development; Health of the Oceans; and Oceans Science and Technology (Oceans Performance Management Strategy 2012).

In accordance with the *Oceans Act*, the Minister of Fisheries and Oceans is the leader and coordinator for "the development and implementation of a national network of MPAs on behalf of the government of Canada" (DFO, 2013d). To aid in this task, the Federal Marine Protected Areas Strategy is a plan for collaboration among departments and agencies that establish federal MPAs. Furthermore, in 2011 a National Framework for Canada's Network of Marine Protected Areas was approved. The document, which was developed through federal-provincial-territorial collaboration, provides guidance for the design of a national network of MPAs that will be composed of 13 bioregional networks (DFO, 2013d).

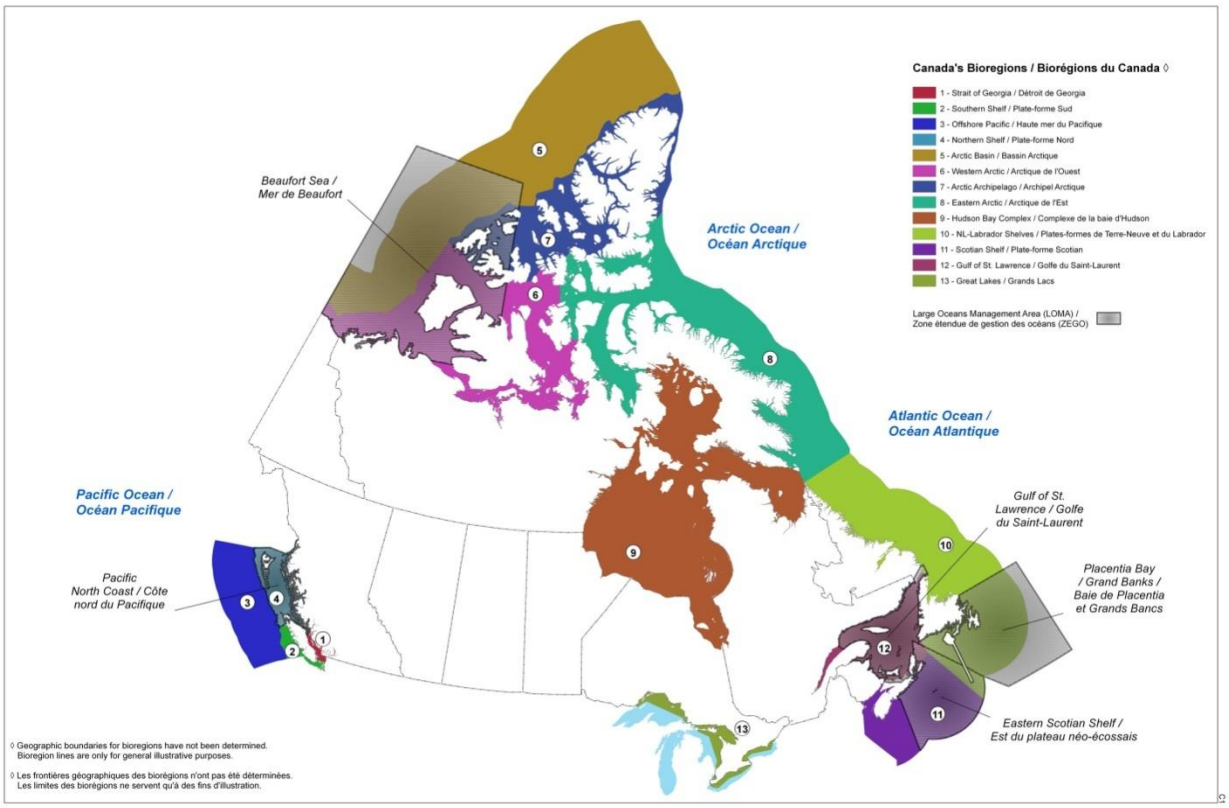

Figure 2: Map of Canada's marine bioregions (Fisheries and Oceans Canada, 2011)

Table 1: Marine bioregion locations across Canada

Ocean	Marine Bioregions
Atlantic	Scotian Shelf (including the Bay of Fundy and the Gulf of Maine) Newfoundland-Labrador Shelves Gulf of St. Lawrence
Pacific	Northern Shelf Strait of Georgia Southern Shelf Offshore Pacific
Arctic	Hudson Bay Complex Arctic Archipelago Arctic Basin Eastern Arctic Western Arctic

Oceans Act MPAs are designated for a variety of purposes: the protection of a single species, the protection of biodiversity, and the protection of commercially harvested species, and these differences will have implications for the selection of indicators for a monitoring plan template. Numerous *Oceans Act* MPAs have been designated in the last decade.

Canada's Oceans Strategy highlights the need for "results-based management and accountability frameworks for measuring progress, relevance and effectiveness" (DFO, 2002 as cited by Koropatnick, 2009) but *Oceans Act* MPAs do not have comprehensive monitoring and evaluation programs and determining if the objectives and goals are being reached is difficult to quantify (Koropatnick, 2009), and therefore, often subjective. Currently, the need for ecological indicators is being satisfied by the DFO Science sector which develops indicators, protocols and strategies for the evaluation of the ecological aspects of the management of each individual *Oceans Act* MPA in Canada.

The Department of Fisheries and Oceans Canada (DFO) utilizes the *Oceans Act* to create MPAs to protect and conserve: commercial and non-commercial fishery resources, endangered marine species, unique habitats, areas of high biodiversity, and any other marine resource or habitat to fulfill the Minister's mandate (DFO, 2013b). Other federal departments collaborate with DFO in the creation and management of federal marine conservation sites. For example, Environment Canada establishes and manages marine wildlife areas which protect and conserve habitat for a variety of wildlife. In addition, Parks Canada governs national marine conservation areas that protect and conserve Canada's natural and cultural marine heritage while providing opportunities for public education and enjoyment (DFO, 2013b).

Under the *Oceans Act,* there is a specific process for establishment of MPAs. Areas of Interest (AOIs) are selected through the "large ocean management area-based integrated oceans management process" (DFO, 2013c). Subsequently, an overview and assessment report is created containing an ecological overview, a social/cultural/economic overview, and an assessment of the interaction among the ecological, social, and cultural aspects of the site. A draft regulatory intent is created with conservation objectives and the management approach. Consultation occurs with stakeholders to provide input on the regulatory intent and information for the cost-benefit analysis. This analysis is needed for the regulatory impact analysis statement and strategic environmental assessment while the site is still an AOI. The regulatory impact analysis statement is used to ensure that "regulatory activities result in the greatest overall benefit to Canadians" (Canada School of Public Service, 2013) and is produced for each proposed regulation (Treasury Board of Canada Secretariat, 2001). The regulations for MPA designation are created and published for feedback from the public then a management plan is developed to aid in the management of the site and the implementation of the regulations (DFO, 2013c).

There are currently eight *Oceans Act* MPAs in existence: Basin Head, Bowie Seamount, Eastport, Endeavour Hydrothermal Vents, Gilbert Bay, Musquash Estuary, Tarium Niryutait, and The Gully. Canada also possesses eight Areas of Interest: Race Rocks, St. Lawrence Estuary, Hecate Strait/Queen Charlotte Sound Glass Sponge Reefs, Laurentian Channel. St Anns Bank, Shediac Valley, American Bank and Anuniaqvia niqiqyuam, all in varying stages of designation towards becoming *Oceans Act* MPAs (see Figure 2). While the characteristics of the area for site designation and conservation

objectives cover a wide spectrum, all these sites are designated under the same legislation and are managed by DFO.

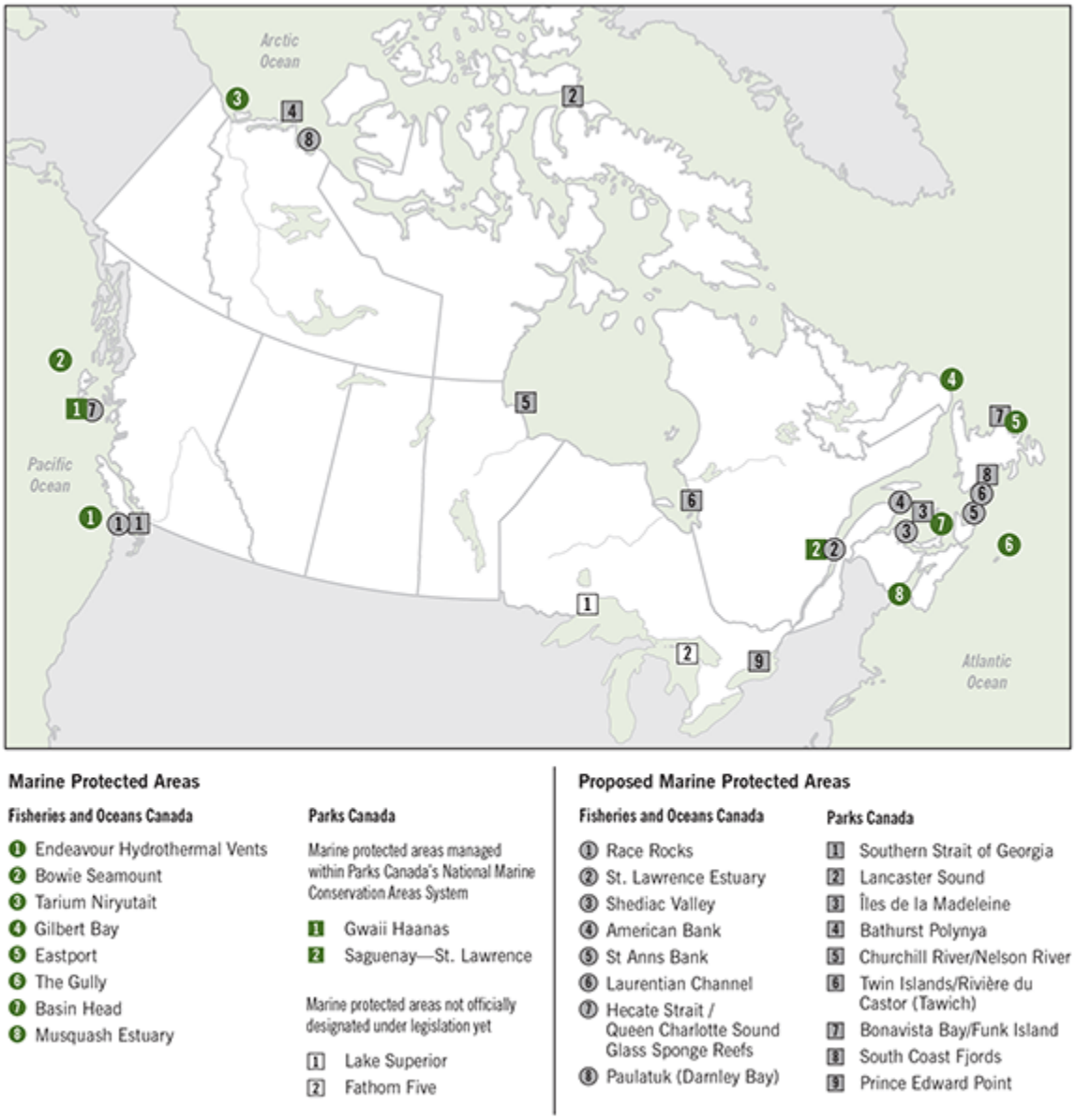

Figure 3: Map of Canada's *Oceans Act* MPAs and AOIs (Office of the Auditor General of Canada, 2013)

Numerous *Oceans Act* MPAs have been designated in the last decade. Table 1 summarizes which portions of the *Oceans Act* apply to each of the current MPAs, resulting in their designation. The information for the designation of the Bowie Seamount

and Tarium Niryutait are lacking due to the fact that their management plans have not been published therefore this information has not been formalized as of yet. The purpose of designation of the site is directly related to each sites' conservation objectives, as it is essential to the MPA's goal(s) and purpose. Therefore the majority of conservation objectives for *Oceans Act* MPAs relate to habitat, productivity, and biodiversity.

Table 2: Summary of designation criteria for current *Oceans Act* MPAs

The Oceans Act authorizes the Governor in Council to designate, by regulation, MPA for one or more of the following reasons under sub-Section 35(1):	Basin Head	Bowie Seamount	Eastport	Endeavour Hydrothermal Vents	Gilbert Bay	The Gully	Musquash Estuary	Tarium Niryutait
Site Designation:	2005	2008	2005	2003	2005	2004	2006	2010
a) the conservation and protection of commercial and non-commercial fishery resources, including marine mammals and their habitats			X		X	X	X	
b) the conservation and protection of endangered or threatened marine species and their habitats			X			X		

c) the conservation and protection of unique habitats	X			X	X	X	X	
d) the conservation and protection of marine areas of high biodiversity or biological productivity			X	X		X	X	
e) the conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister	X		X		X	X		

2.2 *Oceans Act* MPAs

Basin Head MPA was designated October 2005 and is a shallow coastal lagoon on the eastern end of Prince Edward Island (PEI). Irish moss, *Chrondrus crispus*, is a commercially harvested species throughout the Maritimes, but this site is the location of a unique species not found anywhere else. The Irish moss in Basin Head does not possess a holdfast, instead it is weighed down by blue mussels and held in place their byssal threads (DFO, 2009). This variation is also significantly larger than the varieties found anywhere else. Site designation was driven by public and government interest. The management plan will be created in collaboration with the Basin Head Lagoon Conservation Committee (DFO, 2013i).

Bowie Seamount was designated April 2008 (DFO, n.d.) and is a group of three offshore submarine volcanoes 180 km offshore of Haida Gwaii (Fisheries and Oceans Canada, 2013h). This site was designated due to its vulnerability to exploitation, high biologically diversity, and ecological uniqueness. Bowie Seamount is the shallowest seamount in Canada and is one of the most biologically rich submarine volcanoes in the world. The Haida Nation was essential in the creation of the MPA and a memorandum of understanding (MOU) was signed in 2007 between the Government of Canada and the Council of the Haida Nations for the establishment of a joint management board. The principal conservation objective of the site is the conservation and protection of "the unique biodiversity and biological productivity of the area's marine ecosystem which includes Bowie, Hodgkins and Davidson seamounts and the surrounding waters, seabed and subsoil" (DFO, 2013h).

Eastport was designated in October 2005 and is located on Bonavista Bay, Newfoundland. In 1995, lobster harvesters formed the Eastport Peninsula Lobster Protection Committee (EPLPC) to implement a lobster conservation strategy to address declining catches. In 1997 EPLPC worked with DFO to place limits on the fishery and close two areas of lobster habitat. In 1999 the EPLPC contacted DFO to make Eastport into an *Oceans Act* MPA (DFO, 2013l).

Endeavour Hydrothermal Vents was designated March 2003 and is a portion of the Juan de Fuca Ridge system. The section located within the MPA is an active seafloor spreading zone with black smokers supporting some of the highest levels of microbial diversity along the ridge system. The Endeavour Hydrothermal Vent is located 250 km southwest of Vancouver Island. The principle conservation objective of the site is to

“ensure that human activities contribute to the conservation, protection and understanding of the natural diversity, productivity and dynamism of the ecosystem and are managed appropriately such that the impacts remain less significant than natural perturbations” (DFO, 2013g).

October 2005 the Gilbert Bay site was designated. While only 47 km^2, this site was established for the conservation of a genetically-distinct species of Atlantic cod, *Gadus morhua*, which is a reddish-brown color. Gilbert Bay is located on the southeast coast of Labrador (DFO, 2013k). In the area, it is known as the "golden cod" and it carries out the majority of its life cycle in Gilbert Bay (DFO, 2007).

Musquash Estuary located in New Brunswick and feeding into the Bay of Fundy was designated December 2006. This site is unique in the region due to the size of the estuary and its relatively undisturbed condition. Not only is it a diverse habitat with a profusion of wildlife but it also supports commercial fisheries (DFO, 2013i). Below the ordinary water mark is a federal MPA, while the area between the ordinary water mark at low tide and the ordinary water mark at high tide is referred to as the Administered Intertidal Area (AIA). The AIA is Submerged Crown Lands and Waters and has received its status through an agreement between the Government of New Brunswick and the Government of Canada. The federal MPA is protected under the Musquash Estuary MPA regulations while the New Brunswick Coastal Areas Protection Policy and the Fisheries Act are used for the management of the AIA in a manner consistent with the MPA (Management Plan).

The first Arctic MPA, Tarium Niryutait, was designated August 2010. Tarium Niryutait consists of 3 areas: Niaqunnaq, Okeevik and Kittigaryuit which are located in

the estuary of the Baufort Sea and the Mackenzie River Delta. Tarium was a collaborative effort among DFO, the Inuvialuit people, private industry, local stakeholders and governments. The goals of this site are to conserve and protect biological resources and to support a healthy population of beluga whales. Objectives for the MPA include: the preservation of the harvesting traditions of the Inuvialuit people in the Inuvialuit Settlement Region, the sustainable management of one of the world's largest summering stock of belugas, and the prohibition of activities that could negatively impact the belugas or the ecosystem they are dependent upon (Beaufort Sea Partnership, n.d.).

The Gully was designated May 2004. This site is the largest submarine canyon in eastern North America and is located offshore Nova Scotia. The Gully contains a high level of biodiversity and provides habitat for the deep-sea corals and the northern bottle nose whale (DFO, 2013j).

The 2009 *Oceans Act* Marine Protected Areas Policy outlined the requirements for management plans that include governance, monitoring, reporting, surveillance and enforcement, but currently indicators have only been identified for six of the eight MPAs of which only three are being monitored systematically (Office of the Auditor General of Canada, 2013) and to date, two MPAs have captured trends in monitoring (P. Doherty, personal communication, March 3rd, 2013). This is an area of active research at DFO, as it is relevant to current MPAs and the designation of sites in the future.

2.3 Current Status of Monitoring and Evaluation in Canada

The 2009 *Oceans Act* Marine Protected Areas Policy outlines the requirements for management plans that include governance, monitoring, reporting, surveillance and enforcement. Currently, ecological indicators have only been identified for six of the eight MPAs of which only three are being monitored systematically (Office of the Auditor General of Canada, 2013) and to date, two MPAs have captured trends in monitoring (P. Doherty, personal communication, March 3rd, 2013).

Ecological indicators, protocols, and strategies are developed and recommended by the Canadian Science Advisory Secretariat (CSAS) for each individual site based on the conservation objectives. Ecological indicators from CSAS can fall into two categories: monitoring the impacts of anthropogenic activities and monitoring the ecosystem reference state (Davies, Miriam & Boutilier, 2011). When recommending ecological indicators, CSAS uses a five step stressor-based indicator identification framework, as the principle component with Pathways of Effects (PoE). PoE identifies anthropogenic activities that may stress the environment and then attempts to understand the extent and nature of impacts. For example, if the activity is fishing, then one stressor is the removal of target species and the effect is loss of biodiversity. PoE is followed assigning mitigation measures and an ecological risk assessment for stressors where mitigation is not possible (Davies et al., 2011).

The Oceans Management Program Performance Measurement Strategy involves monitoring governance, social, and economic factors of Oceans Management program, of which *Oceans Act* MPAs are a part. This strategy involves reporting to DFO national

headquarters twice a year on all Oceans program projects: integrated ocean management, MPAs, MPA network development, etc (DFO, 2013).

Parks Canada creates State of the Park Reports for its national marine conservation areas (NMCAs). At this point in time, only two NMCAs have been officially designated and a State of the Park Report has only been published for the Five Fathoms NMCAs in Lake Huron. This means it cannot be discerned whether or not the indicators and/or evaluation categories will be consistent across all NMCAs. The Five Fathoms NMCA State of the Park Report indicators are summarized in the following table (Table 3) and it should be noted that many categories did not have enough data to report on or were not being monitored (Parks Canada, 2010).

Table 3: Summary of Parks Canada's indicators at Five Fathoms national marine conservation area

Resource Conservation	Ecological	Coastal Ecosystem	-Coastal wetland water quality -Lake levels -Aquatic plant community -Coastal fishes -Coastal connectivity
		Islands Ecosystem	-Habitat amount and connection -Alvar Quality -Colonial waterbirds
		Offshore Ecosystem	-Benthic invertebrate community -Water quality -Lake trout -Ice Coverage
		Species at Risk	
	Cultural	Resource Condition- Submerged and Terrestrial	-Archaeological sites -Objects -Building and structures -Landscapes and landscape features

		Resource Management Practices- Submerged and Terrestrial	-Inventory -Evaluation -Cultural resource management strategy -Monitoring
Visitor Experience		Visits	-Attendance -Satisfaction with information -Making efforts
		Learning	-Attendance -Learning opportunities -Satisfaction: Learning
		Enjoyment	-Extent of Enjoyment -Facilities -Services -Activities -Staff
		Satisfaction	-Overall -Fees
		Meaning	-Overall
Public Appreciation and Understanding		Appreciation and Understanding Support	-Overall

CHAPTER 3: METHODOLOGY

In order to complete this research, a desk-top study was completed at the Department of Fisheries and Oceans, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. This research consisted of a literature review, consultation with DFO experts and the analysis of two case studies, resulting in the creation of a monitoring plan template and an indicator toolkit. Figure 4 summarizes the methodology utilized in this study.

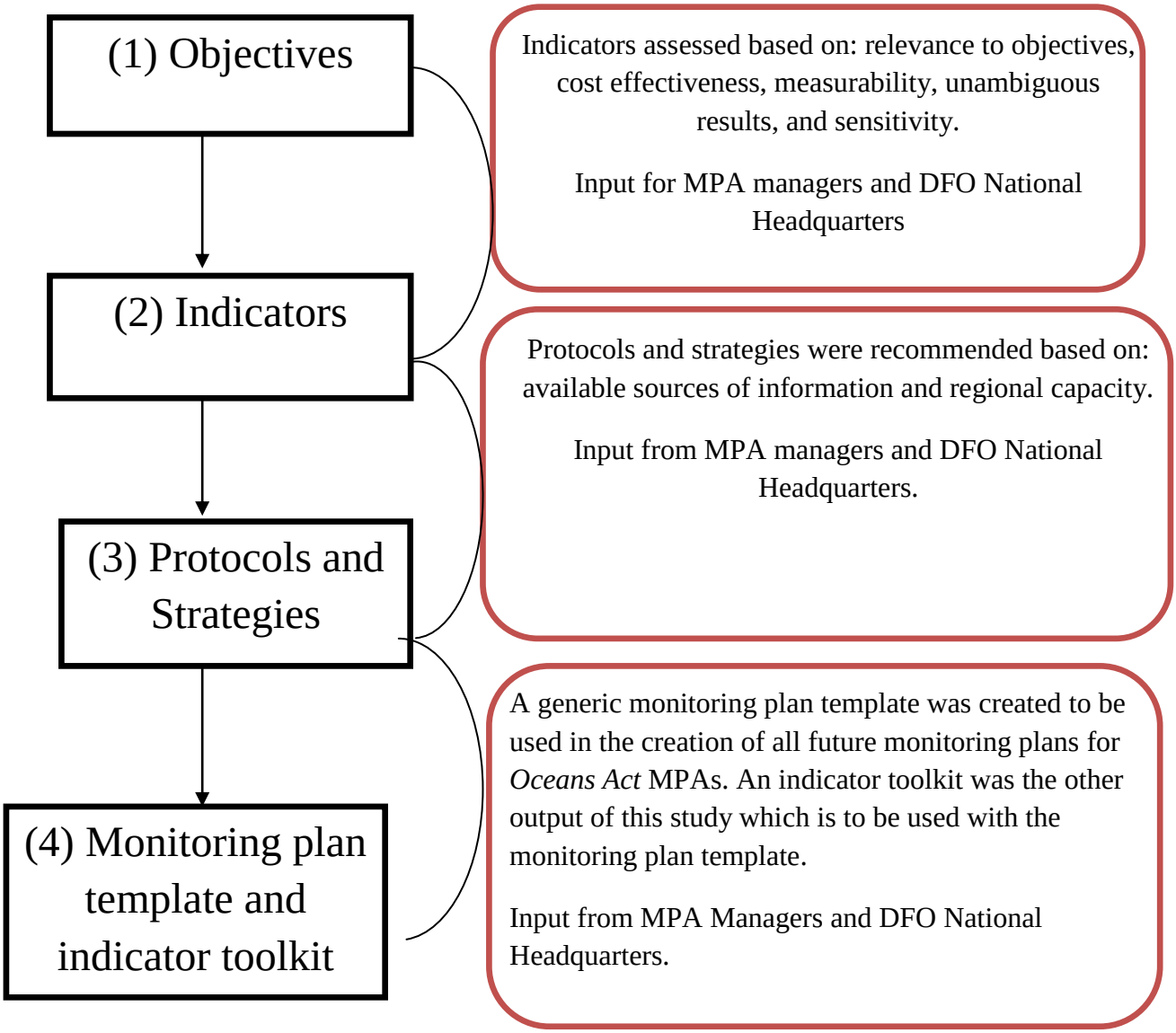

Figure 4: Summary of methodology undertaken in study

The overall methodology of this study followed that described by Pomeroy et al. (2004) in the document *How is your MPA doing?* This is a general framework for the design and implementation of a monitoring and evaluation program for MPAs. The only

significant difference in the two methodologies for selecting indicators is this study looked at indicators beyond those in *How is your MPA Doing?,* thus the indicator selection criteria was also different since Pomeroy et al. (2004) matched site objectives with its indicators. The following are the general methods utilized in this study: (1)The goals, objectives, and in some cases, the management actions, for each *Oceans Act* MPA were compiled and categorized to determine the principal ecological, socio-economic, and socio-cultural aspects that would require monitoring. (2) In order to match relevant indicators to the appropriate goals and objectives, a master list of indicators was collected from the literature. Once the duplicate indicators were removed, the indicators went through a selection process. Following this process, the indicators were reviewed with MPA practitioners and DFO National Headquarters staff to ensure that the proposed indicators were appropriate and tailored to be as relevant as possible to *Oceans Act* MPAs. Furthermore, attempts were made to prioritize indicators not relevant to all MPAs based on MPA objectives and resources needed to complete the monitoring and evaluation. (3) Methodologies for the monitoring of the recommended indicators were suggested and discussed with DFO Maritimes staff, in order to ensure that information needs was accessible. (4) Finally the recommended indicators were placed in a indicator toolkit which would accompany a monitoring plan template when MPA managers are establishing monitoring programs. The following sections provide more detail on some of the key steps undertaken in this research.

3.1 Indicator Selection Process

The study began by compiling the objectives of all existing *Oceans Act* MPAs in Canada. The principle sources of this information were management plans, but in the few cases where management plans had not yet been published (Bowie Seamount MPA and

Tarium Niryutait MPA) the objectives were taken from the draft management plans. In addition, other information about the protected area, such as major stakeholders driving the designation process and management actions outlined in the management plans were also included to gain as holistic as possible an understanding of the purpose of each MPA.

A study was completed identifying social and governance indicators for *Oceans Act* MPAs in 2009 entitled "Framework for Evaluating *Oceans Act* MPA Management Effectiveness" (Koropatnick, 2009). This study proposed indicators within a monitoring framework, but they were principally for The Gully MPA and Musquash Estuary, therefore current literature was examined to determine if there are other indicators that are just as or more relevant than those previously identified for all *Oceans Act* MPAs. Socio-economic, socio-cultural, and governance indicators were collected from the two existing monitoring plans, experiences of the MPA managers and frameworks/methodologies in the literature. Once an extensive list of indicators was compiled, a list of five qualities of a good indicator was used to eliminate indicators that were not relevant to *Oceans Act* MPAs.

Indicators were selected based on five criteria proposed by Schromaker (1997): relevance, cost-effectiveness, measurability, unambiguous results, and sensitivity. There are many different qualities that can be used for the selection of indicators. A commonly-used set is SMART: specific as in unambiguously defined, measurable qualitatively or quantitatively, achievable within limits of resources, relevant to the issue and time-bound meaning that it is sensitive to change within the restrictions of the evaluation period (Schomaker, 1997 as cited by Niemeijer & de Groot 2008). A simpler set contains just

three criteria: policy relevance, analytical soundness and measurability (OECD, 2001 as cited by Niemeijer & de Groot 2008). On the other hand, a very extensive set of criteria are: general importance, conceptual basis, reliability, temporal and spatial scales of applicability, statistical properties, data requirements, necessary skills, robustness, international compatibility, costs, benefits and cost-effectiveness (NRC, 2000 as cited by Niemeijer & de Groot 2008). A study of common environmental indicator selection criteria found: strong scientific and conceptual bases, sensitive to changes within policy time frames, measurable in qualitative or quantitative terms, achievable in terms of available resource and relevance for the issue and target audience at hand were the qualities most common between ten sets of indicators (Niemeijer & de Groot, 2008).

Each criteria was scored between 1 and 5 (see Table 4), with one being a quality that the indicator did not possess in terms of the objectives of the *Oceans Act* MPAs and five being the indicator fully embodied the quality to a high degree. The scores for each indicator were tallied to provide an overall score out of 25. Only indicators with a score of 23 (92%) or higher proceeded to the next stage of the selection process (Appendix 1). Such a high score was necessary to sufficiently reduce extraneous indicators because while many were applicable, the literature recommends starting with a simple monitoring plan and only adding more indicators when needed (Jones, 2000).

Table 4: Definition of scores used for assessment of indicators

Score	Meaning of score
1	This indicator criteria is not relevant to *Oceans Act* MPAs
2	This indicator criteria is relevant to a few *Oceans Act* MPAs
3	This indicator criteria is relevant to a some *Oceans Act* MPAs
4	This indicator criteria is relevant to majority of *Oceans Act* MPAs
5	This indicator criteria is relevant to all *Oceans Act* MPAs

Indicators then went through further review and adjustment based on discussions with DFO staff in the Maritimes region and National Headquarters. Multiple revisions and discussions were had with DFO Maritimes staff. Furthermore, feedback from the DFO National Headquarters staff and *Oceans Act* MPA practitioners across Canada were incorporated into the development of the indicator toolkit consisting of: indicators, recommended methodologies for monitoring, and evaluation scorecards.

3.2 Case Study Selection Criteria

Two international case studies were selected for review to determine if any lessons learnt in these cases could be included in the monitoring plan template and indicator toolkit. While the initial search focused on monitoring plan templates that included ecological, socio-economic, socio-cultural, and governance indicators, this

proved to be a challenge, therefore the criteria used for the selection of case studies was that it was created for use in a developed country and that the framework was applied to several (four or more) MPAs that were not designated together to create a regional network. Furthermore, a method for reporting to the public and multiple reasons for site designation were required. These are characteristics of the *Oceans Act* MPA program and therefore desired in the case studies influencing the monitoring program this study designed. The two case studies selected were: United States National Marine Sanctuaries and New South Wales Marine Parks. International case studies were utilized as the criteria listed above was not met by any marine protected area program found in Canada.

The in-depth review of these two case studies included monitoring, evaluation, and reporting mechanisms influenced the recommended monitoring plan template and indicator toolkit.

3.3 Methods for Creating the Monitoring Plan Template

This process resulted in indicators for national reporting and optional indicators that were relevant to objectives of various individual MPAs. Once the list of indicators was finalized, the components of a monitoring plan template were discussed with DFO staff to determine what would be the most useful for practitioners. The literature was also examined for the commonly used components of a monitoring plan and lessons learned from the analysis of case studies were also applied.

CHAPTER 4: MONITORNG AND EVALUATION LITERATURE REVIEW

Monitoring and evaluation needs to be encouraged in the realm of MPA management because only 10-35% of existing MPAs are achieving their objectives (Kelleher et al., 1995; Alder, 1996; Tun et al., 2004 as cited by Pajaro et al., 2010). This is slowly changing as monitoring and evaluation tools become more common for protected areas. A global study conducted in 2005 and 2007, over 6300 assessments of protected areas distributed over 100 countries (Leverington et al. 2008a).While there is a lack of consensus on the definitions used in the monitoring and evaluation of management effectiveness (Day, 2008), it is widely accepted that when completed effectively, the benefits are worth the effort. The following are the seven key steps in an evaluative management system (Jones, 2000):

Step 1: Identify management objectives

Step 2: Define key desired outcomes

Step 3: Identify performance indicators

Step 4: Undertake monitoring

Step 5: Periodically assess results

Step 6: Report findings and recommendations

Step 7: Adjust management as necessary

Since management objectives can sometimes be broad and general in nature, defining the desired outcomes for each objective provides more concrete guidance around which to develop indicators. Performance indicators provide information on the achievement of the desired outcome. Monitoring is a time and resource intensive process; therefore monitoring programs are often designed around the prioritized needs for

performance information. Assessment involves the identification of factors aiding or hindering management performance through the examination of the achievement of the desired outcomes. The final few steps are reporting findings and making appropriate changes in management (Jones, 2000).

Since the management objectives were already in place for the *Oceans Act* MPAs at the onset of this study, the focus will remain on the identification of indicators, the development of the monitoring program, the creation of a monitoring plan template, reporting, and adaptive management.

4.1 Indicator Selection

Indicators are generally selected based on at least two criteria: relevance and effectiveness. The relevance of an indicator is the linkage between the indicator and the objective which relate an observed change in indicator value to the objective in a meaningful way. Relevant indicators possess sensitivity, the ability of an indicator to respond to variations in pressure. Effectiveness is the "condition that allows the indicator to reach its predefined targets" (Beliaeff & Pelletier, 2011). There are certain known characteristic and tasks that indicators should accomplish and possess. Indicators should lead towards the appropriate management decision that will reduce the impact or certify the positive status (Beliaeff & Pelletier, 2011). The SMART principles: specific, measurable, achievable, realistic and time-limited are all useful qualities in indicators (Jones, 2000 as cited as Day, 2008). A study was completed examining all the qualities used for identifying indicators and the ones most commonly used were: analytically soundness, time-bound, measurability, resource demand, and relevance (Niemeijer & de Groot, 2008). Time-bound is related to the indicator's sensitivity to change within the

evaluation period while resource demand is the ability to complete monitoring using the resources that are available (Niemeijer & de Groot, 2008).

An indicator should lead to the appropriate decision on the fate of the activity being evaluated while minimizing the risk of error. Indicators need to be sensitive to change in the aspect being monitored while also being able to reflect changes at a relevant spatial and temporal scale. Indicators also should be easy to measure and interpret while also being cost-effective during the data collection, analysis and interpretation phases (Hockings et al., 2000)

4.2 Monitoring Plan and Evaluation

Several assessment tools and methodologies, some of which will be described in more detail, provide recommendations on what should be included in a monitoring plan. According to *How is your MPA doing?*, an evaluation work plan should answer the following questions (Pomeroy et al., 2004):

- Why is the evaluation being completed?
- Who is the audience?
- Who should participate?
- What methods are being used?
- What resources are needed?
- What is the evaluation timeline?
- How will the data collected be managed and analyzed?
- How will the results be communicated and used for decision-making?

Another study recommends that the methodology should include: structures for the inclusion of stakeholders, a timeline for the assessment procedures, the indicators being

utilized, the structure for reporting findings, and the processes for adaptive management (Hockings et al., 2000). Overall, it appears as though the monitoring plan should provide clear direction on how the monitoring and evaluation will be completed and how the results will be utilized. If monitoring results cannot be used in a timely manner leading to some new applicable knowledge or management action, most likely the monitoring program is a waste of time and resources.

Evaluation has become necessary as management has moved away from expert opinions and estimates of progress towards evidence-based management (Day, 2008). Furthermore, evidence-based feedback is needed for adaptive management, which is designed to improve management strategies (Day, 2008). Some of the uses of evaluating management effectiveness are: adaptive management, improvement of planning, promotion of accountability, and appropriate resource allocation (Day, 2008).There are two categories of evaluation for management: process-orientated and outcome-orientated. Process-orientated evaluation analyzes progress in management through the assessment of governance and evaluation of specific policy programmes. Outcome-orientated evaluation analyzes the achievement of management goals and associated changes in social and environmental conditions through the use of outcome indicators (Vella, 2008).

4.3 IUCN-WCPA Framework

A framework for management effectiveness was developed by the IUCN World Commission for Protected Areas (WCPA) and serves as the basis of the vast majority of the assessment tools currently in use around the world. IUCN's Best Practice Protected Area Guidelines Evaluation Effectiveness utilizes six elements of management: context, planning, inputs, processes, outputs, and outcomes (see Table 5) (Hockings et al., 2000).

The WCPA Framework can be used for three different levels of monitoring and evaluation depending on the circumstances, available resources, and reasons for evaluation. Level 1 requires little or no additional data collection to assess the context and appropriateness of planning, inputs and processes of management. Level 2 covers the items in Level 1 plus additional monitoring of outputs and outcomes of management. Finally, Level 3 focuses on outputs and outcomes to determine the achievement of management objectives. Level 3 also monitors context, planning, inputs and processes, and is used is mainly for site level assessment (Hockings et al., 2000).

Table 5: Summary of WCPA Framework (adapted from Hockings et al., 2000)

	Elements of evaluation	Explanation	Criteria that are assessed	Focus of evaluation	Level of monitoring and evaluation
Design	Context	**Where are we now?** Assessment of importance, threats and policy environment	Significance Threats Vulnerability National context	Status	1,2,3
	Planning	**Where do we want to be?** Assessment of protected area design and planning	Protected area legislation and policy Protected area system design Reserve design Management planning	Appropriateness	1,2,3
Appropriateness and Adequacy	Inputs	**What do we need?** Assessment of resources needed to carry out management	Resourcing of agency Resourcing of site Partners	Resources	1,2,3

	Process	**How do we go about it?** Assessment of the way in which management is conducted	Suitability of management processes	Efficiency appropriateness	1,2,3
Delivery	Output	**What were the results?** Assessment of implementation of management programmes and actions; delivery of products and services	Results of management actions Services and products	Effectiveness	2,3
	Outcome	**What did we achieve?** Assessment of the outcomes and the extent to which they achieved objectives	Impacts: effects of management in relation to objectives	Effectiveness appropriateness	2,3

4.4 Protected Area Assessment Tools and Methodologies

It is not practical to have just one assessment tool because there is too much variability among values, cultural settings and management regimes for this to be reasonable (Hockings et al., 2006). The creation of assessment tools is challenging as the information collected needs to be detailed, but if the process of monitoring and evaluation is too onerous then it will not be completed as effectively or frequently as necessary for use in adaptive management (Growcock, Sutherland & Stathis, 2009). In addition, when assessing multiple sites that serve different conservation purposes the assessment must be flexible enough to compensate for the variation, but also collect information in a systematic manner (Growcock et al., 2009). The following are some assessment frameworks and tools, based on the IUCN-WCPA framework, for the creation of monitoring and evaluation plans for management effectiveness of protected areas that are

more specific: Rapid Assessment and Prioritization of Protected Area Management (RAPPAM), Management Effectiveness Tracking Tool (METT), How is your MPA doing?, Enhancing our Heritage, and WWF-World Bank MPA scorecard.

RAPPAM is an assessment tool created by WWF for resource allocation, increasing awareness and support for the protected area, and management improvement at the system level (Leverington, Hockings & Costa, 2008b). The tool is based on the WCPA evaluation framework and consists of a questionnaire that covers the six elements contained in the framework. RAPPAM contains five steps: defining the scope of the assessment, assessment of the existing information pertaining to each protected area, administering the Rapid Assessment Questionnaire, analysis of the results, and identification of future steps and recommendations. This tool was designed for broad-level comparisons between multiple protected areas and for forest protected area. It should be noted though, that the developers believe that the framework can be modified for other environments, including marine, and that the tool can be applied to a single site but it will not provide detailed enough information for adaptive management (Ervin, 2003).

METT is a rapid assessment created by the World Bank and WWF Alliance and is based on a scorecard questionnaire. METT covers all the WCPA Framework components but places an emphasis on context, planning, inputs, and process. The purpose of this assessment tool is evaluation, adaptive management and accountability (Leverington et al., 2008b). METT describes itself as a "simple site-level tracking tool to facilitate reporting on management effectiveness of protected areas within WWF and World Bank Projects" (Stolton et al., 2007). The tool consists of datasheets and an assessment form.

The assessment form allows for threats to the protected area to be identified and ranked, as well as the identification of next steps. This tool should be used for tracking progress in a single site or closely related sites over time (Stolton et al., 2007).

How is your MPA doing? is a guidebook of indicators for evaluating MPA management effectiveness created by the MPA Management Effectiveness Initiative (2000), a collaboration between the IUCN World Commission of Protected Areas, World Wildlife Fund (WWF), and the U.S. National Oceanic and Atmospheric Administration (NOAA).. This guidebook differs from other documents as it consists of marine-specific biophysical, socio-economic, and governance indicators for monitoring of management effectiveness. In the creation of the guidebook, over 130 indicators were analyzed and numerous revisions followed field-testing of the document at pilot sites. The guidebook describes itself as a generic starting point for the creation and application of an evaluation plan as well as a tool box of indicators but not a complete list (Pomeroy et al., 2004).

Enhancing our Heritage was created by UNESCO, IUCN, and University of Queensland for adaptive management, increasing support, accountability, and resource allocation. This assessment tool provides an in-depth participatory assessment of all the WCPA elements but it focuses on the outcomes of management. *Enhancing our Heritage* identifies values, confirms the appropriateness of objectives, and assesses management effectiveness in the achievement of objectives through 12 tools (Leverington et al., 2008b). This assessment tool was designed for use in World Heritage sites but can be applied to other protected areas. It was created for tracking a single site opposed to comparison between sites. While it does not provide an overall score for effectiveness,

Enhancing our Heritage does use a rating system in some of its components (Hockings, Stolton, Leverington, Dudley & Courrau, 2006).

WWF-World Bank MPA Scorecard is used for adaptive management and accountability. This is a simple scorecard system and it covers all elements of the IUCN-WCPA Framework broadly with a relatively low level of analysis (Leverington et al., 2008b). According to the creators of the scorecard, it provides a quick overview of status of management steps up to and including outputs. The scorecard is useful for prioritization of issues but less so in determining achievement of management objectives because it does not include a detailed evaluation of outcomes. The scorecard consists of two components: a data sheet and an assessment form. The data sheet contains information on the characteristics and management objectives of the site, while the assessment form has questions, scoring, and areas for qualitative judgements (Hatziolos & Staub, 2004).

4.4 Challenges Associated with Monitoring and Evaluation

A major challenge associated with monitoring and evaluation is objectives that are too general or abstract to adequately serve their role as the basis of the development of indicators (Day, 2008). Indicators are directly related to the objectives of a conservation site and broad objectives lead to indicators that are also broad, that lack sensitivity and make it challenging to determine what is actually occurring.

Limitations of selecting indicators for monitoring the effectiveness of MPAs are resources and capacity. *Oceans Act* MPAs are offshore, in the Arctic, but also in easily accessed coastal areas. This inconsistency impacts the frequency at which data may be collected and the amount of resources needed to conduct the same monitoring at different

sites. Another limitation of this study is the interpretation of the recommendations for selecting other indicators to complete the monitoring plan. Since monitoring will be completed by regional offices, recommendations will be open to interpretation and therefore may be a source of inconsistency in the selection of additional indicators, thus decreasing national consistency which the monitoring plan template will strive to create.

CHAPTER 5: CASE STUDIES

The Convention on Biological Diversity (CBD) highlights the need for monitoring and evaluation in the marine and coastal environment. Operational objective 3.4 require all member states "to provide support for and facilitate monitoring of national and regional systems of marine and coastal protected areas" (United Nations, 1992) but according to voluntary reports and other documents, countries and conservation organizations around the world are at various stages in the process of effectively fulfilling this objective. For example, Sweden does not possess a national monitoring program specifically for marine protected areas, but as of 2009 a program for all protected areas in the country was under development (Ministry of the Environment Sweden, 2009).On the other hand, Germany has established a national monitoring program for the North and Baltic Seas (Germany Voluntary Report on CBD, 2009) but Finland does not have a comprehensive monitoring system specifically for marine and coastal protected areas (Finland Voluntary Report on CBD, 2009).Portugal identifies scare human resources and difficulties in maintaining long-term monitoring programs as challenges associated with monitoring (Portugal Voluntary Report on CBD, 2009) which is a plight likely to be shared with many other nations and organizations.

The following case studies; The National Marine Sanctuaries Program in the United States of America and The Marine Parks Authority in New South Wales, Australia highlight two of the national and sub-national organizations that have monitoring, evaluation and reporting systems with lessons that could be applicable to the creation of similar plans for *Oceans Act* MPAs. Each case study will begin with a brief introduction to the marine conservation program and the relevant documents supporting the monitoring and evaluation of these programs, both internally and externally. This

chapter will conclude with factors to be included in the national monitoring plan template for *Oceans Act* MPAs and a summary table of information from the two case studies discussed in this chapter.

5.1 United States National Marine Sanctuaries

The Marine Protection Research and Sanctuaries Act was enacted in 1972, since then 13 marine sanctuaries have been designated: Monitor (1975), Key Largo (1976), Channel Islands (1980), Gulf of the Farallones (1981), Looe Key (1981), Gray's Reef (1981), Fagatele Bay (1986), Cordell Bank (1989), Florida Keys (1990), Flower Garden Banks (1992), Monterey Bay (1992), Stellwagen Bank (1992), Hawaiian Islands Humpback whale (1992), Olympic Coast (1994), and Thunder Bay (2000) (NOAA, 2013a).

The mission of the national marine sanctuary program is "to conserve, protect, and enhance biodiversity, ecological integrity and cultural legacy of these ecosystems." While the primary focus of the sites is conservation, multi-use is permitted as long as it does not interfere with the primary objective. All management activities: regulations, education, enforcement, etc., are conducted in accordance with the individual sanctuary's management plan (NOAA, 2004).

The National Marine Sanctuaries Act permits the Secretary of Commerce "to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational or esthetic qualities. Meanwhile the day-to-day management is conducted by NOAA's Office of national Marine Sanctuaries (NOAA, 2013b).

5.1.1 System-Wide Monitoring Framework (SWiM)

System-wide monitoring framework (SWiM) was published July 2004 and is a monitoring system for the United States' 14 national marine sanctuaries that allows marine sanctuaries to "develop effective ecosystem-based monitoring programs that address management information needs." The three principle components of this study are: an ecosystem framework, design steps for the creation or improvement of a site-specific monitoring plan and a reporting strategy for multiple scales (NOAA, 2004).

The entire monitoring framework is centered around a generic ecosystem framework. SWiM acknowledges that each marine sanctuary possesses unique characteristics but they believe that the generalized relationships within their marine ecosystem framework can be adapted to individual sanctuaries through the addition of site-specific details. The three ecosystem components identified in the ecosystem framework are: water, habitats and living resources. From this general ecosystem framework, SWiM possesses 17 "system questions" which are to be applied to all sanctuaries. These questions are quite broad and are categorized based on the three ecosystem components (NOAA, 2004).

The second major component is the design process which contains three phases: requirements, protocols, and observing. "Requirements" involve creating sanctuary-specific questions relating existing threats to management objectives. These sanctuary specific questions, known as priority questions, are then organized within the context of the 14 system questions which is useful for reporting. Priority questions are an opportunity for public participation and involvement of sanctuary staff/experts to identify: current/anticipated anthropogenic threats, resources affected by threats and potential responses for each question. A requirements matrix is created that summarizes

this information by containing most pertinent resources and measures that address particular questions. The second phase, protocols, covers the aspects needed for field sampling programs. This phase begins by going through the requirements matrix and determining which variables are currently being adequately assessed and which are not, which may require statistical analysis. Where variables are not being assessed, protocols and sampling procedures need to be determined. This phase results in numerous implementation options: a program that utilizes only existing resources, a program that improves existing programs to a level of minimally acceptable monitoring, or a wide-ranging program that possesses variables and protocols related to all priority resources (NOAA, 2004).

The final phase of the design steps is "observing", the collection, processing and reporting of data. SWiM recognizes the need to report different amounts of detail to different audiences for different purposes and recommends using report cards to provide summaries of studies at different spatial scales. These summary reports will be color coded and have a symbols key. The color represents the current status while the symbol represents the trend, improving, deteriorating, or no trend detected (NOAA, 2004).

5.1.2 Performance Evaluation Manual for the National Marine Sanctuary Program

The manual, which was created May 2007, combines all relevant performance evaluation information into a single document for the National Marine Sanctuary Program. Instead of indicators, this document uses "program performance measures" which quantify progress towards objectives based on time-specific targets. In order to track progress towards these targets, milestones track progress on specific Annual

Operation Plan activities, and are usually monitored on an annual basis. The progression of milestones is also used for external management and budget tracking (NOAA, 2007).

The Performance Evaluation Manual leads to the creation of the evaluation action plan which is located in the management plan of each sanctuary. This action plan outlines how each performance measure will be tracked for progress, which staff member(s) will be responsible for collecting this information, and how the information will be reported. There is no standard format for the evaluation action plan. The Stellwagen Bank National Marine Sanctuary Management Plan has the evaluation action plan split into mini tables distributed throughout the plan associated with the appropriate management action (U.S. Department of Commerce, NOAA & Office of National Marine Sanctuaries, 2010) while Fagatele Bay National Marine Sanctuary Management Plan has a singular table describing all the program performance measures (U.S. Department of Commerce et al., 2012). At the end of each fiscal year, the information collected at individual marine sanctuaries will be compiled and reviewed by the Strategic Planning and Program Integration Team. There is also a specified biannual review of the program performance measures (NOAA, 2007).

The manual concluded by summarizing each of the 19 program performance measures with detailed descriptions of: reporting responsibility, reporting periodicity, target measures, measurement description and procedure, determining the final target measure, and responsibilities of different departments (NOAA, 2007).

5.1.3 Reporting Mechanisms and Documents

Two of the reporting documents that have resulted from SWiM are *Our National Marine Sanctuaries Accomplishments* and *National Marine Sanctuary Condition Reports*.

Our National Marine Sanctuaries Accomplishments reports on all 14 sanctuaries in one document. The document highlights accomplishments at different marine sanctuaries relevant to: Resources Protection and Management, Science and Exploration, Maritime Heritage, Community Involvement and Partnership, and Education and Outreach. In addition the document includes two pages providing more in-depth description of the accomplishments of each marine sanctuary that year and the sanctuary's plans for the following year (National Marine Sanctuary Program, 2006; National Marine Sanctuary Program, 2011). The second document, the *National Marine Sanctuary Condition Report*, is focused on individual marine sanctuaries. This document has a standard format shared between the marine sanctuaries. This document begins with a national marine sanctuary condition summary table containing the 17 system questions, the rating, the basis for judgement, description of findings, and the response from sanctuary management. It follows with a description of the site with a focus on water, habitat, living resources and maritime archaeological resources; pressures on the sanctuary, such as commercial fishing and shipping; state of the sanctuary resources, focusing once again on water, habitat, living resources and maritime archaeological resources; and finally the response to pressures (Gitings, Tartt, & Broughton, 2013).

The Performance Evaluation Manual results are published in the *Annual Progress Report* and summarized in the *State of the Sanctuary Report*. The Annual Progress Report looks at each program performance measure in-depth. A target table with the year, targets and actual accomplishments tracks progress up to the fiscal year in review. The table is followed by the status of the program performance and measure, explanation for the current status, a discussion of current progress and a disposition for the performance

measure (Office of National Marine Sanctuaries, 2009). The *State of the Sanctuary Report* is a two page document that is published annually for each individual marine sanctuary. This document briefly introduces the marine sanctuary highlights some of the accomplishments for that year, lists some of the plans for the future and lists the members of the Marine Sanctuary Advisory Council (National Marine Sanctuary, 2006; National Marine Sanctuary, 2011).

5.2 New South Wales Marine Parks

The province of New South Wales in Australia is home to six multiple-use marine parks, 12 aquatic reserves, and 62 national parks and reserves with marine components. The marine parks: Batemans, Cape Byron, Jervis Bay, Lord Howe Island, Port Stephens-Great Lakes, and Solitary Islands, are zoned for multiple activities to occur (NSW, n.d.a). The marine parks are designated under the Marine Parks Act 1997 and managed by the NSW Department of Primary Industries staff (NSW, n.d.b).

The New South Wales Marine Park Authority was established in 1997 with the purpose of "developing and managing a representative system of marine protected areas in the coastal, estuarine and oceans waters of New South Wales" (NSW, n.d.b).

5.2.1 Strategic Framework for the Evaluation and Monitoring of Marine Parks in NSW

This framework, created by the Marine Parks Research Committee provides guidance on the selection of marine parks, designating boundaries, park evaluation, establishing research programs and reporting information in a very general flexible manner (NSW Marine Parks Research Committee, 2004).

The framework recommends that all marine parks possess a core monitoring program that looks at management decisions and their ability to meet the park's primary objectives plus additional research projects covering a wide spectrum; from ecological, social or economic impacts to permitted activities to basic marine biology. To guide this process, the framework states that each marine park should have a scientific program detailing proposed research for a one to three year time frame with funding arrangements. There is a generic format or template for these research plans created by the Marine Parks Research Committee (NSW Marine Parks Research Committee, 2004).

The key categories upon which the framework recommends marine parks to focus on are: biodiversity and ecological processes, indigenous and non-indigenous culture and heritage; ecologically sustainable use, specific environmental impacts, and socio-economic impacts. The framework also provides some generic tips for monitoring such as, utilizing the BACI design (Before-After-Control-Impact), adequate replication and the avoidance of pseudo-replication (NSW Marine Parks Research Committee, 2004).

The framework summarizes monitoring into four tasks: (1) conduct detailed habitat mapping; (2) design and initiate monitoring programs (ecological and socio-economic) once some plans are adopted; and (3) establish a Marine Park Monitoring Unit to coordinate and (4) undertake mapping and monitoring activities, evaluation of resulting data and recommend modifications to the management arrangements (NSW Marine Parks Research Committee, 2004).

5.2.1 Strategic Research Framework

While the research framework for 2010-2015 is just that, a research framework, it also provides some guidance on monitoring within New South Wales marine parks. This document lists the same five key research areas as in the framework for evaluation and monitoring and recommends that they be used for monitoring and research (NSW Government, 2010).

According to the framework the objectives of a research and monitoring program are: advice for the establishment of a comprehensive, adequate and representative system of marine parks, zoning plans, adaptive management, assessment of successfulness of management, and guidance of future research and monitoring (NSW Government, 2010).

5.2.2 Marine Park Research Work Plan

The research work plans published for each marine park for 2006-2007 possessed a standard format for describing the research and monitoring planned for the marine park. An introduction to the marine park and the purpose of the research work plan start off all documents. For each indicator or performance measure, background information, the objectives of the research, project contacts, and the key categories the project addressed that are identified in the *Strategic Research Plan* (Marine Parks Authority New South Wales, 2007)

5.2.3 Reporting Mechanisms and Documents

The principle reporting mechanisms are *Marine Park Summary of Research and Monitoring,* and *NSW Marine Parks Authority Status Report*. Summaries of Research and Monitoring are created for each marine park. This document is broken down by indicator and provides preliminary results and trends in data collected as well as plans for

that indicator or performance measure in the future (Marine Parks Authority New South Wales, 2010).

The second reporting document, *NSW Marine Parks Authority Status Report*, appears to be more focused on reporting out to the general public. This document describes the New South Wales marine parks program in general terms and then provides updates on each marine park in the following topic areas: education, information and visitor assistance; visitor infrastructure and management; surveillance and enforcement; permit administration; consultation and planning; and research and monitoring. The information regarding research and monitoring programs is provided in a table and covers social, economic and ecological data collection (Marine Parks Authority NSW, 2006).

5.3 Summary of Comparison of Case Studies

Table 6: Comparison of case studies

	United States	New South Wales
Reason(s) for site designation	-conservation recreational -ecological -historical -scientific -cultural -archaeological -educational esthetic	-conservation -recreational -ecological -historical -scientific -cultural -archaeological -educational -esthetic
Monitoring and evaluation frameworks	-System-wide Monitoring Framework -Performance Evaluation Manual	-Strategic Framework for the Evaluation and Monitoring of Marine Parks -Strategic Research Framework

Monitoring and evaluation documents	-Evaluation plan	-Marine Research Work Plan
Topics/areas being monitored	-Water -Habitats -Living resources -Permitting -Education -Maritime heritage resources -Public awareness -Characterization -Marine Zones -Enforcement -Volunteer -Partnership -Management Plan -Sanctuary Advisory Council -Operations -International Partnership -SHIELDS -Oceans Observing -Outreach Efficiency -Operations Efficiency	-Biodiversity and ecological processes -Indigenous and non-indigenous cultural and heritage -Ecologically sustainable use Specific environmental impacts -Socio-economic impacts
Reporting mechanisms	-Our National Marine Sanctuaries Accomplishments -National Marine Sanctuary Condition Reports -Annual Progress Report -State of the Sanctuary Report	-Marine Park Summary of Research and Monitoring -NSW Marine Parks Authority

5.4 Lessons to be applied to *Oceans Act* MPAs national monitoring template

· Flexible monitoring frameworks to be applied to a variety of designations: Both the American marine sanctuaries and the New South Wales marine parks have sites designated for a variety of reasons which is similar to the *Oceans Act* MPAs in

Canada. Despite the individuality of each site, each conservation program created a general framework with indicators/performance measures which are applicable to all sites. This leads to the conclusion that in spite of the differences between the *Oceans Act* MPAs, a flexible monitoring program can be created to adapt to the individuality of each site.

- Pre-planned reporting mechanisms for different purposes: Both the marine sanctuary and the marine park programs had multiple reporting strategies designed for the sharing of the information from the monitoring and evaluation. The format of the monitoring and the reporting were directly related in both programs therefore when designing the monitoring plan template for the *Oceans Act* MPAs current reporting and the potential for new reporting will be considered.
- Standard indicators/performance measures applicable to all sites: By keeping ecological and socio-economic indicators broad and standardizing the governance indicators, it is possible to apply the same group of indicators to diverse group of marine protected areas.
- Ecological, social, governance, and economic monitoring and evaluation: Both of these monitoring and evaluation programs have included ecological, social, governance and economic indicators. These advanced monitoring programs suggest that the same could be done for *Oceans Act* MPAs.
- A consistent template used by sites being monitored: Using a consistent template would be very useful for *Oceans Act* MPAs where MPAs are managed by regional offices. The templates were flexible enough to include details about the specific sites but ensured that each site is providing similar information and levels of detail.

- Adaptive process for the monitoring and evaluation plan: Both these programs recognize the importance of reviewing and updating monitoring and evaluation plans. This should be included in the monitoring plan template for the *Oceans Act* MPAs, as relevance and efficiency of indicators are likely to change over time requiring compensation. The time frame for review will be dependent on the frequency of data collection for monitoring and the frequency of site evaluation.
- Generalize ecological information for reporting and evaluation: While it appears that indicators and protocols were site specific in the national marine sanctuaries program, through the use of the systems questions, trends were able to be generalized allowing for an ease of reporting and evaluation. This is also possible for the *Oceans Act* MPAs.

These case studies were very useful as they confirmed many assumptions from the literature of monitoring and evaluation of MPAs in developed countries and provided some new ideas to be incorporated into the national monitoring plan template for Canada's *Oceans Act* MPAs.

CHAPTER 6: RESULTS

6.1 Recommended Indicators for *Oceans Act* MPAs

The following series of tables are to be distributed to *Oceans Act* MPA practitioners to aid in the development of monitoring programs for MPAs designated across Canada. The tables include indicators and/or evaluation scorecards for ecological, governance, socio-cultural and socio-economic aspects of *Oceans Act* MPAs. The tables also recommend when monitoring and evaluation should occur, which indicators are relevant for which sites, the rationale behind the indicator, and the link to the Oceans Performance Management Strategy (OPMS). OPMS is an evaluation process for the entire Oceans Program and is an internal reporting document. The linkages to OPMS are highlighted as finding these connections was important to DFO National Headquarters.

HOW TO USE THIS TOOLKIT: The following tables can be used for the design of a monitoring program and/or an evaluation of management effectiveness for *Oceans Act* MPAs. Both monitoring and evaluation are included in these tables because of their close relationship.

Theme: Indicates the broad category that the indicator is related to

Indicator Statement: Describes what the indicator will be monitoring. It should be noted that the following recommendations for ecological aspects does not include specific ecological indicators, instead the focus is on general evaluation scorecards for consistency on reporting at sites across Canada.

Recommended for: The recommendations are based on information located in the *Oceans Act*, site objectives, management actions, and general requirements for effective management. All indicators should be considered by all sites when designing their monitoring plan. Furthermore this is not a definitive list of indicators; it is a starting point and other indicators may need to be developed specifically for each individual site.

Monitoring: Provides brief information concerning how the monitoring should be done. While some adaptation of procedure may be necessary for the individual site, please attempt to stay as consistent as possible with the procedure described in the tables as it will increase consistency in national reporting.

Evaluation: This section has the evaluation question, a scorecard to assess effectiveness in this area, a recommended frequency for evaluation, "trigger" which is the score that requires management action, and in some cases additional methods for completing the evaluation. Evaluations are recommended for every 3-5 years corresponding with the re-evaluation of management plans.

Additional information: This section briefly described the rationale behind the indicator and links it to the Oceans Performance Measurement Strategy (OPMS)

Indicators that DFO National Headquarters has identified as potentially being of use for the program

Table 7: Ecological Indicators

Theme	Indicators	Recommended for:	Monitoring	Evaluation	Additional Information
Habitat	Specific to the individual MPA[1]	All MPAs	**Responsibility:** Specific to individual indicator **Data Source(s):** Specific to individual indicator **Methods:** The data collected from all ecological indicators relevant to this theme should be summarized and encapsulated in this evaluation scorecard. **Frequency of data collection:** Specific to individual indicator	Are habitats adequately protected within the MPA?[2] **Scorecard Rank (0-3):** No trend in data (N/A); The habitat is not being monitored (0); The condition of the habitat has decreased (1); The condition of the habitat has remained constant (2); The condition of the habitat has improved (3) **Frequency**: 3-5 years[3] **Trigger:** 1 and lower	**Rationale**: Indicator is linked to site designation criteria which directly influences conservation objectives. **Link to OPMS**: Percentage of healthy areas

[1] Indicator statements are not provided within the table as ecosystem indicators are specific to individual sites.

[2] The ecological evaluation questions and scorecards are intended to allow for the rolling up of site-specific ecosystem indicators for national reporting.

[3] 3-5 years is intended to correlate with the re-evaluation of management plans which is dependent on individual MPAs.

Productivity	Specific to the individual MPA	All MPAs	**Responsibility:** Specific to individual indicator **Data Source(s):** Specific to individual indicator **Methods:** The data collected from all ecological indicators relevant to this theme should be summarized and encapsulated in this evaluation scorecard. **Frequency of data collection:** Specific to individual indicator	Is ecosystem productivity adequately protected within the MPA? **Scorecard Rank (0-3):** No trend in data (N/A); The productivity is not being monitored (0);The status of productivity has decreased (1); The status of productivity has remained constant (2); The status of productivity has improved (3) **Frequency**: 3-5 years **Trigger:** 1 and lower	**Rationale**: Linked to site designation criteria which directly influences conservation objectives. **Link to OPMS**: Percentage of healthy areas
Biodiversity	Specific to the individual MPA	All MPAs	**Responsibility:** Specific to individual indicator **Data Source(s):** Specific to individual indicator **Methods:** The data collected from all ecological indicators relevant to this theme should be summarized and encapsulated in this evaluation scorecard. **Frequency of data collection:** Specific to individual indicator	Is biodiversity adequately protected in the MPA? **Scorecard Rank (0-3):** No trend in data (N/A); The biodiversity is not being monitored (0);The status of the biodiversity has decreased (1); The status of biodiversity has remained constant (2); The status of biodiversity has improved (3) **Frequency**: 3-5 years **Trigger:** 1 and lower	**Rationale**: Linked to site designation criteria which directly influences conservation objectives. **Link to OPMS**: Percentage of healthy areas

Human Pressures	Specific to the individual MPA	All MPAs	**Responsibility:** Specific to individual indicator **Data Source(s):** Specific to individual indicator **Methods:** The data collected from all ecological indicators relevant to this theme should be summarized and encapsulated in this evaluation scorecard. **Frequency of data collection:** Specific to individual indicator	Has the MPA adequately reduced human pressures on the site? **Scorecard Rank (0-3):** No trend in data (N/A); Human pressures not being monitored (0); Human pressures within the site are increasing and interfering with goals and objectives of the site (1); Human pressures within the site are remaining constant and are interfering with goals and objectives of the site (2); Human pressures within the site are adequately controlled to meet goals and objectives of the site (3) **Frequency**: 3-5 years **Trigger:** 1 and lower	**Rationale**: MPAs minimize human pressures in order to conserve and protect habitat, productivity, and biodiversity. **Link to OPMS:** Percentage of healthy areas
Target Species	Specific to the individual MPA	Tarium Niryutait Basin Head Eastport Gilbert Bay	**Responsibility:** Specific to individual indicator **Data Source(s):** Specific to individual indicator **Methods:** The data collected from all ecological indicators relevant to this theme should be summarized and encapsulated in this evaluation scorecard. **Frequency of data collection:** Specific to individual indicator	Are target species adequately protected within the MPA? **Scorecard Rank (0-3):** No trend in data (N/A); Target species not being monitored (0); Target species within the site are decreasing (1); Target species within the site are remaining constant (2); Target species within the site are increasing (3) **Frequency**: 3-5 years **Trigger:** 1 and lower	**Rationale:** Linked to site designation criteria which directly influences conservation objectives. **Link to OPMS:** Percentage of healthy areas

Table 8: Governance Indicators

Theme	Indicator Statement	Recommended for:	Monitoring	Evaluation	Additional Info
Stakeholder Involvement	**Composition of Advisory Committee**				
	Percentage of stakeholders on Advisory Committee membership list that are identified in terms of reference	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** Membership list, terms of reference **Methods**: Compare the membership list to the terms of reference and identify any gaps between the two documents as well as any new relevant stakeholders. Use the terms of reference as the denominator and the number of representative stakeholders as the numerator then multiple by 100% **Frequency of data collection**: Annually **Target:** 100%	Is the current Advisory Committee membership composition appropriate for the MPA's purpose and uses (Koropatnick, 2009)? If not, what should this membership be? **Scorecard (Rank 0-3):** No Advisory Committee (0); Not appropriate and contains many gaps (1); Not entirely appropriate but contains only 1 or 2 gaps (2); Entirely appropriate (3) **Additional Methods:** Use trends from monitoring data. Also provide current Advisory Committee members with a short survey to determine if they believe the composition is appropriate. Use activity proposals, knowledge of managers, and knowledge of Advisory Committee to identify gaps, challenges and opportunities associated with membership. **Frequency:** 3-5 years **Trigger:** 2 or lower	**Rationale**: Ensure that relevant/important sectors and/or groups are being engaged in the management. Gaps in stakeholder engagement could result in diminished compliance and relevant stakeholders may change over time. **Link to OPMS**: Percentage of meetings achieving quorum
	Opportunities for involvement				

	Percentage of opportunities for stakeholder involvement, committed to in work plans or management plans, which occurred.	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** stakeholder survey, records/table of meetings, email communication, events and activities involving interaction, and annual report **Methods**: Compare the documents describing stakeholder involvement with commitments. Use the number of involvement opportunities committed to as the denominator and the number that actually occurred as the numerator then multiple by 100% **Frequency of Data Collection:** Annual **Target:** 100%	Do MPA managers create sufficient opportunities to interact with all relevant stakeholders to meet management requirements (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No opportunities (0); Opportunities occurred but not sufficient/some of relevant stakeholders involved (1); Somewhat sufficient but more needed to fully meet requirements/many relevant stakeholders participate (2); Sufficient opportunities and adequate participation from relevant stakeholders (3) **Additional Methods**: In addition to looking at trends in monitoring data, provide short stakeholder surveys to determine if stakeholders believe there are sufficient opportunities for involvement. If they do not, consider increasing the number of opportunities committed to annually. **Frequency:** 3-5 years **Trigger:** 2 or lower	**Rationale**: Open lines of communication between managers and stakeholders increase compliance and allow for adaptive management. Commitment as an objective or management action. **Link to (Oceans Performance Measure Strategy) OPMS**: Percentage of meeting achieving quorum
	Utilization of stakeholder involvement opportunities				

	Percentage of stakeholder participation in opportunities for involvement	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** attendance documents, stakeholder surveys, managers' knowledge, meeting documents **Methods:** Use attendance documents to determine if stakeholders are participating in the provided opportunities. Record information as a percentage: the denominator will be the total number of stakeholders times the number of opportunities for involvement. The numerator will be the total attendance of stakeholders in meetings (etc.) and multiply by 100%. MPA managers need to attempt to be subjective and comment on level of contribution of stakeholders when they attend involvement opportunities and if the same stakeholders are regularly attending meetings (etc.) and engaging. (Should be completed by more than one manager to increase objectivity) **Frequency of data collection**: Annual **Target:** 100% attendance and high level of participation when in attendance	Do stakeholders use the opportunities provided by MPA managers to adequately engage in management activities (Koropatnick, 2009)? If not, what can be done to increase participation? **Scorecard (Rank 0-3):** No opportunities (N/A); Stakeholders have not used opportunities (0); Some key stakeholders participate but most do not (1); Many participate but more is needed to meet management needs (2); Level of engagement is sufficient (3) **Additional Methods:** Stakeholder surveys can be used to determine why the current level of engagement is occurring and to determine if stakeholders believe they are contributing enough to the management of the MPA. **Frequency:** 3-5 years **Trigger:** 1 or lower	**Rationale**: Providing opportunities that are not being used is a waste of resources and may be an indication that the form of interaction is not appropriate for stakeholders or discontent with management actions. **Link to OPMS**: Percentage of meetings achieving quorum
Education,	**Quantity of education materials and outreach activities**				

stewardship and outreach	Percentage of educational materials and outreach activities, committed to in work plans, which were produced.	Basin Head Bowie Seamount Eastport Endeavour Gilbert Bay	**Responsibility**: MPA Practitioner **Data Source(s):** materials and activities, website information, email account **Methods**: List the materials and activities then compare to commitments made in the annual work plan. Show as a percentage (see "Percentage of opportunities for stakeholder involvement") **Frequency of data collection**: Annually **Target:** 100%	What education, outreach and stewardship materials and/or activities have been generated during the evaluation period and are they adequate to promote public and user awareness of the MPA (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No materials/activities committed to during the evaluation period (N/A); No materials/activities generated during evaluation period (0); Materials/activities generated not adequate quantity to meet commitments (less than 50% of commitment) (1); Somewhat adequate but quality or quantity could be improved (50-90%) (2); Sufficient in quality and quantity (90-100% of commitments achieved) (3) Bonus (+1): 100% of educational material and outreach activity commitments made in the evaluation period were completed **Frequency:** 3-5 years **Trigger**: 2 or lower	**Rationale**: This is either an objective or a management action listed in all the published management plans therefore just evaluating progress on a commitment. **Link to OPMS**: Percentage of knowledge products committed to in work plans that were produced. Percentage of knowledge products and tools completed that were posted on a DFO website.
	Effectiveness of educational materials and outreach activities				

	Number of visits on MPA website and total number of MPA page views. Number of people aware of the MPA.	All MPAs	**Responsibility:** MPA Practitioner **Data Source(s):** public surveys and web statistics **A) Methods**: Graph web statistics in terms of hits per year from the time that web statistics are available. **B) Methods**: Complete public surveys (i.e. through Stats Canada, local polling agency, etc.) to determine those that are aware of the MPA(s) in question. **Frequency of Data Collection:** Web statistics should be collected annually and added to graph. Public surveys should be conducted every 3 to 5 years and also graphed **Target:** __% increase in web hits and __% increase in public awareness of MPA (make specific to individual MPA)	How effective is the education/outreach program in engaging individuals to learn about MPAs (Koropatnick, 2009)? **A) Scorecard (Rank 0-3):** Web statistics are not available for the website (N/A); The MPA does not have a website(0); The number of website hits per year is decreasing (1);The number of website hits per year has remained constant (2); The number of website hits per year is increasing or remaining constant (3) **Trigger:** 1 or lower **Frequency**: 3-5 years **B) Scorecard (Rank 0-3):** The number of people aware of MPA has decreased (0); The number of people aware of MPA has remained constant (2); The number of people aware of MPA has increased (3) **Trigger:** 2 or lower **Frequency**: 3-5 years	**Rationale**: Educational materials and outreach activities increase knowledge, support for conservation efforts, and compliance with MPA regulations. Commitment as an objective or management action. **Link to OPMS**: Number of visits on Oceans website and total number of page views. Percentage of knowledge products and tools completed that were posted on a DFO website.
Research,	**Research and Monitoring Utilization**				

monitoring and other permitted activities	Quantity of research and monitoring occurring in the MPA	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** Activity approvals, MPA manager's knowledge, meeting minutes concerning management decisions **Methods:** List research and monitoring activities and show connections to ecosystem monitoring plans. Identify gaps if necessary. **Frequency of data collection:** Annual	What research and monitoring is occurring in the MPA, and is it sufficient to support ecosystem monitoring plans (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No research or monitoring occurring (N/A); Research activities are conducted without consideration for objectives/management planning (0); Some research/monitoring supports objectives/planning (1): Most but not all research/monitoring supports MPA objectives/planning (2); All research/monitoring supports objectives/planning (3) **Frequency:** 3-5 years **Trigger**: 1 or lower	**Rationale**: This is either an objective or a management action listed in all the published management plans therefore just evaluating progress on a commitment. Commitment as an objective or management action.
	Quantity of quality research being produced within the MPA				

	Number of quality research publications produced through permitted activities within the MPA	Eastport The Gully Endeavour	**Responsibility**: MPA Practitioner **Data Source(s):** Activity approval documents, list of publications **Methods**: Compare the list of publications and the activity approval documents related to research and monitoring and consider the timeframe of the research. Document as a percentage. **Frequency of data collection:** Biannual **Target:** 100% of research activity approvals resulting in publications	How many scientific publications are produced from the research and monitoring occurring in the MPA per year and is the level of publication adequate given the amount of research and monitoring occurring in the MPA (Koropatnick, 2009)? **Scorecard (Rank 0-3):**No research/monitoring OR research is too new to expect publications (N/A); Regular research/monitoring but no publications (0); Publications sporadic and not sufficient (1); Publications produced regularly but not entirely sufficient given amount of activity (2); Publications sufficient given level of research and monitoring activity (3) **Frequency:** 3-5 years **Trigger**: 1 or lower	**Rationale**: Level of publication is a proxy for the quality of research being conducted within the MPA.
	Research efficiency				

	Number of conflicts, duplicate activities and unnecessary intrusions into the MPA from research and monitoring	Bowie Seamount Endeavour The Gully	**Responsibility**: MPA Practitioner **Data Source(s)**: Activity approval documents **Methods**: Compare activity approval documents related to research and determine if duplicate activities are being permitted to occur within the site. **Frequency of data collection:** 3-5 years **Target:** 0 duplication/unnecessary disturbance due to research	Are research and monitoring activities coordinated to minimize conflicts, duplicate activities and unnecessary intrusions in the area (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No research and monitoring OR no conflicts/duplicate plans have been submitted that would require coordination (N/A); No coordination attempted (0); Sometimes coordinated but conflicts/duplication still occurs (1); Often coordinated but conflicts/duplication may still occur (2); Coordinated wherever possible to minimize conflicts, duplications, and unnecessary intrusions (3) **Frequency:** 3-5 years **Trigger**: 2 or lower	**Rationale**: Duplicate research activities are sources of unnecessary disruption of MPAs and wasted resources.
	Comprehensiveness of activity approval process				

	Number of gaps and inconsistencies with the activity approval process	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):**Activity approval process documents, information from MPA managers **Methods**: Use activity approval documents and knowledge of MPA managers to determine if current process is adequate or needs updating immediately or in the near future. Identify problems/inconsistencies and suggest improvements. **Frequency of Data Collection**: 3-5 years **Target:** 0 gaps and inconsistencies	Is the activities approval process adequate to address proponent and MPA management needs (Koropatnick, 2009)? **Scorecard (Rank 0-3):** There is no approval process for activities within the MPA (N/A); Activity approval process is not adequate to address proponent or management needs (0); Activity approval process is somewhat adequate to address proponent and management needs (2); Activity proposal is completely adequate to address proponent and management needs (3) **Frequency: Trigger**: 2 or lower	**Rationale**: Approval process should be in place to ensure that activities do not interfere with MPA objectives but uses for MPA are likely to change over time therefore the approval process should be monitored. Commitment as an objective or management action.
	Service Standards				

	Number of activity plans processed within the timelines set out in the MPA regulation	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** Activity approval process documents, information from MPA managers **Methods**: Use activity approval documents and knowledge of MPA management to determine if current process is adequate or needs updating. Identify problems/inconsistencies and suggest improvements **Frequency of Data Collection**: Annual **Target:** 100%	How many activity proposals have been processed in the regulatory time frame? **Scorecard (Rank 0-3):**There have been no activity proposals in the monitoring period (N/A); None of the activity proposals were completed in the regulatory timeframe (0); 0-50% of activity proposals processed in regulatory time frame (1); 50-80% of activity proposals were completed in the regulatory timeframe (2); 80-100% of activity proposals were processed in regulatory timeframe Bonus (+): 100% of activity proposals in valuation period were processed in regulatory timeframe **Frequency:**3-5 years **Trigger**: 2 or lower	**Rationale**: Timeframes for the activity approval process is provided to proponents with the expectation that the information will be processed in that time period. Commitment as an objective or management action.
Enforcement	**Surveillance**				

and compliance	Number of surveillance activities	All MPAs	**Responsibility:** MPA Practitioner **Data Source(s):** Information from MPA managers, surveillance and enforcement partners (number of patrol hours, usage of surveillance and enforcement partners (number of patrol hours, usage of surveillance/compliance monitoring, technologies, etc.) **Methods**: Identify gaps and new opportunities. Note of you have addressed gaps/implemented new opportunities **Frequency of data collection**: Annual **Target:** __ number of surveillance activities per year (will be individual to each MPA and dependent on the anthropogenic risks in the area)	Is MPA surveillance coverage adequate relevant to anthropogenic risks to the site? (Koropatnick, 2009) **Scorecard (Rank 0-3):** No surveillance activity (0); Inadequate coverage for enforcement and compliance relevant to risks (1); Somewhat sufficient for enforcement and compliance relevant to risks (2); Sufficient for enforcement and compliance relevant to risks (3) **Frequency:** 3-5 years **Trigger**: 2 or lower	**Rationale**: Adequate surveillance is imperative to enforcement and compliance but will be relative to anthropogenic risks therefore a standard number of patrols is not provided in scorecard.

	Enforcement and compliance mechanisms				
	Enforcement and compliance efforts	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** Information provided by MPA managers and surveillance and enforcement partners **Methods**: List incidences of non-compliance, actions taken, and gaps. **Frequency of data collection**: Annual	Are existing enforcement and compliance efforts adequate to support goals and objectives of the MPA (Koropatnick, 2009)? **Scorecard (Rank 0-3):** Existing enforcement and compliance efforts are insufficient to support goals/objectives (0); Existing enforcement and compliance efforts are somewhat support goals/objectives but many areas could be improved (1); Enforcement and compliance efforts mostly support goals/objectives but some areas could be improved (2); Existing enforcement and compliance efforts are sufficient to support goals and objectives (3) **Frequency**: 3-5 years **Trigger**: 2 or lower	**Rationale**: Evaluates enforcement action post-detection. Compliance with regulations is essential to an effective MPA and is not possible without enforcement mechanisms in place and in use if necessary.
	Interagency/intersectoral collaboration				

	Interagency/ Intersectoral collaboration	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** MOUs, meeting minutes/reports, other forms of communication **Methods**: Provide evidence of formal or informal intersectoral/interagency mechanisms **Frequency of data collection**: Annual	Are interagency/intersectoral communication, planning, and procedural mechanisms adequate to support MPA enforcement and compliance (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No interagency/intersectoral communication, planning and procedural mechanisms available to support enforcement and compliance (0); Communications occurred but few planning/procedural mechanisms exist (1); Communication, planning and procedural mechanisms exist but could be improved to fully support enforcement and compliance (2); Interagency/intersectoral communication, planning, and procedural mechanisms are sufficient to support enforcement and compliance(3) **Frequency:** 3-5 years **Trigger**: 1 or lower	**Rationale**: While DFO has overall responsibility for ensuring that conservation measures are respected and enforced, a coordinated inter-agency approach to enforcement is generally required for MPAs. If the lines of communication are not open between agencies and/or sectors, MPA effectiveness may be reduced.
	User and non-governmental surveillance				

	Number of illegal activities occurring within the MPA reported by users and/or non-governmental partners	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** See enforcement and compliance partners and/or databases , surveys of users and/or non-governmental partners **Methods**: List situations were reporting occurred and complete surveys of users and/or non-governmental partners to assess comfort level with site regulations, reporting infractions, and methods for reporting available at specific site **Frequency of data collection**: Annual and surveys should occur every 3-5 years	Do users and other non-government partners participate in surveillance activities (Koropatnick, 2009)? **Scorecard (Rank 0-3):** Users/non-governmental partners are not expected to participate (N/A); No users or non-governmental partners participate in surveillance activities (0); Users and/or non-governmental partners rarely participate (1); Users/non-governmental partners sometimes participate (2); Users/ non-governmental partners regularly participate (3) **Frequency:** 3-5 years **Trigger**: 1 or lower	**Rationale**: Especially relevant for offshore sites where surveillance and monitoring are challenging and expensive as well as coastal sites with community involvement or specifically designated surveillance programs.
Capacity and	**Personnel**				

management	Adequacy of personnel to support MPA management	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s)**: Work plans, information from MPA manager **Methods**: Provide a table or list of personnel (staff / volunteers/interns /contractors) and estimated hours contributed per year by each during the evaluation period. **Frequency of data collection**: Annual	Are there adequate personnel to support MPA management (Koropatnick, 2009)? **Scorecard (Rank 0-3):** Personnel inadequate for essential regulatory management activities (0); Personnel are somewhat adequate for essential regulatory activities (1); Personnel are adequate for essential regulatory activities but more needed to fulfill all aspects of management (2); Personnel are adequate for all aspects of MPA management (3) **Frequency:** 3-5 years **Trigger**: 2 or lower	**Rationale**: Adequate personnel have adequate training and are highly skilled in order to complete work. Without adequate personnel, MPA will not be as effective as possible.
	Budget				

	Adequacy of budget allotted to MPA management staff to meet program commitments	All MPAs	**Responsibility**: MPA Practitioner Data Source(s): Budgetary documents, information from MPA manager **Methods**: Provide the annual budget allotted and spent for each fiscal year during the evaluation period, and estimated shortfall, if applicable **Frequency of data collection**: Annually	Is the annual budget allotted to MPA management staff adequate to meet program commitments (regulatory requirements, monitoring, etc.) (Koropatnick, 2009)? **Scorecard (Rank 0-3):**No funding for MPA (0); Budget inadequate and serious constraint on capacity (1); Budget acceptable but could be improved to fully achieve effective management (2); Available budget is sufficient (3) **Frequency:** 3-5 years **Trigger:** 2 or lower	**Rationale**: Adequate funding to complete managerial commitments is necessary to maximize the effectiveness of an MPA. **Link to OPMS**: Budget related reporting (Section 5)
	Management Commitments				
	Effectiveness of achieving management commitments	All MPAs	**Responsibility:** MPA Practitioner **Data Source(s):** Annual work plan, managers' knowledge **Methods:** Table of management commitments classified as: complete, on track, delayed, incomplete (Time-limited); on-going, dormant (long-term) **Frequency of data collection:** Annually **Target:** 100% of management commitments completed	Are annual management commitments completed, on track for completion, or otherwise addressed by MPA managers during the evaluation (Koropatnick, 2009)? **Scorecard (Rank 0-3):** 0-24% of commitments addressed (0); 25-49% of commitments addressed (1); 50-74% of commitments addressed (2); 75-100% of commitments addressed (3) Bonus (+1): 100% of commitments addressed **Frequency:** 3-5 years **Trigger**: 2 or lower	**Rationale:** Provides information on whether MPA managers are able to effectively manage projects and programs by making realistic commitments and following through with deliverables. **Link to OPMS:** Percentage of objectives achieved (…MPA plans…)
Conflict	**Resource Conflict**				

Resolution	Level of resource conflict	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** Manager's knowledge **Methods**: List the conflicts and rate severity. Create a matrix/table of conflicts: issue, stakeholders involved, time period, intensity, scale, ongoing/managed/resolves, and how conflict was managed/resolved. **Frequency of data collection:** 3-5 years	Have user conflicts been managed or reduced (Pomeroy et al., 2004)? **Scorecard (Rank 0-3):** No user conflicts occurred (N/A); User conflicts occurred but have not been addressed (0); User conflicts occurred and were somewhat addressed (1); User conflicts occurred and were mostly addressed (2); All user conflicts were addressed (3) **Frequency**: 3-5 years **Trigger**: 2 or lower	**Rationale**: "In the context of an MPA, [conflict] usually means that there is a group or groups whose interests are in opposition to those of the MPA" (Pomeroy et al., 2004).

Table 9: Socio-cultural Indicators

Theme	Indicator Statement	Recommended for:	Monitoring	Evaluation	Additional Info
Contribution to Management	**Traditional Knowledge**				
	Amount of utilization of traditional knowledge in MPA management decisions	Tarium Niryutait Bowie Seamount	**Responsibility**: MPA Practitioner **Data Source(s):** manager's knowledge, management documents, stakeholder survey **Methods**: Examine documents and experiences of cases of TEK utilization. Use a stakeholder survey to determine if, from their perspective, the TEK provided has been utilized and/or sufficiently considered. Quantify the number of situations in which TEK was used during the monitoring period and provide relevant comments. **Frequency of data collection**: Annually	Has traditional ecological knowledge (TEK) influenced management decision-making during the evaluation period (Koropatnick, 2009)? **Scorecard (Rank 0-3):** No TEK has been shared during evaluation period (N/A); Available TEK is not considered during management decision-making (0); Available TEK is occasionally considered during management decision-making (1); TEK regularly influences management decision-making but additional effort is needed to fully utilize this resource (2); TEK is adequately considered during management decision-making (3) **Additional Methods**: Include information pertaining to the challenges and opportunities of traditional knowledge utilization in MPA site management **Frequency:** 3-5 years **Trigger**: 1 or lower	**Rationale:** TEK can be a valuable information resource. If it is available, it should be considered along with other information sources for management decision making.
	Community tolerance for illegal activities				

	Level of community tolerance for illegal activities within the MPA	Musquash Estuary Eastport Gilbert Bay Tarium Niryutait	**Responsibility**: MPA Practitioner **Data Source(s):** See ___ **Methods**: Reports from community reporting methods (hotlines, calls to Fisheries officers, etc) should be examined to determine if community members are reporting illegal activities occurring within MPA. Distribute surveys to local communities to determine their knowledge of the MPA regulations **Frequency of data collection**: 3-5 years	Does the community have a low tolerance for illegal activities and report illegal actions to authorities (Hinch & De Santo, 2011; Stern, 2006)? **Scorecard (Rank 0-3):** Illegal actions are the norm/widely accepted in community (0); Mixed acceptance in the community for illegal activities (1); Low tolerance but rarely acted upon (2); Low tolerance or otherwise acted upon (3) **Frequency:** 3-5 years **Trigger:** 2 or lower	**Rationale**: Relevant for coastal/inshore sites where reporting by users/local communities is encouraged and/or has specific programs community monitoring program (i.e. Musquash Watch).
	Indigenous Contribution to Management				
		All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** interview with MPA manager, stakeholder survey **Methods**: Examine data sources for evidence of indigenous contribution to management decisions. Identify challenges and opportunities. **Frequency of data collection:** 3-5 years **Target:**	Do Aboriginal people who regularly use the MPA have input into management decisions (Koropatnick, 2009)? **Scorecard (Rank 0-3):** Aboriginal people are not known to regularly use the MPA (N/A); Aboriginal people who regularly use MPA have very little input into management decisions (1); Aboriginal people regularly use MPA, have input but involvement could be improved (2); Aboriginal people who regularly use the MPA have sufficient input into management decisions (3) **Frequency: Trigger**: 2 or lower	**Rationale:** Contribution to management is an important source of engagement that increases compliance with MPA regulations
	Local Contribution to Management				

		Musquash Estuary Eastport Bowie Seamount	**Responsibility**: MPA Practitioner **Data Source(s):** interview with MPA manager, stakeholder survey **Methods**: Examine data sources for evidence of local community contribution to management decisions. Identify challenges and opportunities **Frequency of data collection:** 3-5 years	Do local communities and users of the sites have input to management decisions (Stolton et al., 2007; Koropatnick, 2009)? **Scorecard (Rank 0-3):** Local communities and site users have very little input into management decisions (1); Local communities and site users have input but involvement could be improved (2); Local communities and site users have sufficient input into management decisions (3) **Frequency: Trigger**: 2 or lower	**Rationale:** Contribution to management is an important source of engagement that increases compliance with MPA regulations
Cultural	**Traditional harvest of marine resources**				

Benefits	Amount of traditional harvest occurring within the MPA	All MPAs	**Responsibility**: MPA Practitioner **Data Source(s):** MPA regulations, stakeholder survey **Methods**: Average results from the stakeholder survey and compare with non-traditional harvesting data for changes in stocks. **Frequency of data collection**: Annually	Does the MPA contribute to traditional harvesting? **Scorecard (Rank 0-3):** Traditional harvest/access has been considered but Aboriginal people do not regularly use the MPA (N/A); Traditional harvest cannot occur within the MPA due to diminished resources (0); Traditional harvest within the MPA has decreased (1); Traditional harvest within the MPA has remained constant (2); Traditional harvest within the MPA has increased (3) **Additional Methods**: May be useful to use this as an opportunity to poll communities about other aspects of traditional harvest (Do they find the regulations adequate? Are there changes in there harvesting practices? What is their perspective on the stock they are harvesting- increasing, decreasing, etc.)? **Frequency:** 3-5 years **Trigger:** 1 or lower	**Rationale**: If traditional harvest is increasing this could be a sign of increased species abundance or harvesting effort both of which are important to management. It is important to include other questions in the survey to attempt to differentiate between the two.
Perceptions	**User attitudes and perceptions**				

and Attitudes	Percentage of user attitudes and perceptions that are favourable		**Responsibility**: MPA Practitioner **Data Source(s):** MPA user surveys, MPA email account (complaints and praise may be shared with practitioners electronically), other sources of information of user experiences **Methods**: Quantify the percentage of user attitudes and perceptions that are favourable **Frequency of data collection**: 3-5 years **Target**: 80% of user attitudes and perceptions favourable	What are the attitudes and perceptions of users and their experiences? **Scorecard (Rank 0-3):** Perceptions mostly unfavourable (0-45% favourable responses) (0); Perceptions balanced between favourable and unfavourable (45-55% favourable responses) (1) Perceptions mostly favourable (55-80% favourable responses) (2) Perceptions overwhelmingly favourable (80-100% favourable responses) (3) **Frequency**:3-5 years **Trigger**: 1 or lower	**NOTE**: This indicator can be adjusted to focus on topics specific to the MPA, (e.g., attitudes/perceptions of MPA regulations, experiences in the MPA). **Rationale**: If MPA users are dissatisfied with aspects of management of the MPA, it could be a source of reduced compliance and is also an opportunity to increase service to site users. Finally, it might be an indication that public education and awareness of the MPA is insufficient and may require more attention in the future.

Table 10: Socio-economic Indicators

Theme	Indicator Statement	Recommended for:	Monitoring	Evaluation	Additional Info
MPA Uses	**Fishing**				
	Changes in catch per unit effort (CPUE) in the vicinity of the MPA	All MPAs	**Responsibility:** MPA Practitioner **Data Source(s):** logbooks, fishing effort, landings **Methods:** Plot changes in landings and/or fishing effort over time. Make notes of significant changes in the fisheries each (i.e. changes in technology, increases in quota, etc.) **Frequency of data collection:** Add to graph annually	Has the MPA had an effect on fishing and other harvesting opportunities overall (i.e. both within the MPA and the surrounding area)? **Scorecard (Rank 0-3**): No fishing occurring within the MPA (N/A); The protected area has reduced CPUE in the general vicinity (0); The protected area has had no net effect on CPUE the general vicinity (1); The protected area has maintained CPUE in the general vicinity (2); The protected area has improved CPUE in the general vicinity (3) **Trigger**: 0 **Frequency**: 3-5 years	**Rationale**: Fishing can benefit from MPAs through protection of habitat, protection of juveniles/nurseries, and the spillover effect (adult fish moving outside of the MPA). With the decline of fisheries stocks around the world maintaining landings from an area should be considered a success.
	Recreational Use and Visitation				

	Number of visitors to the site for recreational use	Musquash Basin Head Eastport	**Responsibility:** MPA Practitioner **Data Source(s):** Number of user-days, number of site visits, visitor surveys, types of use occurring within MPA **Methods**: Plot changes in number of user-days, number of site visits, and types of use occurring within the MPA over time. Use visitor surveys to find out more information about how the site is being used. **Frequency of data collection:** Add information pertaining to user-days, site visits, and types of use to graph annually. Visitor surveys can occur and/or be interpreted every 3-5 years.	Do the MPA and its surrounding area provide opportunities for use and visitation for recreational purposes (e.g. recreational fishing, boating, diving, whale-watching, etc.)? **Scorecard (Rank 0-3):** The MPA and surrounding area does not provide recreational opportunities due to site location (isolated) or sensitivity to anthropogenic activities (low carrying capacity) (N/A); The MPA and its surrounding area does not provide opportunities for recreational use and visitation (0); The MPA and its surrounding area provides recreational opportunities with no consideration for site carrying capacity (1); The MPA and its surrounding area provides recreational opportunities with regulations to minimize impacts of recreational activities (2); The MPA and its surrounding area provides recreational opportunities with regulations to minimize impacts of recreational activities and regular enforcement (3) **Trigger:** 1 or lower **Frequency:** 3-5 years	**Rationale**: Often MPAs are protecting sites that are unique, have high biodiversity, or protect charismatic species. While these areas were in existence prior to becoming MPAs, designation increases public awareness/education and therefore may result in more visitation, tourism opportunities and associated supporting industries which could provide an economic benefit to local communities which will be monitored with the indicator. The evaluation scorecard focuses more on providing the economic benefit to local communities while also considering conservation goals and objectives through environmental consideration.
Ecosystem	**Protection of ecosystem goods and services**				

Goods and Services	Specific to the individual MPA (supporting, provisioning, regulation, and cultural)	All MPAs	**Responsibility:** **Data Source(s):** **Methods:** **Frequency of data collection:**	Has the MPA adequately protected ecosystem goods and services in the site? **Scorecard Rank (0-3):** No trend in data (N/A); Ecosystem goods and services are not being monitored (0); Ecosystem goods and services within the site are decreasing (1); Ecosystem goods and services within the site are remaining constant (2); Ecosystem goods and services within the site are increasing (3) **Frequency**: 3-5 years **Trigger:** 1 and lower	**Rationale:** Some ecosystem goods and services will be covered in other ecological, socio-economic, and socio-cultural indicators. By compiling all those into one score a more holistic view of how the site is benefiting humans is achieved. Furthermore, it provides a category for ecosystem goods and services not covered in other sections. **Link to OPMS:** Percentage of healthy areas

6.2 Relationship between Objectives and Indicators

The following table shows the relationship between the recommended indicators and the site objective or management action identified in the individual site management plan. As can be seen in the table of recommended indicators, some indicators are recommended for all sites while other are specific to other sites. This is to ensure that resources are being utilized as effectively by only monitoring aspects of the MPA that are relevant to each site. In some cases, some indicators may not have objectives or management actions relevant at particular sites but still be relevant to those sites, therefore all the recommended indicators should be considered by the DFO staff creating MPA monitoring programs.

Table 11: *Oceans Act* MPAs Objectives and Indicators

	MPA	Objective/Management Action	Indicators
GOVERNANCE Stakeholder Involvement	Basin Head	To ensure the participation of interested and affected stakeholders in the operation of the MPA	Opportunities for involvement *Composition of Advisory Committee* *Utilization of opportunities*
	Bowie Seamount	Collaborative relationships and open sharing of information and knowledge will contribute to the conservation and protection of the MPSA	
	Eastport	To ensure participation of interested and affected stakeholders and the overall management of the resource	
	Gully	Involve stakeholders and the general public in the management of the MPA	

GOVERNANCE Enforcement and Compliance			Surveillance Enforcement and compliance mechanisms Interagency/intersectoral collaboration
GOVERNANCE Capacity, planning and management			Personnel Budget *Management Commitments*
GOVERNANCE Education, stewardship and outreach	Basin Head	To increase the public awareness of the *Chrondus crispus*, the ecosystem of the Basin Head MPA and its conservation measures	*Quantity of educational material and outreach activities* Quality of educational materials and outreach activities
	Bowie Seamount	Increased awareness about the MPA will contribute to the conservation and protection of biodiversity, structural habitat and ecosystem function of the MPA.	
	Eastport	To increase stewardship and public awareness of lobster, the ecosystem of Eastport MPAs and marine conservation measures	
	Endeavour	Contribute to public awareness of the values of marine ecosystems and the need to protect them	
	Gilbert Bay	The promotion of public awareness, education, and support of the Gilbert Bay MPA	
	The Gully	Promote stewardship activities	
GOVERNANCE Research, monitoring and other permitted activities	Basin Head	To promote scientific research to increase the level of understanding of the Basin Head MPA	Research Utilization *Quantity/Quality of research* *Research efficiency* Activity approval
	Bowie Seamount	Effective monitoring of natural ecosystem variability and impacts related to human activities, will support the conservation and protection of the biodiversity, structural habitat and ecosystem function of the MPA	

	Eastport	To promote scientific research to increase levels of understanding regarding the East port MPA ecosystem and to help achieve the conservation objectives	
	Endeavour	Coordinate human activities to ensure responsible procedures are followed (e.g. sampling, instrument deployment and retrieval, data sharing, appropriate debris disposal)	
	Gilbert Bay	The facilitation of scientific research opportunities on the Gilbert Bay ecosystem	
	The Gully	The research objectives aim to develop a better understanding of the Gully ecosystem through research and monitoring of natural processes and the effects on human activities	
GOVERNANCE Conflict Resolution			*Level of resource conflict*
SOCIO-CULT. Contribution to Management	Bowie Seamount	Best science, Haida traditional knowledge and local knowledge will inform a comprehensive understanding of the biodiversity, structural habitat and ecosystem function of the MPA	*Traditional Knowledge Indigenous Contribution to Management Local Contribution to Management Community Tolerance Community Surveillance*
	Bowie Seamount	Cooperative management of the MPA will result in a plan that is adaptive and responsive	
SOCIO-CULT. Contribution to People			Traditional Harvest *Cultural Resources*
SOCIO-ECON. Economic Benefits	Eastport	To ensure potential economic benefits resulting from conservation of the resource are centred in the local communities of the Eastport Peninsula; and to maintain and enhance the quality of Eastport ecosystem	*Economic Benefits User Experience Spillover Effect Site Visitation*

6.3 National Monitoring Plan Template for *Oceans Act* MPAs

The monitoring plan template is to be distributed to MPA practitioners during the design of monitoring programs and filled in with indicators in the toolkit as well as indicators from other sources. The monitoring plan template is merely a recommended format in order to ensure that all sites include the same information in their monitoring plans thus increasing consistency across Canada.

***OCEANS ACT* MPA MONITORING PLAN – [MPA Name]**

INTRODUCTION

This section should include:
- *Basic information about the site*
  - *Where is it located*
  - *When was it designated*
  - *Rationale for designation*
  - *Site objectives and management actions*
- *Purpose of the monitoring plan*

SUGGESTED TEXT:

X Marine Protected Area (MPA) was designated on **DAY/MONTH/YEAR** via regulations under Canada's *Oceans Act*. **X** MPA is located **off the coast of/near….** and within the **X** bioregion[4]. The **X** MPA contributes to Canada's national network of marine protected areas and supports ecosystem-based management in the **X** region. The **X** MPA meets criteria for designating an MPA under section 35 of the *Oceans Act*, specially the

[4] Thirteen marine bioregions have been identified in Canada. It is within these bioregions that networks of marine protected areas will be developed. See National Framework for Canada's Network of Marine Protected Areas.

conservation and protection of **commercial and non-commercial fishery resources, including marine mammals, and their habitats; endangered or threatened marine species, and their habitats; unique habitats; and marine areas of high biodiversity or biological productivity**. The purpose of designating the **X** MPA is to conserve and protect **X** therefore the **goal/vision** for **X** MPA is**: X.**

The **X** Division of Fisheries and Oceans Canada, **X** Region is responsible for achieving the objectives described in the management plan. However, protection of the **X** MPA is achieved collaboratively in cooperation with other regulatory authorities. Management of the **X** MPA is also guided by the advice of relevant stakeholders, other government departments and Aboriginal groups including members of the **X MPA Advisory Committee, X Management Board and/or X LOMA Committee.**

The purpose of this monitoring plan is to outline monitoring activities in **X** MPA for the next **X** years. Monitoring is an essential component of the management cycle. Goals and objectives provide the basis for management action while monitoring provides information on the effectiveness of these actions at achieving the goals and objectives. Different indicators are used to assess progress towards achievement of the conservation objectives. The information collected through the use of the document will be used in the next management plan review, occurring in **FISCAL YEAR** and to inform ongoing management decision making. It should be noted, that while this monitoring plan was developed by the Department of Fisheries and Oceans, implementation of the activities described are dependent on available resources.

MONITORING AND EVALUATION

This section should include:

- *Basic information about monitoring and evaluation*
  - *What is and why do we do it?*
  - *International requirements*

SUGGESTED TEXT:

Monitoring, analysis and evaluation of indicators provides information on whether or not actions are producing the desired outcomes. When applied to the field of MPA management, monitoring and evaluation is needed in order to measure the effectiveness of management actions in reaching the objectives of a MPA (Pomeroy et al., 2004).

Several different types of monitoring are needed for a Marine Protected Area monitoring program. Activity monitoring can be used to determine the nature and extent of impact from human activities in the area. Compliance monitoring can ensure that regulations and legislation around human activities are being followed. Trend monitoring can be used to track changes in the ecosystem through time, and effectiveness monitoring can evaluate ability of management actions to meet conservation objective. This monitoring plan will cover all of these types of monitoring (Davies et al., 2011).

Monitoring, analysis and evaluation can serve a multitude of purposes when it comes to the management of protected areas, but the most prominent one is adaptive management. Adaptive management is a cyclic process of continually improving management policies and practices by learning from the outcomes of previously

employed policies and practices (Government of Canada, 2011). Monitoring and evaluation is also important for reporting to the public and other stakeholders, prioritizing activities, highlighting successes and influencing resource allocation (Hockings et al., 2009).

Indicators should be related to the objectives and goals of an MPA and therefore relevance is an essential factor in the indicator selection process. This monitoring plan covers ecological, governance, **socio-economic, and socio-cultura**l factors of MPA management to provide a holistic interpretation of management actions in relation to site objectives.

Canada has made numerous international and national commitments related to the monitoring and evaluation of MPAs. The following are the key domestic and global commitments:

-CBD *Programme of Work on Protected Areas* Goal 4.2 calls for the development and implementation of systems for assessing the management effectiveness of protected areas (Goal 4.2; Convention on Biological Diversity, 2004)

-Canada's *Federal MPA Strategy* highlights the need for evaluation of management effectiveness against goals and objectives as part of program implementation (Government of Canada, 2005)

-*Canada's Ocean Strategy* states that there is a need for accountability frameworks that measure progress, relevance and effectiveness (DFO, 2002)

-*Oceans Act Marine Protected Areas Policy and Operational Framework* points to the need for periodic review and evaluation of MPAs (Government of Canada, 2010)

CONSERVATION OBJECTIVES

The conservation objectives of **X** MPA are:

- _____
- _____

ECOLOGICAL INDICATORS

This section should include:

- *Why ecological indicators?*
- *Selection process*
- *Broad categories for filling in with site specific indicators (Habitat, Productivity, Biodiversity, and Human Pressures)*
- *For each indicator briefly:*
  - *Explain each indicator*
  - *Why was the indicator selected?*
  - *Linkage to conservation objectives*
  - *Referral to specific monitoring protocol in annex*

SUGGESTED TEXT:

Ecological aspects of MPA are important to monitor analyze and evaluate as the primary of objectives of *Oceans Act* MPAs are related to conservation of marine habitat and species, productivity, and biodiversity. MPAs reduce or redirect human pressures on the marine environment through the restriction of activity. Therefore, monitoring the human pressures that are occurring within the MPA is also important to provide insight into ecosystem changes and information to facilitate adaptive management.

Ecological indicators, strategies and protocols were recommended by Canadian Science Advisory Secretariat (CSAS) and adapted for the **X** MPA. **The monitoring of**

ecological indicators is often in collaboration with other federal departments, industries, or universities. X MPA has research/monitoring partnerships with: X.

The following table summarizes the ecological indicators being monitored within X MPA.

Ecological Themes	**Indicators**	**Timing [annual; 3-5 years, 5 years, etc.]**	**Organization conducting monitoring [optional]**	**Conservation Objective**
Marine Habitat				
Productivity				
Biodiversity				
Human Pressures				

GOVERNANCE COMMITMENTS/OBJECTIVES

The governance **commitments/objectives/management actions** in need of monitoring are:

- **Stakeholder involvement: [include site specific details]**
- **Education, stewardship, and outreach: [include site specific details]**
- **Research, monitoring and other permitted activities: [include site specific details]**
- **Enforcement and compliance: [include site specific details]**
- **Capacity, planning and management: [include site specific details]**

GOVERNANCE INDICATORS

This section should include:

- *Why governance indicators?*
- *Summary table of broad categories for filling in with site specific indicators*

(Stakeholder Involvement, Education, stewardship and outreach, Research, monitoring and other permitted activities, Enforcement and compliance, and Capacity, planning and management)

- *For each indicator briefly describe*
  - *Explain each indicator*
  - *Why was the indicator selected?*
  - *Linkage to objective/management actions, etc.*
  - *Referral to specific monitoring protocol in annex*

SUGGESTED TEXT:

Governance indicators monitor the way the MPA is being managed to ensure that management is as effective as possible. Governance indicators cover a variety of topics including: **stakeholder involvement; education and outreach; research monitoring and other permitted activities; enforcement and compliance; and capacity planning and management**. The **X** MPA management plan identifies governance objectives **or** even though the MPA management plan doesn't identify governance objectives, governance indicators are included here because they are inherent to the management of a protected area and are used as national reporting indicators for all *Oceans Act* MPAs.

The following table summarizes the governance indicators being monitored with X MPA.

Governance Themes	**Indicators**	**Timing**	**Governance Objective/**

			Commitment
Stakeholder Involvement	Opportunities for involvement		
Education, stewardship and outreach	Effectiveness of education materials and outreach activities		
Research, monitoring and other permitted activities	Research utilization Activity approval process Service standards		
Enforcement and compliance	Surveillance Enforcement and compliance mechanisms Interagency/intersectoral collaboration		
Capacity, planning and management	Personnel Budget		

The indicator, **X**, is monitoring **X**. This is related to **X governance objective/commitment/management action**. It was selected because **X**. Please refer to monitoring protocol number **X** in Annex 1. **[repeat for each ecological indicator]**

SOCIO-CULTURAL OBJECTIVES [only if X MPA has this type of objectives]
The socio-cultural objectives of **X** MPA are:

- _____
- _____

SOCIO-CULTURAL INDICATORS [only if MPA has socio-cultural objectives]

This section should include:

- *Why socio-cultural indicators?*
- *Broad categories for filling in with site specific indicators*
- *For each indicator briefly describe*
  - *Explain each indicator*
  - *Why was the indicator selected?*
  - *Linkage to conservation objectives*
  - *Referral to specific monitoring protocol in annex*

SUGGESTED TEXT:

In addition to their primary conservation focus, some *Oceans Act* MPAs **[, such as X MPA],** conserve culturally important resources or marine environments and others **[such as X MPA],** strengthen communities through their educational and recreational opportunities. Through the use of socio-cultural indicators, these added benefits can be monitored and elicit appropriate management actions if needed.

The following table summarizes the socio-cultural indicators being monitored with X MPA. **DFO is responsible for the monitoring of these indicators.**

Socio-cultural Themes	**Indicators**	**Timing**	**Socio-cultural Objective**

The indicator, **X**, is monitoring **X**. This is related to X **socio-cultural objective**. It was selected because **X**. Please refer to monitoring protocol number **X** in Annex 1. **[repeat for each ecological indicator]**

<u>SOCIO-ECONOMIC OBJECTIVES</u> [only if X MPA has this type of objectives]
The socio-economic objectives of **X** MPA are:

- _____

- _____

<u>SOCIO-ECONOMIC INDICATORS</u> [only if X MPA has socio-cultural objectives]

This section should include:

- *Why socio-economic indicators?*
- *Broad categories for filling in with site specific indicators*
- *For each indicator briefly describe*
  - *Explain each indicator*
  - *Why was the indicator selected?*
  - *Linkage to conservation objectives*
  - *Referral to specific monitoring protocol in annex*

SUGGESTED TEXT:

While not always a benefit of MPAs, socio-economic by-products do occur in some *Oceans Act* MPAs, including X MPA. These socio-economic benefits can range from increased employment for local communities to the spillover effect associated with protecting essential fisheries habitat.

The following table summarizes the socio-economic indicators being monitored with X MPA. **DFO is responsible for the monitoring of these indicators.**

Socio-economic Themes	Indicators	Timing	**Socio-economic Objective**

The indicator, **X**, is monitoring **X**. This is related to **X socio-economic objective**. It was selected because **X**. Please refer to monitoring protocol number **X** in Annex 1. **[repeat for each ecological indicator]**

MONITORING PLAN REVIEW

This monitoring plan, for **X** MPA, will undergo a review in **X** year. This review will allow the monitoring plan to reflect changes in monitoring protocols, site uses, and MPA condition.

CHAPTER 7: DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

7.1 Discussion of the Results

Evaluation of MPA networks and systems is a relatively new field of study (Marine Protected Areas Federal Advisory Committee, 2009) and this study has furthered this process for DFO by providing indicators which will be useful for evaluating effective management of *Oceans Act* MPAs. Further refinement of indicators and the monitoring plan template is planned before the methodology can be operational. This will involve further discussion with MPA practitioners and DFO national Headquarters staff to ensure that the recommended tools meet their needs and ensure that their expectations as realistic, as not all recommended indicators are intended for use by all MPAs. Furthermore this is not an exhaustive list of indicators and additional indicators may need to be developed for specific MPAs.

Since all the MPAs are designated and managed under the same legislation, the *Oceans Act*, it was expected that this study would result in both (1) governance, socio-economic, and socio-cultural indicators that were relevant to all of the MPAs and (2) a monitoring plan template flexible enough to accommodate site specific indicators and monitoring. While this goal was accomplished it proved to be more challenging than expected for many reasons, the first of which is that the *Ocean Act* allows MPAs to be designated for a variety of ecological reasons, which can have a large influence on the socio-economic and socio-cultural indicators. The broadness of section *35(1)* of the *Oceans Act* results in very diverse ecological goals and objectives at each site, as they are directly related to the reasoning behind the site designation. Second, socio-economic and socio-cultural objectives are not required for the *Oceans Act* MPAs as it is not part of the

mandate of the Minister under the *Oceans Act*. Effective governance of MPAs is necessary to achieve all types of goals and objectives.

As was previously alluded to, no ecological indicators were recommended in this study, but following the lead of the U.S. Marine Sanctuaries System-Wide Monitoring Program (SWiM) and the North American Marine Protected Area Network (NAMPAN), evaluation questions and scorecards were provided allowing individual MPAs to focus on ecological indicators most relevant to their site. This permits for national reporting to international groups and the public in a concise manner. Furthermore, by doing some preliminary aligning of the monitoring plan template with information pertinent to NAMPAN, monitoring programs should be more efficient with fewer redundancies and gaps. NAMPAN is completing pilot studies of their monitoring program at sites along the west coast of North America and while the evaluation questions posed by NAMPAN are not exactly the same as those being recommended in this study, the similarities are close enough to provide useful information to DFO and NAMPAN (Commission for Environmental Cooperation, 2011).

The majority of the listed indicators and scorecards went through intense modification to be applied to *Oceans Act* MPAs. The majority of the tools and methodologies that were sources for the indicators and scorecards were designed for use by developing countries and in many cases for sites where the focus was more on sustainable development than ecological conservation. This does not mean that *Oceans Act* MPAs are strictly no-take areas, but they have a conservation focus, therefore there are more restrictions of existing activities than the development of sustainable activities

within these MPAs which influenced the development of the indicators, especially the socio-economic and socio-cultural ones.

7.2 Limitations of the Study

7.2.1 Time

Time is the principle limitation of this study and the majority of other limitations described are directly or indirectly related to time constraints. The project was completed within a very small time frame therefore; despite the best efforts of DFO staff members' collaboration was high with Maritimes regional staff and National Headquarters staff but limited with others across Canada. Timing challenges are a reality of life therefore the selection and application of this set of indicators is essentially a 'work in progress'. Following the submission of this study, further work will be done in collaboration with DFO to increase the relevance of the indicators to the Oceans Program and hopefully result in improvement of monitoring in *Oceans Act* MPAs across Canada.

7.2.2 Access to Stakeholders

It is generally recommended that stakeholders be involved in the development and establishment of a monitoring program in an MPA (Hockings et al., 2000) Including stakeholders other than DFO was not possible given the time constraints of this study, which attempted to recommend indicators which could be utilized at multiple *Oceans Act* MPAs with different kinds of stakeholders. I would recommend that this lack of input from stakeholders can be countered by increased stakeholder involvement during the development of the monitoring program for the individual MPA. It would also increase the relevance of the process to stakeholders. Furthermore, when the monitoring plan for

each MPA is reviewed, it is strongly recommended that the input of stakeholders beyond the members of advisory committees, be involved.

7.2.3 Supporting Documents

There are several supporting documents which would be beneficial to this study especially for providing instructions for applying the indicators in the field and analyzing the resulting data. They could not be developed within the time constraints of the study. Eventually, an in-depth guide/supplementary document should be created to increase the consistency of use of the monitoring plan template and indicator toolkit by the MPA practitioners across Canada. This document should explicitly state which indicators should be used by all MPAs and how to select others specific to the needs of the individual site. Furthermore, surveys need to be created. A number of the indicators recommended using surveys as a data source. Guidance on conducting the survey and a template should be created for all the surveys referred to. This will allow for increased consistency across the nation and ensure that MPA practitioners are maximizing the amount of useful information collected. In addition, reporting document templates and guidance documents were also outside the scope of this study. Reporting is considered a component of monitoring and evaluation. However, due to the restrictions of this project, it was not possible to create these documents. While DFO National Headquarters is well schooled in formatting reporting documents for international organizations, it may be useful to provide templates for individual sites to use when reporting to specific groups of stakeholders as well as the general public; similar to the SWiM program in United States marine sanctuaries.

7.2.4 Future MPAs

It is unclear how the recommended indicators will be applied to *Oceans Act* MPAs designated in the future, but due to the flexible nature of the products of this study, it is highly likely that the monitoring plan template will continue to be applicable. Even with the consistent designation framework of the *Oceans Act*, there is already so much diversity in the MPAs currently in existence; it is probable that there will be further expansion in the future. That being said, it does not mean that the indicator toolkit will become obsolete; simply that it may require updating as more effective indicators are identified. Therefore, review of the indicator toolkit is recommended on an on-going basis in the future, similar to monitoring program reviews, to ensure that the selected indicators continue to be the most relevant and effective for the purpose they were created.

DFO is also in the beginning processes of designing bioregional networks of MPAs in collaboration with Environment Canada and Parks Canada. The indicator toolkit recommended in this study is not intended for use in the bioregional networks as their objectives will be different and this will require unique indicators. Furthermore, work is being done on indicators for the bioregional network prior to site designation to avoid a situation similar to the eight existing *Oceans Act* MPAs, where monitoring is being implemented retroactively like the majority of the rest of the world.

7.2.5 Ecological and Ecosystem Goods/Services Indicators

DFO National Headquarters staff in the Policy and Economics department questioned the lack of ecosystem goods and services indicators in the socio-economic indicator category but at this point in time the creation of ecosystem goods and services indicators specific to each site is outside the scope of this study. While not dealt with in

economic terms, many ecosystem goods and services are monitored through ecological, governance, socio-cultural, and socio-economic indicators. It is recommended in the future that the possibility of standardising some of the ecosystem goods and services indicators be explored. The tools of both environmental economics and ecological economics could be employed.

7.2.6 Information Analysis and Management System

An information analysis and management system is also not addressed in this research. While brief methods are provided for monitoring and in some cases, additional procedures accompany the evaluation scorecard, more guidance is necessary in order to increase consistency in reporting as analysis is necessary in order to evaluate management effectiveness.

7.3 Challenges and Sources of Error

7.3.1 Baseline Data

Since the recommended indicators will be implemented retroactively by DFO, baseline data will be a challenge, as some of the *Oceans Act* MPAs have been in existence for over a decade. Fortunately, in the case of the governance indicators some of this information, such as budget, personnel, composition of advisory committee, etc. is already documented to some degree. For other indicators, this will not be possible and could pose a challenge when attempting to determine the socio-economic and socio-cultural role of an MPA.

7.3.2 Monitoring Plans in Existence and in Review

Oceans Act MPAs are in various stages of developing monitoring plans involving an array of indicators. The managers of those MPAs that already have indicators and monitoring plans are unlikely to revise their monitoring plans until their next major review. When selecting indicators all eight current MPAs were considered, whether or not they had or were in the process of developing a monitoring plan, in the hopes that in the future, when reviewing their monitoring plan, managers might consider adding some of the indicators recommended in this study for their site.

7.3.3 CSAS Ecological Indicators

DFO Canadian Science Advisory Secretariat (CSAS) recommends ecological indicators for *Oceans Act* MPAs, therefore many of these documents were reviewed, and it was found that ecological indicators were outside the scope of this project and no recommendations were made. Instead, some generic evaluation questions and scorecards were created which should aid in the internal reporting process at DFO. This could be a source of error as the process used by CSAS for indicator recommendation is very different from the one used in this study. CSAS focuses on relevant indicators that are already being monitored and due to the time constraints of this study, it was impossible to do the same for the governance, socio-cultural and socio-economic indicators recommended in this study. It should be noted that differences in ecological indicators should not lead to significant differences in governance indicators, as the manner in which *Oceans Act* MPAs are governed is dictated by the same legislation and policies across Canada.

7.3.4 Variation in Resources and Capacity at Regional Offices

The capacity and resources at the regional offices varies greatly and this results in challenges for monitoring and evaluation, and a source of error when initially recommending indicators. During this study, time was spent at the DFO Maritimes Regional Office at the Bedford Institute of Oceanography. This region has extensive experience with MPA management as it possesses two established MPAs, The Gully and Musquash Estuary, and is in the final steps of the designation process of St Anns Bank AOI as an MPA. The experience of personnel and capacity of this office, resulted in very high expectations for the other regional offices and the initial recommendations of some indicators that would not be feasible in all regions. This source of error was minimised through the revision of indicators by Maritimes regional office staff with experience in other regions in conjunction with National Headquarters staff.

7.3.5 Diversity of MPA Objectives

There are six DFO regional offices, Central/Arctic, Gulf, Maritimes, Newfoundland/Labrador, Pacific and Quebec, and the MPAs are managed by the office in the appropriate region. This proved challenging as the phasing and types of objectives vary greatly between MPAs. For example, some management plans describe objectives as regulatory and non-regulatory, while others focus on conservation objectives and management objectives. Furthermore, some sites focus more on uses of the site which can vary greatly, when evaluating research and fisheries benefits. In an attempt to minimise this source of error, goals, objectives, management actions, and some context specific to all the MPA were included when attempting to determine the relevance of various indicators to *Oceans Act* MPAs.

7.3.6 Management Plan Review Process

Part of the management cycle of *Oceans Act* MPAs includes the review and adaptation of the management plan. Many of the indicators were based on management actions identified in the management plans. This could be a source of error in indicator identification as changes in the management plans could be planned or in draft format. For the purpose of this study only published management plans, with the exception of Bowie Seamounts and Tarium Niryutait, were used for the compilation of site goals, objectives, and management actions. Bowie Seamount and Tarium Niryutait were a different situation; these management plans had yet to publish their first complete edition therefore drafts were the only possible sources for this information.

7.4 Recommendations

7.4.1 Indicators outside the Jurisdiction of DFO Oceans Program

Some indicators recommended for the toolkit were not well-received by National Headquarters staff as they wanted to focus on indicators where there is the ability to adapt management practices. This is primarily due to resource limitations as well as the logic that monitoring is supposed to confirm the current management decisions or lead to change. It is recommended that some indicators that DFO may not have jurisdiction over or currently may not be able to adapt still be included in the toolkit. Examples of these indicators are: climate change, invasive species, budget, personnel, etc. Some of these cannot be changed because of the current economic climate and others are items that DFO MPA Practitioners do not control. All of these areas, however, have considerable influence over the ability of achieving an MPA's objectives successfully. For example, it is difficult to demonstrate effective governance without satisfactory resourcing.

Furthermore, some activities like climate change monitoring, could provide baseline data for the region (Marine Protected Areas Federal Advisory Committee, 2009). While it may not be reasonable to monitor these kinds of indicators currently, they should be considered in the near future as useful additions to *Oceans Act* MPA monitoring plans.

7.4.2 Reporting Documents

Increasing public awareness and education about *Oceans Act* MPAs is an objective or management action of all current MPAs and reporting on the effectiveness of management is an opportunity to do this, especially for remote sites where visitation by the general public is difficult. The case studies reviewed in this study presented some interesting reporting documents and there are tools to help with the creation of reporting documents already in existence. Internal reporting templates may also be useful for minimizing efforts at regional offices and National Headquarters when DFO needs to report upon the success of their MPA programs.

7.4.3 Research Partnerships for Governance, Socio-economic and Socio-cultural Indicators

Currently, when DFO CSAS recommends ecological indicators for MPAs, there is a focus placed on monitoring and research that is related to the conservation objectives that are already on-going in the area. This allows DFO to create research and monitoring partnerships and synergies and thus reducing the need for additional resources. It is recommended that similar research partnerships be established for some of the governance, socio-cultural, and socio-economic indicators described in this study. By establishing research partnerships, fewer government resources would be needed for monitoring and hopefully, MPAs could expand their monitoring programs to be truly comprehensive much sooner.

7.4.4 Adaptation of Monitoring Plan

It is recommended that each MPA begins with a modest monitoring plan and develop the program over time (Day, 2008). This will allow time for research partnerships to be built, allow practitioners to gain experience in monitoring governance, socio-economic, and socio-cultural indicators, and allow an adaptive process to take place with minimal resource use. The Oceans Program should commit to review the monitoring program in the same manner commitments are made to adapt the MPA management plan. It is recommended that the monitoring program go through review either every 15 to 20 years since the majority of evaluations are recommended to occur every five years. This would allow enough data to be collected to create trends but also enough time that uses or pressures in the MPA would change and require monitoring. This does not mean that if a need arises, appropriate indicators cannot be added ad hoc, but that systematic evaluation of the monitoring program is also an integral part of effective management.

7.5 Conclusion

In conclusion, this study resulted in the recommendation of 19 governance, six socio-cultural, and three socio-economic indicators as well as ecological evaluation scorecards for Canada's *Oceans Act* MPAs. The indicators recommended cover a wide range of components and have been tailored to maximize relevance within the Canadian context. Furthermore, the recommended indicators are accompanied by a monitoring plan template which will improve consistency in indicator measurement across Canada's regional DFO offices.

While the final recommended indicators will be undergoing further consultation with DFO MPA practitioners before being operational, this study has taken work focused on The Gully MPA and Musquash Estuary MPA, and with additional work has created a set of indicators relevant to *Oceans Act* MPAs across the country, thus aiding in the creation of a comprehensive monitoring program for *Oceans Act* MPAs.

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APPENDIX 1: TABLE OF INDICATORS AND SELECTION CRITERIA

Theme	Indicator	Qualities of a Strong Indicator (Schromaker, 1997)						Comments
		Relevant	**Cost effective**	**Measurable**	**Unambiguous**	**Sensitive**	**Total**	
Stakeholder Involvement	Do stakeholders use the opportunities provided by MPA mangers to adequately engage in management activities?	5	5	5	5	5	**25**	Recommended indicator
	Advisory Committee Quorum	3	5	5	2	5	**20**	It appears as though is indicator is attempting to determine if the stakeholders are utilizing the engagement opportunities, but this indicator is a little unclear and lacks sensitive as many variables may influence attendance and it does not leave room for excused absences

	Involvement of external stakeholders	2	5	5	3	5	**20**	Not relevant to *Oceans Act* MPAs as the Advisory Committee is the principle method of engagement of stakeholders. Monitoring this indicator would be setting MPA managers up to fail
	Is the current Advisory Committee membership composition appropriate for the MPA's purpose and uses? Identify gaps.	5	5	5	5	5	**25**	Recommended indicator
	Is the information generated from research and monitoring activity in the MPA reported to the Advisory Committee?	2	5	5	3	5	**20**	The relevance for this indicator is a little unclear: is this an attempt at monitoring the communication between the managers and the stakeholders? A stakeholder survey is recommended to gain a better understanding of these kinds of factors
	Level of training provided to stakeholders in participation	2	5	5	2	5	**19**	Training stakeholders is not an objective and may not be occurring if stakeholders can

								participate meaningfully without it
	Do MPA managers create sufficient opportunities to interact with key stakeholders to meet management requirements?	5	5	5	5	5	**25**	Recommended indicator
Education, stewardship and outreach	What education, outreach, and stewardship materials and/or activities have been generated during the evaluation period and are they adequate to promote public and user awareness of the MPA?	5	5	5	5	5	**25**	Recommended indicator
	Is there a planned education programs?	2	5	4	4	1	**16**	This indicator is not very informative for *Oceans Act* MPAs. Planned educational programs do not mean that the public was actually educated or engaged. Due to the type of monitoring and evaluation being conducted, finding out what has been generated is more useful than what was planned. Focus is on

								outcomes and outputs rather than planning.
	A strategy for information sharing is developed to allow information sharing/exchange among managers, the local public, government and scientists	2	5	4	4	1	**16**	Once again, education and stewardship are objectives for the majority of the MPAs and due to the fact they have all been in existence for many years and the majority possess these plans, it may be more useful to focus on what has been distributed rather than the planning process. Focus is on outcomes and outputs rather than planning.
	Does the MPA have an up-to-date website with relevant content? What is the date of the latest update?	2	5	4	4	4	**19**	While very specific to *Oceans Act* MPAs the breadth of this indicator is very narrow. It is recommended that information about the website may be included in responses to one of the broader indicators being recommended.
	Is an MPA email account used as a means	2	5	4	3	4	**18**	While very specific to *Oceans Act* MPAs the

	of engaging with the public?							breadth of this indicator is very narrow. It is recommended that information about the email account may be included in responses to one of the broader indicators being recommended.
	How effective is the education/outreach program in engaging individuals to learn about MPAs?	5	5	5	5	5	**25**	Recommended indicator
	Visitor/user understanding and satisfaction levels	3	5	5	4	5	**22**	This indicator is not relevant to all *Oceans Act* MPAs therefore it is recommended that it be placed in a "toolkit" as it will be relevant at some sites
	What research and monitoring is occurring in the MPA, and is it sufficient to support adaptive management?	5	5	5	5	5	**25**	Recommended indicator

	How many scientific publications are produced from the research and monitoring occurring in the MPA per year and is the level of publication adequate given the amount of research occurring in the MPA?	5	5	5	5	5	**25**	Recommended indicator
	Are research and monitoring activities coordinated to minimize conflicts, duplicate activities and unnecessary intrusions in the area?	5	5	5	5	5	**25**	Recommended indicator
	Are the results of the research and monitoring that takes place within the MPA made available to the MPA managers in a timely fashion?	2	5	5	3	5	**20**	This indicator is not as relevant as the others recommended for use. While timeliness could influence the ability to use research and monitoring activities for adaptive management, for sites that have not been evaluating their management effectiveness, it may be more important to focus on the use of

								research in adaptive management
	Have research and monitoring results, TEK, and/or scientific advice influenced management activities by triggering adaptive management of the MPA during the evaluation period?	4	5	5	4	5	**23**	While adaptive management is important, this information can be included in the broader indicator focused on management in general, as not all the sites list adaptive management as a guiding principle
	Annual number of research and monitoring programs directly in support of TNMPA and costs of those projects	3	5	5	3	4	**20**	Amount of research is included in another indicator and it is not clear what is to be gained by monitoring the costs of research projects
	Presence of a monitoring and reporting system	3	5	3	5	1	**17**	More of a planning indicator while the monitoring plan template is focused on outcomes and outputs of management

	Has a process been developed to approve activities within the MPA? What activities have occurred in the MPA during the evaluation period that are not covered by the current approval process?	5	5	5	5	5	**25**	Recommended indicator
	For activities that have an approval process, is the process adequate to address proponent and MPA management needs? Identify any problems and/or inconsistencies and suggest changes to improve the process if applicable	5	5	5	5	5	**25**	Recommended indicator
	Allowable and restricted activities are clearly defined for the protected area	3	5	5	5	1	**19**	More of a planning indicator while the monitoring plan template is focused on outcomes and outputs of management
	Numbers of authorised people accessing reserve	4	5	5	2	5	**21**	The purpose of this indicator is a little unclear: Is this supposed to be an estimate of the amount of authorised

								disturbance to the MPA? Should be able to determine this information in a different manner
	Extent of unauthorised access	4	5	5	3	5	**22**	
	Extent of disturbance from: authorised activities and unauthorised activities or other anthropogenic cause	4	5	2	3	5	**19**	May be challenging to discern the source of disturbance between authorised and unauthorised activities because in some cases it may be similar. Information concerning disturbance form human activities needs to be included somewhere though, most likely in the biophysical/ecological indicators
	Annual number of FA application for letter of advice or authorizations for activities related to development of SDLs	2	5	5	3	5	**20**	Very specific can the information it would provide could be included in a broader indicator
	Annual number of applications for disposal at sea under the CEPA for Ocean dumping	2	5	5	3	5	**20**	Very specific can the information it would provide could be included in a broader indicator

Enforcement and compliance	Are existing enforcement and compliance mechanisms adequate to support goals and objectives of the MPA?	5	5	5	5	5	**25**	Recommended indicator
	Is MPA surveillance coverage adequate? Identify gaps, emerging technologies and new opportunities.	5	5	5	5	5	**25**	Recommended indicator
	Percentage of violations (per occurrence and per intervention) for both DFO-Oceans enforced and partner enforced regulations	2	5	5	5	5	**22**	While compliance is an important factor in management effectiveness, enforcement and non-compliance is not under the jurisdiction of DFO but rather a collaborative effort with other agencies and organizations
	Number of officially reported incidences of non-compliance per annum (no.)	2	5	5	5	5	**22**	While compliance is an important factor in management effectiveness, enforcement and non-compliance is not under the jurisdiction of DFO but rather a collaborative effort with other agencies and organizations

	Number of successful prosecutions per annum (no.)	2	5	5	5	5	**22**	Often issues of non-compliance are not dealt with prosecution; other mechanisms include warnings and fines
	Number of "unofficial" incidences of non-compliance per annum (no.)	1	5	1	3	5	**15**	
	Number of patrols per time period	2	5	5	3	5	**20**	Some MPAs will require fewer patrols due to their location, the types of anthropogenic activities permitted in the MPA, or the activities occurring in the vicinity
	Is MPA regulatory training provided for enforcement personnel?	1	5	5	4	5	**20**	MPA Managers do not complete the enforcement of the sites therefore this indicator is not in their control
	Are interagency/intersectoral communication, planning, and procedural mechanisms adequate to support MPA enforcement and compliance?	5	5	5	5	5	**25**	Recommended indicator

	Resource user compliance with conservation regulations	4	5	5	5	4	**23**	
	Local understanding of MPA rules and regulations	3	5	5	5	5	**23**	
	Notices of regulatory requirements distributed	4	5	5	3	2	**19**	
	Access to and transparency and simplicity of management plan ensured and compliance fostered	4	5	5	5	2	**21**	
	The community has a low tolerance for illegal activities and reports illegal actions to authorities	5	5	5	5	5	**25**	Recommended indicator
	Do users and other non-government partners participate in surveillance activities?	5	5	5	5	5	**25**	Recommended indicator
Conflict resolution	How many conflicts have occurred?	2	5	5	5	5	**22**	
	User conflicts managed and/or reduced: within and between user groups and/or between user groups and the local community or between the community and people outside it	5	5	5	5	5	**25**	Recommended indicator

	A mechanism for conflict resolution is identified and used.	5	5	3	5	1	**19**	MPA managers usually use informal methods to mitigate conflict and have received training in conflict resolution therefore the above indicator would be more useful to monitor.
Capacity, planning and management	Are existing regulations/legislation sufficient to support the goals and objectives of the MPA? If not, identify gaps	5	5	5	5	2	**22**	
	Availability and location of MPA administrative resources	3	5	5	3	4	**20**	
	Are there adequate personnel to support MPA management? List contributing personnel hours, and identify shortfall if applicable.	5	5	5	5	5	**25**	Recommended indicator
	Is the annual budget allotted to MPA management staff adequate for MPA management? List annual budget and estimate shortfall if applicable	5	5	5	5	5	**25**	Recommended indicator

	What training has management staff completed during the evaluation period that supports the achievement of MPA goals and objectives?	3	5	5	3	5	**21**	Training can be included in the indicator concerning "adequate" personnel by making it clear that "adequate" personnel would have the training needed to effectively complete their duties.
Traditional harvest/access	Do regulations consider traditional access/harvest?	4	5	5	5	5	**24**	Recommended indicator
	Consumption of marine resources by Indigenous peoples	4	5	5	3	4	**21**	Consumption of marine resources and secure livelihoods are not objectives and not really relevant to the vast majority of the *Oceans Act* MPAs. This should be considered for the toolkit though as it may be applicable in the Arctic
	Maintenance of sustainable use of natural, cultural and archaeological resources based on traditional use	4	5	5	4	5	**23**	Recommended indicator
	Use of the TNMPA for subsistence harvesting	4	5	5	3	5	**22**	Very specific to some sites therefore should be considered for

								toolkit
	Perception of health of TNMPA marine ecosystem directly linked to Aboriginal culture	3	5	5	3	4	**20**	Very specific to some sites therefore should be considered for toolkit
Input to management decisions	Do indigenous and traditional peoples regularly using the MPA have input to management decisions?	5	5	5	5	5	**25**	Recommended indicator
	Inventory of socio-cultural resources	1	5	3	4	2	**15**	
	Local values and beliefs about marine resource	3	5	5	4	4	**21**	
	Have adverse effects on traditional practices been avoided or minimised?	4	5	5	4	4	**22**	Very specific to some sites therefore should be considered for toolkit
	Measures of community wellbeing	2	5	5	4	4	**20**	
	Assessment of overall costs/benefits to communities	2	5	4	4	5	**20**	
	Hydrocarbon development	3	5	5	3	5	**21**	Mentioned in a single management action therefore too specific to be truly relevant-consider for toolkit
	Tourism	3	5	5	3	5	**21**	
	Transportation	3	5	5	3	5	**21**	
	Harvesting	3	5	5	3	5	**21**	

Employment related to TNMPA (monitoring, surveillance, logistical support or administrative support)	1	5	5	5	5	**21**	The creation of employment opportunities is not the objective or management action of any MPAs
Practices and intensity of local use of marine resources	4	5	5	3	5	**22**	Would be covered more specifically through indicators designed by CSAS covering human pressures
Employment in activities related to marine resources	3	5	3	3	5	**19**	Some types of employment may be challenging to pinpoint location activities are occurring in or attribute to MPA
Perception and appraisal of marine resources based on local culture	2	5	5	4	5	**21**	
Types of important fish and invertebrates for household use, consumption, sale, and cultural value	1	5	5	4	5	**20**	
Benefits of MPA to household and community	4	5	3	4	5	**21**	Some types of employment may be challenging to pinpoint location activities are occurring in or

							attribute to MPA
Perceptions of non-market and non-use value	2	5	5	4	5	**21**	
Material style of life	2	5	5	1	5	**18**	
Quality of human health	1	5	5	1	5	**17**	
Perceptions of local harvest	4	5	5	3	5	**22**	
Local marine resource use patterns	4	5	5	3	5	**22**	
Household income distribution by source	3	5	5	3	5	**21**	
Number and nature of markets	1	5	3	3	5	**17**	May be challenging to measure specifically for the MPA and difficult to determine what the results really mean
Community infrastructure and business	1	5	5				
Are visitor experiences in the MPA improving?	1	5	5	5	5	**21**	Since visitor access is not the objective of the *Oceans Act* MPA program this indicator is incorporated into other indicators

What are the attitudes and perceptions of users and their recreational experience and how has that changed over time?	1	5	5	4	5	**20**	Not designated for recreational use
Has commercial catch or income changed for the statistical area(s) affected?	4	5	5	5	5	**24**	Recommended indicator
Have impacts financially harmed or benefited individual businesses? Have impacts harmed or benefited local and/or regional economies?	4	5	3	4	5	**21**	Individual businesses may be challenging due to changes in marine resource use patterns and how adding pressure in some areas and reducing it in others effects economics
Are use, attendance and visitation changing over time?	5	5	5	4	5	**24**	Recommended indicator
How many companies and jobs are associated with identified uses and how has this changed over time?	1	5	5	4	5	**20**	
Are regulations affecting users being complied with?	5	5	5	5	5	**25**	Recommended indicator
What uses are being made of the area, where do the uses occur, and how do they affect	5	5	4	4	4	**22**	Indicators related to human pressures are designated by CSAS and are more specific

	species and habitat?							to each site
	Are there programmes that consider local people's welfare whilst conserving the sites resources?	1	5	5	4	5	**20**	
	Is visitor access sufficiently controlled?	2	5	5	4	5	**21**	Since visitor access is not the objective of the *Oceans Act* MPA program this indicator is incorporated into other indicators. Also difficult to isolate effects of visitors to determine if sufficiently controlled as it is often accompanied by other pressures (fishing, pollution,etc.)
	Do local communities resident or near the protected area have input to management decisions?	4	5	5	5	5	**24**	Recommended indicator

	Is the protected area providing economic benefits to local communities (e.g. income, employment, payment for environmental services)?	4	5	5	5	5	**24**	Recommended indicator

APPENDIX 2: TABLE OF *OCEANS ACT* MPAS' GOALS, OBJECTIVES AND MANAGEMENT ACTIONS

MPA	Context	Goals	Objectives	Management Action	Categorization
Basin Head (Fisheries and Oceans Canada, 2009)	Size:2,227 hectares Purpose: to conserve and protect a unique species of Irish moss (*Chrondrus*	To maintain the unique Irish moss species and habitat [primary conservation objective]	Maintain the quality of the marine environment supporting the *Chondrus crispus* [Secondary conservation objective]		Ecological

	crispus)				
	Surrounding area: rural agrarian -strong local support for designation -Abegweit and Lennox Islands First Nations and the Mi'kmaq Confederacy of PEI		Maintain the physical structures of the ecosystems supporting the *Chondrus crispus* [Secondary conservation objective]		Ecological
			Maintain the health (biomass and coverage) of the Basin Head *Chondrus crispus* [Secondary conservation objective]		Ecological
			Maintain the overall ecologocal integrity of the Basin Head lagoon and inner channel. *Ulva* growth, maintenance of adequate oxygen levels, and maintenance of diversity of indigenous flora and fauna [Secondary conservation objective]		Ecological

	-threats: eutrophication, stability of entrance channel/dune structure (flushing rates), erosion from land, invasive species		To ensure the participation of interested and affected stakeholders in the operation of the MPA	-Continuation of Advisory Board meetings to ensure stakeholders support and involvement -Investigate the possibility of establishing an Irish moss centre of expertise within the area -Increase Aboriginal involvement in the MPA	Governance-Stakeholder Involvement
			To promote scientific research to increase the level of understanding of the Basin Head MPA	-To continue to collaborate with Island Nature Trust and the University of PEI to meet the monitoring requirements identified in the Operational Management Plan	Governance-Research, monitoring and other permitted activities

				-Development of Activity Plans and Approvals as outlined in Section 5.0 of the Basin Head MPA Regulations -To continue to identify potential partners for collaborative research projects	
			To maintain and enhance the quality of the Basin Head ecosystem	-To continue to collaborate with Island Nature Trust and University of PEI to meet the monitoring requirements identified in the Operational Management Plan -Development of Activity Plans and Approvals as outlined in Section 5.0 of the Basin Head MPA Regulations	Governance-Research, monitoring and other permitted activities

				-To implement best management practices to reduce the impact of nutrient enrichment on marine environmental quality within the Basin Head ecosystem -To reduce the spread of aquatic invasive species in the Basin Head ecosystem	
			To increase the public awareness of the *Chrondus crispus*, the ecosystem of the Basin Head MPA and its conservation measures	-To develop a Basin Head MPA website -To enhance the existing on site laboratory to maximize education potential -To increase public awareness through publication of brochures and involvement in community events -Support the establishment of an Irish moss centre of expertise within the area	Governance-Education, stewardship, and outreach

Bowie Seamount (D.Freethy, personal communication, May 21, 2013)			Conserve and protect the unique biodiversity, structural habitat and ecosystem function of the SK-B MPA		
			Impacts from human activities shall not compromise the conservation and protection of biodiversity, structural habitat and ecosystem function of the MPA	Impacts from fishing shall not compromise the conservation and protection of the MPA	
				Impacts from vessel traffic shall not compromise the protection of the MPA	
				Impacts from scientific research and monitoring activities shall not compromise the conservation and protection of the MPA	
				Impacts from marine tourism activities shall not compromise the conservation and protection of the MPA	
			Effective monitoring of natural ecosystem variability and impacts related to human activities, will support the conservation and protection	A monitoring plan will increase understanding of biodiversity, structural habitat, and ecosystem function of	

			of the biodiversity, structural habitat and ecosystem function of the MPA	the MPA	
				Monitoring results will be used to inform a management decisions and contribute to the conservation and protection of biodiversity, structural habitat and ecosystem function of the MPA	
			Best science, Haida traditional knowledge and local knowledge will inform a comprehensive understanding of the biodiversity, structural habitat and ecosystem function of the MPA	Best science, Haida traditional knowledge and local knowledge will be compiled support decision making	
				Knowledge gaps will be assessed and research priorities will be established to fill gaps and inform MPA management	

				Collaborative relationships and open sharing of information and knowledge will contribute to the conservation and protection of the MPSA	
			Cooperative management of the MPA will result in a plan that is adaptive and responsive	Cooperative management of the MPA achieves coordinated, integrated and effective management decision-making	
				Periodic review and revision of the management plan as necessary will contribute to the conservation and protection of the MPA	
			Increased awareness about the MPA will contribute to the conservation and protection of biodiversity, structural habitat and ecosystem function of the MPA.	An outreach strategy will increase awareness of the MPA among responsible agencies, stakeholders and other interested parties	

Eastport (Fisheries and Oceans Canada, 2007a)	Size: 2 closed areas (Round Island and Duck Island)= 2.1 km2 Purpose: -7 core communities and Eastport Peninsula has relied heavily on fishing for generations		The protection and sustainable fishery of the local American lobster (*Homarus americanus*) population		Ecological
			To maintain a viable population of American lobster through conservation, protection, and sustainable use of resources and habitats		
			To ensure the conservation and protection of threatened or endangered species		
			To ensure participation of interested and affected stakeholders and the overall management of the resource	-Continuation of steering committee meetings to ensure stakeholder support and involvement -Annual Science Briefing Meeting -Annual Regional MPA Science Workshop	Governance-Stakeholder involvement

				-Annual Public Meeting -Investigate the possibility of conduction a feasibility study for a Lobster Science Interpretation Center/Science Station.	
			To increase stewardship and public awareness of lobster, the ecosystem of Eastport MPAs and marine conservation measures	-To develop, produce, and distribute future issues of the Coastal Current -Maintain Eastport MPAs website -To increase public awareness through publications of brochures, involvement in community events, promote education participation in festivals -To support a feasibility study for a Lobster Science Interpretation Center/Science Station	Governance-Education, stewardship and outreach

			To promote scientific research to increase levels of understanding regarding the East port MPA ecosystem and to help achieve the conservation objectives	-Collaboration with Newfoundland and Labrador Legacy Nature Trust to meet needs for at sea sampling data collection, tagging data collection, and a community coordinator in 2006 -Development of the collaborative agreement with Memorial University in 2007 to provide scientific support for MPA related research -Development of Activity Plans and Approvals as outlined in Section 5.0 in the MPA Regulations -Renewal of collaborative agreement with MUN on an annual basis	Governance-Research, monitoring and other permitted activities

			To ensure potential economic benefits resulting from conservation of the resource are centred in the local communities of the Eastport Peninsula; and to maintain and enhance the quality of Eastport ecosystem	-Limitation of commercial lobster fishing rights to traditional users within the EPLMA will continue in the future to help ensure possible economic benefits related to the lobster fishery stay within the area -To increase tourism in the area through increased public awareness materials such as signage, brochures, participation in public events, etc. -To increase economic benefits through expenditures associated with research activities in the area, This is closely related to increasing the promotion of scientific research in the area	Socio-economic-Livelihoods and food security

				-To investigate further possible economic benefits associated with the MPA such as a Lobster Science Interpretation Centre/Science Station -To investigate the benefits of eco-labeling	
			To maintain and enhance the quality of the Eastport ecosystem	-Initiate invitation to local fish plant owners to attend Best Management Practices Workshop -Initiate a public awareness program with respect to marine debris -Monitor fish plants for improper offal dumping and effluent disposal -Investigate alternate use for fish offal to reduce or eliminate offal dumping at sea	

				-Implement best management practices to reduce the impact of fish plant effluent on marine environmental quality.	
Endeavour Hydrothermal Vents (Fisheries and Oceans Canada, 2010)	-high density of hydrothermal vents therefore one of the most scientifically interesting and extensively studied venting regions in the ocean -"The designation of the Endeavour Hydrothermal Vents as a Marine Protected Area will provide for the long-term protection of this biologically		Ensure that human activities contribute to the conservation, protection and understanding of the natural diversity, productivity and dynamism of the ecosystem and are managed appropriately such that the impacts remain less significant than natural perturbations	-Develop annual report -Review annual reports and perform overall review every five years -Develop annual work plan	Governance-Capacity, planning and management

	diverse and productive ecosystem” -no substantive First Nation interests in the EHV MPA but may be in the future (Nuu-chah-nulth Tribal Council Treaty claim)			-Identify research/management priorities -Develop monitoring framework to assess MPA effectiveness -Maintain communication with DFO Conservation and Protection Branch and the Department of National Defence regarding Endeavour MPA enforcement	

				requirements -Obtain surveillance coverage information from DFO Conservation and Protection Branch	Governance-Enforcement and compliance
			Contribute to public awareness of the values of marine ecosystems and the	-Implement Outreach plan	Governance-Education, stewardship and

			need to protect them	-Develop Education plan -Update Endeavour web material -Formalise photography use agreement-facilitate ease of release for educational purposes -Develop key outreach materials for EHV users -Advise appropriate vessel scheduling/access authorities of Endeavour cruise planning/reporting requirements; provide outreach materials for dissemination to EHV users	outreach
			Coordinate human activities to ensure responsible procedures are followed (e.g. sampling, instrument deployment and retrieval, data sharing, appropriate	-Apply Research Activity Review Framework consistently for foreign and domestic research requests	Governance-Research, monitoring and other permitted activities

			debris disposal)	-Manage, review and respond to access requests with guidance from TAC where appropriate -Apply guidance of access to encourage collection of needed information -Obtain biological/compliance data from cruise reports, logbooks, video, etc. -Improve timely follow-up through cruise plans and post cruise reporting -Develop monitoring strategy with DFO Science -Develop detailed gap analysis -Use geo-referenced database (MSS) to enhance coordination of vessels, instruments, sampling; reduce areas of duplicate effort and	

				multiple sampling	
				-Improve mapping data (resolution/accuracy); incorporate into MSS and management approach	
Gilbert Bay (Fisheries and Oceans Canada, 2007b)	Size: Vision: To sustainably manage the marine ecosystem, habitats, and species of Gilbert Bay as a community united by its people, culture and mutual		The conservation and protection of the Gilbert Bay cod and its habitats	-Ensure commercial fishing for cod does not take place within the MPA -Ensure recreational fishing for cod does not take place within the MPA -Monitor the cod population in Gilbert Bay	Ecological

	desire to share with future generations -key communities: Port Hope Simpson and William's Harbour -community and fish harvester approached DFO			-Identify critical habitats for Gilbert Bay cod -Ensure scientific research is for the purpose of conservation, protection, ecological understanding or improvement of the Gilbert Bay MPA -Ensure water quality is maintained -Understand the predator-prey relationship of cod in Gilbert Bay		

	-Steering Committee looking at ways in which the MPA can assist in environmentally sustainable economic development within their region (tourism and transportation)				Governance-Research, monitoring and other permitted activities
			The facilitation of scientific research opportunities on the Gilbert Bay ecosystem	-Encourage appropriate scientific research and partnerships -Collaboration with Newfoundland and Labrador Legacy Nature Trust to meet	Governance-Research, monitoring and other permitted activities

				needs of a community coordinator in 2006 -Renewal of the collaborative agreement with Memorial University in 2007 to provide scientific support for MPA related research -Development of Activity Plans and Approvals as outlined in Section 5.0 in the MPA Regulations -Encourage honours, graduate and doctoral students to focus their research on understanding the Gilbert Bay ecosystem -Renewal of collaborative agreement with MUN -Continued partnership with LMN for additional patrol in Gilbert Bay by river guardians	

			The promotion of public awareness, education, and support of the Gilbert Bay MPA	-Raise public awareness and education -To develop, produce and distribute future issues of the Coastal Current -Maintain Gilbert Bay MPA Website -Develop an educational package -Continue participation at annual Golden Cod Festival -Encourage LMN in educational/public awareness intiatives -Continuation of steering committee meetings to ensure stakeholder support and involvement -Annual Science Briefing Meeting -Annual Regional MPA Update and Science Workshop	Governance-Education, stewardship and outreach

				-To increase public awareness through publication of brochures, involvement in community events, promote education and participation in festivals	
			The conservation and protection of the Gilbert Bay ecosystem	-Describe the inter-tidal and sub-tidal biotopes -Identify the importance of Gilbert Bay for marine mammals -Monitor the impacts of fishing activities with Gilbert Bay -Monitor potential impact of forestry operations in the watersheds associated with Gilbert Bay -Support environmental impact assessments for proposed new developments	Ecological
Musquash Estuary (Fisheries and Oceans Canada, 2008a)	Vision: Conservation and protection of the MPA and AIA marine	The conservation objectives are to ensure no unacceptable	Biodiversity by maintaining the diversity of individual species, communities, and populations within the different ecotypes		Ecological

	ecosystem	reduction or human-caused modification in:	Productivity so that each component (primary, community, population) can play its role in the functioning of the ecosystem by maintaining abundance and health of harvested species		
			Habitat in order to safeguard the physical and chemical properties of the ecosystem by maintaining water and sediment quality		
Tarium Niryutait (Fisheries and Oceans Canada and Fsheries Joint Management Committee, 2012)			To conserve and protect beluga whales and other marine species, their habitats and their supporting ecosystem		
The Gully (Fisheries and Oceans Canada, 2008b)	Vision: To protect the marine ecosystem of the Gully MPA for future generations by providing	Protecting the ecological integrity of the Gully which includes the natural biodiversity, productivity,	Protect the natural biodiversity		Ecological
			Protect the health and integrity of the Gully Ecosystem		

	effective programs for management, conservation, research, monitoring and stewardship	and ecosystem components, functions and properties	Maintain the productivity of the Gully ecosystem		
			Promote collaboration among all users, regulators and other interests		
		Establish effective management of the Gully MPA	Involve stakeholders and the general public in the management of the MPA		Governance-Stakeholder Involvement
			Establish co-operative agreements with responsible regulatory authorities to meet objectives for the MPA		Governance-Capacity, planning and management
			Ensure that human activities within the MPA are consistent with Regulations and the conservation objectives		Governance-Enforcement and compliance
			Increase understanding of the Gully ecosystem among regulators, user groups, and the public		Governance-Education, stewardship and outreach
		Promote stewardship activities	Promote active participation and engagement in management and research		Governance-Education, stewardship and

			Increase our understanding of the Gully and the potential for human impacts on this ecosystem		outreach
		The research objectives aim to develop a better understanding of the Gully ecosystem through research and monitoring of natural processes and the effects on human activities	Foster collaboration and communication among managers and natural and social scientists		Governance-Research, monitoring and other permitted activities
			Provide managers with accurate and timely information on the state of the Gully ecosystem and potential threats to conservation and management objectives		